United States International Trade Commission

Conditions of Competition for Milk Protein Products in the U.S. Market

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PREFACE

On May 14, 2003, the U.S. International Trade Commission (Commission) received a request from the Senate Committee on Finance (Committee), under section 332(g) of the Tariff Act of 1930 (19 U.S.C. 1332(g)) that the Commission conduct an investigation regarding U.S. market conditions for milk proteins (appendix A). On June 5, 2003, the Commission instituted investigation No. 332-453, *Conditions of Competition for Milk Protein Products in the U.S. Market*. The Committee specifically asked the Commission to examine the competitiveness of a variety of milk proteins in the U.S. market, focusing on milk protein concentrate, casein, and caseinate; and the market for those products compared with other milk proteins, including whole milk, skim milk, dried whole milk, dried skim milk, whey, dried whey, and whey protein concentrates. The Committee requested that the investigation cover the period 1998-2002 to the extent possible, and that the Commission provide its completed report 12 months from the receipt of the request. In its letter, the Committee requested the Commission to transmit a report that can be fully disclosed to the public, that is, containing no confidential business information.

As requested by the Committee, the Commission's report on the investigation includes the following information:

- an overview of the global market for milk proteins in their various forms, including such factors as consumption, production, and trade during the period 1998-2002;
- profiles of the milk protein industries of the United States and major dairy exporting countries, and in particular, the industries of Australia, New Zealand, and the European Union;[1]
- information on the overall level of government support and other government intervention affecting producers of milk proteins in the United States and in each of the above-referenced trading partners together with a discussion of competitive factors, including government policies, that impact U.S. production, use, and trade in milk protein products in their various forms;
- information on U.S. imports and exports of milk protein in its various forms with data broken down, to the extent possible, by protein content, end use, and manufacturing processes;
- a history of U.S. tariff classification of milk proteins and tariff treatment of these products, including any fees or quotas imposed under section 22 of the Agricultural Adjustment Act, tariff-rate quotas established pursuant to the Uruguay Round Agreements, and U.S. Customs Service classification decisions;

[1] For the purpose of this report, the European Union refers to Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and United Kingdom (i.e., EU-15).

- a qualitative and, to the extent possible, quantitative assessment of how imported milk proteins affect farm-level milk prices in the United States; and,

- other information relating to competitive factors affecting: (1) the U.S. industry that imports and consumes milk proteins; (2) the U.S. industry that supplies competitive products; and, (3) the competitive factors, including government policies, that impact potential U.S. production of milk proteins in their various forms.

Public notice of the investigation, reproduced in appendix B, was posted in the Office of the Secretary, U.S. International Trade Commission, Washington, DC, and published in the *Federal Register* (68 FR 35004) of June 11, 2003. A public hearing on the investigation was held on December 11, 2003, in Washington DC.[2]

[2] A list of witnesses who testified at the hearing is included in appendix C.

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Conditions of Competition for Milk Protein Products in the U.S. Market

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ABBREVIATIONS AND ACRONYMS

AAA	Agriculture Adjustment Act
ABARE	Australian Bureau of Agricultural and Resource Economics
ADPI	American Dairy Products Institute
AFFA	Agriculture, Fisheries, and Forestry Australia
AMA	Agricultural Management Association program
AMAA	Agricultural Marketing Agreement Act
AMS	Agricultural Marketing Service
AUV	Average unit value
AVE	Ad valorem equivalent
CAP	Common Agricultural Policy of the European Union
CBI	Confidential business information
CCC	Commodity Credit Corporation
CDR	Wisconsin Center for Dairy Research
CFR	Code of Federal Regulations
CME	Chicago Mercantile Exchange
CN	Common nomenclature
CNI	Coalition for Nutritional Ingredients
COA	Court of Auditors
Commission	U.S. International Trade Commission
Customs	U.S. Bureau of Customs and Border Protection
cwt	Hundredweight, 100 pounds
DCANZ	Dairy Companies Association of New Zealand
DEIP	Dairy Export Incentive Program
DF	Diafiltration
DFA	Dairy Farmers of America
DIAP	Dairy Industry Adjustment Package
DIP	Dairy Indemnity Program
DIRA	Dairy Industries Restructuring Act
DMLA program	Dairy Market Loss Assistance program
DMS	Domestic market support
DPSP	Dairy Price Support Program
DRAP	Dairy Regional Assistance Program
DRDC	Dairy Research and Development Corporation
DSAP	Dairy Structural Adjustment Program
ECU	European Currency Unit
EDA	European Dairy Association
EQIP	Environmental Quality Incentive Program
ERS	USDA, Economic Research Service
EU	European Union
FADN	Farm Accounting Data Network (EU)
FAO	The United Nations Food and Agriculture Organization
FAS	USDA, Foreign Agricultural Service
FDA	U.S. Food and Drug Administration
FDI	Foreign direct investment
FMD	Foreign Market Development Assistance Program
FMMO	Federal Milk Marketing Orders
FRST	Foundation for Research Science and Technology
FSA	USDA, Farm Services Agency
FY	Fiscal year

