

The Structure of Dairy Markets: Past, Present, Future. By Alden C. Manchester and Don P. Blayney. Commercial Agriculture Division, Economic Research Service, U.S. Department of Agriculture. Agricultural Economic Report No. 757

Abstract

The U.S. dairy industry, many segments of which supported dairy policy changes in the 1996 Federal Agriculture Improvement and Reform Act, is much different than it was 20 or even 10 years ago. This report provides a historical overview of the industry, more detailed examinations of the fluid milk market and selected manufactured dairy product markets, a discussion of future prospects and trends in the industry, and some thoughts on the implications of those prospects and trends for dairy farmers and their organizations, processors, dairy product manufacturers, and retailers.

Keywords: Dairy, butter, cheese, nonfat dry milk, market structure, pricing, competition

Note: Use of brand or firm names in this publication does not imply endorsement by the U.S. Department of Agriculture.

Foreword

Our objective in this report is to bring up to date the information on the structure of markets for dairy products such as that provided in Manchester, 1983, and Cook and others, 1978. Changes in public programs brought about by the Federal Agriculture Improvement and Reform Act of 1996 will affect market structure to some extent, although not nearly as much as complete deregulation would have. The changes will not be completely known (or observed) until 1999 when revised milk marketing orders will be implemented.

The data on fluid milk market structure, up through 1970, are from Manchester, 1983. For 1980 and 1988, the data are from Lough (1981 and 1991), with adjustments made to make market categories more comparable to those of earlier years. The 1993 figures are entirely our own estimates.

We appreciate the reviews by our colleagues Bill Gillmeister, formerly in the Animal Products Branch, Commercial Agriculture Division, ERS, USDA, now with the Massachusetts Department of Agriculture; Ken Mathews and Jim Miller, in the Animal Products Branch, Commercial Agriculture Division, ERS, USDA; Jim MacDonald in the Food Markets Branch, Food and Consumer Economics Division, ERS, USDA; Carolyn Liebrand of Cooperative Services, Rural Business-Cooperative Service, USDA; Robert Miller of the Dairy Division, Agricultural Marketing Service, USDA; and Richard Kilmer at the University of Florida.

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Summary

The 1996 Federal Agriculture Improvement and Reform Act fundamentally redesigned Federal farm policies for the producers of many commodities, including milk. The act will phase out dairy price supports and reform the Federal milk marketing order system. The debate on dairy policy and programs in the act was marked by something different—many in the industry supported a reduced Federal role in the dairy economy. While conclusions on the effects of the policy changes would be speculative at this point, we do know one thing for certain—the dairy industry that supported changes is much different than it was 20 or even 10 years ago. This report provides a broad historical overview of the U.S. dairy industry, detailed examination of the fluid milk market and selected manufactured dairy product markets, and a discussion of some possible future trends.

Restructuring has been a characteristic of the dairy industry at all levels in the last 50 years. Farming has changed from an operation that depended heavily on human and animal labor to one where most operations, including milking, are mechanized. Farms with 100 cows were considered large in 1950. Today, there are many dairy farms with 5,000 cows, especially in the West. Milk assembly has shifted from the processor picking up 40-quart cans at the farm in a truck to dairy cooperatives pumping milk from bulk tanks into large tank trucks for delivery to processing or manufacturing sites. Over half of the milk delivered in 1950 was to the home in quart bottles. Today, that share is 2 percent, with most milk sold through supermarkets in gallon jugs. Cheese, butter, ice cream, yogurt, and other dairy products are now mostly branded products sold in supermarkets.

Technological developments have changed the way things are done on the farm, in assembly, in processing, and in distribution. At every level, economies of scale (the costs in large operations vs. smaller ones) have led to fewer and larger operations. The kinds of firms changed drastically in response to cost pressures and pressures from investment markets.

Both total and per cow milk production increased during 1970-95. Production has grown in the Southern Plains, Mountain, and Pacific regions at rates that have led to changes in the regional pattern of production. Farm numbers have declined and herd size has increased, but ownership and production remain firmly in the hands of individuals and families.

Dairy cooperatives and private companies supply milk and manufactured dairy products. The numbers of both have declined over time. About 86 percent of the milk sold to plants and dealers in 1994 was handled by cooperatives, up from 76 percent in 1973. There are two major types of dairy cooperatives: bargaining-only and manufacturing/processing. In 1992, about 68 percent of dairy cooperatives could be considered bargaining-only. Dairy cooperatives are expected to continue to be major players in the milk market.

For much of this century, eight large specialized dairy companies dominated the marketing of fluid milk and manufactured dairy products. The significant role played by these companies from the 1930's into the 1970's shaped the structure

of the period and the nature of competition. Since then, corporate restructuring through mergers, acquisitions, and divestitures has taken many of them out of business and others out of all or most aspects of dairy. Foreign-owned companies also have been more involved in U.S. dairy markets in recent years, particularly in ice cream, yogurt, and cheese.

Since 1950, large companies have increased their collective share of dairy processing, with the increase mostly from large cooperatives, although large U.S. proprietary (noncooperative) companies increased their share from 1950 to 1975. Large foreign companies raised their share 11 percentage points during the 1950-94 period as additional foreign companies entered the U.S. dairy industry by purchasing U.S. firms. Most large corporations in the dairy industry now concentrate on core businesses in branded products—cheese, yogurt, and premium and super-premium ice creams.

Several markets are examined in the report: bulk raw milk, bulk natural cheese, processed cheese, butter, packaged fluid milk products, frozen desserts, and ingredients (dry milk products). Each market is unique with respect to characteristics and participants. Several companies are active in several markets, with no one company involved in all markets. Cooperatives have been most important in the manufactured product markets, while proprietary firms have gravitated toward fluid milk processing and frozen products, with interests in yogurt and cheese as well.

Fluid milk processing has changed dramatically during the last 40 years as large dairy companies, supermarket chains, convenience stores, and, to a lesser extent, cooperatives have participated in the business. Fluid milk plant numbers fell from almost 10,000 in 1940 to 478 in 1995, while average size increased.

In the 1950's and 1960's, home delivery of fluid milk was dominant but supermarket and dairy store sales were increasing. Fluid milk processors were numerous in most markets. Competition generally was carried on behind the peaceful facade of adherence to the going price structure. All market participants recognized the potential impacts of unfettered competition.

However, the markets could not always assimilate the changes taking place in the fluid milk business, and price wars commonly marked such adjustments. Current competitive conditions in the fluid processing industry rest on a fundamental change in distribution—the switch from home delivery to supermarket sales with centralized buying by chains and retailer groups.

Market power has shifted to retailers and those who service retail outlets. Among nonfluid dairy products, cooperatives dominate the butter and ingredient markets, and private firms the frozen products market. The natural cheese market is shared—43 percent cooperative, 57 percent proprietary firms in 1992. Cooperatives mainly supply American-style cheeses, while proprietary firms supply the largest proportion of Italian varieties.

As in the fluid industry, plant numbers in all of the product markets have declined, while average size (volume produced or sold) has increased. Pricing of all manufactured dairy products, except for frozen products, generally involves

so-called formula pricing where buyers and sellers use a quoted reference price, commonly from an exchange, and various adjustments to establish prices. In recent years, this pricing method has come under fire. Frozen products tend to be priced almost according to “what the market will bear,” partly because of increased demand for superpremium ice creams and for nonfat products.

What does the future hold for dairy markets? Dairy farmers, who supply a highly standardized raw material to processors, will have few opportunities to market differentiated identity-preserved products, except perhaps organic or non-bST milk. (bST, bovine somatotropin, is a growth hormone that increases a cow’s milk production.) The most likely ways for dairy farmers to earn premiums will be in larger volume or in higher percentage of ingredients such as protein or butterfat.

Dairy cooperatives could face a significant change in role as public dairy programs are either reduced or eliminated. Members may expect them to make efforts to reduce price volatility, set production quotas to limit milk production, spend more time managing product supplies and inventories, and expand marketing activities related to sales. However, as the cooperatives have grown, their membership has become more diverse, meaning maintaining member satisfaction may be more difficult.

The Structure of Dairy Markets

Past, Present, Future

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Introduction

The dairy industry has been dramatically restructured at all levels in the last 50 years. Farming has changed from an operation heavily dependent on human and animal labor to one where most operations, including milking, are mechanized. Farms with 100 cows were considered large in 1950. Today, those with 5,000 head are numerous, especially in the West. Milk assembly has shifted from 40-quart cans picked up at the farm by the processor's truck to bulk tanks being pumped into large tank trucks, most operated or hired by dairy cooperatives, for delivery to processing or manufacturing sites. In 1950, over half of the milk delivered was to the home in quart bottles; nowadays that share is 2 percent, with most milk sold through supermarkets in gallon jugs. Cheese, butter, ice cream, yogurt, and other dairy products are now mostly branded products sold in supermarkets.

The kinds of firms at all levels of the industry are now much different as well. Technological developments changed the way things are done on the farm and in assembly, processing, and distribution. At every level, economies of scale (the costs in large-scale operations versus smaller-scale ones) led to fewer and larger operations. The kinds of firms changed drastically in response to cost pressures and pressures from investment markets.

The 1996 Federal Agriculture Improvement and Reform Act removes price supports and provides for reform of Federal milk marketing orders, drastically reducing the role of government in dairy markets. Federal dairy policy has been directed toward milk producers, although State milk controls embodied a substantial element of "save the milk dealer." Federal

programs have also played a role in how firms and businesses in the milk marketing channel have evolved. For a large segment of businesses in the industry, not only is public dairy policy important but so too is public policy related to agricultural cooperatives (Manchester, 1982).

The structure of markets and marketing institutions has become a major issue as the firms involved have grown larger. However, contrary to perceived negative aspects of size, an analysis of measures of concentration suggests that dairy businesses are not nearly as highly concentrated as other agricultural product businesses.

The last time there was any kind of industrywide perspective related to dairy market structure was in the late 1970's and early 1980's (Cook and others, 1978; Manchester, 1983). This report provides an historical overview of the U.S. dairy industry and more detailed examinations of the fluid milk market, selected manufactured dairy product markets, and the forces causing changes in those markets. The report also discusses the prospects for farmers and their organizations, processors and dairy product manufacturers, and retailers related to structural changes in the dairy markets.

Milk Production

Milk production is the foundation of all studies of the dairy industry, regardless of their specific emphasis. The story of the structural changes taking place on dairy farms has received much wider attention than changes beyond the farm gate in recent years. What are the key features of milk production? We will consider the following: (1) quantity produced (both aggregate and per cow), (2) location, (3) number, size, and ownership of dairy farms, and (4) producer milk prices. Although discussed separately, these and other factors affecting production are interrelated.

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Quantity

Total U.S. milk production has grown in 15 of the last 20 years. The National Agricultural Statistics Service (NASS) reported milk production in 1995 at just over 155.6 billion pounds, 35 percent greater than the 115.4 billion pounds produced in 1975. Production has grown while milk cow numbers have been declining. Over the 1975-95 period, the annual average number of cows on dairy farms declined about 15 percent, from 11.14 million to 9.46 million. Growth in milk per cow reconciles the increasing total production with decreasing numbers of cows. From 10,360 pounds in 1975, average milk per cow has risen almost 59 percent to 16,451 pounds.

Each of a long list of changes in the technology of milk production has made a contribution toward changing the way a farm is organized and operated. The overall effect is to drastically increase production per cow, per hour of labor, and per unit of feed. In the process, purchased inputs—machinery, artificial breeding services, feeds, and many others—have been substituted for inputs of the farmer's own labor or for feeds, forages, and young stock raised on his or her own farm.

The way farmers sell milk has been affected by changes on the farm and in the marketing system. Direct marketing of milk for fluid use by individual producers to consumers has declined to about 1 percent of total milk production. Milk used on the farms where it was produced dropped from 25 percent of production in 1929 to 5 percent in 1964 and 1 percent in 1995. In the late 1920's, about one-third of all U.S. milk production was separated into skim milk and cream, with only the cream being sold. Beginning during World War II, sharp increases in the value of the nonfat solids in milk have encouraged farmers to market whole milk, not separate it. In 1964, only 4 percent of milk production was sold as farm-separated cream, and in 1995, the amount was minuscule.

After World War II, nearly all milk producers, especially those supplying fluid markets, installed bulk tanks and abandoned selling milk in cans. Farmer cooperatives and proprietary handlers encouraged the change—sometimes they even required it. Technological change was important not only on the farm; it was playing a major role in the development and operation of larger scale plants and marketing operations that needed large volumes of milk to operate efficiently.

The quality of milk produced has also changed. The amount of Grade B milk (eligible only for manufactured products—see box) has declined since World War II. In 1945, 58 percent was fluid grade. Fluid-grade milk prices that were higher than those for manufacturing-grade milk provided the principal incentive for producers to convert to fluid-grade production, with bulk tank assembly, stricter sanitary standards for manufacturing-grade milk, and plant inefficiencies also playing a role. In 1975, 80 percent of the milk sold to plants and dealers was fluid grade and 20 percent (23.1 billion pounds) was Grade B. In 1995, 5 percent, or 7.6 billion pounds, was Grade B.

Location

Next to prices, location of milk production is likely to underlie most of the recent discussions about the structure of milk production. Seldom is location really a separate issue from quantity. Milk is produced in all 50 States but, as would be expected in an area as diverse as the United States, production is not evenly distributed across geographic space.

In 1975, the top five milk producing States were Wisconsin, California, New York, Minnesota, and Pennsylvania. These five States produced just over 48 percent of the Nation's milk. In 1995, the same five States were the top producers but in a different order: California, Wisconsin, New York, Pennsylvania, and Minnesota produced slightly over 51 percent of the total (table 1). The top 10 States produced 64.5 percent of the milk in 1975; in 1995, the percentage was 68.

Grades and Classes of Milk

Grades of milk depend on meeting sanitary (health) standards, usually set by the State health department.

Grade A milk meets the sanitary standards for use in fluid milk products and can be used for any dairy product—Class I, II, or III.

Grade B milk meets somewhat lower sanitary standards and can be used only for manufactured products such as butter, cheese, nonfat dry milk, and canned milk—Class III (or III-A) products.

The class depends on the use of the milk—that is, which products come from the milk. Class I is beverage milk use. Class II is "soft product" uses such as ice cream and cottage cheese. "Hard" products such as butter, cheese, and condensed milk are in Class III and nonfat dry milk is sometimes defined in a Class III-A use category.

Table 1—Milk production by State and share of U.S. total, 1975 and 1995

State	1975	Share of U.S. total	State	1995	Share of U.S. total
	<i>Billion pounds</i>	<i>Percent</i>		<i>Billion pounds</i>	<i>Percent</i>
Wisconsin	18.900	16.4	California	25.344	16.3
California	10.853	9.4	Wisconsin	22.942	14.8
New York	9.964	8.6	New York	11.600	7.5
Minnesota	8.946	7.8	Pennsylvania	10.600	6.8
Pennsylvania	7.140	6.2	Minnesota	9.409	6.1
Michigan	4.411	3.8	Texas	6.113	3.9
Ohio	4.259	3.7	Michigan	5.565	3.6
Iowa	3.893	3.4	Washington	5.302	3.4
Texas	3.208	2.8	Ohio	4.600	3.0
Missouri	2.840	2.5	Idaho	4.210	2.7
Top 10 total	74.414	64.5	Top 10 total	105.744	68.0
Illinois	2.446	2.1	Iowa	4.050	2.6
Washington	2.322	2.0	New Mexico	3.623	2.3
Kentucky	2.319	2.0	Missouri	2.690	1.7
Indiana	2.210	1.9	Illinois	2.392	1.5
Tennessee	2.031	1.8	Vermont	2.545	1.6
Vermont	2.009	1.7	Florida	2.381	1.5
Florida	1.956	1.7	Arizona	2.230	1.4
Virginia	1.755	1.5	Indiana	2.214	1.4
South Dakota	1.556	1.3	Kentucky	2.020	1.3
Idaho	1.555	1.3	Virginia	1.950	1.3
Maryland	1.550	1.3	Tennessee	1.745	1.1
North Carolina	1.498	1.3	Oregon	1.677	1.1
Nebraska	1.431	1.2	South Dakota	1.581	1.0
Kansas	1.392	1.2	Georgia	1.555	1.0
Georgia	1.221	1.1	Colorado	1.551	1.0
Oklahoma	1.060	0.9	Utah	1.473	0.9
Louisiana	1.054	0.9	North Carolina	1.403	0.9
Oregon	0.990	0.9	Maryland	1.340	0.9
Utah	0.919	0.8	Oklahoma	1.303	0.8
North Dakota	0.917	0.8	Kansas	1.180	0.8
Mississippi	0.876	0.8	Nebraska	1.095	0.7
Colorado	0.845	0.7	Louisiana	0.905	0.6
Arizona	0.840	0.7	North Dakota	0.838	0.5
Arkansas	0.707	0.6	Arkansas	0.732	0.5
Alabama	0.686	0.6	Mississippi	0.710	0.5
Maine	0.629	0.5	Maine	0.641	0.4
Connecticut	0.608	0.5	Connecticut	0.526	0.3
Massachusetts	0.601	0.5	Alabama	0.482	0.3
New Jersey	0.528	0.5	Massachusetts	0.448	0.3
South Carolina	0.512	0.4	Nevada	0.425	0.3
New Mexico	0.366	0.3	South Carolina	0.391	0.3
West Virginia	0.350	0.3	New Hampshire	0.326	0.2
New Hampshire	0.336	0.3	New Jersey	0.320	0.2
Montana	0.278	0.2	Montana	0.315	0.2
Nevada	0.168	0.1	West Virginia	0.266	0.2
Hawaii	0.146	0.1	Delaware	0.145	0.1
Delaware	0.127	0.1	Hawaii	0.142	0.1
Wyoming	0.110	0.1	Wyoming	0.085	0.1
Rhode Island	0.063	0.1	Rhode Island	0.033	0.0
Alaska	0.017	0.01	Alaska	0.012	0.01
United States	115.398	100.0		155.425	100.0

Source: USDA, NASS, *Milk Production*, various issues.

Table 2—Regional shares of U.S. milk production, 1975-95, selected years

Region	1975	1980	1985	1990	1991	1992	1993	1994	1995
<i>Percent of U.S. total</i>									
Northeast	20.4	20.1	20.0	18.4	18.6	18.8	18.6	18.1	18.4
Lake States	28.0	28.7	28.7	26.7	26.3	25.9	25.2	24.3	24.4
Corn Belt	13.6	11.8	11.8	11.4	11.2	10.9	10.8	10.4	10.3
Northern Plains	4.6	3.8	3.9	3.6	3.5	3.4	3.1	3.1	3.0
Appalachian	6.9	6.1	6.1	5.5	5.4	5.3	5.2	4.9	4.8
Southeast	3.8	3.1	3.1	3.3	3.3	3.3	3.3	3.3	3.1
Delta States	2.3	1.8	1.8	1.7	1.7	1.7	1.6	1.6	1.5
Southern Plains	3.7	3.6	3.6	4.6	4.5	4.5	4.8	4.9	4.8
Mountain	4.4	5.5	5.5	6.4	6.7	7.1	7.5	8.5	8.9
Pacific	12.3	15.5	15.5	18.4	18.7	19.1	19.8	21.0	20.9
United States	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Sources: Compiled from Blayney, Miller, and Stillman, 1995; and USDA, NASS, *Milk Production*, various issues.

While the percentages reported here may not seem very different, the underlying quantities involved are.

Regional shares of U.S. milk production for selected years in the 1975-95 period are shown in table 2. The regions are the 10 standard USDA production regions. The major trend in these regional shares is the growth in the Mountain and Pacific regions versus relatively flat or very slow-growing shares in other regions.

Some of the fastest growing milk producing States (in percentage terms) are in the Mountain region; New Mexico and Idaho are prime examples. California's production increased the most in quantity terms. Other States (Arizona and Washington) in the Mountain and Pacific have grown steadily but not at such high rates. Some regions, like the Lake States and the Northeast, appear to have increased production share, at least slightly, after periods of declining shares.

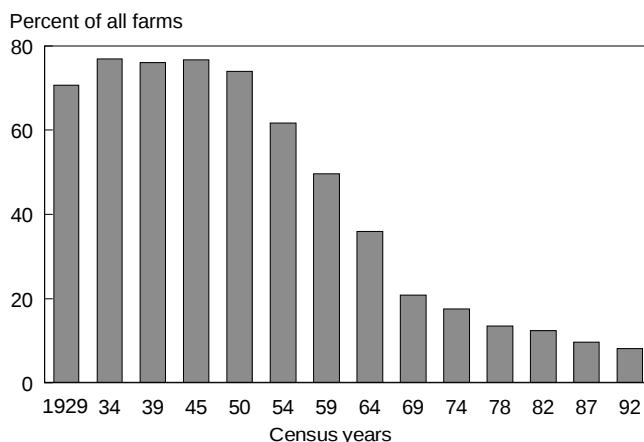
Number, Size, Ownership

The number of farms in agriculture as a whole and those with cows have been shrinking since the Depression. Within the context of the smaller sector, there are fewer operations with milk cows and fewer cows.¹ In 1930, over 70 percent of all farms had milk cows but only 13 percent of farms with milk cows were commercial dairy farms (figs. 1 and 2). Since World War II, the number of farms with one or two cows for home use only has dropped sharply and milk used on the farm where it is produced has declined from 17.5 percent to 0.2 percent of production. The proportion of commercial dairy farms has been rising

since 1945 and accounted for 73 percent of farms with cows in 1992 (fig. 2). Because the rates of decline are different, the average size of operations with milk cows is increasing. The most recent NASS data show 126,800 operations with milk cows, down from almost 149,000 in 1994 (table 3). The average size of operation in 1996 was 74 cows, up 10 cows from 1994 and up about 289 percent from 1975.

