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**Structural Change in the U.S. Dairy Industry:
Growth in Scale, Regional Shifts in Milk Production
And Processing, and Internationalism**

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**STRUCTURAL CHANGE IN THE U.S. DAIRY INDUSTRY:
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W.D. Dobson and Paul Christ*

Abstract

Structural changes in the U.S. dairy industry from the early 1980s to the late 1990s included familiar increases in concentration, industry adjustments to serve large supermarkets, the emergence of two national fluid milk firms (Suiza Foods and Dean Foods), and the emergence of two national dairy cooperatives (Dairy Farmers of America and Land O'Lakes, Inc.). Shifts in the location of milk production in the U.S. to the Western states have caused new dairy product manufacturing plants to locate in those states. This development promises to intensify battles over market share in the expanding U.S. cheese market between Western firms and Upper Midwestern firms. Foreign direct investment in the U.S. dairy industry--especially by European Union firms and a large Canadian firm--increased during the 1980s and 1990s. Facing challenges to expand dairy exports or shrink, the U.S. dairy industry probably will gravitate toward the latter unless government price support and trade policies change to increase price incentives for U.S. firms to export dairy products.

Introduction

This paper analyzes structural changes in the U.S. dairy industry from the early 1980s to the late 1990s. Structural change, as used in the paper, refers to changes in the size, number, and location of firms, changes in firms' market shares, changes in organizational arrangements used by firms, and changes in the competitive strategies of firms. The paper begins with capsule descriptions of the structure of the U.S. dairy industry in the early 1980s and the late 1990s. Second, statistics are presented on changes in the size,

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number, market shares, and concentration ratios for U.S. dairy firms--emphasizing cooperatives--from the early 1980s to the late 1990s. Finally, drivers of structural changes in the U.S. dairy industry are discussed. The important drivers include (a) forces that have produced industry concentration in milk processing and distribution--mainly developments causing processors to seek economies of scale in processing, capitalize on economies associated with extended shelf life products, and gear up to serve large supermarkets effectively, (b) economic forces that have caused an increasing proportion of U.S. milk production and processing to shift to the Western U.S., and (c) international market forces and institutions that have limited U.S. dairy product imports and exports and expanded foreign direct investment in the U.S. dairy industry. As will be apparent, the structure of the U.S. dairy industry changed in mostly an evolutionary fashion from the early 1980s to the late 1990s but the structure of the late 1990s has been influenced by strategic moves by a few firms. Those firms making dramatic strategic moves included Suiza Foods, Dean Foods, Dairy Farmers of America (DFA), Land O' Lakes, Inc., and the Saputo Group Inc.

The U.S. Dairy Industry in the Early 1980s

In many ways, the structure of the U.S. dairy industry in the early 1980s was similar to that which exists today. Partly because of the pervasive impacts of the U.S. Department of Agriculture's (USDA) dairy price support program in the early 1980s, the market environment was less risky and posed fewer challenges for U.S. milk processors then. Prices processors paid for manufacturing milk were more stable in the early 1980s in part because U.S. manufacturing milk prices rested on USDA dairy price supports throughout much of the 1980s until about 1989. Prices processors paid for fluid milk reflected this stability since, under federal milk orders and cooperative bargaining arrangements, fluid milk prices were determined by adding fixed fluid differentials to manufacturing milk prices. Dairy imports posed few threats to the domestic industry because quotas limited imports of most dairy products. Casein represented an exception. Imports of this product were not limited by quotas and carried a zero tariff.

In the early 1980s, strong upward trends in the use of milk for cheese production had been in evidence for at least 15 years. Downtrends in consumption of full-fat whole milk also were well established.

Following long established trends, concentration of milk processing continued in the early 1980s. Borden and Dean Foods--the No. 1 and No. 2 fluid milk processors in the country--engaged in new product development

and other product differentiation measures, and were busily buying regional dairies to acquire strong regional brands and to obtain scale economies in processing and distribution [10]. Other fluid milk processors mimicked these measures, entered into joint ventures, and pursued a host of other strategies to reduce marketing and processing costs. Processors continued to construct large butter and cheese processing plants in the Western U.S. at limited risk to themselves because minimum prices for output from these plants were guaranteed by the USDA's dairy price support program. In addition, California manufacturing milk processors received guaranteed processing margins under that state's milk stabilization program.

Mergers of U.S. dairy cooperatives slowed during the 1980s. While fringe cooperatives continued to join larger dairy cooperatives, there were no mergers of the size that formed the large cooperatives such as Associated Milk Producers, Inc., Mid-America Dairymen, and Dairymen, Inc. during the late 1960s and 1970s. Moreover, fragmentation of dairy cooperatives in the Southeastern U.S., in particular, increased during the 1980s. These developments increased incentives for cooperative mergers to reduce fragmentation and countervail the market power gained by investor-owned processors and supermarkets during the late 1990s.

The U.S. Dairy Industry in the Late 1990s

Those familiar with the U.S. dairy industry in the early 1980s would easily recognize the industry that had evolved by the late 1990s. However, the increased volatility of milk prices in the late 1990s introduced more price risk into milk production and dairy processing. Concentration in milk processing and asset redeployment continued during the late 1990s, as a few large firms recorded the most noteworthy changes. Among the noteworthy changes was Borden's exit from the U.S. dairy business.