ABBREVIATIONS AND ACRONYMS—*Continued*

GAO	General Accounting Office
GATT	General Agreement on Tariffs and Trade
GMP	Glycomacropeptide, one type of whey protein found in milk
GSSE	General services support estimate
HS	Harmonized system
HTS	Harmonized Tariff Schedule of the United States
IDB	Irish Dairy Board
IDF	International Dairy Federation
IDFA	International Dairy Foods Association
IDIA	Irish Dairy Industry Association
IE	Ion exchange
IFCN	International Farm Comparison Network
IP	Inward processing
ITC	U.S. International Trade Commission
lb	Pound
MAF	New Zealand Ministry of Agriculture and Forestry
MAP	Market Access Program
MF	Microfiltration
MFN rate	Most favored nation rate
MIG	Marketing and Innovation Group
MILC payments	Milk Income Loss Contract payments
MPC	Milk protein concentrate
MPI	Milk protein isolate
mt	Metric tons
MTR	Mid-Term Review
NAC	Nominal assistance coefficient
NAICS	North American Industry Classification System
NAFTA	North American Free Trade Agreement
NASS	USDA, National Agriculture Statistics Service
NDM	Nonfat dry milk
NDPRP	National Dairy Promotion and Research Program
NFDM	Nonfat dry milk
NMPF	National Milk Producers Federation
NPC	Nominal protection coefficient
NRCS	USDA, Natural Resources Conservation Service
NSPF	not specifically provided for
NTR rate	Normal trade relations rate
NZDB	New Zealand Dairy Board
NZDG	New Zealand Dairy Group
NZDRI	New Zealand Dairy Research Institute
OECD	Organization for Economic Co-operation and Development
PMO	Pasteurized Milk Ordinance
PSE	Producer support estimate
R&D	Research and development
SDA Scheme	Supplementary Dairy Adjustment Scheme
SIC	Standard Industrial Classification System

ABBREVIATIONS AND ACRONYMS—*Continued*

SMP	Skim milk powder
SNF	Solids-not-fat, also known as skim solids, or the portion of milk containing the lactose, minerals, and proteins
SSG	Special safeguard
SUR	Seemingly unrelated regression
TEAGASC	Irish Agriculture and Food Development Authority
Tilt	A USDA policy change in which the support price for SMP is lowered (raised) necessarily raising (lowering) the support price for butter, usually done to control forfeitures to the CCC
TMP	Total milk protein
TRQ	Tariff-rate quota
TSUS	Tariff schedule of the United States
UF	Ultrafiltration
UF milk	Milk that has been ultrafiltered to remove lactose and minerals but has not been dried, also known as liquid MPC
UF MPC	Milk protein concentrate produced by ultrafiltration
UHT	Ultra high temperature
URA	Uruguay Round Agreement
URAA	Uruguay Round Agreement on Agriculture
USDA	U.S. Department of Agriculture
USDEC	U.S. Dairy Export Council
USTR	U.S. Trade Representative
VAR	Vector autoregression model
WMP	Whole milk powder
WPC	Whey protein concentrate
WPI	Whey protein isolate
WTO	World Trade Organization
ZMP	Zentrale Markt und Preisberichtstelle