The distribution of operations with milk cows and inventories (cow numbers) has changed rather dramatically since the 1970's (table 3). In 1978, almost 65 percent of the operations were in the 1- to 29-head category (approximately 239,250 operations). By 1996, the share in that category had fallen to 31.4 percent, representing about 39,800 operations. Only 4.3 percent of the operations (15,900) had 100 or more head in 1978. The percentage in 1996 was almost four times

Figure 1
Farms with milk cows as a share of all farms, selected years

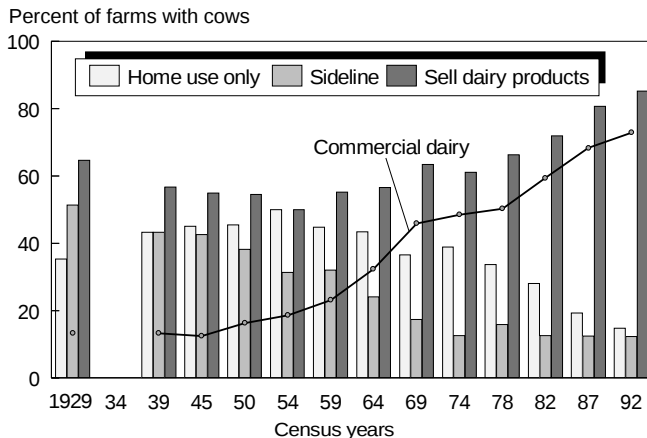


Source: Census of Agriculture, various years.

¹An operation is a place with one or more milk cows. A farm may include more than one operation.

Figure 2

Activities of all farms with milk cows, selected years



Source: Census of Agriculture, various years.

higher (17.1) but the number itself was only 40 percent greater at 21,700 operations.

Almost 16 percent of the inventories in 1978 were on operations of 1 to 29 head, about 1,600,000 cows (table 3). The number in 1995 was approximately 378,500, only 4 percent of the inventories. The share of operations with inventories of 100 or more head was 30.2 percent in 1978 and 55 percent in 1995 (3,045,000 and 5,204,000 cows). Within the individual size categories, the average number of cows has increased. In 1978, the average number of cows on operations in the 1- to 29-head category was 7; in 1995, it had risen only to 8. On operations with 100 or more head, the 1978 average was about 192 cows; in 1995, the average had increased to 238.

Data have been reported by NASS for a 200-or-more-head category since 1993. In both 1993 and 1995, just over 7,000 operations were in the 200-plus category. Inventories grew from about 2,992,000 to 3,311,500 cows on these operations, with average numbers at 426 and 473. In the 1992 Census of Agriculture, 4.1 percent of farms with 200 or more cows had 31.6 percent of the cows—13.7 percent on farms with 200 to 499 cows; 8.0 percent on farms with 500 to 999 cows; and 9.9 percent on farms with 1,000 or more cows.

While the number and size of operations have changed noticeably, the ownership of dairy farms has remained relatively stable. The four major categories of legal organization are individual or family (sole proprietorship); partnership; corporation; and other. The corporate category is separated into family-held and non-

family-held categories. Many partnerships are also between or among family members.

Since 1974, the ownership and operational decision-making in milk production have been mainly in the hands of individuals and families (table 4). Over 80 percent of the dairy farms in the Standard Industrial Classification (SIC) (those approximating commercial dairy farms) in 1992 were classified as individual or family, and 3.5 percent were family-held corporations. Another 15.5 percent of the farms were partnerships, many of which involved family members. An increasing share of dairy farms are incorporating; financial considerations, including tax status and inheritance laws, are likely reasons for such a move.

Producer Prices

Milk pricing in the United States depends on the characteristics of milk and the various forces that have affected the industry throughout its history. After the Civil War, as commercial milk production increased in importance, seasonal fluctuations in supply that were mismatched with use resulted in shortrun price instability and longrun uncertainties among producers. Substantial numbers of producers left the business, exacerbating the production and price swings.

It became apparent that the methods used for pricing many agricultural commodities could not be used for flow products like milk, where variable daily production and marketing are involved. Several pricing plans were tried, many backed by dairy cooperatives (see glossary) that had been organized to bargain with processors and manufacturers for prices, but the Great Depression brought a widespread breakdown in producer prices. Pricing and marketing problems for dairy farmers during this economic upheaval led the cooperatives to ask for government intervention to stabilize markets and raise prices. Border protections for dairy products in the form of import quotas were put in place in 1951.

Beginning with the Agricultural Adjustment Act of 1933, the Federal Government became a prominent force in the dairy economy. The Agricultural Marketing Agreement Act of 1937 and the Agricultural Act of 1949 have been the basic legislation underlying the two major programs affecting the dairy industry—marketing orders (see glossary) and price supports. The 1996 Act is reducing price support levels annually for 3 years and then will eliminate them. A recourse loan program will begin in 2000—potentially useful to

Table 3—U.S. milk production by size of operation, 1970-96

Year	Operations	Cows	Average cows per operation	Distribution of operations in each category					Distribution of inventories in each category				
				1-29 head	30-49 head	50-99 head ¹	100-199 head ²	200+ head	1-29 head	30-49 head	50-99 head ¹	100-199 head ²	200+ head
	<i>Number</i>	<i>Thousands</i>	<i>Number</i>	<i>Percent</i>									
1970	647,860	12,000	19	—	—	—	—	—	—	—	—	—	—
1971	591,870	11,839	20	—	—	—	—	—	—	—	—	—	—
1972	539,350	11,700	22	—	—	—	—	—	—	—	—	—	—
1973	497,040	11,413	23	—	—	—	—	—	—	—	—	—	—
1974	470,240	11,230	24	—	—	—	—	—	—	—	—	—	—
1975	443,610	11,139	25	—	—	—	—	—	—	—	—	—	—
1976	416,160	11,032	27	—	—	—	—	—	—	—	—	—	—
1977	393,510	10,945	28	66.9	17.4	15.7	—	—	18.2	24.2	57.6	—	—
1978	369,210	10,083	27	64.8	18.3	12.6	4.3	—	15.9	24.3	29.6	30.2	—
1979	349,470	10,734	31	63.1	18.3	13.8	4.8	—	14.8	23.3	30.2	31.7	—
1980	334,180	10,799	32	60.8	18.9	14.9	5.4	—	13.5	22.9	30.4	33.2	—
1981	320,160	10,898	34	58.5	19.6	16.2	5.7	—	12.5	22.6	31.3	33.6	—
1982	307,920	11,011	36	56.5	20.2	17.2	6.1	—	11.6	22.2	31.9	34.3	—
1983	297,740	11,059	37	54.2	20.9	18.4	6.5	—	10.6	21.7	32.8	34.9	—
1984	282,430	10,793	38	52.2	21.6	19.3	6.9	—	10.5	21.7	32.7	35.1	—
1985	269,050	10,981	41	50.5	21.5	20.5	7.5	—	10.1	20.5	33.1	36.3	—
1986	249,190	10,773	43	48.6	21.5	22.0	7.9	—	9.1	19.4	33.9	37.6	—
1987	227,880	10,327	45	46.0	22.4	22.8	8.8	—	8.3	19.2	33.0	39.5	—
1988	216,130	10,224	47	44.2	23.0	23.4	9.4	—	7.8	18.6	32.4	41.2	—
1989	202,890	10,046	50	42.2	23.1	24.4	10.3	—	7.2	17.9	32.1	42.8	—
1990	192,660	9,993	52	40.9	23.3	24.8	11.0	—	6.9	17.3	31.5	44.3	—
1991	180,640	9,826	54	39.8	22.8	25.9	11.5	—	6.3	16.6	31.7	45.4	—
1992	170,500	9,688	57	38.9	22.1	26.0	13.0	—	5.5	15.2	30.0	49.3	—
1993	159,450	9,589	60	37.6	21.9	26.9	9.2	4.4	5.1	14.8	29.6	19.3	31.2
1994	148,690	9,500	64	35.8	22.0	27.7	9.9	4.6	4.6	14.0	28.7	19.3	33.4
1995	137,030	9,458	69	33.9	22.4	27.1	10.6	5.0	4.0	13.0	28.0	20.0	35.0
1996	126,800	9,351	74	31.4	22.4	29.1	11.6	5.5	4.0	12.0	27.8	20.0	37.0

— = No data collected or reported for the year and size category.

¹Includes 100+ for 1977. ² Includes 200+ for 1974-1992.

Sources: Compiled from Perez, 1994, and USDA, NASS, *Milk Production*, various issues.

Table 4—Organization of U.S. dairy farms, 1974-92, selected years¹

Year	Sole proprietorship	Partnership	Corporation		Other ²
			Family	Nonfamily	
Percent of farms					
1974	88.2	88.2	1.1	NA	0.1
1978	84.2	13.6	1.9	0.2	0.2
1982	81.7	15.4	2.5	0.2	0.2
1987	80.8	15.8	2.9	0.1	0.4
1992	80.4	15.5	3.5	0.1	0.4
Percent of sales					
1974	NA	NA	NA	NA	NA
1978	72.3	19.7	6.8	0.9	0.3
1982	68.7	21.8	8.3	0.7	0.4
1987	66.4	23.1	9.3	0.5	0.7
1992	63.7	24.4	10.4	0.7	0.8
Percent of cows					
1974	NA	NA	NA	NA	NA
1978	74.6	18.6	5.8	0.7	0.3
1982	71.1	20.8	7.1	0.7	0.3
1987	68.8	22.1	8.1	0.4	0.6
1992	66.0	23.6	9.2	0.6	0.6

NA = Not available.

¹Dairy farms are defined by the Standard Industrial Classification (SIC) as farms with more than 50 percent of sales consisting of dairy products.²Includes cooperative farms, estates or trusts, institutional, etc.

Source: Compiled from the U.S. Department of Commerce, Bureau of the Census, Census of Agriculture, various years.

manufacturers of butter, powder, and cheese through loans to assist in managing inventories at modest interest rates within the fiscal year. The farm act also mandates consolidating and modifying Federal milk marketing orders. This process is beginning to unfold and must be completed by April 1999. As a participant in the recently completed General Agreement on Tariffs and Trade (GATT) Uruguay round, the United States will reduce border protection over time and has committed to opening the U.S. dairy market to greater access.

For the producer, the price actually received for milk is called the mailbox price. The Agricultural Marketing Service (AMS) began reporting the prices for selected Federal milk marketing orders in 1995 (table 5). Mailbox prices are different from the minimum Federal milk marketing order class prices (paid by regulated handlers) and the minimum blend prices associated with them. The difference is due to various premiums or charges allocated to producers.

Table 6 shows five domestic prices: the all-milk price, the support price, the manufacturing-grade price, the all-

market Federal order minimum Class I price, and the Minnesota-Wisconsin/basic formula price (M-W/BFP).

The support price has underpinned the entire price structure for bulk milk sold by farmers, either directly to processors or through cooperatives, since World War II. The dairy price support program will be changed by 2000, so the support price will no longer be applicable. Federal order prices that do not provide a floor under market prices will remain, but the system will be streamlined by merging orders.

The price paid to farmers for manufacturing-grade milk has been free to move above the support price level if supply and demand conditions have warranted. For many years, it rested on the support price, only rising above it during the short-supply season of the year (the fall). From 1990 to 1995, support prices were held level and the prices paid to producers were above them.

The M-W or BFP is an "institutional" price used in Federal milk marketing orders that is based on milk with a 3.5 percent butterfat content and is adjusted periodically by changes in prices of manufactured

Table 5—U.S. mailbox prices for selected Federal milk marketing orders, monthly, 1995¹

Federal milk order	January	February	March	April	May	June	July	August	September	October	November	December	Annual average
<i>Dollars per cwt</i>													
New England	11.83	11.86	11.98	11.93	11.92	11.39	11.35	11.71	11.88	12.42	13.14	13.20	12.05
New York-New Jersey	12.00	12.02	12.14	11.88	11.82	11.45	11.39	11.74	12.01	12.61	13.17	13.31	12.13
Middle Atlantic	12.15	12.07	12.06	11.83	11.86	11.50	11.60	12.14	12.26	12.82	13.50	13.32	12.26
Carolina	12.81	12.41	12.59	12.39	12.77	12.40	12.28	12.69	12.70	13.20	13.95	14.10	12.86
Tennessee Valley	12.63	12.39	12.37	12.16	12.41	11.87	11.79	12.41	12.17	12.71	13.53	13.70	12.51
Southeast	—	—	—	—	—	—	12.08	12.40	12.39	12.89	13.53	13.55	—
Georgia ²	12.92	12.58	12.41	12.47	12.65	12.25	—	—	—	—	—	—	—
Alabama-Western Florida ²	12.90	12.52	12.48	12.36	12.68	12.13	—	—	—	—	—	—	—
New Orleans-Mississippi ²	12.65	12.32	12.24	12.09	12.49	12.10	—	—	—	—	—	—	—
Greater Louisiana ²	12.87	12.40	12.46	12.17	12.65	12.28	—	—	—	—	—	—	—
Florida ³	13.98	13.60	13.68	13.77	13.92	14.04	13.77	14.29	14.09	14.20	14.96	15.43	14.14
Southern Michigan	12.07	11.98	12.02	11.94	11.86	11.39	11.34	11.74	11.96	12.47	13.23	13.23	12.10
Eastern Ohio-Western Pennsylvania	12.20	12.20	12.26	12.17	12.09	11.61	11.50	11.83	12.11	12.60	13.37	13.56	12.29
Ohio Valley	12.13	12.04	12.16	12.09	12.04	11.37	11.32	11.89	12.17	12.48	12.83	13.63	12.18
Indiana	12.29	11.93	12.02	12.08	11.93	11.24	11.22	11.66	11.89	12.42	13.25	13.40	12.11
Chicago Regional	12.20	12.44	12.46	11.96	11.80	11.75	11.52	11.87	12.69	13.57	14.08	13.92	12.52
Southern Illinois-Eastern Missouri	11.73	11.61	11.63	11.62	11.53	11.18	11.03	11.37	11.49	12.05	12.74	12.96	11.75
Louis.-Lex.-Evans.	12.30	12.04	12.02	11.97	12.17	11.66	11.58	12.02	12.01	12.56	13.21	13.35	12.24
Upper Midwest	11.97	12.24	12.23	11.67	11.52	11.49	11.35	11.73	12.55	13.41	13.94	13.75	12.32
Nebraska-Western Iowa	11.64	11.73	11.86	11.46	11.35	11.19	11.11	11.41	11.85	12.63	13.24	13.05	11.88
Iowa	12.01	12.15	12.19	11.78	11.65	11.44	11.28	11.62	12.31	13.22	13.82	13.68	12.26
Texas	11.99	11.88	11.87	11.52	11.66	11.35	11.23	11.86	11.95	12.48	13.04	13.02	11.99
Southwest Plains	11.44	11.34	11.45	11.25	11.03	10.83	10.80	11.35	11.56	12.13	12.72	12.78	11.56
Eastern Colorado	12.05	12.08	12.11	11.45	11.82	11.54	11.30	11.83	11.97	12.53	13.01	13.14	12.07
Southwestern Idaho-Eastern Oregon	11.24	11.56	11.79	11.15	10.84	10.92	10.83	11.13	11.72	12.27	12.74	12.60	11.57
Great Basin	11.25	11.33	11.31	10.99	10.90	10.82	10.67	11.23	11.53	11.90	12.35	12.44	11.39
New Mexico-W. Texas	10.39	10.32	10.35	10.10	10.10	9.99	10.06	10.75	10.82	11.35	11.80	11.69	10.64
Pacific Northwest	11.23	11.21	11.20	11.11	11.04	10.81	10.84	11.21	11.38	11.92	12.47	12.19	11.38

— = Data not reported for the separate or merged orders. Annual average not calculated because only 6 months of data available. ¹Mailbox price is net pay price received by farmers marketing milk to handlers regulated under the Federal orders. Includes all payments received for milk sold and all costs associated with marketing the milk. Price is reported at the market average butterfat test. ²Orders merged into the Southeast order, the price of which is reported from July 1995 on. ³Weighted average of information for Upper Florida, Tampa Bay, and Southeastern Florida orders.

Source: Compiled from USDA, AMS, *Dairy Market News*, various issues.

Table 6—Selected U.S. milk prices, 1970-99, selected years

Year	Support ¹	M-W or BFP ²	U.S. manufacturing grade ³	All-market minimum Class 1 ⁴	U.S. average all-milk ⁵
<i>Dollars per cwt</i>					
1970	4.57	4.66	4.71	6.74	5.72
1975	7.36	7.92	7.71	9.36	8.78
1980	12.04	11.88	12.05	13.77	13.05
1981	13.10	12.57	12.73	14.69	13.76
1982	13.10	12.49	12.66	14.63	13.59
1983	13.10	12.49	12.63	14.69	13.57
1984	12.60	12.49	12.54	14.41	13.45
1985	11.97	11.48	11.78	13.88	12.73
1986	11.60	11.30	11.55	13.60	12.52
1987	11.28	11.23	11.43	13.90	12.49
1988	10.60	11.03	11.23	13.42	12.22
1989	10.73	12.37	12.49	14.51	13.56
1990	10.10	12.21	12.28	15.54	13.68
1991	10.10	11.05	11.12	13.30	12.24
1992	10.10	11.88	11.87	14.57	13.09
1993	10.10	11.80	11.76	14.19	12.80
1994	10.10	12.00	11.83	14.75	12.97
1995	10.10	11.83	11.78	14.19	12.78
1996	10.35	13.39	13.38	16.19	14.40
1997	10.20	NA	NA	NA	NA
1998	10.05	NA	NA	NA	NA
1999	9.90	NA	NA	NA	NA

NA = Not available.

¹Price set by legislation for purchase programs. ²Market order basic formula price adjusted by product price movements. Used as price mover in the Federal market orders. ³Average price of milk not eligible for fluid use. ⁴Average of Class I price in all Federal milk marketing orders. ⁵Average price of all the milk sold to plants and dealers.

Sources: Compiled from Manchester, Weimar, and Fallert, 1994; USDA, AMS, Dairy Market Statistics, various issues; and USDA, ERS, 1996.

dairy products, mainly cheese and butter. Minimum Class I prices are above the basic (M-W or BFP) by a fixed amount (differential) in each Federal milk marketing order. The all-milk price is a weighted average price of milk in all uses and classes.

Interrelationships

Much of the recent growth in milk production has been in the West in areas where manufactured products predominate. Readily available land, good climate, ample supplies of high-quality forages, lower production costs, markets for fluid milk and products, either local or elsewhere, and relatively stable, known prices through price support programs, and to some extent the Federal (and State) marketing orders in place made these western areas fast-growing milk production centers.

The growth of large milk supplies in Idaho, California, New Mexico, and recently, Washington has stimulated construction of large modern plants, or rehabilitation

of older plants. Cheese production in the region has grown rapidly, but production of butter and nonfat dry milk is still important in the region.

In conjunction with many of these large cheese operations, plants for manufacturing dry whey products have been built. Both cooperatives (Darigold is an example) and proprietary firms (such as Leprino) have been building new cheese capacity in the West. This trend toward production for manufactured product markets will likely continue since fluid markets, even though they are growing, are more than amply supplied.

While the previous discussion emphasized the situation in the West, production structure is changing in other regions of the country as well. Larger farms are appearing in traditional dairy areas, such as New York, Michigan, and Wisconsin, providing added milk to fill local plant capacity. Large dairy farms are also appearing in the Northern Plains (Kansas, Nebraska, and

South Dakota), a region where milk production had been declining for some time.

In Nebraska, recruiting large dairies for rural economic development has been a major theme, along with the desire to fill available dairy plant capacity. Kansas and South Dakota have similar goals. The scale of the dairies that have been established in these States to date, 1,500 to 3,000 cows, is clearly much larger than previously existed. Some industry observers suggest that it is only a matter of time before such operations appear even farther east (Bailey, 1996; Klintberg, Mooney, and Mohr, 1996).

Structure of Dairy Markets

The markets for fluid milk and dairy products are supplied by two types of firms: proprietary companies and cooperatives. Over time, the numbers of both firm types have declined and the size of those remaining has, on average, increased. Many of the proprietaries are either large companies or their subsidiaries. Cooperatives range from very small, either by volume or membership criteria, to very large. Proprietary companies have gravitated toward the fluid milk and frozen products businesses, while cooperatives have played major roles in the hard manufactured product markets.

Each of the markets within the overall dairy market has its own characteristics and a distinctive set of participants. Some companies participate in several of the submarkets, but none are present in all of them. This analysis deals with the markets for the following:

- Bulk raw milk, supplying milk to manufacturers of:
- Bulk natural cheese, supplying:
 - Manufacturers of processed cheese,
 - Packagers of natural cheese for retail (cut and wrap),
 - Processors of natural cheese who produce shredded and grated cheese for retail,
 - Food service—fast food chains, especially pizza and hamburger, and foodservice wholesale distributors,
 - Manufacturers of other foods, such as frozen pizza, cheesecake, macaroni and cheese, and salad dressings.
- Butter—For many years, bulk butter (in tubs) was sold to assemblers who packaged butter for retail. Today, one operation does it all.