U.S. manufacturing milk prices generally remained above the USDA's price support levels during the late 1990s and became more variable, injecting additional risk into milk buying and dairy product inventory management. The price volatility emerged partly because the government support level had been reduced by about 25% from levels existing in the early 1980s and supply-demand balances in U.S. dairy markets tightened. In the late 1990s, nonfat dry milk--for which a structural surplus exists in the U.S.--was the only product purchased in volume under the USDA's dairy price support program. Portions of this structural surplus were exported with subsidies under the USDA's Dairy Export Incentive Program(DEIP).

To combat the increased price risk, futures markets and options for milk and dairy products were introduced.

While there were a few changes, long-standing increases in per capita cheese consumption and the decline in consumption of certain other dairy products--especially fluid whole milk--continued. Changes that may have impacts in the 2000s include a slower rate of increase in cheese consumption. While the Uruguay Round GATT/WTO agreement increased access to the U.S. cheese market, dairy imports and exports continued to be small. The New Zealand Dairy Board supplied much of the additional cheese that entered the U.S. as a result of the Uruguay Round trade agreement [11].

The Borden Company and Suiza Foods contributed mightily to restructuring and redeploying assets in the fluid milk industry. Borden began selling fluid milk plants located in the Midwestern U.S. and Southern U.S. in 1989 in regions where competition was particularly strong and Borden's share of the fluid milk market was low. The firm continued to divest itself of U.S. fluid milk plants in subsequent years and in 1997 sold the last of its dairy businesses (Borden/Meadow Gold Dairies) to Mid-America Dairymen, a farmer cooperative located in Springfield, Missouri [5]. Mid-America Dairymen determined that Southern Foods Group, a company in which the cooperative held 50% ownership, would handle the transaction and manage the dairies. Borden also exited from the cheese business.

Founded in 1989, Suiza Foods emerged during the period when Borden was exiting from the U.S. dairy business [16]. Suiza began with a single Puerto Rican dairy in 1993. Following a string of 20 major fluid milk company acquisitions in the 1990s, Suiza's annual sales grew to U.S.\$4.5 billion in 1999 while penetrating fluid milk markets in 46 states stretching from Florida to California [4]. The largest of the acquisitions was the 1999 purchase of the Southern Foods Group whose brands included Borden, Meadowgold and Schepps. Suiza acquired the Southern Foods Group from Dairy Farmers of America (DFA) under an alliance arrangement whereby DFA will supply raw milk to the Southern Foods Group plants. The acquisition of the Southern Foods Group pushed Suiza's share of the U.S. fluid milk market to about 18% in 1999 [34].

Dean Foods, which was the second largest fluid milk processor in the U.S. during much of the 1980s and which moved into first place after Borden exited from the industry, again found itself in the second position--this time to Suiza--in the late 1990s. Like Suiza, Dean Foods went on an acquisition spree in the 1990s, acquiring 14 fluid milk companies in 1997

and 1998 [13]. The acquisitions pushed Dean's sales to U.S.\$3.8 billion in 1999, up from U.S.\$2.7 billion in 1998 [8,9]. The company's fluid milk plants are concentrated in the Midwest, South Central states, and California.

Mid-America Dairymen, a cooperative representing about 12,600 farmers in 30 states, merged with three other cooperatives to form DFA on January 1, 1998. In addition to Mid-America Dairymen, the DFA cooperative included Milk Marketing, Inc. (Ohio), Western Dairymen Cooperative, Inc. (Colorado), and the Southern Region of Associated Milk Producers, Inc. (Texas). DFA represented 22,000 milk producers in 42 states and controlled about 21% of the U.S. milk supply [25].

Headquartered since its founding in Minnesota in the Upper Midwestern U.S., Land O' Lakes, Inc. became a national dairy cooperative in 1998 when it merged with Dairymen's Cooperative Creamery Association in Tulare, California [19]. The California merger came on the heels of the firm's merger with Atlantic Dairy Cooperative of Pennsylvania a year earlier. The California merger positioned the firm to take advantage of the rapidly increasing milk supplies in this Western State. This was important because milk supplies in many parts of the Upper Midwestern U.S. were flat or declining. The two mergers increased Land O' Lakes' milk supply from four billion pounds per year to about 12 billion pounds per year.

Aided by its famous butter brand, Land O' Lakes had about a 31% market share in the U.S. retail butter market in 1999 and has expanded that figure by recent acquisitions. Previously primarily a buyer of butter from other firms, the cooperative has expanded control over the U.S. butter supply to about the same percentage as its share of the retail butter market. The firm also is in the fluid milk and farm input supply businesses.

The Saputo Group of Canada acquired Stella Foods, Inc. of Lincolnshire, Illinois in 1997 for U.S.\$ 405 million [6]. Stella Foods was the fifth largest U.S. cheese company prior to the acquisition. With the acquisition of Stella, the Saputo Group, one of Canada's largest cheese firms, tripled its revenues to about U.S.\$1.1 billion per year and placed three-quarters of the Group's sales in the U.S. It also acquired Stella's well known cheese brands, including Stella, Frigo, Lorraine, Dragone, and Gardenia. More on the Saputo Group later.

Changes in Size, Number, Market Share, and Concentration Ratios for U.S. Dairy Firms

Data for the U.S. dairy industry relating to firm size, firm numbers, market shares, and concentration ratios for dairy cooperatives and propriety

firms for the early 1980s through 1997 appear in this section. Aggregate figures on U.S. dairy cooperatives are presented first followed by figures for processors of fluid milk, cheese, butter and milk powder. Information on U.S. dairy cooperatives was obtained from widely used periodic surveys of all U.S. dairy cooperatives conducted by the USDA's Rural Business Cooperative Service [20,21,22].