EXECUTIVE SUMMARY[1]

On May 14, 2003, the U.S. International Trade Commission (Commission) received a request from the Senate Committee on Finance (Committee), under section 332(g) of the Tariff Act of 1930 (19 U.S.C. 1332(g)) that the Commission conduct an investigation regarding U.S. market conditions for milk proteins. On June 5, 2003, the Commission instituted investigation No. 332-453, *Conditions of Competition for Milk Protein Products in the U.S. Market*. The Committee specifically asked the Commission to examine the competitiveness of a variety of milk proteins in the U.S. market, focusing on milk protein concentrate (MPC), casein, and caseinate; and the market for those products compared with other milk proteins, including whole milk, skim milk, dried whole milk, dried skim milk, whey, dried whey, and whey protein concentrates (WPC). The Committee requested that the investigation cover the period 1998-2002 to the extent possible, and that the Commission provide its completed report 12 months from the receipt of the request. In its letter, the Committee requested the Commission to transmit a report that can be fully disclosed to the public, that is, containing no confidential business information.

As requested by the Committee, the Commission's report on the investigation includes the following information:

- an overview of the global market for milk proteins in their various forms, including such factors as consumption, production, and trade during the period 1998-2002;

- profiles of the milk protein industries of the United States and major dairy exporting countries, and in particular, the industries of Australia, New Zealand, and the European Union (EU);[2]

- information on the overall level of government support and other government intervention affecting producers of milk proteins in the United States and in each of the above-referenced trading partners together with a discussion of competitive factors, including government policies, that impact U.S. production, use, and trade in milk protein products in their various forms;

- information on U.S. imports and exports of milk protein in its various forms with data broken down, to the extent possible, by protein content, end use, and manufacturing processes;

- a history of U.S. tariff classification of milk proteins and tariff treatment of these products, including any fees or quotas imposed under section 22 of the Agricultural

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[1] The information and analysis provided in this report are for the purposes of this report only. Nothing in this report should be construed to indicate how the Commission would find in an investigation conducted under statutory authority covering the same or similar subject manner.

[2] For the purpose of this report, the European Union refers to Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and United Kingdom (i.e., EU-15).

Adjustment Act, tariff-rate quotas (TRQs) established pursuant to the Uruguay Round Agreements and U.S. Customs Service (Customs) classification decisions;

- a qualitative and, to the extent possible, quantitative assessment of how imported milk proteins affect farm-level milk prices in the United States; and,

- other information relating to competitive factors affecting: (1) the U.S. industry that imports and consumes milk proteins; (2) the U.S. industry that supplies competitive products; and, (3) the competitive factors, including government policies, that impact potential U.S. production of milk proteins in their various forms.

Commission questionnaires that surveyed milk protein importers, purchasers, and foreign producers provided the key information necessary to respond to the Committee's request. In particular, questionnaire responses provided new information on the protein content, manufacturing processes, and uses of imported and domestically produced MPC. Also, data generated from the Commission questionnaires enabled an estimation of how much U.S.-produced milk protein may have been displaced by imported milk protein. The data also allowed an assessment of the impact of milk protein imports on farm-level prices. Highlights of the report and its major findings are summarized below.

What Are the Major Products and Market Characteristics for the Milk Proteins Covered in this Investigation?

In its request letter, the Committee specifically asked the Commission to examine the competitiveness of a variety of milk proteins in the U.S. market, focusing on MPC, casein, and caseinate. MPC is a concentrated milk protein product that contains both of the major forms of protein found in milk—casein and whey—and is produced using one of three different production processes: ultrafiltration, blending, or co-precipitation. MPC is used in several food applications, especially as an ingredient in processed cheese and specialty nutrition products (such as infant formula, medical nutrition, and sports bars and beverages). The protein content of MPC can vary considerably, from 40 percent to over 90 percent. MPC is often referred to by its protein concentration (e.g., MPC with a protein concentration of 42 percent is referred to as MPC 42). Imports of MPC are subject to a minimal duty of $3.70 per metric ton (about 0.1 percent ad valorem equivalent (AVE)). The U.S. market for MPC is roughly 40,000 to 50,000 metric tons, virtually all of which is supplied by imports. There is limited domestic production, although in 2003 commercial production of MPC began in the United States. In 2002, New Zealand supplied about 55 percent of the U.S. market, with an additional 25 percent from the EU. Other suppliers of MPC imports to the U.S. market include Australia, Poland, and India.