- Packaged fluid milk products
- Frozen desserts
- Ingredients—dry milk, condensed milk, and whey products used in dairy products, other nondairy foods, and animal feeds.

The markets for bulk milk, bulk cheese, and ingredients are for “commodities.”² Retail store cheese, frozen desserts, yogurt, and butter are often branded products with much private (store) label (table 7). Milk is mostly private label.

The Bulk Milk Market³

Cooperatives are the primary marketers of bulk (raw) milk from U.S. dairy farms. In 1995, dairy products accounted for about 31 percent of the value of all agricultural products marketed by cooperatives (Richardson and others, 1996). Consistent with trends in agriculture and other sectors, dairy cooperatives are fewer in number and are handling larger volumes of milk than they were previously. They also process, manufacture, and market significant shares of some dairy products.

In 1995, 241 dairy cooperatives with a membership of about 117,300 were in operation (table 8), about one-

Table 7—Private label share of U.S. supermarket sales, 1995

Product	Share of dollar sales	Share of unit sales
	Percent	
Milk	65.4	63.0
Cottage cheese	41.3	44.8
Butter	41.4	45.3
Cream	30.5	36.0
Sour cream	32.0	36.7
Cheese ¹	26.5	32.0
Yogurt	14.9	22.0
Spreads	12.7	12.2

¹For detail by type of cheese, see table 21.

Source: *Private Label Manufacturers Association 1996 Yearbook*, in IDFA, 1996b.

²In trade parlance, “commodities” are products either unbranded or with weak branding that are subject to the fairly full play of changes in supply and demand, especially supply. Prices of commodities fluctuate more widely than those of differentiated products. The distinction is a matter of degree, not an either/or categorization. The least differentiated commodities are known as “cordwood.”

³This section draws on Liebrand, 1995; Ling and Liebrand, 1994 and 1995; Richardson and others, 1995; and Richardson and others, 1996.

Table 8—U.S. dairy cooperative statistics, 1935-95, selected years

Year	Cooperatives	Members	Milk marketed to plants and handlers by cooperatives ¹	Business volume	Cooperative share of total milk delivered to plants and handlers
	<i>Number</i>		<i>Million pounds</i>	<i>Million dollars</i>	<i>Percent</i>
1935/36	2,270	720,000	31,058	520	48
1943/44	2,286	702,000	NA	1,203	NA
1956/57	1,746	777,240	53,038	2,764	59
1964	1,244	561,085	76,743	3,524	67
1973	592	281,065	83,227	6,102	76
1980	435	163,549	95,634	13,666	77
1987	296	120,603	105,798	16,548	76
1992	265	110,440	122,622	20,239	82
1993	258	122,396	127,090	20,510	86
1994	247	124,666	129,780	21,503	86
1995	241	117,313	NA	21,784	NA

NA = Not available.

¹ERS estimates for 1993 and 1994.

Source: Compiled from Liebrand, 1995; Kraenzle, 1996; and Richardson and others, 1996.

tenth the number of cooperatives in 1935/36 and one-sixth the membership. The quantity of milk marketed by cooperatives quadrupled from just over 31 billion pounds in 1935/36 (48 percent of all milk delivered to plants and handlers) to just under 130 billion pounds in 1994 (86 percent of all deliveries). Business volume increased from \$520 million to \$21.8 billion in 1995.

Today's dairy industry landscape has been shaped by cooperative merger activity perhaps more than at any time since the 1960's and 1970's when the large regional dairy cooperatives were formed. Table 9 shows the top 50 dairy cooperatives in 1995-96 and reflects the changes that mergers caused. For example, Milk Marketing, Inc. became the third largest cooperative (in volume) when it merged with Eastern Milk Producers Cooperative. The union of Mid-America Dairymen, Inc. (Mid-Am), Southern Milk Sales, and Dairymen, Inc., initially kept Mid-Am second on the list, but it rose to first in 1995 when the Morning Glory Farms division of Associated Milk Producers, Inc. (AMPI) joined with Foremost Farms. The top 50 dairy cooperatives represented 80,764 members and 121.42 billion pounds of milk. Because of differences among organizations in fiscal years, volume and membership are not all for calendar year 1995.

There are two basic types of dairy cooperatives today—bargaining-only and manufacturing/processing. The bargaining-only cooperatives negotiate prices and

terms of trade for their members' milk. Many manufacturing/processing cooperatives bargain for prices and market some or all of their members' milk through their own processing and manufacturing facilities. In 1992, 68 percent of dairy cooperatives could be described as bargaining-only, the rest being manufacturing/processing. About 57 percent of the cooperatively marketed milk was sold as raw milk; the remaining 43 percent was processed or manufactured in plants operated by cooperatives (table 10).

The bargaining-only cooperatives rarely take title to members' milk and do not own manufacturing or processing plants. They tend to be smaller volume milk handlers (averaging about 200 million pounds in 1992) that require minimal capital, but they may operate milk receiving stations. Based on the 1992 average volume and number, approximately 30 percent of cooperative milk went through the bargaining-only cooperatives. Prices received by members are likely to have fewer (and smaller) deductions, reflecting the lower cost operations of these cooperatives. The potentially greatest risk for bargaining-only cooperative members is covering fixed commitments in extreme market conditions—selling milk at “distressed” prices, shipping milk long distances to find markets for all members' milk, or paying large premiums for milk needed to fulfill local supply obligations.

Table 9—Top 50 U.S. dairy cooperatives, 1995-96

Cooperative	Annual member milk volume	Members	Cooperative	Annual member milk volume	Members
	<i>Billion pounds</i>	<i>Number</i>		<i>Billion pounds</i>	<i>Number</i>
Mid-America Dairymen, Inc.	20.64	13,193	Carolina Virginia Milk Producers Association	1.07	445
Associated Milk Producers, Inc.	14.90	8,679	Independent Co-op Milk Producers Association	0.97	780
Milk Marketing, Inc.	7.00	7,125	Upstate Milk Cooperative	0.96	500
California Milk Producers Association	6.26	353	First District Association	0.96	1,150
Farmers Union Milk Marketing Cooperative	5.62	8,624	Prairie Farms Dairy, Inc.	0.94	857
Darigold Farms	5.10	1,007	St. Albans Cooperative Creamery, Inc.	0.87	578
Dairyman's Cooperative Creamery Association	4.03	267	Tampa Independent Farmers' Association	0.85	114
Land O'Lakes, Inc.	3.90	3,850	Bongard's Creameries	0.70	1,100
Atlantic Dairy Cooperative	3.90	3,691	Security Milk Producers Association	0.66	25
Dairylea Cooperative, Inc.	3.88	2,618	Valley of Virginia Cooperative Milk Prod.Association	0.46	275
Foremost Farms USA, Cooperative	3.51	5,015	Tillamook County Creamery Association	0.45	160
Manitowoc Milk Producers Cooperative	3.27	3,321	Farmers Cooperative Creamery	0.43	95
Michigan Milk Producers Association	3.00	2,550	Ellsworth Cooperative Creamery	0.42	570
Western Dairymen Cooperative, Inc.	2.95	876	Cass-Clay Creamery	0.42	721
California Gold Dairy Products	2.83	351	Cal-West Dairymen, Inc.	0.40	36
Agri-Mark	2.35	1,753	Central Pennsylvania Milk Marketing Co-op	0.38	274
San Joaquin Valley Dairymen	2.05	215	Lowville Producers Dairy Cooperative, Inc.	0.29	253
United Dairymen of Arizona	2.04	105	Plainview Milk Products Cooperative	0.26	274
Maryland and Virginia Milk Producers Association	1.98	1,173	Tri-State Milk Cooperative	0.25	602
Milwaukee Cooperative Milk Producers	1.85	1,826	Humboldt Cooperative Creamery Association	0.22	105
Florida Dairy Farmers Association	1.74	155	Cooperative Milk Producers Association, Inc.	0.22	103
Danish Creamery Association	1.70	116	Hastings Cooperative Creamery Association	0.19	176
Allied Federated Cooperative	1.50	1,500	Burnett Dairy Cooperative	0.16	240
Alto Dairy Cooperative	1.45	1,296	Midwest Dairymen's Company	0.16	136
Swiss Valley Farms	1.15	1,405	Calhoun Cooperative Creamery Company	0.15	131
			Total	121.42	80,764

Source: Compiled from *Hoard's Dairyman*, October 10, 1996.

Manufacturing/processing cooperatives vary in operations and organizational structure (table 11). They usually manufacture or process products and bargain for prices. A few may not bargain for prices at all if they market all members' milk through their own plants. Some have partial or joint ownership of plants but do not operate them. Greater capital needs and marketing expenses may lead to prices to members lower than those received by bargaining-only cooperative members, at some times. "Reblending" of prices, which

reflects earnings (or losses) and investment decisions for plant or equipment, may also lead to lower prices.

The periods of potentially greatest risk for members of manufacturing/processing cooperatives are when supplies are in balance or short of demand. During these times, manufacturing capacity may not be efficiently used as milk is diverted to meet other commitments (Liebrand, 1995). Periods of milk surpluses also carry risk; even though cheaper milk is keeping plants full, sharply reduced premiums for quality and services and

Table 10—U.S. cooperative milk volume handled and sold, 1957-92, selected years¹

Item	1957	1964	1973	1980	1987	1992
<i>Million pounds</i>						
Milk handled by all cooperatives ²	58,038	76,743	83,227	95,634	105,798	122,622
Raw whole milk sold by all cooperatives	36,213	43,443	52,180	52,495	53,640	69,974
<i>Percent</i>						
Milk sold to plants and dealers:						
Milk handled	59.1	67.2	75.8	76.7	76.1	82.4
Raw whole milk sold	36.8	38.0	47.5	42.1	38.6	47.0
Milk handled by cooperatives sold as raw whole milk	62.4	56.6	62.7	54.9	50.7	57.1

¹Adjusted for intercooperative transactions. Includes purchases from other sources. Volume covered by bargaining is included. ²Producer deliveries to cooperatives were 83.6 percent Grade A in 1973 and 95.3 percent Grade A in 1992.

Sources: Compiled from Gessner, 1959; Tucker and others, 1977; and Ling and Liebrand, 1994.

Table 11—U.S. cooperatives that manufactured or distributed dairy products, 1957-92, selected years

Product	1957	1964	1973	1980	1987	1992
<i>Number</i>						
Cooperatives that manufactured or distributed dairy products:						
Butter	888	740	207	148	82	68
Natural cheese	323	294	187	157	94	75
Nonfat dry milk	191	212	57	48	31	26
Cottage cheese	108	126	64	42	23	22
Ice cream and ice milk	130	143	60	38	21	20
Dry whey products	NA	NA	NA	NA	NA	17
Packaged fluid milk products	455	215	85	60	34	29
All manufactured products	1,180	856	291	192	121	86
<i>Percent</i>						
Cooperatives' share of total dairy product production:						
Butter	58	65	66	64	71	65
Natural cheese	18	21	35	47	45	43
Nonfat dry milk	57	72	85	87	91	81
Cottage cheese	14	15	13	22	13	13
Ice cream and ice milk	4	5	5	11	8	10
Dry whey products	NA	NA	NA	81	53	48
Packaged fluid milk products	NA	9	12	16	14	16

NA = Not available.

Sources: Compiled from Gessner, 1959; Tucker and others, 1977; and Ling and Liebrand, 1994.

the possible distressed pricing of products or milk sales reduces revenues for the cooperative. Managing dairy product inventories has become more chancy since the late 1980's due to volatility in milk prices, thus adding to costs despite higher prices and give-up charges. Several manufacturing/processing cooperatives have become interested in international dairy markets in recent years, partly as a result of the conclusions of the Uruguay round of the General Agreement on Tariffs and Trade (GATT) and the North American Free Trade Agreement (NAFTA) among Canada, Mexico, and the United States. These trade agreements have focused on removing the nontariff barriers to trade that have often surrounded dairy industries. As international dairy product prices adjust to fewer or lower trade barriers, U.S. prices are likely to become more competitive.

Large Companies⁴

Corporate America, the world of large corporations, has been restructuring on a massive scale for 35 years, and the pace is accelerating. Mergers, acquisitions, leveraged buyouts, and divestitures have drastically changed the organization of food manufacturing and the kinds of business manufacturers do. Large companies are manufacturing a greater share of food and are more diversified in a variety of food and nonfood products. Dairy companies, meatpackers, and canners of fruits and vegetables have expanded their lines to a wide variety of products. Large food companies are also moving toward specialization in a single segment of the market: branded products for the grocery store trade, products for food service, or ingredients for other manufacturers.

The large companies operate in a very different world from the great majority of firms. Most are publicly held, and the investment community sets the pace, which has changed over time. Today's large companies emphasize different objectives and operate differently, with different performance, from the large companies of the 1950's and early 1960's. The perceived ability to raise prices on the stock market has increasingly come to dominate the corporate world.

Wall Street today is a very different place than it was. In 1950, institutional investors—pension funds, mutual

funds, and the like—held 8 percent of total equity. In the 1960's and early 1970's, diversification became a favored strategy of large companies, both into related lines and, most prominently, into conglomerate acquisition of unrelated businesses. Beginning in the late 1970's, emphasis shifted to shortrun movements in stock prices. In the 1980's, many State and municipal pension funds and some university endowments invested in buyout portfolios managed by such firms as Kohlberg, Kravis, Roberts & Co. (KKR) in a search for higher returns than stock market averages. This investment activity increased the funds available for acquisition of publicly traded firms' securities.

By 1990, institutional investors held 60 percent of total equity. These investors have had purely shortrun financial objectives—that is, they focused on rising stock prices on a monthly or quarterly basis. Most are required to spread their holdings over many stocks, so their investment in any one company is very small, and typically an individual stock is held less than 2 years. Many invested 70 to 80 percent of their equity holdings in index funds. Thus, most stocks were held by agents who had relatively little information about or interest in particular companies, other than the stock price.

Today's large firm is often made up of multiple divisions, groups, or segments, each of which specializes in producing and marketing one product line. Each division is effectively a separately organized business that acts in many respects like an independent firm specializing in the same business. Decentralized organization makes each of the units a candidate for sale or purchase. Trends in buying and selling the constituent parts of companies, both in the United States and abroad, consequently have been accelerating. The rash of pure conglomerates in the 1960's and 1970's led to numerous acquisitions of unrelated businesses and the subsequent selloffs of many, often only recently acquired.

All of this means the large firms now manufacture two-thirds of U.S. food, about the same as in 1975 and up from 42 percent in 1950, but large diversified companies have increased their share from 24 percent to 57 percent (fig. 3).

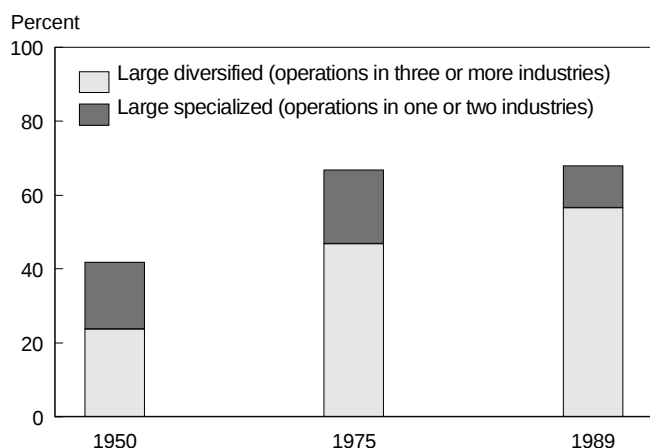
Wall Street now favors high-margin branded products. Commodity⁵ lines, which include fresh meat, fluid milk, natural cheese, canned fruit and vegetables, and

⁴Large companies are those with minimum sales of \$68 million in 1950, \$250 million in 1975, \$433 million in 1985, and \$630 million in 1994. Large cooperatives are included, although this section deals with only proprietary (investor-owned) companies. See Manchester, 1992, for further discussion.

⁵See footnote 2 for definition of "commodity."

Figure 3

Large manufacturers' share of U.S. food sales, selected years



Source: Manchester, 1992.

raw sugar, were sold off rapidly in the 1970's by companies wishing to specialize in branded foods. Since wholesale operations are low-margin, albeit profitable, the stocks of relatively few food wholesalers are traded on the exchanges.

Large Dairy Companies⁶

Eight large dairy companies were major players in dairy product processing and distribution from the 1920's until the 1970's. Their actions set much of the tone of competition throughout this period. The large dairy companies were assemblers in their early years. Beatrice produced 52 percent of the butter it sold in 1918. Borden produced 12 percent of its butter in 1936. Land O'Lakes was organized in 1921 and became a major distributor of butter for its member cooperatives, many of which were merged into Land O'Lakes after World War II.

Borden was the largest dairy company in 1919 but concentrated in manufactured products, especially canned milk. It set out to become a full-line dairy firm through merger, more than doubling sales by 1929. National Dairy Products Corporation (later Kraft) was organized in 1923 and embarked on a similar course. By the mid-1930's, it was the largest dairy company. Beatrice and Carnation grew to large-company status by 1919 but were substantially smaller than the others until the mid-1950's. Beatrice was mostly in butter and Carnation in canned milk. Most of the growth of Borden, National, and Beatrice was due to mergers. In

fluid milk and ice cream where distribution was more localized, becoming a full-line company meant broadening the geographic spread of operations, mostly by acquisition of independent milk dealers.

The large proprietary companies increased their share of dairy product sales from 33 percent in 1950 to 39 percent in 1975. Since then, their share dropped to 33 percent in 1994 (table 12). Large cooperatives were organized in the 1960's and 1970's. Their share of product sales grew from 17 percent in 1975 to 27 percent in 1994.

The seven large dairy companies of 1975 (much the same as in 1950) have since been merged and then often sold off (table 13). Only Borden retained its name, and it was bought out by Kohlberg, Kravis, Roberts & Co. (KKR) in a swap deal for R.J.R. Nabisco, and early in 1997 announced its intention to leave the dairy business.

A number of large foreign companies have bought into the U.S. dairy industry. In 1994, Labatt (Canadian) and Wessanen (Dutch) were in fluid processing, Danone and Bongrain (both French) in yogurt,⁷ Unilever (British-Dutch) in frozen products (Good Humor and Breyer's) and soft cheeses, Grand Metropolitan (U.K.) in frozen products (Haagen Dazs), Nestle (Swiss) in frozen desserts, dairy-based beverages, and other, Allied Domecq (U.K.) in frozen desserts (Baskin-Robbins), Sodial (French cooperative) in yogurt, butter, and dairy ingredients, and the others in cheese (table 14). These large foreign companies produced 11 percent of the natural cheese and 22 percent of the frozen products in 1994. Many smaller foreign compa-

Table 12—Share of domestic dairy product sales by large dairy companies, 1950-94, selected years¹

Type of firm	1950	1975	1985	1994
<i>Percent</i>				
Large proprietary companies: ²				
Diversified	20.8	37.6	33.9	24.9
Specialized	12.1	1.6	2.2	7.8
Large U.S. cooperatives	0.0	16.9	20.5	26.8
Smaller companies	67.1	43.8	43.5	40.5
Total	100.0	100.0	100.0	100.0

¹Sales value of raw bulk milk, packaged fluid milk products, frozen desserts, cottage cheese, butter, natural and process cheese, dry milk products, canned milk, and bulk condensed milk from U.S. operations. ²U.S. and foreign companies.

⁷Bongrain sold its Columbo packaged frozen yogurt business to General Mills in December 1993 but retained its three cheese plants.

⁶See footnote 4 for definition related to minimum sales.

Table 13—The seven large U.S. dairy companies of 1975 and where they went

Company	Total sales	Domestic dairy product sales	Disposition
Million dollars			
Kraft	4,857	2,280	Dart & Kraft, 1982; Kraftco, 1986; To Philip Morris, 1989
Beatrice	4,806	1,374	Became conglomerate; broken up; fluid to Borden, cheese to ConAgra ¹
Borden	3,367	925	To Kohlberg, Kravis, Roberts & Co.
Foremost-McKesson	2,553	452	To Winn Enterprises
Carnation	2,075	813	To Nestle
Pet	1,011	312	To IC Industry/Whitman, 1978; sold dairy operations except canned milk, 1985
Fairmont	515	218	To American Financial
Total seven companies	19,184	6,374	
Total industry	NA	20,026	

NA = Not available. ¹For a discussion of Beatrice's conglomeration and leveraged buyouts, see Baker, 1992; Gazel, 1990; and Haller, 1995.

Source: See Appendix B.