Changes in the Size and Nature of U.S. Dairy Cooperatives

While there was a 48% decline in the number of U.S. dairy cooperatives during 1980 to 1997, the numbers remained relatively large in the latter year. The large number of cooperatives in the 1990s reflects, among other things, the presence of numerous small cheese manufacturing cooperatives and many small milk assembly cooperatives.

Table 1. Figures describing U.S. Dairy Cooperatives for Selected Years, 1980-97.

Item	1980	1987	1992	1997
Number of Dairy Cooperatives	435	296	265	226
Number of Farmer Members	163,549	120,603	110,440	87,938
Farm Milk Marketed by Cooperatives (1,000 mt.)	43,356	47,982	55,601	57,778
Cooperative Share of All Farm Milk Marketed	77%	76%	82%	83%
Farm Milk Marketed by the				
--Largest 4 Cooperatives	26%	25%	25%	29%
--Largest 8 Cooperatives	36%	35%	36%	42%
--Largest 20 Cooperatives	52%	56%	58%	65%

*Source: Ling, K.C. and C. Betts-Liebrand [20], Ling, K.C. and J.B. Roof, [21]; and Ling, K. C. [22].

The share of all milk U.S. marketed by dairy cooperatives increased from 1980 to 1997. It is difficult to assess unambiguously what this figure means since U.S. dairy cooperatives perform different functions. Some are simply the bargaining agent for milk channeled to propriety processors. Others process butter, cheese and other dairy products into bulk lots for sale to propriety handlers for further processing. Still others process and market finished dairy products. The value added by the bargaining agents, the producers of bulk dairy products, and the processor-distributors differ substantially but no information on this point is provided by the figures.

As expected in a period of increasing cooperative concentration, the percentage of cooperatives that processed and marketed most dairy products declined from 1992-97. Ling reports that the percentage of cooperatives marketing butter declined most (47%) during 1992-97 [22]. A larger percentage of cooperatives adhered to manufacturing and marketing dried whey products and nonfat dry milk--there was only a 6% and 8% reduction, respectively, in the number of cooperatives marketing these products from 1992-97.

Lastly, the four firm concentration ratio for milk marketed by U.S. dairy cooperatives recorded a limited increase from the early 1980s to the late 1990s, reaching 29% in 1997. This ratio, of course, may have increased in 1998 as a result of the formation of DFA and the merger of Land O'Lakes with Dairymen's Cooperative Association of California. The concentration ratio showing the largest percentage increase was for the largest 20 cooperatives which recorded a 13 percentage point increase from 1980 to 1992, suggesting that some intermediate-sized dairy cooperatives expanded business substantially during 1980 to 1997.

Changes in the Structure of Fluid Milk, Cheese, Butter, and Milk Powder Processing Industries

While the figures in Table 2 provide information on general trends in processor concentration, production, and value of shipments for fluid milk, butter, cheese and milk powder, there are unfortunately gaps in the statistics for milk powder. Those gaps are identified with an "NA" in the table.

Fluid Milk Products. The number of companies processing fluid milk declined by nearly 50% from 1982 to 1997. These figures and the number of fluid milk establishments can be expected to show further reductions as Suiza Foods and Dean Foods acquire companies and serve retail outlets from the most profitable locations.

The quantity of milk processed into fluid milk products in the U.S. plateaued in the 1990s at about 25 million metric tons. However, the

nominal value of fluid milk products shipped continued to increase from the early 1980s to the late 1990s. In real (deflated) terms, however, there was a decline in the value of fluid milk shipments during the 1990s.

Cooperatives have for decades processed a relatively small percentage of the fluid milk sold in the U.S. This pattern remains evident in the figures in Table 2. While Prairie Farms Cooperative (Illinois) represents a prominent exception, most U.S. cooperatives have not found fluid milk processing to be profitable. Accordingly, large cooperatives such as DFA make extensive use of joint ventures under which the cooperative supplies the raw milk, but proprietary handlers do most of the processing.

Cheese Production. Familiar trends appear in Table 2 for cheese. The number of companies producing cheese declined by about 30% from 1982 to 1997 in the U.S. The amount of cheese produced increased by 61% from 1982 to 1997 while the value of shipments recorded nearly a 90% increase during this period. The cooperative's share of cheese production declined from 1980 to 1997. Propriety firms such as Kraft, Leprino, and Saputo were strong bidders for milk destined for processing into the increasingly popular and sometimes highly differentiated cheese products.

Butter Production. While the decline began from a smaller base, the reduction in number of U.S. butter companies (-48%) from 1982 to 1997 was similar to that for fluid milk (Table 2). The smallness of the figures for number of companies and number of establishments reflect the economies of scale in continuous process butter manufacturing. Unlike the situation for production of specialty cheeses, small plants generally are not economically viable in butter production.

The decline in value of butter shipments reflects mainly the reduction in the support price for butter. However, the uptick in the value of butter shipments in 1997 presumably reflects a modest increase in the price of butter during the late 1990s, especially for premium butter brands such as those marketed by Land O' Lakes, Inc.

Cooperatives manufactured about two-thirds of the butter in the U.S. during the 1980s and 1990s. For decades U.S. cooperatives have processed butter to use milk which was surplus to fluid milk and cheese making. While cooperatives remain dominant in butter making, the firms now produce butter mainly from cream that is surplus to fluid milk operations.