Casein is a form of concentrated casein protein (one of the two major proteins found in milk) and is derived from skim milk. Depending on the method of manufacture, casein is classified as either acid casein or rennet casein, and both types are high-protein products with protein concentrations ranging from 85 to 90 percent. Both acid casein and rennet casein contain very little whey protein and therefore cannot be classified as MPC. Casein is used mainly in so-called "nondairy foods" (such as imitation cheese, coffee creamers, and margarine) and specialty nutrition products. Imports enter the United States free of duty. The U.S. market for casein was about 67,000 metric tons in 2002 and was served almost exclusively by imports. Major suppliers include the EU, accounting for about 45 percent of U.S. imports, and New Zealand, with a 32-percent share. Other suppliers include Australia, India, and Ukraine. Casein production recently began in the United States, although is not yet commercially significant.

Caseinate is a soluable form of casein derived from acid casein. Common forms of caseinate are calcium caseinate and sodium caseinate. All forms of caseinate contain protein concentrations of approximately 90 percent. Caseinate is used mostly in specialty nutrition products, yogurt, and ice cream. Imports are subject to a minimal duty of $3.70 per metric ton (about 0.1 percent AVE). In 2002, the U.S. market for caseinate was about 23,000 metric tons, virtually all supplied by imports, although several U.S. firms produce caseinate from imported dry casein. New Zealand (50-percent share) and the EU (36-percent share) are the major suppliers of caseinate to the U.S. market.

How Are Milk Proteins Utilized in the U.S. Market?

Information on the uses of milk protein products in the U.S. market was obtained primarily from a Commission questionnaire sent out to 450 companies, covering the full range of potential users, including manufacturers of cheese and other dairy products, bakery products, snack food products, soups and sauces, animal feed, and specialty nutrition products. Nondairy food applications (such as imitation cheese and coffee creamers) and specialty nutrition products accounted for approximately 82 percent of all casein and caseinate purchases. Use of imported MPC varied somewhat by protein content. The end-use applications of imported MPC are summarized in tables ES-1 and ES-2 below.

Table ES-1
Milk protein concentrate: Use in all applications, processed cheese products, and specialty nutrition, by percent protein, 2002

	Milk protein concentrate, protein concentration (percent)						
End-use application	40-49	50-59	60-69	70-79	80-90	90+	40-90+
	Share of total purchases						
All end-uses	8	4	0	60	22	6	100
Processed cheese products	1	0	0	91	8	0	100
Specialty nutrition[1]	1	6	0	0	70	24	100

[1] Includes medical nutrition, sports nutrition, geriatric nutrition, meal replacers, and infant formula.

Source: Compiled from data submitted in response to Commission questionnaires.

Key observations from table ES-1 (based on 2002 data):

- 88 percent of MPC purchases were high-protein MPC (containing 70 percent or more protein).

- 60 percent of MPC purchases were MPC 70-79 (mostly MPC 70).

- Over 90 percent of all MPC used in the production of processed cheese products was MPC 70-79 (mainly MPC 70).

- Only 1 percent of purchases by producers of processed cheese products was low-protein MPC (MPC 40-69).

- Almost all MPC purchases for use in specialty nutrition had very high-protein concentration (80 percent or greater).