Table 14—Large companies in U.S. dairy, 1994 (sales of \$630 million or more)

Company	Domestic operations' sales ¹							International operations' sales			
	Total sales	Total domestic	Food					Total international	Food		
			Total food	Dairy					Total food	Dairy	Nonfood
				Total dairy	Fluid products	Manufactured products	Nonfood				
Million dollars											
U.S. companies:											
Proprietary—											
Borden, Inc.	6,495	4,535	3,519	1,577	1,277	300	1,016	1,960	959	NA	1,001
Philip Morris/Kraft	53,776	33,785	18,309	2,500	0	2,500	15,476	19,991	10,113	NA	9,878
Mars	12,500	7,800	7,175	200	0	200	625	4,700	NA	NA	NA
Pet, Inc.	1,779	1,521	1,480	20	0	20	41	258	258	0	0
Dean Foods	2,629	2,617	2,595	1,512	1,081	431	22	12	12	2	0
Leprino Foods	1,020	1,020	750	750	0	750	270	0	0	0	0
Schreiber Foods	1,320	1,320	920	920	0	920	400	0	0	0	0
Shamrock Foods	703	703	175	175	0	175	528	0	0	0	0
Simplot Industries	2,200	1,650	905	325	0	325	745	550	NA	NA	NA
ConAgra	24,109	21,759	17,069	1,078	0	1,078	4,690	2,350	2,220	0	130
Specialty Foods/Stella	1,979	1,979	1,900	800	0	800	79	0	0	0	0
General Mills	8,980	8,004	4,841	350	0	350	3,163	976	772	0	204
Cooperative: ²											
Land O'Lakes	2,859	2,859	1,468	1,468	NA	NA	1,391	0	0	0	0
Mid-America Dairymen ³	2,497	2,497	2,491	2,491	NA	NA	6	0	0	0	0
Milk Marketing, Inc.	1,050	1,050	1,050	1,050	800	250	0	0	0	0	0
Prairie Farms ³	773	773	758	758	430	328	15	0	0	0	0
Agway/Hood	2,100	2,100	484	484	NA	NA	1,616	0	0	0	0
AMPI	2,627	2,627	2,587	2,587	NA	NA	40	0	0	0	0
Dairymen, Inc.	784	784	784	784	NA	NA	0	0	0	0	0
Darigold, Inc.	906	906	906	906	NA	NA	0	0	0	0	0
Foreign companies:											
John Labatt	2,230	550	400	400	400	0	150	1,680	0	0	1,680
Unilever	45,419	8,251	2,900	1,000	0	1,000	5,351	37,168	21,003	NA	16,165
Besnier S.A.	3,900	500	500	500	0	500	0	3,400	3,400	3,400	0
Groupe Danone S.A.	13,556	450	450	450	450	0	0	13,106	2,700	NA	10,406
Grand Metropolitan	10,580	6,486	2,935	NA	0	NA	3,551	4,094	1,575	NA	2,519
Bols Wessanen	2,907	1,245	645	645	600	45	600	1,662	1,662	NA	0
Avonmore Foods	796	250	250	250	0	250	0	546	546	546	0
Bongrain S.A.	1,744	90	90	90	0	90	0	1,654	1,654	1,654	0
Fromageries Bel	1,334	100	100	100	0	100	0	1,234	1,234	1,234	0
Sodiaal	3,176	150	150	150	0	150	0	3,026	3,026	3,026	0
Allied Domecq	8,138	NA	NA	600	0	600	NA	NA	NA	700	NA
Nestle	41,626	8,938	7,971	500	0	500	967	32,688	32,043	10,768	645

NA = Not available. ¹Domestic operations are manufacturing plants in the U.S. and include exports of products from those plants. ²Sales of most include bulk milk.

³Have additional sales of dairy products in joint ventures.

Source: See Appendix B.

nies are in U.S. cheese manufacturing on a more modest scale.

The story of Labatt's foray into U.S. dairy markets illustrates a number of the quirks of the corporate world.⁸ John Labatt Co. was a successful Canadian brewing company that moved into some Canadian food lines in the 1920's. It entered Canadian dairy markets in 1968. In 1985, it moved into dairy markets in the United States and began buying fluid milk firms in New York, New Jersey, Pennsylvania, and Maryland, becoming the dominant seller in Philadelphia and New Jersey and obtaining a 20- to 40-percent share in New York City.

The regulatory health barriers of New York City and State licensing, which prevented processors outside the city from selling in the city, were removed in the late 1980's by court orders. Competition for the market became intense as large New Jersey sellers and others entered the city. Labatt closed two plants in the city and served the market from its remaining plants. Losses drove the company out of the U.S. fluid milk business.⁹ The firm left the dairy and other food industries in Canada, and the remaining (original) beer business was sold to Interbrew, a Belgian brewer, in 1995.

The large domestic companies in 1994 included the following:

- Borden, Dean, Prairie Farms, Agway (Hood), Mid-America, Land O'Lakes, and Dairymen, Inc. (merged with Mid-America in 1995) in fluid milk.¹⁰ Most also produced frozen desserts and cottage cheese.¹¹
- Kraft, Leprino, Schreiber, Simplot, ConAgra, AMPI, Mid-America, Darigold, Specialty Foods (Stella), and others in manufactured natural cheese.

The only dairy companies (sales of more than 50 percent dairy products) were Dean, Leprino, and the cooperatives.

⁸The Labatt story draws on Dobson, 1992, p. 439.

⁹The last subsidiary, Lehigh Valley Dairies, was sold by Interbrew, which had acquired Labatt, to Tuscan Dairy Farms/Dellwood Foods in 1996.

¹⁰Agway sold Hood to Catamount Co., a petroleum marketer, in early 1996.

¹¹See Dobson, 1992, for a discussion of the competitive strategies of 10 large fluid milk firms.

The significant role played by the eight large companies from the 1930's into the 1970's shaped the structure of the period and the nature of competition. Corporate restructuring through mergers, acquisitions, and divestitures since then has taken many of them out of business and others out of all or most aspects of dairy. Most large corporations in today's dairy industry are concentrating on core businesses in branded products—cheese, yogurt, and premium and superpremium ice creams.

Structure of Fluid Milk Processing

The food business of the past 40 years has drastically changed in many dimensions. Three groups of firms are especially relevant in the fluid milk business—large companies, supermarket chains, and the rest of the processors.

The ranks of fluid milk handlers have been thinning ever since city milk distribution began over 100 years ago. A major influence has been the shift in the scale curve—the relative costs of small firms compared with large ones. A century ago, very little happened to fluid milk between the farmer and the consumer. The equipment was simple and the costs of the small distributor were not greatly different from those of the large distributor. The glass bottle, introduced before the turn of the century, was about the earliest development that altered the shape of the scale curve. Even simple bottle-filling equipment was expensive when used for only a few quarts of milk per day. As a result, many small distributors went out of business.

In the first two decades of the 20th century, many cities required pasteurization of milk, which raised costs to small distributors as compared with large ones, and many more small distributors found that they could no longer compete. In the 1920's and 1930's, classified pricing plans provided for uniform prices to producers by all handlers, forcing many small handlers to pay the same prices as their larger competitors did, a requirement many found impossible and they, too, went out of business. In the late 1930's and the 1940's, the introduction of the paper carton raised costs to smaller distributors. Plastic containers have replaced nearly all glass and most paper ones, requiring large volume to cover the cost of the plastic molding equipment.

Nearly 10,000 fluid milk plants (not including 30,000 producer-distributors) were operating just before World War II. The number has declined nearly every year since then (fig. 4). Plants of all sizes have gone out of business, but a greater number have been small plants, so average size has risen at least since 1950. Average plant size more than doubled from 1988 to 1993 and in every decade since the 1940's.

Between 1980 and 1988, 440 plants closed (not including California plants, for which data are not available). Fifty-six percent processed less than 1 million pounds per month; 32 percent, 1 to 5 million pounds; 8 per-

cent, 5 to 10 million pounds; and 4 percent, 10 million pounds or more. Scale economies—bigger plants have lower unit costs—are major factors. The minimum efficient plant size in every food processing industry has increased several-fold since World War II.

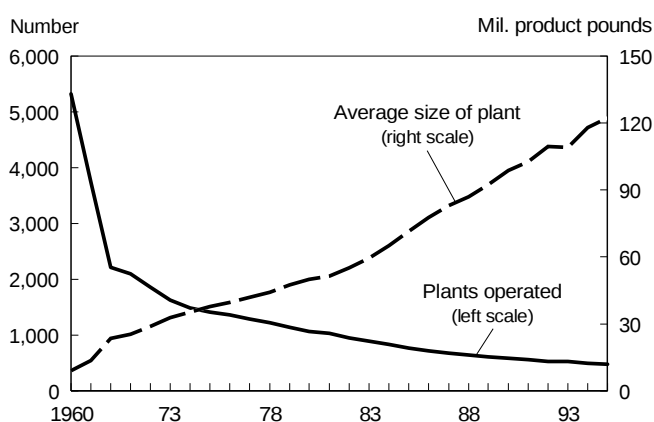
From the late 1950's into the 1970's, seven national dairy firms¹² made about a quarter of the fluid milk sales and had large sales of other dairy products. All but Borden disappeared as independent businesses in the 1980's (table 13).¹³ In 1988, only Borden, Dean, and Morningstar (which had bought Southland's dairy operations) remained. Morningstar has since left the fluid milk business (tables 15 and 16).

Integrated Supermarkets

Fluid milk processing was very popular among retail food chains in the 1960's and 1970's when many built or bought large, efficient plants. These plants were used to process only high-volume products, leaving cream and other minor products to other processors.¹⁴

Figure 4

Number and average size of fluid milk bottling plants operated by commercial processors, selected years



Source: Manchester, 1983 and updates.

¹²Beatrice, Borden, Carnation, Kraft, Pet, Fairmont, and Foremost. Sales of the first five were 81 percent dairy products in 1954, 58 percent in 1964, and 39 percent in 1975.

¹³Borden's sales were 34 percent dairy in 1987 after the acquisition of Meadowgold, 20 percent dairy in 1991, 1992, and 1994, and 13 percent dairy in 1995.

¹⁴In a cost study in the Northeast in 1993-94, supermarket chain plants packaged mostly in gallons and half gallons and under fewer labels, yielding higher product turnover, higher labor productivity, and lower costs than other plants (Erba and Aplin, 1996).

Table 15—Number of U.S. fluid milk bottling companies, 1934-93, selected years¹

Type of firm	1934	1948	1950	1957	1964	1970	1980	1988	1993
<i>Number</i>									
National firms	3	7	7	7	7	7	8	3	2
Regional firms	6	NA	4	5	8	7	4	5	3
Local firms:									
Multi-unit	*	NA	NA	120	99	44	19	13	NA
Single-unit	8,756	NA	NA	4,760	3,234	1,609	667	340	NA
Cooperatives:									
Multi-unit	*	NA	NA	72	35	23	18	15	NA
Single-unit	163	NA	NA	383	152	83	27	15	NA
Integrated supermarkets: ²									
Sole outlet ³	2	4	6	12	21	25	19	33	NA
Others ⁴	0	0	0	0	2	4	15	NA	NA
Total	8,930	7,750	7,430	5,359	3,558	1,802	777	424	358

*Included in single-unit companies.

NA = Not available.

¹See appendix table 3 for number of plants. ²Firms of which their primary business is operating supermarkets. ³Most milk sales through own stores.

⁴Substantial sales through outlets other than own stores. Excludes Arden-Mayfair, which is classified as a regional firm through 1970 and local in 1980.

Sources: Compiled from Manchester, 1983 and updates, and Lough, 1981 and 1991b.

Table 16—Sales of U.S. fluid milk products by type of firm, 1934-93, selected years

Type of firm	1934	1950	1957	1964	1970	1980	1988	1993
<i>Percent</i>								
National firms	31.9	21.7	28.6	27.2	23.3	25.0	16.8	12.4
Regional firms	5.7	4.2	5.5	5.1	7.7	4.0	11.3	5.1
Local firms ¹	57.7	67.1	58.1	54.7	48.5	38.7	38.7	48.3
Cooperatives ²	4.7	7.0	7.8	9.7	11.5	14.8	14.8	15.6
Integrated supermarkets: ³								
Sole outlet ⁴	NA	NA	NA	2.9	8.2	14.2	18.4	18.6
Others ⁵	0.0	0.0	0.0	0.4	0.8	3.3	NA	NA
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

NA = Not available.

¹Includes integrated supermarket firms, 1934-57. ²Approximations, 1934 and 1950. ³Firms of which their primary business is operating supermarkets.

⁴Most milk sales through own stores. ⁵Substantial sales through outlets other than own stores. Excludes Arden-Mayfair, which is included in regional firms through 1970 and local in 1980. Included with sole outlet, 1988 and 1993.

Sources: Compiled from Manchester, 1983 and updates, and Lough, 1981 and 1991b.

Resale price control under State regulations, as seen most clearly in California, was one stimulus for retail food chains to integrate into fluid milk processing. With guaranteed margins for processors and a guaranteed market provided by the supermarkets themselves, supermarket operators often had an opportunity to earn a substantial return on investment in fluid milk processing. Some operators produced only a very limited line of products and containers, which helped to keep their costs at very low levels, and purchased specialty products and low-volume container sizes from other companies.

Vigorous enforcement of the rules of the Robinson-Patman Act (which requires charging the same prices to large and small buyers) against large milk distributors in their contracts with chains also provided some incentive to integrate. Large distributors were the only ones who could handle the business of a substantial retail chain, but the Federal Trade Commission (FTC) took a dim view of contracts in which the price recognized the fact that the business of a chain could affect the volume of a plant so as to change costs and profitable prices significantly.

The slowdown in the supermarket boom in the 1960's and 1970's boosted incentives to integrate. By the early 1960's, all but the fastest growing markets in portions of the Sunbelt were well provided with supermarkets. Expansion in those markets could no longer be achieved by displacing small grocery stores so the supermarket firms looked for other growth opportunities. Other forms of retailing, especially drug stores and general merchandise stores, were tried, and verti-

cal growth was also attractive to some larger chains. Fluid milk processing was a significant growth area for many. Earnings were guaranteed, and the firms apparently made no comparisons to see if they could have made more money by purchasing milk from existing processors.

Another attractive source of cost savings was for supermarket firms to deliver their own milk to their own stores using drivers who belonged to the chain retailer local of a union rather than to the dairy local. This permitted delivery of pallet loads of packaged fluid milk to the dock rather than stocking individual containers in the cooler.

In the 1980's, the three largest chains of the 1970's made major readjustments and disposed of milk plants. A&P fell on hard times in the 1970's and closed many stores, including entire divisions, leaving their milk plants with substantial overcapacity. For a time, some A&P plants packaged milk for other chains that had closed or sold their own plants, but this business was eventually lost. A&P is now out of the fluid milk processing business altogether.

Safeway and Kroger went through major restructuring in the 1980's as a result of a leveraged buyout (LBO) at Safeway and efforts to avoid a hostile takeover at Kroger. Safeway sold several store divisions along with the milk plants that had supplied them, reducing stores by more than 40 percent. In 1995, Safeway closed its milk plant in the Washington, DC, area and contracted for fluid products. Kroger disposed of many of its food manufacturing operations.

Some of these plants were closed and others sold to other fluid milk companies. Obtaining a contract to supply the chain's remaining stores was an attractive arrangement to other companies. Plants that were sold off with an entire division of stores were often sold to the same buyer.

Several States withdrew from retail price fixing or modified their practices, removing the guaranteed margins for milk and reducing incentives for integrating into fluid milk processing. Labor contract provisions that favored integrated operations (by permitting milk delivery on the same terms as groceries and other foods from the chain warehouse to its stores) have largely disappeared. In addition, many of the integrated milk plants had been built in the 1960's and 1970's; by the late 1980's, such plants needed substantial investment in more modern equipment.

Integrated Convenience Stores

Many chains of dairy stores were started by fluid milk processors in the 1960's when dairy products comprised 40 percent of the sales of such stores. The pioneer was Southland, a dairy and ice company, which started its 7-Eleven chain in the 1930's, although its major growth came after World War II. Over the years, the share of dairy product sales declined in all these stores and they gradually became convenience stores.

In 1988, Southland sold its manufacturing operations and several divisions of stores in an effort to reduce debt incurred in a leveraged buyout.¹⁵ Fairmont, one of the large dairy companies of the 1950's and 1960's, went heavily into convenience stores and eventually sold off its dairy operations.

In the late 1970's, about 60 percent of the fluid milk sales by dairy/convenience stores were from their own plants, dropping to 40-plus percent in the early 1980's and to about 25 percent since Southland sold its plants.

Cooperatives

Dairy cooperatives became important in bulk fluid milk markets early on, but their share of packaged milk has hovered around 14 to 16 percent since 1980. Cooperative fluid milk packaging is down sharply from 1992-93. Mid-Am acquired Dairymen, Inc., in 1994 and sold the packaged milk subsidiary Flav-O-

Rich to Land O'Sun, a proprietary firm. Agway sold H. P. Hood to private owners in 1996.

The State of Competition in Packaged Milk

Packaged fluid milk markets offer a glimpse of how competition in the markets has evolved over time. A key feature of these markets, at least early on, was cooperation that led to a "managed" competition among the various groups of firms in the markets. It was implicitly recognized that unfettered competition could be detrimental to all firms concerned.

Competition in the Fifties and Sixties¹⁶

The broad outlines of the competitive process in city markets from the 1920's up until about 1960—the period of what might be called "dealer dominance"—have been described by Harris (1966, pp. 6-9). In the larger markets, a few large firms competed as oligopolists. Small firms normally conformed to the price and sales policies of the oligopolists but had nothing to do with determining those policies. They were effectively barred from direct competition in parts of the market dominated by the large firms.

In the early 1960's, the typical fluid milk market was supplied by a relatively small number of large handlers, with many others occupying the fringe (table 17). In the smallest markets, the largest firm sold a bit more than half of the milk and the four largest sold 95 percent.

The place of the small dealer in a city market was usually somewhat precarious. They typically sought a place on the fringes or within the crevices of the market. Larger dealers operated on a wider base and, in general, were more firmly entrenched in the market. They delivered to homes and stores throughout the market and were able to obtain and hold the business of larger stores, restaurants, and institutions. The largest dealers had the resources to offer special discounts, equipment, or credit when these incentives could win or protect accounts.

Struggles for individual accounts always went on behind the peaceful facade of adherence to the going

¹⁵The dairy operations were organized as Morningstar and sold to an investment company. Morningstar fared badly and disposed of the dairy plants to other fluid milk firms.

¹⁶This section draws heavily on Edmond S. Harris, 1966 and 1967, for the period up through the mid-1960's. See also Hedlund, 1964.

Table 17—Average number of U.S. handlers distributing milk by size of market, March 1962

Size of Market	Markets	Handlers ¹	Average market share	
			Largest firm	Four largest firms
<i>Million pounds</i>	<i>Number</i>		<i>Percent</i>	
Less than 5.0	9	16.0	51.0	95.1
5.0-7.9	8	20.4	46.5	94.6
8.0-11.9	10	20.6	38.4	91.2
12.0-15.9	14	27.3	37.0	88.0
16.0-23.9	10	30.9	35.3	78.3
24.0-39.9	8	46.4	29.9	70.8
40.0-59.9	7	28.6	22.8	65.4
60.0 or more	5	93.8	22.6	61.1
All markets	71	32.3	36.6	82.6

¹All handlers selling in the market, including producer-dealers and handlers located in other markets.

Source: Manchester, 1965, pp. 10 and 14.

price structure. Each dealer usually operated within a certain sphere of competitive influence. The larger dealers normally respected the place in the market that the smaller dealers made for themselves. This mutual, tacit respect was sometimes expressed as “Live and Let Live” policy.

The competitive situation was, however, always fluid. Areas of influence were never so clearly defined that intense sales competition did not take place at their boundaries. If an incursion into another’s territory occurred, retaliatory sales competition could be expected, with the possibility of a price war. It was also common for a gradual encroachment on the business of others to culminate in retaliatory competitive action designed to reverse the process. Under normal conditions, competition among dealers not only skirted special influence areas but also avoided taking certain forms, most notably reducing the quoted price.

Adherence by all dealers to a quoted price or price structure was partly a recognition of their mutual interest as sellers in relation to buyers. Secret price cutting, special rebates, discounts, or special services might seem to make the quoted prices more the exception than the rule. Quoted prices were the guide for all sellers, and even practices that modified uniform pricing effects followed a pattern of restraint. The effect was to give each dealer the fullest advantage in negotiating with buyers who were, because of geographic location or lack of knowledge, isolated from other sellers. When dealers competed, discounts and related practices provided a kind of price flexibility without jeopardizing each dealer’s advantages with respect to their customers. Knowledge of accepted ranges of discounts and rebates, of the kinds of special services, and of the situations in which they would be offered were better

known among the few dealers than among the many buyers—offering an advantage to sellers when negotiating to get or retain a customer.

Milk dealers’ general adherence to mutually acceptable quoted prices reflected a general ambivalence toward competition and cooperation. The facts of business life required some forms of cooperation, possibly imposed by more economically powerful firms, to avoid putting each other out of business and to promote common interests. The result was a certain degree of order among the firms, which partially replaced the impersonal order imposed on sellers by a purely competitive market. These same cooperative mechanisms could also provide the means for oligopolistic exploitation of the market by the imposition of excess prices or distorted price relationships.

The most significant form of cooperation among milk dealers was that which resulted in a recognized structure of prices and some tacit understanding of the manner and extent to which discounts and special services would be used when competing for customers. This form of cooperation was influenced by laws and public policies that placed obstacles in the way of open and formal agreements. Written agreements were taboo. The process of arriving at a price structure or of amending prices became an interfirm activity that the participants tried to carry out with the same degree of privacy as activities within the firm. Meetings, luncheons, and telephone communications provided fairly effective means for arriving at common understandings or to clear up misunderstandings on prices, customer relations, and other matters of common interest.