Milk Powder (Skim Milk Powder and Whole Milk Powder). In the U.S., most milk powder produced is skim milk powder. For reasons that are not clear, the decline in number of milk powder producing establishments from 1982 to 1997 was lower than for the other dairy commodities. There

Table 2. Number of Companies, Number of Establishments, Quantity of Product, Value of Shipments, and Share of Product Produced by Cooperatives, Fluid Milk and Manufactured Dairy Products, U.S., 1982-1997.*

Structural Item and Product	1982	1987	1992	1997
Number of Companies				
Fluid Milk	854	654	525	435
Cheese	575	507	418	398
Butter	61	44	31	32
Milk Powder	NA	NA	NA	NA
Number of Establishments				
Fluid Milk	1,191	946	746	612
Cheese	704	643	576	524
Butter	74	49	32	34
Milk Powder**	87	79	89	70
Production of Product (1,000 mt.)				
Fluid Milk	22,962.4***	24,633.6	25,035.8	24,998.6
Cheese	2,059.9	2,423.6	2,942.4	3,324.3
Butter	570.1	500.7	619.0	522.0
Milk Powder**	681.6	545.6	599.5	607.7
Value of Shipments (U.S.\$ Billion)				
Fluid Milk	\$ 18.736	\$ 20.590	\$ 21.927	\$ 22.212
Cheese	10.763	12.971	18.352	20.326
Butter	1.687	1.420	1.034	1.368
Milk Powder**	1.496	1.021	1.044	1.543
Share of Product Manufactured by Cooperatives				
Fluid Milk	16%***	14%	16%	14%
Cheese	47%***	45%	43%	40%
Butter	64%***	71%	65%	61%
Milk Powder**	87%***	91%	81%	76%

*Sources: Ling, K.C. and C. Betts-Liebrand [20], Ling, K.C. and J.B. Roof [21], Ling, K.C. [22], and U.S. Department of Commerce [38].

**Includes skim milk powder and whole milk powder.

***Data for 1980.

also was a modest increase in U.S. milk powder production from 1987 to 1997, probably reflecting growth of the structural surplus of this product.

Skim milk powder is to some extent a joint product produced with butter. The percentage of milk powder produced by cooperatives declined from 1987 to 1997. In the early 1980s and before, milk powder production was a surplus disposal activity--typically handled by cooperatives--for dealing with skim milk that was surplus to fluid milk and cheese making. The decline in the percentage of milk powder produced by cooperatives may reflect increased use of milk powder for cheese making by investor-owned firms.

Drivers of Structural Change in the U.S. Dairy Industry

The drivers of structural change in the U.S. dairy industry are linked and, to some extent, similar to those producing structural change in other parts of the world. Probably the driver with the potential to alter the structure of the U.S. dairy industry most is the shift of milk production and processing to the Western regions of the country.

Forces Producing Concentration in Milk Processing and Distribution

As noted earlier, the U.S. dairy industry is becoming more concentrated both in the fluid milk and manufactured dairy product sectors. However, concentration in the U.S.--as reflected in sales figures for the largest firms--has not proceeded as far as in Europe. According to Robobank International, the U.S. accounted for only five of the largest 25 dairy firms in the world in 1998 [30]. Europe dominated the list with only the U.S. firms Kraft, DFA, Suiza Foods, Land O' Lakes, and Dean Foods appearing on the top 25 list [30].

Concentration in U.S. Fluid Milk Processing. Pursuit of scale economies in processing and distribution and a desire to increase capacity utilization underpin many moves toward concentration in U.S. fluid milk processing.

Both Suiza and Dean Foods cite these points as reasons for the acquisitions sprees in which both have been involved. Both firms point out that demands of large supermarkets have fostered concentration, noting that large retailers are getting more market power and frequently wish to be served by only one or two firms. Smaller dairies, they note, might not be able to service big retailers because the feasible service areas of the small firms don't extend far enough geographically or the firms don't have the capacity to serve the large retailers from their plants [17]. Dean Foods also

noted that it was encouraged to accelerate the pace of its acquisitions by competition from Suiza for desirable regional firms to acquire.

Suiza Foods claims that its acquisitions have produced a situation where "For the first time in the fluid milk industry, a national company can serve retailers that have national operations [34]." Industry analysts have concluded that Suiza has advantages in negotiating contracts with larger supermarket chains [34].

C. Nubern, Director of Economic Research for the National Milk Producers Federation, pointed out that the top 10 supermarket chains in the U.S. now control about 52% of all retail grocery sales, a percentage that has nearly doubled since 1987 [14]. The concentration in food retailing in the U.S. promises to increase still further because of Wal-Mart's strong movement into this retail market segment [31]. Wal-Mart and other large retailers often prefer to be served by a few suppliers who deliver in large quantities, according to specification, and for prices that smaller milk processors would find it difficult to meet.

Before the Borden Company exited from the dairy business, the firm identified cost economies to be realized from increases in the scale of fluid milk processing as follows [1]:

"Borden engineers have plant designs in hand--using proven equipment and technology--that can process three times as much raw milk as our largest plant today. Our hyperplant would replace perhaps five or six of our smaller, less efficient dairies. The savings are substantial even with higher costs for transporting milk greater distances."

Borden officials also pointed out that they can build large, economic plants even for specialty products such as half-and-half, whipping cream, and extended shelf life products.