Table ES-2
Milk protein concentrate: End-use application purchases by protein concentration, as share of total purchases, 2002

	Milk protein concentrate, protein concentration (percent)						
End-use application	40-49	50-59	60-69[1]	70-79	80-90	90+	40-90+
	Share of total purchases						
Processed cheese products[2] . . .	7	6	0	95	22	0	62
Specialty nutrition[3]	2	38	0	0	77	95	24
Other dairy products[4]	64	45	0	2	1	0	9
Other[5]	27	11	0	3	0	5	5
All end-uses	100	100	([6])	100	100	100	100

[1] No purchases of MPC 60-69 were reported in 2002.
[2] Includes a small volume of MPC used as starter culture in natural cheese.
[3] Includes medical nutrition, sports nutrition, geriatric nutrition, meal replacers, and infant formula.
[4] Includes yogurt, ice cream, and frozen desserts.
[5] Includes nondairy foods (margarine, imitation cheese, nondairy creamers), bakery, confectionery, meat products, animal feed, and industrial products.
[6] Not applicable.

Source: Compiled from data submitted in response to Commission questionnaires.

Key observations from table ES-2 (based on 2002 data):

- MPC purchases are dominated by two end-use applications: processed cheese products (62 percent) and specialty nutrition products (24 percent).

- 56 percent of all MPC purchased in 2002 was MPC 70-79 used in the production of processed cheese products (MPC 70-79 accounted for 91 percent of the MPC used in the production of processed cheese products (table ES-1)).

- Processed cheese products accounted for a very small share of the end uses for low-protein MPC (MPC 40-69).

- Much of the very high-protein MPC (80 percent protein and greater) purchased was used in specialty nutrition products.

- Low-protein MPC (MPC 40-69) was overwhelmingly used in dairy products other than processed cheese products, such as cultured products and frozen desserts.

- Other key end-use applications for low-protein MPC (MPC 40-69) were in bakery and confectionery products, as well as animal feed.

How Are Milk Protein Products Classified in the Harmonized Tariff Schedule of the United States?

U.S. imports of MPC are classified under HTS subheadings 0404.90.10 for imports with a protein concentration of 40 to 90 percent; and 3501.10.10 for imports with a protein concentration of 90 percent or more. U.S. imports of casein and caseinate are classified under HTS subheadings 3501.10.50 and 3501.90.60, respectively. U.S. tariffs on imported milk protein products vary considerably. Imports of skim milk powder (SMP), whole milk powder (WMP), and fluid milk are subject to TRQs with high over-quota tariffs that limit imports. U.S. imports of MPC and caseinate are subject to very low tariffs of 0.37 cents per kilogram. Casein may be imported free of duty.

Section 22 of the Agricultural Adjustment Act of 1933 permitted the imposition of quotas on agricultural imports if those imports interfered with U.S. Department of Agriculture (USDA) programs for the product, and therefore virtually all dairy products were subject to quotas, except casein, caseinates, lactalbumin (i.e., whey), and soft-ripened cow's milk cheese. Virtually all section 22 quotas were converted into TRQs in 1995 under the World Trade Organization (WTO) Agreement on Agriculture, but since MPC and casein were not covered under section 22 import quotas, they were not subject to TRQs.

What Are the Most Recent Trends in the Global Market for Milk Proteins?

Milk protein products are produced and consumed throughout the world. However, the global dairy market is highly concentrated among major producing and consuming countries. In 2002, the EU and the United States accounted for about 39 percent of world milk production. India and Brazil were also major milk producing countries. Australia and New Zealand are major suppliers of processed milk protein products, including SMP, WMP, casein, caseinate, and MPC, to world markets, but are not among the world's top milk producers. International trade in milk and dairy products accounts for a small share of global milk production (6 percent on a milk-equivalent basis). Global milk protein exports are dominated by the EU, New Zealand, and Australia. The United States is not a major exporter of milk protein products. New Zealand and Australia have increased their share of the global protein market, whereas that of the EU has declined, mostly reflecting the EU's lack of international competitiveness and export refund limits under the WTO Agreement on Agriculture. Global import markets for milk protein products are generally located in dry or tropical regions of Latin America, North Africa, the Middle East, and Asia, where climatic conditions are unfavorable to efficient production of milk and dairy products.