A rather tenuous “balance of competition” normally prevailed, maintained by the various forms of coopera-

tion described and by mutual respect for each dealer's sphere of special influence. The balance of competition did not prevent struggles for survival and growth. Competition within the permissible limits might be intense and sporadically bitter. But as long as the competitive balance prevailed, prices were generally quite stable, and price changes were made in an orderly, concerted manner.

This competitive balance could be upset by changes that could not be assimilated in a gradual and orderly way. This might set in motion a whole series of changes, sometimes of cumulative intensity, and be accompanied by a marked disequilibrium of prices. When the balance was restored, some firms might be gone, the sales of those remaining might be reallocated, and distributive techniques and price relationships might have changed.

Changes in fluid milk processing and marketing—especially the increased mobility of packaged milk and the increasing share of supermarket sales—made the competitive equilibrium in more city markets subject to price warfare during the 1950's and 1960's.

Price wars had both destructive and constructive effects. One important function was to provide a means to adjust the existing price structure to changes in milk marketing. The usefulness of a price structure is in promoting an orderly marketing process. If the price structure was to remain useful, it had to change as marketing conditions changed...if not gradually, then by an outbreak of price warfare.

Because firms in a market engage in price wars when they cannot adjust to changes in marketing conditions without resorting to what might be called commercial violence, the pattern of price wars over time provides an indication of the stresses on price structures. There were 15 price wars in 1954 and 1955 in 81 markets. In the late 1950's and the first half of the 1960's, the rate increased, dropping off in the late 1960's.

Number of price wars in 81 markets without resale price control, 1954-69:

1954-55	15
1956-57	12
1958-59	21
1960-61	25
1962-63	23
1964-65	22
1966-67	16
1968-69	9

There were an additional 19 price wars in 19 markets in 9 States that had resale price control for part but not all of the period. The pattern of these additional price wars was heavily conditioned by the timing of removal or imposition of resale price control, so they tell us something about the adjustment process only on a case-by-case basis.

The Present Competitive Situation

Since the early 1960's, the balance of power in establishing price structures for milk has shifted from dealers to retailers, primarily supermarket groups. The buying market facing fluid processors has changed drastically. The thousands of individual consumers on home delivery routes have been replaced by a handful of buyers for groups of stores, restaurants, and institutions. Increasing integration into fluid milk processing by major supermarket chains meant that a significant portion of the market was foreclosed to other fluid milk processors—in 1980, 17 percent, and in 1993, 19 percent. Integrated dairy and convenience store groups foreclosed another 8 percent in 1980 and 2.5 percent in 1993. Central buying of fluid milk by retail groups who have chosen not to operate their own milk plants greatly reduces the number of buyers and changes the nature of the price-bargaining process.

Home-delivered milk—the dominant form until the 1960's—depended more on personal service and selling efforts than on advertising (table 18). As supermarkets became major outlets for milk, sellers changed their focus. Except for Safeway, Kroger, Ralph's, and a few others who built their own milk plants around 1930, milk previously had been sold on consignment, usually from several milk companies per store. All the retailer did was to collect at the cash register.

In the 1960's, most large supermarket chains installed central milk programs. Some built their own plants, especially to capture guaranteed margins in those States where wholesale and retail prices of milk were set by a State agency. The others contracted with one milk company for private label milk at significantly lower prices made possible both by larger volume (one processor instead of three or four) and limited service (delivery to the retailer's platform instead of arranging individual cartons in the case). Milk remains a commodity at retail.¹⁷ Almost none is strongly branded, and private label is the best seller. In 1994, 63 percent

¹⁷See footnote 2.

Table 18—Marketing channels for U.S. fluid milk products, 1929-93, selected years

Outlet	1929	1939	1948	1954	1969	1977	1980	1988	1993
<i>Percent</i>									
Home delivered	73.3	70.3	56.2	50.0	28.0	6.6	2.4	0.9	0.8
Plant and farm sales	5.9	5.0	2.0	2.0	1.9	1.5	2.7	2.0	1.7
Stores:									
Supermarkets—									
Integrated	0.0	*	*	1.0	7.1	13.4	17.3	18.4	18.6
Other	0.0	0.5	5.0	11.5	14.9	25.0	31.9	34.6	38.7
Dairy and convenience—									
Integrated	*	*	*	0.1	4.4	5.6	8.0	4.4	2.5
Other	2.0	2.7	2.4	2.8	3.1	4.2	4.5	9.1	7.5
Other stores	5.9	6.0	20.6	19.1	21.5	27.2	19.0	17.2	17.4
All stores	7.9	9.2	28.0	34.5	51.0	75.4	80.7	83.7	84.7
Food service and institutional outlets:									
Military	0.0	*	1.1	2.8	1.6	1.3	1.4	1.1	1.0
Schools	*	*	1.3	2.1	6.5	7.1	7.2	6.9	6.3
Restaurants, hotels, and institutions	12.9	15.5	11.4	8.4	8.6	5.7	5.6	5.5	5.5
All food service and institutional outlets	12.9	15.5	13.8	13.3	16.7	14.1	14.2	13.5	12.8
Other	*	*	*	0.2	2.4	2.4			
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

* Less than 0.05 percent.

Source: Manchester, 1983 and updates.

of supermarket milk was store brand or generic (Nielsen Marketing Research, 1995).

In 1993, two-thirds of milk sold by handlers under Federal orders went to supermarket chains and dairy/convenience store chains, up from 53 percent in 1977 (table 19). Most of this was private label. Private label contracts seem to be shifting toward long-term arrangements for most products.

Dairy buyers for New York State supermarkets buy fluid milk from an average of just under 4 vendors—2.8 vendors for smaller firms (sales less than \$1 billion) and 4.4 vendors for larger firms. Most buyers use annual or monthly contracts or agreements with purchases at a predetermined price. The most important factors in selecting suppliers for the dairy department are the suppliers' willingness to tailor promotional programs to the retailers' needs and supplier reliability. Price and quality are not viewed as critically important—probably because they do not vary much (McLaughlin and Perosio, 1996).

Structure of Manufactured Product Markets

Manufactured dairy product markets can be examined separately; there is little competition between or among the final products. However, each market competes for milk as the primary raw input for manufacture. Lough (1991a) identified six major dairy product groups: butter, natural hard cheese, dry milk products, condensed and evaporated milk, cottage cheese, and frozen dairy products. Because of their importance to public dairy policy, the first three groups are of most interest. The frozen products market, mainly for ice cream, is also discussed in some detail.

Natural Cheese¹⁸

Because of strong demand for cheese, much of the milk available for manufacturing dairy products goes to cheese production. One would expect that, sooner or

¹⁸Production data for cheese and other manufactured products are from USDA, NASS, 1996, and cooperative data are from Ling and Liebrand, 1994.

Table 19—Retail chains in Federal order markets, 1977-95, selected years

Year	All chains		Vertically integrated chains	
	Supermarket	Dairy/convenience	Supermarket	Dairy/convenience
	<i>Percent</i>			
1977	42.9	10.0	12.1	6.0
1979	46.2	10.7	13.1	6.9
1981	49.7	9.8	16.2	4.7
1983	50.2	9.8	14.5	4.6
1985	52.6	9.4	15.5	4.4
1987	51.2	10.6	14.5	4.4
1989	53.8	10.4	15.8	2.8
1991	55.2	10.4	16.8	2.4
1993	57.3	10.7	16.7	2.7
1995	56.5	10.3	16.4	2.2

Source: USDA, AMS, *Packaged Fluid Milk Sales in Federal Order Markets: By Size and Type of Container and Distribution Method During November 1995*. March 1997 and earlier editions.

later, the growth in demand for cheese will slow. For the near term, however, cheese demand is not expected to slow much. The increase in production of Italian cheese varieties was particularly large during the 1975-94 period, driven partly by the growth of away-from-home food consumption and the popularity of pizza. A lot of cheese is used in pizza, hamburger, and Mexican food restaurants, fast food places, and salad bars; in 1992, 35.3 percent of cheese sales by weight were made to food service (IDFA, 1995a).

Total American and other cheese production (excluding cottage cheese) was 6.94 billion pounds in 1995 compared with 2.81 billion pounds in 1975. Production of Italian varieties grew from 672 million to 2.64 billion pounds over the same period. The share of all cheese that is Italian grew to 38 percent in 1995 from 24 percent in 1975.

Cheese production is located where (1) large quantities of Grade B milk were formerly available; (2) excess supplies of Grade A milk are available and are looking for a home; or (3) both, which is sometimes possible. As the joint butter-powder operations that long characterized the butter industry dwindled (see p. 28), cheese production became the residual use of milk. Wisconsin has long been and continues to be the leading producing State for most cheese varieties.

Other States are also important cheese production centers. American varieties are produced primarily in Minnesota, California, and Idaho; California, New York, and Pennsylvania have large Italian cheese production. A relatively recent phenomenon in the cheese industry is rapid production growth in Western States, such as Idaho, New Mexico, and Washington. With

relatively low costs, these States have strong growth in milk production and because most of the added production exceeds fluid needs, which is not increasing as rapidly as production, the milk is ready-made for the cheese vat.

The number of cheese plants has been declining nearly every year since 1975 and, because production has increased, average plant output has increased. Plants producing cheese (excluding cottage cheese) in 1995 numbered 432, down from 839 in 1975. Many plants are modern and efficient, but many older, smaller, less-efficient cheese plants are still operating. Modernizing these plants to the extent needed to match the efficiency of more recently built facilities would probably require a healthy infusion of resources. Owners and operators of these plants will need to consider whether cheese demand is likely to continue to be strong enough to warrant the investments needed.

Proprietary and cooperative firms share the natural cheese market in the United States. In 1992 (the most recent data available to compare proprietary and cooperative firms), cooperatives distributed 2.8 billion pounds of natural cheese (excluding cottage cheese). Proprietary firms marketed the rest, 3.7 billion pounds. The shares were 43 percent for the cooperatives, 57 percent for the proprietary firms (see table 11).

American and Italian varieties are the two major cheese types marketed in the United States. In 1992, 258 plants produced 2.94 billion pounds of American cheese and 166 produced 2.51 billion pounds of Italian varieties. In 1992, 464 plants produced natural cheese.

The hard natural cheese marketed by cooperatives was mostly American types. Sales by cooperatives accounted for 75 percent of U.S. cheddar cheese production, 54 percent of other American, 29 percent of Mozzarella, 14 percent of other Italian, and 8 percent of other natural varieties. In 1992, 75 dairy cooperatives distributed natural cheese made in 80 plants that produced American cheese and 46 plants that produced Italian varieties (Ling and Liebrand, 1994, tables 2 and 7).

Based on the plant numbers and production data for American and Italian cheeses, some key features of the cheese industry emerge. The average output for cooperative plants was 26.125 million pounds of American cheese and 12.34 million pounds of Italian.

Noncooperative plant output was 4.775 million pounds of American and 16.18 million pounds of Italian. These data suggest that the cooperatives have invested more in larger scale, more efficient American cheese production facilities than have proprietary firms. Plants producing Italian cheese do not exhibit such a wide difference in output between the cooperative and proprietary firms.

Table 20 shows concentration measures for dairy cooperatives based on natural cheese sales and production. Note how the concentration ratios differ. The top half of the table is based on gross sales by all cooperatives selling cheese; the bottom half compares net cooperative sales and total U.S. production.

These ratios show that cheese sales by cooperatives have grown more concentrated over time and that concentration is reaching relatively high levels. Cooperatives' share of total production also suggests

Table 20—U.S. cooperative “concentration” measures for natural cheese, 1980-92, selected years

Cheese distributed by cooperatives	1980	1987	1992
	<i>Percent</i>		
Share of total cooperative sales: ¹			
4 largest cooperatives	53	55	66
8 largest cooperatives	73	68	80
20 largest cooperatives	78	88	96
Share of total U.S. production: ²			
4 largest cooperatives	19	25	29
8 largest cooperatives	26	31	35
20 largest cooperatives	36	40	42
All cooperatives	47	45	43

¹Shares of gross sales, including intercooperative transactions.

²Net shares of each group, excluding intercooperative transactions.

Source: Ling and Liebrand, 1994.

growing concentration but still at very moderate levels. Dramatic changes in the numbers for 1997 are unlikely.

Cheese Pricing¹⁹

Cheese markets have relied on quotation pricing almost since the first cheese factories were established. The first efforts at organized marketing were made in the 1870's, when dairy boards were established in Wisconsin, Illinois, and New York. These boards were originally organized as auctions, but most soon turned to private selling. Even when the organization of boards was taking place rapidly, by far the greatest proportion of the cheese produced was sold on the basis of board prices plus predetermined premiums.

Around the turn of the century, call boards replaced the dairy board auctions. Under the call board system, cheese factory salesmen's quantity offerings of cheese were listed. Bids were entered opposite each offer to sell, and the highest bidder on each lot got it. In Wisconsin, the call boards peaked in number, and probably volume, when they sold about 10 percent of Wisconsin cheese (Weld, 1919, p. 295). Call boards in the other States followed much the same path.

By the 1920's, few call boards were left and the Plymouth, Wisconsin, cheese board (also known as the Wisconsin Cheese Exchange and more recently the National Cheese Exchange (NCE)) emerged as the major price-making organization for natural cheese. A group of disaffected farmers did organize the Farmers Call Board, also in Plymouth, in 1921. But its sessions immediately followed the weekly session of the Wisconsin Cheese Exchange and merely ratified the prices made there. The Farmers Call Board lasted until 1941, but it had not been a major factor for many years.

Cheeses other than American were not traded on the various boards and exchanges until 1937. In the early to mid-1930's and probably before, manufacturers and assemblers of Swiss cheese met monthly and agreed on a price. Kraft, the dominant assembler of Swiss cheese from southwestern Wisconsin plants, was indicted for price fixing in the late 1930's and pleaded

¹⁹This section draws on Holmes, compiler, 1913, pp. 38-42; Weld, 1919; U.S. Federal Trade Commission, 1928, pp. 630-645; Nicholls, 1939a; Miller, 1951; Boston Class II Price Committee, 1951; Graf, 1966 and 1979; Williams and others, 1970; Gould, 1979; Hayenga, 1979b; Lough, 1975 and 1980; Hamm and March, 1995; and Mueller and others, 1996.

nolo contendere. Thereafter, Kraft acted as a price leader, announcing prices which were generally followed by other assemblers. Even after all types of cheese became eligible for trading, most were not traded (Graf, 1966; Hayenga, 1979b).

In 1937, only about 507,000 pounds of cheese were sold on the Wisconsin Cheese Exchange. This was roughly one-half of the volume sold in each of the preceding 2 years and much lower than the amounts sold for many years before that. The decline in the sales volume gave increased credence to charges that had brought on a series of investigations over the years. It became evident that drastic action would become necessary if the Exchange were to survive.

Since Exchange prices were a key factor in pricing a large proportion of cheese at the factory level and had an important effect at all stages of the marketing process, both factory owners and operators and dealers were strongly interested in keeping it in operation. As a result, the Exchange was completely reorganized in 1938-39 and a new set of trading rules established.

Major changes in the rules were as follows:

- The board was opened for the sale of all kinds of cheese and rules were set up for the sale of American cheese.
- The assembling charge was increased, and a limit was placed on the delivery time.
- A freight differential was established for all carload sales.
- All cheese offerings were required to be in an approved warehouse with cold storage facilities.
- Offerings without asking prices were eliminated.
- Provisions were made for an arbitration committee to assess damages in cases of failure to deliver or failure to accept lots of cheese sold on the Exchange.
- Quality and weight disputes were to be settled immediately by a disinterested party.
- Sales of less-than-carload lots were limited to a minimum of 3,000 pounds.

The reorganization of the Wisconsin Cheese Exchange apparently resulted in its becoming a market where significant quantities of cheese were bought and sold rather than almost exclusively a price-making agency. Members appeared to have adjusted surpluses and deficits in their holdings of various types of cheese through the Exchange and, in so doing, to have created a substantial sales volume. There was no evidence that

sales had been manipulated in order to rig prices for the benefit of the traders (Miller, 1951). Under previous rules, the market could be completely disrupted by using bids and offers that were withdrawn if any attempt were made to consummate a sale. The new regulations made every bid or offer a firm commitment to carry through a sale if another member were willing to buy or sell at the bid or asking price.

In 1940, the facilities of the Exchange were opened to any cheese factory for the sale of its product, regardless of whether or not it was a member. With these changes in the organization and procedures of the Exchange, the trade volume increased substantially. From July 1946 through February 1949, over 36 million pounds of cheese were sold on the Exchange, roughly equal to half of the receipts of cheese in Chicago.

Operation of the National Cheese Exchange (NCE) changed little in its final years. While only American cheese was traded, the NCE prices were used to price other natural cheeses, except cream cheese, Romano, and Parmesan. NCE volume was small; only about 5 percent of natural cheese is sold on spot markets (which included the NCE). Spot market prices were negotiated by both buyers and sellers who were fully cognizant of NCE activities. Trading in cheese shifted to a cash market on the Chicago Mercantile Exchange on May 1, 1997, and the NCE closed down.

The Cheese Reporter, a trade journal, reports weekly Exchange activities and prices of American cheese in various forms, which are effective until the next trading session (usually a week). Exchange prices become reference prices for natural cheese contracts and entered into Federal milk marketing order pricing through adjustments to the Basic Formula Price (BFP).

About 90 percent of natural cheese is sold under long-term contracts²⁰ made mostly between cheese manufacturers (largely cooperatives) and large companies making processed cheese or cutting and wrapping natural cheese for sale to foodservice outlets or for retail sale. Long-term contracts commit all or a specified portion of a cheese plant's output to sale at a specified price for a specified period (or until the contract is renegotiated). Premiums are renegotiable in some contracts. Some examples of contract price arrangements

²⁰Contracts or standing agreements of this type are more or less formal—sometimes written, sometimes not. Almost universally, they can be terminated by either party at any time, although they typically continue for multiple years.

show how different cheese market participants made use of reference prices and premiums (in different ways and for different reasons).

Most first handler sales to industrial markets used a formula based on the NCE price on the date of cheese production plus a premium. Sales to full-line institutional wholesalers commonly used weekly or monthly price lists. These were based on the NCE price plus a premium. The premium might remain unchanged for up to a year if there is little change in marketing costs or the quantities of cheese required during the year.

The standard pricing arrangement for some large fast food chains used the average NCE price in the preceding month as the base price for the following month, to which a prenegotiated premium was added. This provided the buyers (the chains) with advance knowledge of the raw material costs and “menu margin” for the following month. For the sellers, variations in the monthly cheese prices should average out in a long-term supply arrangement, and inventories should provide a partial hedge against the risk that cheese prices might increase during a month when they are locked into the lower selling prices to these food service customers (Hayenga, 1979b).

Most manufacturers’ brand cheese were sold to retailers on the basis of a weekly price list for nonspecialty cheese, which follows price changes on the NCE. Firms with major brand cheeses followed NCE price changes less closely, considering factors such as changes in other costs and in target margins. Some sales of private label cheese to large retail customers were also based on a list price (less advertising and promotion costs), but most on a formula price using the NCE price plus a premium.

The premium structures in long-term contracts reflected the value of an assured outlet to the seller and assured supplies and tight quality specifications to the buyer—a different market activity than one-time sales on the Exchange. Prices used in the cheese industry—formulas based on a reference price originating on the National Cheese Exchange—economize on transaction costs. Similar formula prices are used for butter, eggs, and meat because they minimize transaction costs on daily or weekly trades.

Cheese pricing was in the news in 1996 because a study by the University of Wisconsin suggested the possibility of price manipulation on the National Cheese Exchange (Mueller and others, 1996). This was not the first time cheese pricing had come under scrutiny, as discussed earlier, but in the context of the effects of cheese prices on milk prices to farmers, the criticism was sufficient to move cash cheese trading to the Chicago Mercantile Exchange.

Cheese prices have generally been above government support purchase prices since 1989 and—due to strong market demands for cheese—there have been almost no sales to the government for price support activities in recent years.

Cheese Markets

American cheese, which can be sold to the Commodity Credit Corporation (CCC) under the price support program, is produced mostly by cooperatives—71 percent in 1992—and largely by the big cooperatives. Italian cheese is mostly produced by proprietary companies—74 percent in 1992. About half of the natural cheese goes to the “industrial” market and is used in processed cheese, cheese food, and related products and in frozen pizzas and other manufactured food products.

Most of the natural cheese used in products is produced by cooperatives under long-term agreements. The major cooperative cheesemakers include AMPI, Mid-AM, and Land O’Lakes. AMPI produces natural cheese and was Kraft’s largest supplier in the early 1990’s. It also produces unbranded processed cheese from its own natural cheese. Mid-Am produces Italian, American, and packaged cheese and buys cheese to meet its sales commitments. It produces shredded cheddar cheese for Taco Bell and large quantities of Mozzarella for pizza. Land O’Lakes is a supplier of bulk cheese to Kraft and Schreiber and produces branded natural, processed, and shredded products.

Kraft and Borden are the major sellers of branded processed cheese. Most of Kraft’s sales are through retail stores—75 percent (Mueller and others, 1996). During 1988-93, about 45 percent of all cheese sold at retail carried the Kraft brand name. Borden had about 8 percent of the retail market. Both companies purchase cheese to meet their needs, Kraft buying 60 percent of

the cheese it uses.²¹ Although mainly involved in retail sales, Kraft plays an important role in other segments of the cheese market. It retained exclusive rights to distribute Kraft-brand foodservice products for 5 years even though the Kraft Foodservice operation was sold to an investment firm in 1995 (*Food and Drink Daily*, Dec. 20, 1994).