Views akin to those expressed by Borden on cost savings available from employing large plants for extended shelf life and long shelf life products are gaining adherents. More of the so-called micro fluid milk (fluid items in pints or quart containers and whipping cream) are being produced as extended shelf life items. As markets for extended shelf life products expand, this development promises to change fluid milk distribution systems, permitting more products to be delivered to supermarkets' warehouses in large lots and less frequently than is necessary when limited shelf-life products are delivered directly to supermarkets. Warehouse delivery of extended shelf life fluid milk products will reduce transportation

costs and allow processors to serve supermarkets across wide areas from large plants that produce these products. Firms such as Suiza Foods and Dean Foods appear to be well positioned to capitalize on the economies obtainable from these developments. As noted later, Parmalat has emphasized extended shelf life products in the firm's U.S. operations, positioning that firm to expand sales of these items.

Borden's financial problems and the firm's decision to exit from the dairy business do not invalidate the firm's conclusions about processing economies associated with large plants. According to Suiza Foods officials, problems with hyperplants were not the force that drove Borden from the U.S. dairy business. Instead, it was Borden's decision to adopt a centralized management model that eliminated local control and created conditions that increased financial instability [4]. Suiza officials argue that use of the centralized model indicated that Borden believed that a thorough knowledge of local market conditions was unnecessary for running regional dairy plants profitably. Management practices of both Suiza and Dean Foods suggest that these firms believe that the contrary is true. As evidence of their belief in the merits of decentralized operations, Suiza and Dean Foods typically leave experienced local managers in place to run fluid milk plants acquired.

Industry analysts disagree about how much additional consolidation will occur in U.S. fluid milk processing. Some analysts argue that consolidation of fluid milk processing has nearly run its course because industry leaders already have made most of the potentially profitable acquisitions. The percentage of U.S. fluid milk sales accounted for by Suiza Foods and Dean Foods combined is about 35% of the U.S. total. Suiza officials suggest that more concentration will occur, noting that concentration is substantially higher than 35% in certain other U.S. food processing sectors. Moreover, if Borden's conclusions about economies available from use of fluid milk hyperplants are valid, expect substantial further consolidation.

Concentration in Production of Manufactured Dairy Products in the U.S. Forces similar to those driving concentration in fluid milk processing are driving concentration in processing of manufactured dairy products. Aggregate statistics, figures on plant sizes and numbers, and trade literature provide information--albeit somewhat anecdotal--on this point. Moreover, larger plants are being planned.

USDA figures show that the number of U.S. firms producing hard manufactured dairy products declined from about 2,061 in 1985 to 1,340 in 1998 (-35%) while output per plant increased by about 75% during this period [14].

Kraft is the largest U.S. producer of branded dairy products (dairy sales of U.S.\$4.3 billion in 1998), selling cheese under the Kraft, Philadelphia Brand, Velveeta, Knudsen's, Cracker Barrel and Polly-O brands. Kraft's U.S. market shares were as follows in 1999 for the cheese brand categories noted in the schedule [18]:

<u>Brand Category</u>	<u>Kraft's Dollar Share</u>
Natural Cheese Brands	21%
Natural Shredded Cheese Brands	31
American Cheese Brands	61

Anecdotal information for Associated Milk Producers, Inc. (AMPI), Leprino Foods, and Dairygold, Inc. reveals certain end results of concentration in butter and cheese. AMPI operates the largest dedicated butter plant in the U.S. in New Ulm, Minnesota. This plant produces about 45,350 metric tons of packaged butter per year [23]. Dairygold, Inc., a cooperative located in the Pacific Northwest, operates a cheese and milk powder plant that processes 1,815 metric tons of milk per day. Leprino Foods Company, a privately held U.S. processor of mozzarella cheese, operates a plant in Roswell, New Mexico that processes 2,360 metric tons of milk daily [3]. The company operates cheese plants in Colorado, Michigan, New York and that typically process 900 to 1,400 metric tons of milk per day.