The most widely traded milk protein products are in the form of commodity-type products, such as SMP, WMP, dry whey, and casein. However, the market is changing with the development of modern filtration and blending technologies that have reduced costs and increased the production of more specialized dairy products, tailored to the specific needs of customers. Such products include MPC, specialized casein and caseinate products, WPC, and whey protein isolate (WPI). Global trade in these highly specialized products is growing, benefitting from low levels of global tariffs and quota protection, as well as relatively high prices of competing, traditionally traded milk-protein products. New Zealand is the world's leading MPC producing country, followed by the EU. New Zealand and the EU are also the largest producers and exporters of casein. World production and exports of caseinate are dominated by New Zealand, the EU, and Australia. The United States is the world's largest market for MPC, casein, and caseinate. Global production and exports of WPC and WPI are dominated by the United States, the EU, Australia, and New Zealand.

What Are the Main Characteristics of the Milk Protein Industry in the United States?

The United States is the world's largest single milk-producing country, and its output of almost 170 billion pounds (or 77 million metric tons) in 2002 accounted for about 15 percent of world milk supply. U.S. dairy farms range from relatively small, high-cost, inefficient operations, to industrial-type operations that are among the largest and most technologically advanced in the world. Trends in U.S. milk production are dominated by three major phenomena: (1) a steady increase in production and productivity over time; (2) an increasing share of U.S. milk supplied from a relatively few, very large dairy operations; and, (3) a regional shift in production from the Northeast and Upper Midwest to the Southwest and West. According to the USDA, average operating costs of production were about $9.50 per hundredweight (cwt) during 2000-2002, of which close to 70 percent was feed costs. Based on a small survey of dairy farms by the International Farm Comparison Network (IFCN), U.S. milk production costs were reported in the $10-13 per cwt range in 2002, significantly higher than New Zealand and Australia, and slightly above those in the EU.

U.S. production of milk protein products has largely been limited to the production of SMP and whey products. Casein has not been produced in the United States since the 1960s, and caseinate production is limited to the further processing of imported casein. Limited commercial production of ultrafiltered milk (UF milk), which also is referred to as liquid MPC, began in the late-1990s. MPC production, other than UF milk, is confined to a few firms that produce blended MPC using imported and domestically produced milk proteins, and one facility that very recently began to produce MPC using the ultrafiltration process.

The competitiveness of the U.S. dairy industry has been affected by the high level of government intervention, mainly through Federal price support and deficiency payment programs, and milk marketing orders. The Dairy Price Support Program (DPSP) attempts to support raw milk prices by requiring USDA to purchase domestic surpluses of butter, cheddar cheese, and SMP at prespecified prices. Direct income support is currently provided through the Milk Income Loss Contract (MILC) Program, which provides dairy farmers with supplemental payments when milk prices fall below a prespecified level. Federal Milk Marketing Orders (FMMOs) require milk processors to pay dairy farmers minimum prices for their milk based on established milk price formulas and its end use. Indirect support of the U.S. dairy industry is provided through several other Federal programs, including assistance for environmental conservation and promotion of milk consumption.

What Are the Main Characteristics of the Milk Protein Industries in the Major Dairy Exporting Countries?

The European Union

Dairy is the most important agricultural sector in the EU, accounting for about 14 percent of agricultural value. However, there are vast differences in the dairy sectors among member states, reflecting significant diversity of geographic, climatic, demographic, and policy conditions in the region. The EU is the world's largest milk producer, with production of about 120 million metric tons (mt) annually, and is the leading global exporter of milk protein products. The EU supplied 40 percent of the total value of U.S. milk protein product imports in 2002, of which 95 percent were from Ireland, France, Germany, the Netherlands, and Denmark.

Milk production in the EU has been stable since 1984 because of quotas that limit production. The EU dairy sector has undergone considerable structural change moving to fewer, larger dairy operations, increased cow productivity, and decreased cow numbers. Costs of producing milk in the EU vary considerably among member states. The 2002 IFCN report estimated production costs ranging from about $6-13 per cwt.