Other large proprietary cheese firms have varied specialties:

- Leprino is “the world’s largest manufacturer of mozzarella.” A distribution operation to pizza places was sold in 1994 to International Multifoods. They have a joint venture with one cooperative and lease plants from two others. (Dryer, Levitt, and Rogers, 1996).
- Schreiber is an old-time packager of natural cheese with limited manufacturing capacity. Now Schreiber makes mostly processed cheese, more than half sold to fast food chains and some as retail private label and its own brands.
- Simplot has five cheese manufacturing plants and a cut-and-wrap plant producing blue, provolone, cheddar, and mozzarella—private label and some branded.
- ConAgra acquired Beatrice cheese operations when it bought the remains of the Beatrice conglomerate in 1990. Beatrice is a significant manufacturer of mozzarella. Their processed cheese uses almost entirely purchased barrel cheese.
- Sargento specializes in shredded cheeses, all made from purchased cheese. It is second only to Kraft in that market.

The share of retailer brands and private labels varies widely among classes of cheese (table 21). Kraft is important in most and dominates in two (over 50 percent of sales), except specialty/imported.

Butter

Butter demand has not been strong for many years. Shortages and rationing during World War II reduced

consumption significantly, and since then, the trend in consumption was downward in the 1950’s and 1960’s and flat in the 1970’s and 1980’s. The availability of margarine as a substitute and changing concerns about fat in the diet have kept consumption low. Butter consumption recently rose as prices for butter became more competitive. Butter was and still is the residual use for butterfat not used in fluid or other manufactured dairy products, but not in the same way as before.

The butter-powder industry as it was known in the 1950’s and 1960’s no longer exists.²² Throughout that period, surplus milk, especially Grade B but Grade A as well, flowed almost exclusively to butter-powder plants. Organizations, such as Land O’Lakes, made some butter and powder in separate plants that were part of an organized system, with the milk separated at the butter plant and the skim milk moved to a powder plant. Since then, surplus whole milk has gradually disappeared, being replaced by separate surpluses of butterfat and skim milk arising at different points in the dairy marketing system.

As lowfat milks replaced much whole milk, cream sales declined, and the fat content of such products as whole milk declined. Butterfat use in fluid milk products as a group fell below the butterfat content of milk coming into fluid milk plants (fig. 5). The butterfat surplus from fluid milk plants went first to ice cream manufacture, partly because many ice cream operations belonged to fluid milk companies and those that did not were nearby. Any remaining fat was made into butter. Cheese plants manufacturing part-skim mozzarella, American, and other cheeses also had a cream surplus, which often went to butter production. However, there was no skim surplus to be moved to powder plants.

Butter production totaled 984 million pounds in 1975, rising to 1,261 million pounds in 1995, up 28 percent. Over the 1975-95 period, the lowest production was 979 million pounds (in 1976) and the highest was 1,365 million pounds (1992). As increasing quantities

²¹In 1964, Kraft, Borden, Swift, and Armour as a group manufactured 32.3 percent of their natural cheese and purchased the remainder. The natural cheese sales of Kraft, Borden, and Swift were 54.1 percent branded and 45.9 percent private label and unbranded (Juers and others, 1966, pp. 350-351). In the mid-1970’s, Kraft bought from “half to two-thirds” of its cheese under contract or sales agreement. It had some joint venture arrangements producing specialty cheeses. Kraft discontinued producing private label cheeses in the 1970’s (Cook and others, 1978, p. 44) but resumed thereafter (Mueller and others, 1996).

²²Until World War II, butter was made mostly from farm-separated cream. Production of nonfat dry milk (powder) was encouraged by the government during the war, and many new plants built after the war produced both butter and powder. The skim milk from plants receiving whole milk but producing only butter was sent to centralizer plants for powder production. In 1961, butter was made in 1,510 plants; 710 made only butter and no other manufactured dairy products. Many of these were no doubt fluid milk plants with a churn to handle surplus cream; 422 were butter-powder plants (Carley and Cryer, 1964).

Table 21—Private label and Kraft share of cheese sales in U.S. supermarkets, 1994

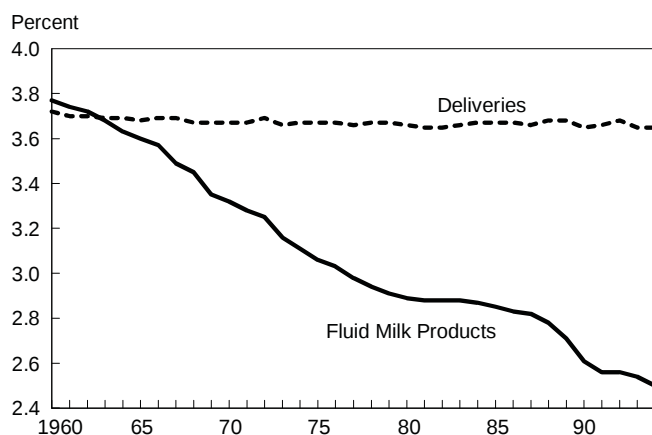
Type	Total sales ¹		Share of sales			
	Quantity	Value	Private label		Kraft	
			Quantity	Value	Quantity	Value
	<i>Million pounds</i>	<i>Million dollars</i>	<i>Percent</i>			
Natural cheese	409	1,325	37.2	33.0	27.4	30.1
Processed cheese ²	1,048	2,790	26.2	20.2	52.6	54.6
Specialty/imported cheese	35	187	4.1	2.8	5.3	5.2
Shredded cheese	280	990	41.3	34.9	20.9	22.2
Grated cheese	54	327	30.5	25.1	50.8	56.1

¹Excludes sales of cheese in supermarket service delicatessens—dollar sales about half as large as sales of packaged natural cheese (DeSanta and Litwak, 1995, and Litwak, 1996). ²Includes cream cheese.

Source: Nielsen Marketing Research, 1995.

Figure 5

Butterfat content in Federal order deliveries and fluid milk products



Source: USDA, AMS, *Federal Milk Order Market Statistics*, annual issues.

of milk have gone into cheese production, use in butter has taken less of the increased milk production.

Milk for butter production used to come from three sources: farm-separated cream, Grade B milk supplies, and excess Grade A milk. By 1975, farm-separated cream had nearly disappeared and butter was produced in areas with Grade B or excess Grade A milk supplies. Wisconsin and Minnesota have been the leaders, with California being an important producing State. Butter production recently has been growing in Western States besides California.

Introduction of the continuous churn in the 1960's led to the end of manufacturing bulk butter in one operation and printing (packaging) it in another, usually in separate plants. Federated cooperatives, such as Land O'Lakes (LOL), had taken bulk butter from member cooperatives and printed it in LOL plants. As the

member cooperatives merged into LOL in the 1960's and 1970's and bulk butter virtually disappeared, inter-cooperative transactions in butter declined from nearly half of cooperative butter in 1964 to 27 percent in 1973, 25 percent in 1980, 17 percent in 1987, and 2 percent in 1992 (Ling and Liebrand, 1994; Tucker and others, 1977).

Butter plants have become larger and more efficient as butter-making technology has continued along the path begun with the advent of continuous churning and soft printing. Fewer plants with more output per plant have marked the butter industry's development over the years. In 1975, 366 plants produced butter, declining to 131 in 1992 and to 109 in 1995.

In 1992, 131 plants produced butter, but in only 32 plants (owned by 31 companies) was butter the primary product (i.e., the product of highest value). Butter was a secondary product (relatively minor) in the other 99 plants. The 32 plants, which made up the butter industry as defined by the SIC code, produced 61 percent of the butter (in value); 75 percent of their output value was butter, the remainder other products, including powder. All butter-powder plants existing in 1992 were included in the Census butter industry category.

Cooperatives have generally played a much larger role in the marketing and distribution of butter than have proprietary companies. The largest manufacturer of butter in 1982 was a cooperative (Rogers and Marion, 1990). In 1992, cooperatives distributed (net of inter-cooperative transfers) 885 million pounds of butter, or 65 percent of total U.S. production. Cooperatives operated 48 plants that manufactured butter in 1992, which implies a rough average of 18.4 million pounds per

plant. Average output of the 83 proprietary plants was 5.8 million pounds.

Cooperative concentration ratios for butter sales are similar to those for cheese for the 20 largest cooperatives while the ratios for the 4 and 8 largest cooperatives are smaller (table 22). Production-based ratios are, not unexpectedly, higher than for cheese.

Companies in the butter business are likely facing the same types of issues as cheese producers. Several small butter plants that are still operating probably need major rehabilitation. Firms in butter markets do not appear to have the incentives to make such investments; domestic demand is stable. The international butter market is viewed by many as a prospective major market, but it is difficult to predict.

Butter capacity is apparently much different than cheese capacity. Some of the butter capacity most in need of replacement is in large western plants, while some of the most modern is in "small" eastern operations. The butter-powder industry is somewhat like the cheese industry, except it is stable or declining instead of growing. The "byproduct" butter industry is much different. Its function is to salvage as much value as possible for the cream coming from fluid milk and cheese plants. The location and quantity of its raw material are determined almost entirely outside butter markets. Economies of size and best technologies are often sacrificed because of supply limits, fluctuations in supply, or procurement costs. Growth in the supply of residual cream and the sometimes very low prices of such cream provide substantial incentives for investment.

Cooperatives produced 65 percent of the butter manufactured in 1992 (see table 11), a year in which 31.5

percent of production went to the CCC, mostly from cooperatives. At retail, the major brands belong to such cooperatives as Land O'Lakes.²³ Store brands account for 45 percent of supermarket butter (IDFA, 1996b). About one-third of the butter sold goes through restaurants, mostly as patties carrying a brand name or 1-pound prints for kitchen use.

Butter Pricing²⁴

Creamery butter was first produced in thousands of small plants located on rail lines in dairy farming areas. Milk was hauled to the plant by horse and wagon, which limited procurement areas. In addition, centralizer plants assembled cream from shipping stations also located on the rail lines, although the cream had usually soured by the time it reached the creamery. Pricing of both product and milk supply were major problems.

Starting in the 19th century, produce exchanges were established at numerous country points and in terminal markets. Here, manufacturers and distributors sold products for which they had no ready outlet or bought to fill shortages, but their major function was to establish prices.

Creameries had previously sold butter to commission houses in major markets, but this soon gave way to loose contracts (standing agreements) providing for pricing in relation to the quoted market price. Sales by creameries to receivers in the Chicago market were typically priced in relation to the price of the Elgin Board of Trade, where the price was established by a quotation committee from 1897 until 1913. Actual trading in the "call" at Elgin had declined by the 1890's, which led to the quotation committee. After the quotation committee was abolished, the Elgin Dairy Report published a "majority" price and later a "predominant" price. The U.S. Food Administration closed down the Board in 1917.

Table 22—U.S. cooperative "concentration" measures for butter, 1980-92, selected years

Butter distributed by cooperatives	1980	1987	1992
	<i>Percent</i>		
Share of total cooperative sales: ¹			
4 largest cooperatives	48	47	46
8 largest cooperatives	61	69	69
20 largest cooperatives	84	94	97
Share of total U.S. production: ²			
4 largest cooperatives	26	33	30
8 largest cooperatives	36	49	45
20 largest cooperatives	53	66	63
All cooperatives	64	71	65

¹Shares of gross sales, including intercooperative transactions.

²Net shares of each group, excluding intercooperative transactions.

Source: Ling and Liebrand, 1994.

²³Land O'Lakes is "the country's number one marketer of branded, consumer butter," with sales of 136 million pounds out of 140 million pounds total in 1994 (LOL Annual Report, 1994). Land O'Lakes buys all the butter that it sells from member associations.

²⁴This section draws on Crowell, 1901, pp. 278-281; Holmes, 1913, pp. 38-48; Weld, 1919; Erdman, 1928, pp.30-35, 155-179; U.S. Federal Trade Commission, 1928, pp. 630-645; Clark and Weld, 1932, pp. 114-115; Nicholls, 1939b; Sprague, 1940; Shepherd, 1946, pp. 48-49, and 1954, pp. 54-55; March and Herrmann, 1953; Irwin, 1961; Juers and others, 1966; Hammond, 1967; Jones, 1977, pp. 24-26; Cook and others, 1978; and Ashmen, 1962.

After 1917, the Chicago butter quotation, based on the spot call on the Chicago Mercantile Exchange as reported by the Aberdeen Press (*Chicago Price Current*), was dominant. Chicago butter and egg quotations dated from May 1894 on the Chicago Produce Exchange. The Chicago Butter and Egg Board, organized in 1898, conducted grading of butter and eggs with qualified inspectors. Butter quotations on the New York market were established by private market reporters as early as 1858. The quotation published by the Uner-Barry Company was, and still is, the price basis for much of the Northeast. It was based largely on the spot call on the New York Mercantile Exchange until 1979.

Butter was sold by manufacturers or assemblers through commission houses in the central markets for most of the 19th century. After the turn of the century, more butter bypassed the central markets and was sold directly to receivers, with prices based on the quotations of major markets. The receivers in the central markets took title to more of the butter that they received, but many continued to charge a nominal commission so they could pay the creameries a price 2 cents above the market quotation.

Butter marketing began to bypass central markets before World War I, and this trend accelerated in the period 1920-50. By 1951, only about 17 percent of butter was sold through central market wholesalers. Pricing was very generally based on spot trading at the Mercantile Exchanges in Chicago and New York, as summarized by the Aberdeen Press (*Chicago Price Current*) and the Uner-Barry Company. Exchange trading was almost entirely to set prices, not to acquire or dispose of butter. Prices typically paid to butter manufacturers were above the exchange quotation, partly because exchange trading was for butter of somewhat uncertain quality but mostly because a manufacturer who received a premium on the market was happier than one who did not and the buyers wanted to retain their suppliers.

Currently, prices received for butter by manufacturers, primary receivers, and others at the wholesale level are based primarily on activities on the Chicago Mercantile Exchange.²⁵ *The Dairy Market News* of the U.S. Department of Agriculture reports Chicago Mercantile Exchange prices, which serve as reference prices for formula pricing of butter.

²⁵Butter trading on the New York Mercantile Exchange was discontinued in 1979 due to lack of activity other than echoing the Chicago price.

Spot prices on the exchange, less freight charges to Chicago, are the almost-exclusive basis for prices received at the manufacturing plants for bulk butter. In addition, a manufacturer may receive a premium for uniformity, size of shipment, a special flavor characteristic, or some other characteristic. Manufacturers who sell only bulk butter are generally pricetakers, not pricemakers.

Manufacturers who soft-print and package butter sell it to primary receivers, grocery chains, dairies, and restaurants. Such manufacturers may, depending on competitive conditions, receive a better return than those who sell only bulk.

Primary receivers buy butter from manufacturers at spot prices (plus possible premiums) and sell to several types of customers. Print butter (packaged in pound cartons, usually 4 quarter pounds) is sold to grocery chains and wholesalers who supply retail food stores. Bulk butter is sold to other receivers, butter wholesalers, food processors, and cold storage firms. These sales are based on spot prices plus markup to cover handling, overhead, and profit.

Primary receivers of butter are both pricetakers and pricemakers. Prices they receive (and pay) are based on spot market prices. Since many of the primary receivers are members of the Chicago Mercantile Exchange, they can influence the spot market price by buying and selling butter there. Nonmembers can also buy and sell on the exchange through brokers.

Ingredient Markets

Dried and condensed dairy products are almost entirely used as ingredients in other dairy products or in various prepared foods. The markets for these products have undergone substantial changes in the past 30 years.

Whey and its products emerged as serious competitors as inputs in dairy and food markets under a combination of negative incentives (don't put it down the drain) and positive incentives (more profitable uses found). About 60 percent of the whey that was not dumped down the drain was returned to the farmers supplying milk to the cheese plant for use as feed in 1960. The commercial market for whey was mostly for feed (table 23).

Changes in markets for nonfat dry milk, casein, and whey products during the last 33 years are dramatic (table 23). Processed meat products, once a significant outlet for nonfat dry milk, use much less. Nonfat dry

Table 23—U.S. sales of ingredient products: Dry milks, casein, and whey, selected periods

Uses	1959-61			1978-80			1992-94				
	Dry milks ¹	Casein ²	Whey ³	Dry milks ¹	Casein ²	Whey ³	Dry milks		Casein ²	Whey ³	Condensed milk solids ⁴
							Whole and buttermilk	Nonfat			
Million pounds											
Ingredient use in:											
Nondairy foods	556	4	*	275	23	492	54	169	—	556	107
Meat processing	66	—	*	16	1	3	0	12	—	1	0
Bakery	336	1	*	87	8	165	21	67	—	107	7
Prepared dry mixes	64	—	—	73	—	35	10	37	—	59	0
Blends	—	—	—	—	—	84	13	17	—	118	0
Confectionery	55	—	—	72	1	27	6	32	—	175	57
Baby food	4	1	—	2	1	77	—	—	—	79	0
Other foods	31	2	—	25	12	101	4	4	—	17	0
Infant formulas	—	—	—	—	—	—	—	—	—	—	32
Mixes	—	—	—	—	—	—	—	—	—	—	7
Dietary foods	—	—	—	—	—	—	—	—	—	—	4
Dairy products	214	1	*	246	—	313	34	469	1	269	259
Fluid fortification ⁵	17	—	—	63	—	—	—	17	—	—	18
Frozen desserts ⁶	58	1	*	53	—	97	—	106	1	—	111
Cheese ⁷	33	—	—	39	—	29	—	220	—	—	80
Cottage cheese ⁸	*	—	—	44	—	*	—	9	—	—	—
Buttermilk and chocolate drink	—	—	—	9	—	—	—	58	—	—	—
Other cultured products	—	—	—	—	—	—	—	—	—	—	9
Mixes/shakes	—	—	—	—	—	—	—	—	—	—	3
Wet blends	—	—	—	—	—	—	—	—	—	—	38
Dairy substitutes	—	—	—	—	59	—	—	—	162	—	—
Imitation cheese	—	—	—	—	42	—	—	—	63	—	—
Coffee whiteners	—	—	—	—	15	—	—	—	99	—	—
Other	—	—	—	—	2	—	—	—	—	—	—
Total food use	770	5	30-50	521	82	805	88	1,048	164	825	366
Institutions and households	207	0	—	167	0	0	1	55	0	0	0
Pet food and feed	69	—	⁹ 259	325	28	454	2	179	—	704	—
Nonfood	22	92	—	25	25	100	1	19	—	53	—
Total uses	1,068	97	⁹ 299	1,038	135	1,359	92	1,301	164	1,582	366

*Some but amount unknown.

— = None.

¹Nonfat dry milk, dry whole milk, and dry buttermilk. Source: American Dry Milk Institute (ADMI). ²Sources: 1959-61: Rough approximations based on Miller, 1971. 1978-80: USDA, ESS, 1981. 1992-94: 1992 Census of Manufactures. ³Includes lactose. Sources: 1959-61: total from U.S. Econ. and Stat. Serv., 1962, uses from Groves and Graf, 1965. 1978-80, and 1992-94: Whey Products Institute (WPI). ⁴Condensed nonfat milk, condensed whole milk, and condensed buttermilk, on a solids basis. From American Dry Milk Institute (ADMI). ⁵1959-61 and 1978-80 estimated assuming 90 percent of the solids used in fortification is nonfat dry milk and 10 percent is condensed skim. 1992-94 from ADMI. ⁶1959-61 calculated from New York Crop Rpt Serv. 1978-80 and 1992-94 includes ice cream mixes and frozen custard; from ADMI. ⁷1959-61 calculated. 1978-80 and 1992-94 from ADMI. ⁸1978-80 from incomplete reports in ADMI and WPI. 1992-94 from ADMI. ⁹Plus 459 million pounds of whey returned to farms by cheese plants.

milk used in processed meats was down to 45 million pounds in 1969, largely as a result of an extension of Federal inspection and standards to plants that had formerly been under State inspection and standards. A number of States had allowed use of nonfat dry milk in sausage and similar products at levels higher than permitted under Federal standards. When they came under Federal jurisdiction, these plants had to conform to Federal standards or obtain a special label showing how much nonfat dry milk was added. The use of nonfat dry milk in those plants dropped sharply. Since then, the decline in nonfat dry milk usage resumed after an upsurge when calcium-reduced nonfat dry milk was introduced. A small portion was taken up by casein, whey, yeast proteins, and single-cell proteins.

Around 1960, the bakery market was by far the most important ingredient use for nonfat dry milk. Much of that market has been lost to whey. Part of this change is due to technology rather than price. Bakers found that a “baker’s mixture” composed of dry whey, sodium caseinate, and mineral salts worked better and cost less than nonfat dry milk, particularly in the continuous-mix process of bread baking, which was becoming the dominant technology. In prepared dried mixes for cakes, rolls, and related products and in confectionery, the use of milk ingredients increased, although whey products have been increasingly substituted for nonfat dry milk.

The use of nonfat dry milk and whey in dairy products has increased. The principal uses of dry milk and whey in the manufacture of dairy products are to fortify low-fat and skim milk products, frozen desserts, processed cheese foods and spreads, and cottage cheese and to produce cheese. Usage has increased for all of the products, with whey being substituted for nonfat dry milk in frozen desserts and processed cheese foods and spreads.