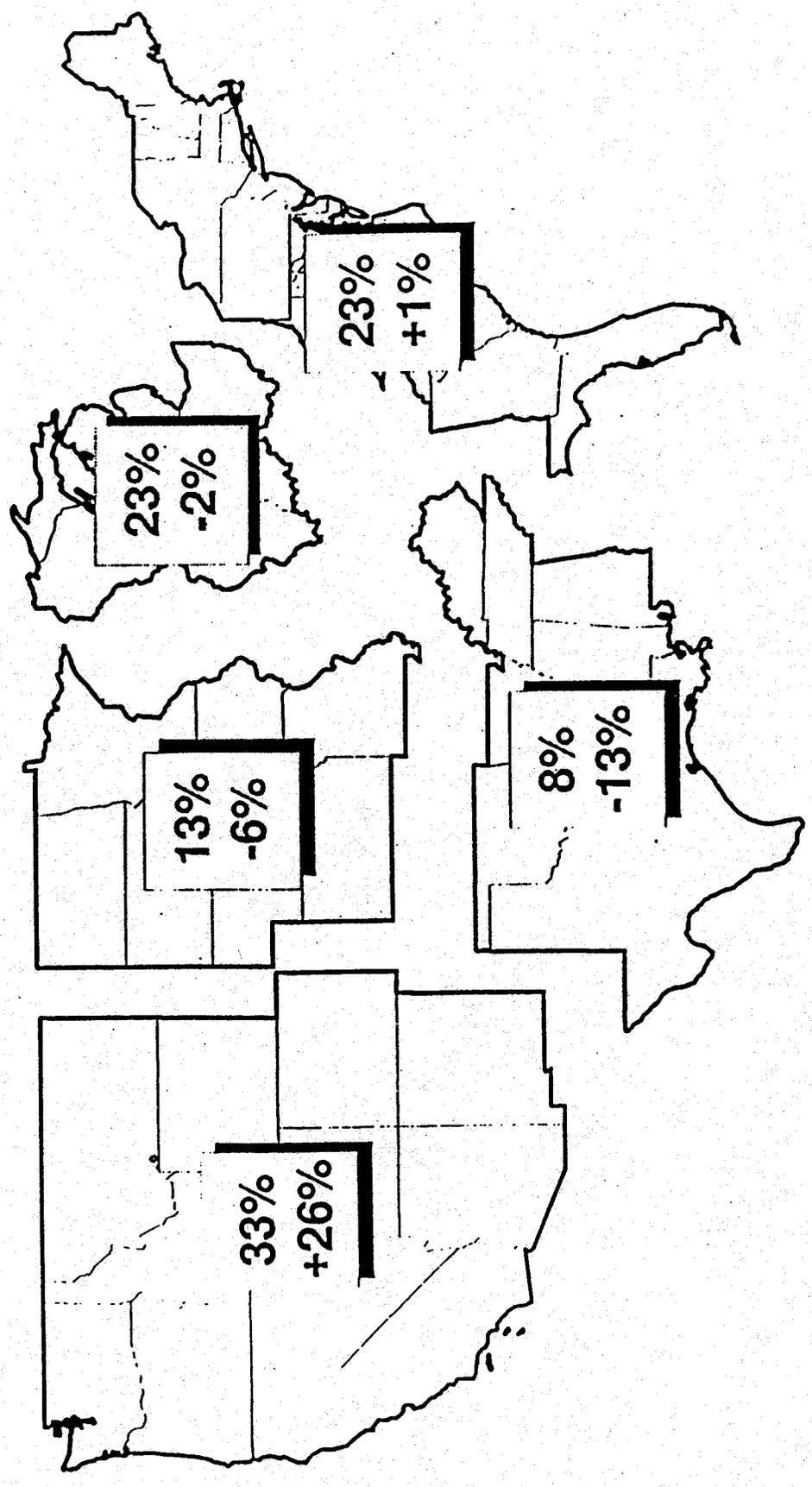
Still larger plants are likely to materialize. Three new cheese processing plants are being built in California by (a) Land O' Lakes, Inc. and Mitsui of Japan, (b) another large cooperative, and (c) Leprino Foods. Land O'Lakes and Mitsui claim that they are building the world's largest cheese plant [7]. The plant, which will be owned 70% by Land O' Lakes and 30% by Mitsui under a joint venture, will produce Cheddar and Mozzarella cheese for the U.S. domestic market, whey fractions for global markets, and whey fractions for producing dietary and sports drinks.

The planned production from these three plants will increase California's cheese production capacity by up to 40% in five years. California dairy industry people believe that California's milk production will increase by enough to supply these plants with raw milk. The rapid growth of milk production in California adds credence to such beliefs.

Forces Producing Expanded Milk Production in the Western U.S.

During the 1990s, the Western States of the U.S. expanded milk production rapidly. California surpassed Wisconsin to become the leading

Figure 1. U.S. Regional Shares of Milk Production for 1998 and Percent Changes in Regional Milk Production from 1993 to 1998.*



*Sources: USDA [35,37].

milk producing state in the U.S. in 1993. Idaho, New Mexico, and Arizona also expanded milk production rapidly during the 1990s.

Figure 1 showing regional shares of milk production for the U.S. in 1998 and the percentage change in regional milk production from 1993 to 1998 provides perspective on the magnitude of the shift in milk production to the Western U.S. in the 1990s. The East North Central Region (includes Wisconsin) had a 23% share of U.S. milk production in 1998, two percentage points lower than in 1993. The share of milk production in the West North Central Region (includes Minnesota) was 13% in 1998, down six percentage points from 1993. The Western region (includes California and Idaho) had a one third market share of U.S. milk production in 1998, up 26% from 1993. For the entire U.S., milk production increased 5% from 1993 to 1998.

Table 3. U.S. Regional Shares of Cheese Production in 1998 and Percentage Changes in Regional Cheese Production, 1993 to 1998.*

<u>Region</u>	<u>% of U.S. Cheese Production in 1998 and % Change from 1993</u>
East North Central	33% + 5%
West North Central	17% -13%
West	33% +69%
U.S.	100% +15%

*Source: USDA [35].

The figures in Table 3 indicate that cheese--the growth item for the U.S. dairy industry--manufacturing is following milk production to the Western region of the country.

What are the economic forces that have flattened or reduced milk production in the traditional dairy areas of Wisconsin and Minnesota and increased milk production in the Western U.S.? In California, Idaho, and

certain other Western states, dairy farming has taken on more of the characteristics of industrialized agriculture. Large feedlot style dairy farming operations exhibiting scale economies and using specialized labor are common. Scientific management--especially use of electronic dairy cow production records--is employed by a larger percentage of the producers in the Western states. The nature of the operations and management practices have produced lower costs and higher milk production per cow in the Western states. The low cost of acquiring and shipping dairy feeds from the growing regions of the U.S. Midwest to the Western states in the late 1990s also has accelerated the expansion of milk production in the latter states. Water shortages and environmental problems--long thought to loom large as important constraints on growth of milk production in California--have not had the expected impact.