The most important food usage of casein is in substitute dairy products, including imitation cheese, whiteners, whipped toppings, and similar products. Imitation cheese, which was unknown in 1960, was the most important use in 1980. Coffee whiteners lead in the 1990’s.

Dry Milk Products

From a policy perspective, nonfat dry milk is the major dry product. For most of the period since the 1930’s, the value of milk has depended mostly on the value of butterfat; thus, dry products did not garner much attention, except when large government purchases and stocks were involved. In recent years, skim-based dry

products have become more important in determining the value of milk in manufactured products. Dry whole milk powders, dry buttermilk, and dry whey are also important products, for various uses.

During World War II, the Government made strenuous efforts to obtain the skim milk that had been kept on the farm and fed to animals when farm-separated cream went to the creameries for human food use. Sixteen milk drying plants were built using lend-lease funds and operated largely by cooperatives, which subsequently acquired the plants. In addition, milk drying equipment was installed in nine existing cooperative plants. The cooperatives’ share of the output of dry milk products increased from 17 percent in 1939 to 56 percent in 1944, while total output more than doubled. When purchases for military and foreign relief use were discontinued, the commercial market could not take up the slack and substantial production capacity was dismantled.

Nonfat dry milk became a consumer product of some importance when the instantized product was introduced in the 1950’s, making reconstitution much easier. It was sold under private labels by many retailers and under a small number of packer labels of a few major companies. Growth of the home market for the product ceased in the 1960’s, and sales declined in the 1970’s as the attraction of cheap milk faded in the wake of rising incomes and lifestyle changes.

Use of nonfat dry milk products fell in the 1980’s, then began to rise in the 1990’s and jumped when Class III-A pricing was introduced in Federal milk marketing orders, lowering the price of milk used for powder. Nonfat dry milk use in cheese production is growing because western powder often is cheaper than the skim solids in midwestern milk and less butterfat is needed in part-skim and lowfat cheeses. Nonfat (solids) has always been available as an additive in certain products and in other nondairy foods.

Total production of nonfat dry milk (for human food), whole milk powder, and dry buttermilk was about 1.110 billion pounds in 1975. Nonfat dry milk production in 1995 was 1.234 billion pounds; whole milk powder 171 million; and dry buttermilk 55 million pounds. Production of the three products in 1995 totaled 1.460 billion pounds, with most of the growth in nonfat and whole dry milk powders.

The joint product nature of butter and nonfat dry milk would lead to the hypothesis that the location of dry

product production would coincide with butter production areas. Some butter and powder²⁶ is still jointly produced but the Western States, particularly California and Washington, produce the largest quantities of dry milk products, most of it being nonfat dry milk. Wisconsin, Michigan, and New York follow well behind. The number of plants producing dry products declined over the 1975-95 period. In the case of nonfat dry milk for human food, the number has fallen from 153 to 59.

Cooperatives market a larger share of U.S. dry milk products than of butter. The largest producer of dry milk (and of concentrated milk and ice cream mix) in 1982 was a cooperative (Rogers and Marion, 1990). In 1992, cooperatives distributed a net volume of 904 million pounds of dry products, 81 percent of the U.S. total. Cooperatives operated 52 plants that produced dry products that year. We cannot directly compare with plant numbers for the United States because dry milk products are not separated for cooperatives. In 1992, 58 plants produced nonfat dry milk for human food in the United States; 38 plants produced dry buttermilk. A major reason for cooperative dominance in dry milk product production is that these are residual products of the entire dairy system. Volumes vary widely both over the dairy cycle and within the year. As proprietary firms turned over the task of balancing the market to large cooperatives, they left production of dry milk and the cooperatives inherited it.

Balancing is a prime example of a marketwide service. The amount of milk supplied by a group of producers varies from day to day, week to week, month to month, and year to year. Demand also varies independently of supply. Balancing supply against demand on a given day means that supplemental supplies may be needed or that supplies not needed for fluid milk products must be routed to manufacturing operations.

A fluid milk processor can balance its own supply and demand, one firm can perform the service for the entire market, or several firms can do it for groups of processors within the market. The balancing function has significant economies of size; that is, costs substantially decline and efficiency grows as the firm handles greater amounts of fluid milk. Such increased efficiency in this marketwide balancing service represents important potential public benefits.

²⁶See the previous discussion of the butter-powder industry.

Table 24—U.S. cooperative “concentration” measures for nonfat dry milk, 1980-92, selected years

Nonfat dry milk distributed by cooperatives	1980	1987	1992
	<i>Percent</i>		
Share of total cooperative sales: ¹			
4 largest cooperatives	41	50	53
8 largest cooperatives	56	73	73
20 largest cooperatives	84	94	97
Share of total U.S. production: ²			
4 largest cooperatives	36	46	43
8 largest cooperatives	50	66	59
20 largest cooperatives	74	86	79
All cooperatives	87	91	81

¹Shares of gross sales, including intercooperative transactions. ²Net shares of each group, excluding intercooperative transactions.

Source: Ling and Liebrand, 1994.

Production of dry products is more evenly spread among cooperatives in about the same shares as is butter. The sales measures of concentration for the largest four and eight cooperatives are less than in cheese sales. Shares of total U.S. production show the importance of cooperatives in dry milk product markets (table 24).

Dry product prices, especially for nonfat dry milk, have been heavily influenced by government program purchases and program opportunities, such as P.L. 480 and the Dairy Export Incentive Program (DEIP). Lately, no, or almost no, nonfat dry milk has been purchased for price support purposes, but relatively large removals under DEIP continue.

Frozen Products (Ice Cream)

The “permanence” of the ice cream industry was established during World War II as manufacturers geared up production for American servicemen. But ice cream had been in the United States for a long time; small manufacturers/retailers produced the product during another war, the American Revolution. The wholesale ice cream industry began in 1851 and was spurred by ongoing technological changes in refrigeration, milk testing, and packaging. The development and introduction of the continuous freezer in the late 1920’s and early 1930’s probably did more to revolutionize the industry than any other technological innovation (Turnbow, Tracy, and Raffetto, 1956).

Early growth in the ice cream industry relied on several factors: improved product quality; improved marketing methods (including transportation); the introduction of novelty items; increased purchasing power of

consumers; greater appreciation of the food value of ice cream; changing social customs (more eating away from the home); and movement toward large-scale production. After World War I, consolidation was the most important economic development in the ice cream industry.

Ice cream was primarily a soda fountain product until the 1930's when home refrigeration and installations of refrigerated cabinets in grocery stores became common. The growth of supermarkets and the appearance of specialty ice cream stores, such as Baskin-Robbins, in the 1950's and 1960's markedly affected ice cream merchandising. Retail sales rapidly shifted to supermarkets after the introduction of prepackaged half-gallon containers in the late 1940's. Specialty ice cream stores, mostly chains or franchised operations, sold relatively high-priced ice cream with higher butterfat content or a different texture than the products available in supermarkets—and they also offered a wider selection of flavors. Borden contributed to the changing ice cream market by introducing a nationally distributed premium ice cream, Lady Borden. Several premium brands are distributed largely through specialty stores that combine eat-it-here and take-home services.

Premium ice cream accounted for 42 percent of supermarket sales of ice cream in 1994. The increasing share of premium ice cream raised the average price of all frozen desserts from \$2.76 per half gallon in 1993 to \$2.86 in 1994 and \$2.96 in 1995 (Food Institute, 1996). Premium in this context means high-fat or lower overrun, more expensive ingredients, and minimal use of stabilizers and emulsifiers.

A superpremium category of ice cream accounted for 13 percent of supermarket sales in 1994.²⁷ This ice cream type was essentially created in 1959 when a Bronx, New York, entrepreneur began peddling his family's homemade ice cream to small candy stores and neighborhood restaurants. By 1985, this ice cream, Haagen Dazs, was battling with other superpremiums (Ben & Jerry's, started in 1978; Steve's Homemade, started in 1972; and Frusen Gladje) for market share.²⁸ Superpremiums have national or regional distribution, mostly through supermarkets, but the volume in most markets does not justify operating an ice cream plant. Most often, distribution is by another ice cream or

frozen food concern under contract and production may be contracted to the distributor as well.

Frozen products, yogurt, and cheese are the only dairy products that have interested large publicly traded companies in recent years. With the thrust toward branded products favored on Wall Street, the premium ice cream market has attracted attention. Store brand commodities—most at relatively low prices, although premium store brands are growing—and brands of premium products compete for space in the supermarket dairy case. The large ice cream manufacturers, like fluid milk processors, are consolidating manufacturing operations in fewer locations and establishing distribution depots, sometimes the closed ice cream plants, from which deliveries are made.

Many of the large companies involved in frozen products (mainly ice cream) are foreign owned. In 1988, Pillsbury, which had acquired Haagen Dazs in 1983, was in turn bought by Grand Metropolitan plc, a British firm. As a result, Haagen Dazs achieved worldwide distribution. Unilever, a British-Dutch company, which has long owned Good Humor, purchased Kraft's ice cream division in 1993; at the time, Breyer's was the largest single brand of ice cream on the basis of sales. Kraft retained their Frusen Gladje superpremium line.

U.S. cooperatives have a small presence in the ice cream and other frozen products industries. In 1992, 21 cooperatives were distributing ice cream and ice milk through 37 plants (does not include mixes). The 37 plants represented about 7 percent of the total number of plants operating in 1992. Cooperatives' share of national production was 10 percent, up from 8 percent in 1987 (see table 11). Five cooperatives, each with sales greater than 10 million gallons, distributed 93 percent of the ice cream and ice milk sold by cooperatives. Cooperatives' share of ice cream production has since declined, along with their share of fluid milk.

Plants making hard ice cream have grown larger as their number has dwindled. The number of plants dropped from 1,167 in 1975 to 473 in 1995, a 60-percent decline. Average production increased 157 percent from about 688,500 gallons to 1,767,000 gallons over the same period.

It appears that ice cream prices have been part of that group of dairy products whose price spreads are growing most rapidly. The rising shares of premium and superpremium ice creams raises average prices and measured margins. Branding and extensive advertising

²⁷The remainder was 35 percent regular and 10 percent economy (IDFA, 1995a).

²⁸Dreyer's tested an Italian-style superpremium in 1996.

likely contribute to this growth. Because so much value is added over and above the milk in the product, prices tend to reflect this addition. Also, the super-premiums use much more expensive nonmilk ingredients. All of these factors result in substantially higher prices for superpremium ice cream.

Changes in Market Organization and Power

A major means of growth of companies in the dairy industry has been merger or acquisition. Additional capacity and volume were usually available at lower cost by acquisition than by building new capacity and competing for sales. Acquisitions by corporations were at an all-time peak in the late 1920's when the National Dairy Products Corporation and the Borden Company started their growth. After dropping off during the Depression, acquisitions of more than 1,000 companies were recorded during World War II, a level never again reached. The Federal Trade Commission (FTC) brought a virtual halt to acquisitions by the eight largest dairy companies in the mid-1950's (table 25).

The large dairy companies turned to diversification in the 1960's. All of them became parts of large diversified firms. Only Borden retained its corporate identity, and dairy was only one among many food lines. The National Dairy Products Corporation, the largest dairy company, changed its name to Kraft and merged with Dart, a drug distributor. This union did not work out, and they eventually separated. Kraft then sold off its

fluid milk operations, and the remaining operations were acquired by Philip Morris (PM), which folded Kraft into its food unit headed by former General Foods' executives who were still in the company. Applying the strategy learned from branded breakfast cereals, Jello, and similar products, the management raised margins on cheese, which led to Kraft losing substantial market share in the early 1990's. Eventually, PM turned the entire food unit over to Kraft, which returned to pre-General Foods strategies (Mueller and others, 1996, pp. VI-48ff).

Manufacturers of consumer goods derive much of their market power from product differentiation through brand preference. The creation of strong brand preference has never been easy for many dairy products. Real differences in flavor, texture, or quality are extremely helpful in creating brand preferences. Standardized products present a greater challenge to the company trying to establish a strong brand position. Basic dairy products were standardized at an early date—the composition of butter by Federal law in 1915, for example.

The basis for branding then becomes uniformity of quality. Variations in butterfat content above the minimum were considerably important for whole milk in earlier times, but in the last 20 years they have virtually disappeared. Somewhat more variation is possible in butterfat content and other constituents for ice cream. Cheese flavor, likewise, can be varied by manufacturing techniques and aging. Thus, for most dairy products, the basis for product differentiation is relatively

Table 25—Acquisitions of U.S. dairy companies by groups of firms, 1921-70¹

Period	Dairy company acquisitions by—			Total
	The eight largest dairy companies ²	Other corporations	Cooperatives	
	<i>Number</i>			
1921-25	74	597	92	763
1926-30	652	1,172	127	1,951
1931-35	141	292	78	511
1936-40	319	389	63	771
1941-45	363	507	146	1,016
1946-50	243	445	167	855
1951-55	349	402	162	913
1956-60	150	363	144	657
1961-65	30	303	152	485
1966-70	17	180	120	317

¹More recent data not available, but this tells the story. ²Borden, Kraft, Beatrice, Foremost, Carnation, Fairmont, Pet, and Arden-Mayfair.

Source: Parker, 1973, pp. 13-14.

weak. Brands are important for processed cheeses, higher priced ice cream, and to some extent, butter.

Market power for those dairy products that are not so dependent on brands rests on other sources. In the heyday of home delivery in the 1930's and early 1940's, success depended on service more than on brand. As fluid milk distribution switched from home delivery to store sales, service to the store operator became paramount. The shift in ice cream distribution from drug stores to supermarkets reflected many of the same developments.

Two major developments have drastically changed the position of processors in fluid milk markets. First, essentially every chain of any size now has a central milk program that includes private label. Instead of handling processor label milk—often from three or four processors—the typical retail food chain now carries its own brand of milk and only a small amount of other processor brands. In many cases, the retail food chains built their own milk plants. The number of such plants is still small, and the share of all milk accounted for them is still below 20 percent. However, in a period when the total fluid milk market had no growth, these new integrated fluid plants added about 10 percent to the total capacity of the fluid milk processing industry, which had serious repercussions.

Firms that lost a substantial share of sales (from 20 to 60 percent in various cases) sought other outlets, and the operating margins of some processors were almost certainly squeezed below the longrun break-even point for a time. Retail store margins appeared to have increased at the same time. Also, retail plant operations effectively foreclosed medium-sized processors from supermarket outlets except in isolated cases.

Cooperative Functions and Power

The other major development that squeezed processors was the growth of large regional milk marketing cooperatives. Whatever advantages individual firms previously had on the procurement side were drastically reduced. The decline in numbers and the growth in size of dairy marketing cooperatives is seen by many as clear evidence of their growth in market power. While the growth in size and the decrease in number of dairy cooperatives have been impressive, much of the growth in cooperative size reflected the increased size of milk markets caused by technological and economic change.

The bases of potential cooperative power to obtain higher prices or lower costs and higher returns include the following:

- Control of supply, either of the volume produced or, more commonly, of the disposition of the supply once produced (these are qualitatively different).
- Control of the sources of milk supply, preventing access to alternative sources.
- Efficiencies derived from economies of size in manufacture of products and, more importantly, from the management of routing and utilization of milk.
- Efficiencies in marketing and merchandising products.
- Product differentiation, including product development.

By 1960, dairy cooperatives had generally recognized the need for centralized management of milk supplies and surpluses. Bargaining associations had long struggled with ways of gaining control of their milk supplies to strengthen their marketing position. As markets grew larger and the number of buyers smaller, cooperatives found themselves potentially in toe-to-toe competition with other cooperatives and increasingly vulnerable to undercutting on prices, service charges, delivery requirements, and other matters.

Reduced market protection and a period of competitive intermarket movements of milk emphasized the incentives for increased coordination between cooperatives in multimarket areas. While maintaining their separate identities, cooperatives in the central part of the country (marketing about a quarter of U.S. milk) began to form federations in the early 1960's. Raising producer incomes through higher prices and realizing cost savings from better organized movement of milk were objectives of the federations (Knutson, 1971; Tucker, 1972).

By the mid-1960's, Federal milk marketing orders began to reflect the increased desire for more stable price alignment among markets. Individual market supply-demand adjusters were dropped. The Minnesota-Wisconsin (M-W) price for manufacturing grade milk became the price for manufacturing use in all Federal orders and then the basic formula price used in determining Class I prices in all orders.

The large federated organizations served member cooperatives as a marketing agency-in-common, improved price alignment among markets, presented a united

position at Federal order hearings, operated a standby pool, and more effectively presented their views to the legislative and executive branches. But the federations also had their problems; their structures hampered bargaining efforts, and they could not deal adequately with problems of operational efficiency, equity among producers, and greater market stability.

By 1970, many of the member cooperatives of the two major federated organizations had merged into four regional centralized full-service cooperatives: Associated Milk Producers, Inc. (AMPI), Mid-America Dairymen, Inc. (Mid-Am), Dairymen, Inc. (DI, which merged with Mid-Am in 1995), and Milk, Inc. (now Milk Marketing, Inc. (MMI). Beginning in the late 1960's, a number of small manufacturing cooperatives in Minnesota and Wisconsin joined the large regional cooperatives in that area. Among other things, members of the manufacturing cooperatives sought assured grade A milk markets, outlets to the growing cheese market, benefits from increased plant operating efficiency, and revolving of equity investments in obsolete facilities.

By 1980, large regional cooperatives not only provided fluid milk handlers with most of their milk but also produced much of the manufactured dairy products made by cooperatives. As milk production rose and fluid milk sales stagnated, cooperative manufacturing operations evolved from operations that were simply trying to minimize losses into profit centers that have become a major function of most cooperatives with manufacturing operations (Liebrand, 1995, p. 31).

The organization of production and marketing of manufactured dairy products is much different from that of fluid milk products. Cooperatives have long dominated butter and nonfat dry milk. Natural cheese production—long a bastion of relatively small proprietary firms—is now split almost evenly among the proprietaries and cooperatives.

Two reasons contributing to the growth of cooperative cheese production and marketing can be identified. First, the regional cooperatives consolidated manufacturing facilities after they were formed, especially milk drying and cheese plants, to improve operational efficiency and to take advantage of cheese market price fluctuations. As a result, regional cooperatives have a relatively large portion of the larger, more efficient, cheese manufacturing plants.

Second, greatly increased diversity in cheese markets has increased the opportunities for cooperatives and

other cheese manufacturers. While the processed cheese and cheese food market for supermarket distribution remains largely in the hands of two firms, development of markets for many varieties of cheese through wine and cheese shops and other similar outlets, as well as service delicatessens in supermarkets, has opened many opportunities for other manufacturers. At the same time, the dramatic growth in sales of pizza and pasta foods has expanded the market for Italian cheeses, primarily mozzarella. Large cheese merchandisers have withdrawn from natural cheese production to some degree, conceding an increasing share to cooperatives.

A primary reason for cooperatives to establish large plants producing commodity products was the value placed on a market for all the members' milk. This would not be possible without ample manufacturing capacity and markets that accept varying quantities of products. The large food companies have been withdrawing from production of commodity products for at least 20 years and turning over that manufacturing to others, mostly cooperatives. Natural cheese, butter, nonfat dry milk, and other ingredient products are mostly produced by large cooperatives, often under long-term contracts. As cooperatives have grown, questions concerning market power have been asked about them, much as had earlier been asked about the large dairy companies.

The market power of large full-service cooperatives derives from the following:

- Efficiencies in handling and routing bulk milk, which allow them to perform that function at lower cost than individual handlers.
- Increased manufacturing capacity for butter, nonfat dry milk, cheese, and other hard products, making it possible to obtain over-order payments from buyers needing raw milk as compensation for giving up the potential profits from manufacturing.²⁹
- Not sharing with other producers the profits from manufacturing operations, including give-up charges.

²⁹When reserve milk is withdrawn from balancing plants to make supplemental shipments of milk to fluid milk handlers, less milk is available for manufacture but fixed costs must still be covered. Thus, unit costs rise. This increase in costs is called "give-up costs." Cooperatives attempt to recover these costs through over-order charges.

The power of the full-service cooperatives is constrained by the ability of limited-service cooperatives to undercut their over-order charges (Christ, 1980, p.287).

The Future

What will the fluid milk industry of the next century look like? Plant numbers will likely continue to decline, although the rate of plant closings will slow further as we run out of small plants and the number of large plants in a given area reaches a minimum. Can distribution be extended further and remain cost effective? When one of the authors (Manchester) started studying these issues in the 1960's, the effective limit to distribution of packaged milk was 250 miles.³⁰ It had not changed significantly 20 years later, although change may be coming. Cornell University has recently reported on research suggesting that switching to cartons like those used for orange juice and adding carbon dioxide will extend shelf life and permit shipping packaged milk greater distances. With this or some other new technology, plant numbers can go much lower and megaplants can develop.

Retail chain operation of milk plants will likely decrease somewhat. The advantages to the chains are not what they were 20 or 30 years ago. The guaranteed margins from State price fixing have about disappeared. The lower distribution costs from dealing with different labor unions are mostly gone. Many plants are middle-aged and need considerable investment. The uncertainties of retail business in a given market mean that the guaranteed market for milk from a plant is much more variable—Safeway's Washington, DC, area plant was closed due to overcapacity, largely brought on by having fewer stores to serve.

The role of dairy cooperatives has changed since the 1970's in many markets. Many of the manufacturing/processing cooperatives have shifted from price bargaining to the operation of a complete procurement/distribution system that includes assembly, managing fluid milk supplies, routing milk to distributors as needed, managing surplus supplies (often through cooperative-owned plants), and marketing (including more focus on differentiating products).

³⁰Supermarket chains distributing from their own plants to their own stores have long been the exception. They can move milk to distant stores in refrigerated trucks carrying a variety of foods and fill a truck with perishables going to only a few stores; other milk processors can not.

Cooperatives face another challenge. Members of any one cooperative are becoming more diverse. Cooperatives traditionally have operated on a basis of equal treatment for members; given divergent farm structure, economies of size in production, widespread geographic locations, and differing needs of members in those areas, equal may not be regarded as equitable. As public programs in the industry are reduced or eliminated, cooperatives will likely be expected to step in and provide the stability of government programs. Whether the cooperative structure is capable of such activities remains to be seen.

Dairy firms, both proprietary and cooperative, are becoming or already are large and somewhat more concentrated (table 26). The most concentrated industry, the result of a massive exodus from the industry, is butter. The cheese industry, as defined, combines two different but related businesses so the data do not tell us much. Dry, condensed, and evaporated products data are a combination of data for several markets. Concentration in ice cream and frozen desserts, and fluid milk is low.

The dairy industry has been adjusting to changing economic and policy conditions. Deregulation of the industry would be expected to change the pace of adjustments. A relatively rapid restructuring of processing and marketing firms in the industry could be triggered by more volatile prices, the need for cooperatives and the proprietary companies to manage both fluid and product supplies and inventories more closely to balance with demands, greater international trade participation with less border protection, and continued changes in consumers' demands. Both producers and manufacturers would likely be affected. Futures markets will be more attractive to both producers and marketers. The recent advent of futures trading in milk on two exchanges provided a learning opportunity for many.

The principal effect of the price support program has been to provide a floor under milk prices. It has also been used to raise the income levels of dairy farmers, although using the program for that purpose caused surpluses to build up in the absence of supply controls and government costs reached high levels at times. Farmers did well but government costs became unacceptable.

Eliminating the guarantee of a floor under prices is likely to change the magnitude and character of the risk to dairy farmers, which could, in turn, significantly affect their evaluations of and their reactions to the

Table 26—Market shares of 4, 8, 20, and 50 largest U.S. manufacturers/processors, industry basis, 1963-92, selected years¹

SIC Code ²	Industry	Year	Share of total value of shipments			
			4 largest	8 largest	20 largest	50 largest
Percent						
2021	Creamery butter	1992	49	78	98	100
		1987	40	63	94	100
		1982	41	61	92	99
		1977	49	66	85	95
		1972	45	58	78	92
		1967	15	22	36	60
		1963	11	19	31	48
2022	Cheese, natural and processed	1992	42	60	74	96
		1987	43	55	68	82
		1982	34	47	62	76
		1977	35	48	62	76
		1972	42	53	65	77
		1967	44	51	61	72
		1963	44	51	59	69
2023	Dry, condensed and evaporated dairy products	1992	43	55	76	94
		1987	45	59	79	95
		1982	35	50	74	95
		1977	30	46	71	92
		1972	39	58	76	92
		1967	41	56	74	90
		1963	40	53	71	90
2024	Ice cream and frozen desserts	1992	24	40	68	87
		1987	25	29	62	83
		1982	22	34	55	79
		1977	28	40	60	79
		1972	29	40	58	75
		1967	33	43	60	73
		1963	37	48	64	74
2026	Fluid milk	1992	22	30	49	68
		1987	21	32	48	67
		1982	16	27	48	66
		1977	18	28	43	60
		1972	18	26	42	56
		1967	22	30	42	51
		1963	23	30	40	48

¹This table is compiled by summing all of the shipments (not just those of the product named) in the specified industry that are owned by the specified number of companies and taking the share of all shipments of all plants in the industry. See Appendix table 2 for figures on the product basis. ²SIC = Standard Industrial Classification.

Source: Census of Manufactures, various years.

economic situation. The price support program reduced one element of risk—extremely low milk prices. It did not remove other risks, such as high feed prices or loss of market for the individual producer. And it did not guarantee profits on milk production, as demonstrated by the out-of-pocket losses of many dairy farmers during 1973-75. Increasing the frequency of such periods likely could increase the incidence of financial stresses and bankruptcy among dairy farmers.

The effects of increased price risk on decisionmaking by producers may differ substantially from those of earlier periods, due to changes in the structure of dairy farming. The owners of large dairy operations often seem to have different attitudes and fewer memories of hard times, unlike the smaller operators of 20 years ago.

Since 1940, the system has allowed dairy farmers in most of the country to produce whatever quantities they wished and pass them to their cooperative to dis-

pose of. The cooperative could take almost unlimited quantities (until it ran out of manufacturing capacity) and sell the output to the CCC. With price supports gone by 2000, the supply balancing function of CCC purchases of butter, cheese, and nonfat dry milk will disappear. Cooperatives and other milk buyers might seek to limit the volume of milk received to anticipated sales. Production quotas set by milk buyers could become much more common.

What are the implications for various dairy industry segments of the prospects we have suggested? Dairy farmers, who supply a highly standardized raw material to processors, will have few opportunities to market differentiated identity-preserved products, except perhaps organic or non-bST milk. With a bulk commodity, the chief opportunity for individual farmers to earn premiums will be for volume and for ingredients of value to dairy product manufacturers, such as protein or butterfat. With more volatile markets, returns to producers will largely depend on the bargaining power of cooperatives.

Fluid milk processing has evolved from a function emphasizing service to one almost completely emphasizing efficiency and minimizing costs. Beverage milk is comprised of a set of homogeneous commodity lines, so lower cost is paramount. Plant and company numbers will almost certainly decline further. Supermarket groups increasingly dominate retail sales of fluid milk products, and the pricing policies of retail chains selling their own brand will be the major determinant of milk prices. The incentive to maintain margins and profits on foods which they manufacture themselves will weaken as more chains close down or sell off captive plants with overcapacity or outdated technology.

Branded consumer dairy products, including cheese, ice cream, yogurt, frozen yogurt, and sour cream, are made mostly by proprietary companies with a major thrust toward new product development, much of which emphasizes low fat content. Foodservice takes a substantial share of cheese for pizzas, cheeseburgers, tacos, and salad bars. Most is produced by large companies, both cooperative and proprietary, under long-term contracts with fast food and restaurant chains or their suppliers. These are mostly different companies from those in the branded food markets. Dry and bulk condensed milk products, which are almost entirely used as ingredients for dairy and other food products, are made mostly by cooperatives and sold in competitive markets.

Dairy cooperatives could face a significant change in role as public dairy programs are either reduced or eliminated. Members may expect them to make efforts to reduce price volatility, set production quotas to limit milk production, spend more time managing product supplies and inventories, and expand marketing activities related to sales. However, as the cooperatives have grown, their membership has become more diverse, meaning maintaining member satisfaction may be more difficult.

Some fundamental changes in dairy policy following passage of the 1996 farm bill have resulted in a less regulated economic environment for the dairy industry. There have already been some issues raised related to the new situation—price volatility is a prime example. Milk producers, processors, dairy product manufacturers, dairy cooperatives, and farms that distribute and market milk and its products all face the prospect of continued changes in structure as they adjust to the different economic climate.

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Glossary

Balancing. A service, usually provided by cooperative associations of milk producers, to tailor the milk supplied to each handler on a market to that handler's needs. It involves directing milk movements between producers' farms and handlers' plants and diverting supplies in excess of handlers' needs to alternative outlets, such as manufactured dairy product plants.

Blend price. A weighted average price based on the proportion of Grade A milk in a pool allocated to each of the use classes. Producers participating in a pool receive its blend price with adjustments for butterfat content and farm location if so specified.

Class I differential. The amount added to the Minnesota-Wisconsin price to obtain a given order's Class I price. Two components usually make up the effective or total Class I differential: a minimum Federal order differential and an over-order payment.

Class I utilization. Grade A milk used in Class I milk products as defined under a milk marketing order. Class I products generally include all beverage milks and may include other fluid products.

Class II utilization. Grade A milk used in fluid cream products or perishable manufactured products (ice cream, cottage cheese, and yogurt) under Federal marketing orders with three classes.

Class III utilization. Grade A milk used to produce storable manufactured products (cheese, butter, canned milk, and dry milk) under a Federal marketing order with three classes.

Class III-A utilization. Grade A milk used to produce nonfat dry milk under Federal milk marketing orders where the class has been established.

Classified pricing. A structure of prices that differ according to category of utilization. In particular, the Federal order pricing system under which regulated processors pay for Grade A milk according to the class in which it is used. Most Federal orders establish minimum prices for each of the above classes.

Cooperative. A firm that is owned by its farmer-members, is operated for their benefit, and distributes earnings on the basis of patronage (volume of milk).

Federal milk marketing order. A regulation issued by the Secretary of Agriculture specifying minimum

prices and conditions under which regulated milk handlers must operate within a specified geographic area.

Fluid grade (Grade A) milk. Milk produced under sanitary conditions that qualify it for fluid consumption. Only Grade A milk is regulated under Federal marketing orders.

Fluid product. Packaged dairy products traditionally including beverage milks, milk and cream mixtures, cream, eggnog, and yogurt.

Fluid utilization. The proportion of Grade A milk pooled in a market and used to produce fluid (Class I) products.

General Agreement on Tariffs and Trade (GATT). An agreement originally negotiated in 1947 by 23 countries, including the United States, to increase international trade by reducing tariffs and other trade barriers. The agreement provides a code of conduct and a framework for periodic multilateral negotiations on trade issues.

Handlers. Generally refers to fluid milk processors but can include manufacturing plants that also supply fluid markets.

Mailbox price. The net pay price received by dairy farmers marketing milk to handlers regulated under the Federal milk marketing orders. Includes all payments received for milk sold and all costs associated with marketing the milk. Reported at the market average butterfat test. For some orders, the price is a weighted average of all pricing zones in the order.

Minimum class price. Under Federal milk marketing orders, the announced class prices are the minimums that regulated handlers must pay for milk used in each class. They may pay more than the minimum.

Manufacturing grade (Grade B) milk. Milk not meeting the fluid grade standards. Less stringent standards generally apply.

Manufacturing milk. Grade B milk or the Grade A milk assigned to Class II and Class III or otherwise used in the production of a manufactured product.

Pool. With a classified pricing system such as that used in Federal and State orders, processors pay for

milk at different prices for each use category. Producers are paid a weighted average, or “blend” price for all uses of milk in a particular order or market. Processors pay into or draw out of the pool on the basis of their use of milk relative to market average use. Producers participating in the

pool receive identical uniform blend prices, with adjustments for butterfat content and location. In markets with multiple component pricing, adjustments are also made for protein or nonfat solids content.

Appendix A: Tables

Appendix table 1—U.S. mailbox prices for selected Federal milk marketing orders, monthly, 1996¹

Federal milk order	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov	Dec.	Annual average (simple)
<i>Dollars per cwt</i>													
New England	13.38	13.23	13.14	13.08	13.49	14.08	14.77	15.00	15.55	15.83	15.37	14.12	14.25
New York-New Jersey	13.44	13.28	13.17	13.15	13.70	14.08	14.82	15.05	15.68	15.68	14.82	13.75	14.22
Middle Atlantic	13.57	13.27	12.86	12.76	13.41	14.40	15.07	15.49	16.05	15.84	15.55	14.30	14.38
Carolina	14.76	14.78	14.43	14.33	14.82	15.68	16.39	16.69	17.44	17.95	17.78	16.36	15.95
Tennessee Valley	14.24	14.23	13.97	13.82	14.16	15.18	15.73	15.95	16.59	17.05	16.78	15.28	15.25
Southeast ²	13.99	14.00	13.78	13.71	14.20	15.09	15.60	15.90	16.52	16.94	16.49	15.13	15.11
Florida ³	15.93	15.93	15.73	15.57	15.80	16.95	17.77	18.59	18.87	19.34	19.64	18.39	17.38
Southern Michigan	13.50	13.29	13.10	13.08	13.51	14.01	14.69	14.90	15.62	15.77	15.18	14.08	14.23
E. Ohio-W. Pennsylvania	13.72	13.66	13.47	13.47	13.74	14.05	14.74	14.98	15.62	15.88	15.50	14.22	14.42
Ohio Valley	13.61	13.84	13.51	13.46	13.67	14.08	14.79	15.02	15.72	16.11	15.93	14.77	14.54
Indiana	13.66	13.51	13.26	13.11	13.50	14.00	14.66	14.89	15.70	16.08	15.86	14.54	14.40
Chicago Regional	13.69	13.52	13.68	13.89	14.61	14.73	15.36	15.88	16.52	15.72	13.69	13.08	14.53
Central Illinois	13.42	13.31	13.17	13.12	13.48	⁴							
S. Illinois-E. Missouri	13.08	13.05	13.03	13.13	13.42	13.73	14.23	14.61	15.35	15.77	15.42	14.14	14.08
Louis.-Lex.-Evans.	13.78	13.73	13.61	13.43	13.71	14.37	15.20	15.37	15.90	16.48	16.55	15.18	14.78
Upper Midwest	13.62	13.43	13.47	13.74	14.37	14.50	15.09	15.73	16.26	15.32	13.51	12.85	14.32
Nebraska-W. Iowa	13.09	12.97	12.98	13.08	13.75	14.01	14.58	15.00	15.66	15.45	14.14	13.26	14.00
Iowa	13.44	13.24	13.31	13.45	14.12	14.29	14.88	15.43	16.17	15.59	14.02	13.12	14.26
Texas	13.27	13.02	12.74	12.98	13.45	13.92	14.87	15.23	15.72	15.87	15.20	13.85	14.18
Southwest Plains	12.97	12.72	12.53	12.57	13.04	13.41	14.16	14.57	15.15	15.19	14.36	13.30	13.66
E. Colorado	13.32	13.18	13.04	13.25	13.62	13.80	14.41	14.50	15.51	15.64	14.32	13.12	13.98
S.W. Idaho-E. Oregon	12.62	12.51	12.54	12.78	13.27	13.63	14.07	14.74	15.20	14.29	12.01	11.71	13.28
Great Basin	12.67	12.52	12.51	12.61	13.05	13.17	13.52	14.30	14.93	14.55	13.04	12.33	13.27
New Mexico-W. Texas	11.93	11.73	11.57	11.75	12.59	13.13	13.72	14.14	14.92	14.48	12.86	12.00	12.90
Pacific Northwest	12.43	12.24	12.08	12.08	12.79	13.91	14.59	14.85	15.48	15.14	13.69	12.91	13.52

¹Mailbox price is net pay price received by farmers marketing milk to handlers regulated under Federal orders. Includes all payments received for milk sold and all costs associated with marketing the milk. Price is reported at the market average butterfat test. ²Georgia, Alabama-W. Florida, New Orleans-Miss, and Greater Louisiana merged into the Southeast order the price of which is reported from July, 1995 onward. ³Weighted average of information for Upper Florida, Tampa Bay, and Southeastern Florida orders. ⁴Central Illinois was added to the series beginning in January 1996, but dropped in June.

Source: Compiled from USDA, AMS, *Dairy Market News*, various issues.

Appendix table 2—Market shares of 4, 8, 20, and 50 largest U.S. manufacturers/processors, product basis, 1963-82, selected years¹

SIC Code ²	Industry	Year	Share of total value of shipments			
			4 largest	8 largest	20 largest	50 largest
Percent						
2021	Creamery butter	1982	29	44	72	94
		1977	30	42	64	84
		1972	37	47	61	78
		1967	14	20	33	51
		1963	8	14	25	37
2022	Cheese, natural and processed	1982	35	46	60	74
		1977	38	50	62	75
		1972	40	51	62	74
		1967	45	53	62	71
		1963	45	50	59	68
20221	Natural	1982	31	41	56	76
		1977				
		1972	36	46	63	77
		1967	38	44	55	68
		1963	34	39	49	61
20222	Processed	1982	64	78	90	97
		1977				
		1972	60	74	86	95
		1967	72	84	94	99
		1963	67	74	(NA)	(NA)
2023	Dry, condensed, and evaporated	1982	33	48	67	86
		1977	32	47	65	83
		1972	34	52	66	80
		1967	35	47	61	73
		1963	33	42	55	70
20231	Dry	1982	33	47	71	94
		1977				
		1972	45	59	73	90
		1967	35	45	57	73
		1963	22	30	47	65
20232	Canned	1982	74	94	100	
		1977				
		1972	69	83	98	100
		1967	62	81	95	100
		1963	66	78	93	100
20233	Concentrated, shipped in bulk	1982	35	56	85	9
		1977				
		1972	29	47	75	98
		1967	31	49	75	94
		1963	41	54	74	91
20234	Ice cream and ice milk mixes	1982	21	35	58	82
		1977	22	36	60	85
		1972	16	30	50	72
		1967	15	26	44	70
		1963	17	26	45	69

Appendix table 2—Market shares of 4, 8, 20, and 50 largest U.S. manufacturers/processors, product basis, 1963-82, selected years¹ --Continued

			Share of total value of shipments			
SIC Code ²	Industry	Year	4 largest	8 largest	20 largest	50 largest
Percent						
2024	Ice cream and frozen desserts	1982	22	32	49	72
		1977	27	36	53	71
		1972	27	37	54	70
		1967	32	42	57	68
		1963	34	43	57	65
2026	Fluid milk	1982	15	26	45	63
		1977	17	26	43	58
		1972	17	26	41	54
		1967	21	29	40	49
		1963	22	29	38	46
20261	Bulk fluid milk and cream	1982	28	40	62	81
		1977	25	38	57	75
		1972	23	34	53	72
		1967	17	27	42	60
		1963	15	22	34	50
20262	Packaged fluid milk and related products	1982	18	31	50	69
		1977	18	30	46	62
		1972	19	29	45	59
		1967	25	34	45	55
		1963	25	32	42	50
20263	Cottage cheese	1982	29	46	69	89
		1977	25	38	62	84
		1972	27	41	62	81
		1967	36	50	68	81
		1963	32	45	58	72

¹Concentration in this table is calculated on the product basis, that is, all shipments of the product by the specified number of companies are divided by the total shipments of that product by all companies. These figures have not been provided since 1982. ²SIC = Standard Industrial Classification.

Source: Census of Manufactures, various issues.

Appendix table 3—Number and average size of U.S. fluid milk bottling plants operated by commercial processors, 1934-95

Year	Plants operated	Average volume processed
	<i>Number</i>	<i>Million product pounds</i>
1934	9,400	1.9
1935	9,520	2.0
1936	9,730	2.0
1940	9,950	2.1
1945	8,570	4.0
1948	8,527	3.9
1950	8,195	4.3
1955	6,726	6.3
1960	5,328	8.9
1965	3,743	13.6
1970	2,216	23.6
1971	2,097	25.4
1972	1,859	28.9
1973	1,627	32.9
1974	1,484	35.3
1975	1,408	37.8
1976	1,361	39.5
1977	1,284	41.9
1978	1,215	44.2
1979	1,135	47.4
1980	1,066	50.1
1981	1,032	51.5
1982	949	55.3
1983	893	59.5
1984	832	65.0
1985	774	71.5
1986	719	77.8
1987	674	83.0
1988	640	86.8
1989	614	92.4
1990	584	98.8
1991	558	102.7
1992	533	109.4
1993	530	109.0
1994	494	118.0
1995	478	122.3

Sources: Compiled from USDA, AMS, *Federal Order MarketStatistics*, various issues, and other sources.

Appendix table 4—Sales of selected dairy products by meat packers as share of U.S. production, 1918-65, selected years

Product	1918	1934	1951	1965
<i>Percent</i>				
Butter	32.3	18.7	23.0	11.0
Cheese	40.9	45.8	NA	NA
Canned milk	9.0	7.2	NA	NA

NA = Not available.

Sources: Compiled from U.S. Federal Trade Commission, 1921 and 1937; March and Hermann, 1953; and Juers and others, 1966.

Appendix B: Methods and Data on Large Companies

The data on large manufacturers were built up from data on each company for the years 1950, 1960, 1975, 1985, 1989, and 1994. For each year, the company's sales were broken down into the following categories

Sales from domestic operations:

Manufactured products—

Food

Dairy products

Fluid milk products

Manufactured products

Alcoholic beverages

Feed and pet food

Tobacco

Nonfood

Wholesaling food

Retailing food

Food service

Other

Sales from foreign operations:

Manufactured products—

Food

Dairy products

Alcoholic beverages

Feed and pet food

Tobacco

Other

All other sales

The data regarding each company were obtained from a wide variety of sources, including, but not limited to, the following:

Moody's Industrial Manual.

Moody's OTC Industrial Manual.

Moody's International Manual.

Company annual reports and Form 10-K's.

Fortune magazine listings.

Forbes magazine listings.

Meat Industry magazine listings.

Meat and Poultry magazine listings.

Company histories.

Trade magazines.

Food Institute Reports.

Connor and Mather, 1978.

U.S. Federal Trade Commission, 1972 (for 1950 data).

For each company, a history was constructed that included its sales breakdown in each of the indicated years, the classes of products manufactured, acquisitions of other companies, divestitures, and, on occasion, its own fate: sale to another company, bankruptcy, or closing down.

The data for the individual companies were summarized by type of firm for each year, providing the data for tables 12, 13, and 14. All categories other than food are aggregated in table 14.