The impact of low feed costs and a host of other developments have pushed milk production up sharply in the Western U.S. in 1999 relative to the Upper Midwest. For example, milk production in California increased by 10% over year-earlier levels in 1999 [40]. In Wisconsin and Minnesota, the comparable figures were 1% and 2%, respectively.

Wisconsin and Minnesota retain certain advantages in milk production. These include a favorable climate for forage and grain production, competitive farmer pay prices for milk, specialization in cheese production in Wisconsin, a generally excellent product image for Wisconsin cheese, and a favorable location for marketing manufactured dairy productions in the Eastern U.S. Using Porter's terminology, one might characterize the advantages of Wisconsin and Minnesota in dairying as those associated with a viable industry cluster [29]. The components of the cluster include university departments that carry out research and extension activities relating to the dairy industry, a pool of experienced people employed in dairy processing and marketing firms, trade organizations and state departments of agriculture that foster exchange of dairy information, and cattle sales organizations that facilitate purchase and sale of replacement cattle, cull cows and dairy beef.

On the farm production side, the disadvantages of the Upper Midwestern dairy industry include relatively low milk production per cow, small herd size, slowness to adopt new production technologies, problems with forage quality, lack of business management training, and resistance to change, all of which can contribute to higher average costs of milk production than found in the Western U.S. In addition, most dairy farmers in the Upper Midwest don't have the equity capital needed to expand to the

size required to be fully competitive with the more efficient Western dairy farmers.

The Upper Midwestern U.S. dairy industry also faces challenges relating to aging processing plants. New construction of large scale dairy processing plants has taken place largely in the Western U.S. to capture long-term competitive advantages in that region. While some remodeling and expansion of milk processing plants has occurred in the Upper Midwestern U.S., the amount is small compared to that which has occurred in the Western region. Nubern in 1999 described the pressures to modernize facing the Upper Midwestern dairy processing sector as follows [28]:

"Even though market shares for milk and cheese production have declined over time, the dairy industry in the Upper Midwest remains competitive mostly due to lower fixed costs associated with plants, buildings, and machinery. In the not too distant future, the Upper Midwest will face a crossroads--keep the status quo and continue suffering a decline in market share or make the necessary investments to remain competitive."

Upper Midwestern dairy processors are, of course, aware of the problem that Nubern described. Partly out of such concerns, two Upper Midwestern-based cooperatives (Land O' Lakes, Inc. and Alto Cooperative of Wisconsin) undertook a feasibility study in 2000 to determine whether to build a jointly-owned cheese plant in Wisconsin that would be the largest cheese plant East of the U.S. Rocky mountains [33]. Whether it will be profitable to build such a plant will depend partly on whether Wisconsin's milk production--fed by further growth in numbers of a Western-type dairy farms in the State--can grow enough to supply the milk needed for such a plant.

The end result of the interregional competition in dairying involving the Upper Midwest and the Western regions of the U.S. is partially dependent of international marketing and trade developments. If, as is now the case, the large farms and processing plants in the Western U.S. continue to have little incentive to export dairy products, they will battle the Midwestern U.S. dairy industry for market share in domestic dairy markets. Accompanying the fierce competition in the domestic market, will be expanded purchases of manufactured dairy products under the USDA's dairy price support program in the early 2000s.

Forces Limiting U.S. Dairy Imports and Exports and Expanding Foreign Direct Investment in the U.S. Dairy Industry

In the aggregate the U.S. dairy imports and exports are small and approximately equal, reflecting the lack of price incentives for either large dairy exports or imports. However, foreign direct investment in the U.S. dairy industry is substantial and involves such well-known foreign firms as the Kerry Group of Ireland, Glanbia of Ireland, Ireland's Dairy Board, Nestle, Unilever, MD Foods of Denmark, the Saputo Group of Canada, Lactalis, Parmalat, and the New Zealand Dairy Board.

U.S. Dairy Exports and Imports. U.S. dairy exports consist mainly of milk powder, dried whey products, ice cream, and a limited quantity of specialty cheeses. U.S. Nonfat dry milk powder exports, which were equivalent to about 22% of production during 1995 to 1999, were made with the aid of DEIP export subsidies [36]. In addition, about 24% of U.S. whole milk powder--a product not produced in quantity in the U.S.--also was exported with the aid of the USDA's export subsidies during this same period. Dried whey, a byproduct of the large U.S. cheese industry, is a growth export. U.S. firms exported this item to more than 10 countries during 1999, with about 35% of the product going to Canada and Mexico [36]. Cheese exports--including high-valued specialty cheeses--equaled about one percent of U.S. cheese production during 1995-99. Fluid milk is costly for U.S. firms to export. However, Dean Foods has developed a small but expanding market in Mexico for fluid milk produced in the firm's Texas plants [27].

The U.S. is a leading world importer of cheese. As a result of the 1994 GATT/WTO agreement, the U.S. agreed to permit within quota cheese imports equivalent to about 5% of U.S. consumption. U.S. cheese imports during 1994-99 approached the 5% within quota access figure during 1994-99 when they averaged the equivalent of 4% to 5% of U.S. cheese consumption [36]. These imports consisted substantially of bulk cheese imported by the New Zealand Dairy Board through its U.S. subsidiaries, and specialty cheeses originating from Europe. In 2000, the New Zealand Dairy Board's U.S. subsidiaries will hold licenses to import nearly 70% of within quota U.S. cheese imports [11].

Why are U.S. dairy imports and exports generally so small? The reasons are simple. There are few price incentives for such economic activity. Reflecting mainly high border protection, U.S. internal prices for bulk dairy products are substantially higher than world prices. For example, in 1999 U.S. prices for cheddar cheese, butter, and nonfat dry milk, respectively, averaged 62%, 90%, and 76% higher than world prices as

measured by the midpoint of fob Northern Europe prices for these items [36]. Thus, with the exception of a few products--e.g., specialty cheeses, ice cream, and dried whey--U.S. dairy products are not priced competitively in world markets. Similarly, the high border protection and limited within quota access to U.S. dairy markets makes it infeasible for firms to sell most imported dairy products in the U.S. market.

Casein, as noted earlier, represents an exception to the statement about the feasibility of importing foreign dairy products. This item enters the U.S. duty free and without quota limits. Irish firms and the New Zealand Dairy Board export substantial quantities of this product to the U.S. Ultra filtered dried (or semi-liquid) skim milk--the so-called total milk protein--also can enter the U.S. without a tariff. If U.S. processors were permitted to use casein and ultra filtered skim milk (under revised standards of product identity) to produce a full range of cheeses in the U.S., these ingredients would find expanded use in the U.S. dairy industry and almost certainly would come under closer scrutiny from the import-sensitive domestic dairy industry.

Foreign Direct Investment in the U.S. Dairy Industry. Foreign direct investment in the U.S. dairy industry expanded during the 1980s and 1990s. European Union (EU) dairy firms gained incentives to invest in the U.S. and other foreign markets partly because of the presence of milk production quotas in the EU, which limited expansion opportunities at home. In addition, EU firms sought to expand into the U.S. and other foreign markets to introduce processing and marketing innovations that had proven successful in the EU. The large, relatively prosperous and homogeneous U.S. market had obvious attractions. These same attractions discourage U.S. firms from expanding into foreign dairy markets.

The Kerry Group and Glanbia of Ireland both mention the quota effect as part of the reason for their decision to enter the U.S. market. Kerry began with casein sales in the U.S. and used this as a springboard for expanding operations in the lucrative U.S. food ingredients markets. One of Kerry's major U.S. acquisitions was the U.S.\$130 million purchase of Beatreme Food Ingredients Company in 1988 [39]. Glanbia's subsidiaries have extensive milk processing operations in the rapidly growing Idaho milk production area.

The Saputo Group of Canada has made several acquisitions in the U.S., notably the previously mentioned Stella Cheese acquisition. Saputo paid what industry sources claim was a high price (U.S.\$405 million) for Stella Foods which had annual sales of U.S.\$ 750 million in the mid-1990s [6]. Saputo apparently was willing to pay the high price because of Stella

Food's well-known brands and potential to grow into a strong regional and national specialty cheese company. Saputo also acquired Wisconsin-based Avonmore Cheese, Inc. and Waterford Food Products, Inc. from Avonmore Waterford Group/PLC of Ireland in 1998. These acquisitions plus additional acquisitions in Canada in the late 1990s have given the Saputo Group a substantial presence in Italian and other specialty cheeses in the U.S. and Canadian markets. Saputo has announced that it has the financial resources to make additional acquisitions.

Nestle and Haagen-Dazs entered into a joint venture in 1999 which gave them together about 10% of the U.S. super-premium packaged ice cream and novelty market [2]. Unilever has a 16% to 20% share of this same U.S. market.

A host of other foreign firms have acquired U.S. dairy processing and marketing operations. Parmalat (Italy) introduced the firm's extended shelf life products to the U.S. and also acquired U.S. plants for producing ice cream and conventional fluid milk products in the U.S. market. MD Foods of Denmark produces and markets Havarti cheese from a Wisconsin plant. Many of other foreign-based firms process specialty cheeses and other high value added dairy products in the U.S. Danone (France) produces and markets cultured dairy products in the U.S.

Kraft is one of the few large U.S. food firms that has made large direct investments in foreign dairy industries. The firm has manufacturing and distribution operations in Australia and Europe. The firm also exports U.S. dairy products into Latin America. Land O' Lakes has acquired a dairy plant in Paslek, Poland.

When, if ever, will U.S. firms engage in expanded exporting or engage in expanded EU-style direct investments in foreign dairy businesses? U.S. firms presently have few price incentives to export bulk dairy products. Hence, unless the U.S. market becomes more open to imports and the USDA's price support program ends, domestic dairy product prices will remain substantially above world dairy product prices and limit incentives of U.S. firms to export bulk dairy products. U.S. firms can be expected to expand exports of specialty dairy products modestly since those products can be exported despite the high tariffs that exist in many foreign markets. U.S. firms will have few incentives to expand foreign direct investment in other countries as long as the U.S. market remains more attractive and less costly to serve than most others.

The disincentives for exporting or foreign direct investment will not persist indefinitely in the U.S. Thomas Suber, Executive Director of the U.S. Dairy Export Council (USDEC), characterized the future of the U.S.

dairy industry as one where real costs of milk production are declining, domestic demand is growing modestly and the role of government is declining. As a result, he claims that "...the processors, cooperatives, traders, and farmers who determine USDEC policy face the future with a cold realism that either we compete internationally or we will shrink as an industry [32]."

Mexico represents an attractive market for U.S. dairy exports and foreign direct dairy investment. As a result of the NAFTA, Mexico's dairy import tariffs will decline to low levels in the next few years, creating an environment that will invite expanded U.S. dairy exports to serve Mexico's dairy markets. Success there might foster interest in exports and foreign direct investment elsewhere.

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