The competitiveness of EU milk protein products in world markets is heavily influenced by government programs under the Common Agricultural Policy (CAP). EU policies impacting dairy producers and processors include: target prices for milk, intervention prices for butter and SMP, minimum import prices (threshold prices) via high tariffs and TRQs, production aids for skim milk and SMP used in animal feed, production aids for skim milk used in casein production, processing support for butter used in food manufacturing, and export refunds. Many of these programs influenced EU exports of MPC to the United States during 1998-2002. Implementation of EU dairy policy reforms (such as reductions in intervention prices and movement to decoupled payments) in 2004 under the Mid-Term Review (MTR) will likely close the gap between EU internal prices and world prices, and therefore may impact future competitiveness of EU milk protein products in world markets.

New Zealand

The dairy industry is an important part of New Zealand's economy, accounting for almost one-quarter of its total export revenues in 2002. New Zealand is the world's seventh-largest milk producer and is a dominant world exporter. New Zealand's pasture-based production system, combined with improved genetics and efficient farming practices, allow it to be one of the world's lowest-cost producing countries. IFCN data reported milk production costs ranging from $4.50-5.40 per cwt in 2002.

Only about 6 percent of New Zealand's milk production is consumed domestically. About 97 percent is used for manufacturing purposes. Returns to the New Zealand dairy industry are based largely on export revenues. New Zealand's milk protein products are sold throughout the world using a highly sophisticated global marketing and distribution network. The United States is the top export market for New Zealand's dairy products.

In 2001, the New Zealand Dairy Industry Restructuring Act (DIRA) resulted in major changes to the structure of the dairy industry. The two largest cooperative milk supply companies (Kiwi Co-operative Dairy Co. and New Zealand Dairy Group) merged with the New Zealand Dairy Board (NZDB) to form Fonterra Co-operative Group Ltd. Fonterra controls 97 percent of New Zealand's milk supply, and produces and exports a wide range of milk protein products, including casein, caseinates, MPC, and WPC. As a result of the 2001 legislation, dairy companies are now allowed to export their products directly without channeling them through the NZDB. However, Fonterra was given exclusive right to export to "designated markets" (i.e., markets subject to TRQs from which quota rents can be derived) until the end of an initial period, which ranges from 2007-2010, depending on the market.

Australia

Dairy products accounted for about 8 percent of total Australian agricultural exports in 2002, and accounted for 11 percent of Australian agricultural production. Australia is the world's tenth-largest milk-producing country; however, it ranks second among leading world exporters of SMP, WMP, and dry whey; and ranks sixth among exporters of casein. Australia is a low-cost milk producing country, with production largely based on seasonal pasture, although use of supplemental feeding has increased in recent years. IFCN data reported milk production costs ranging from $2.70-9.10 per cwt in 2002. About 20 percent of Australia's milk production is consumed as fluid milk and 80 percent utilized for processing. Approximately 60 percent of all dairy products manufactured in Australia is exported. Australia is a major supplier of milk protein products to the United States.

The Australian industry is dominated by producer-owned cooperatives. Though not as concentrated as the dairy industry in New Zealand, the three largest cooperatives account for 60 percent of milk production and 70 percent of the milk used in manufacturing. Murray Goulburn Co-operative Co. Ltd. is Australia's single largest producer and exporter of MPC, casein, and caseinates.

What Has Been the Impact of U.S. Government Programs on Domestic Production and Imports of Milk Protein Products?

Based on an analysis of the costs and returns from producing SMP and MPC, the DPSP appears to be an important factor creating a disincentive to manufacture MPC in the United States. The Commission estimated returns for U.S. processors of SMP and compared them with the returns for U.S. processors of several types of MPC, and found that, under most conditions, U.S. processors could receive a higher return on the production of SMP. Consequently, as a result of the relatively lower costs of production and higher price (as a result of the DPSP) for SMP, U.S. processors are likely to realize a higher return on the production of MPC under only the most advantageous conditions. Other factors that might deter domestic production of MPC are: (1) greater financial risk of MPC production versus SMP production; (2) significant capital costs; and, (3) a relatively small domestic market (largely because U.S. Food and Drug Administration (FDA) standards of identity prohibit the use of MPC in many dairy products).

How Has Government Intervention in the European Union, New Zealand, and Australia Affected Milk Protein Product Exports to the United States?

There is little direct government intervention in the dairy markets in Australia and New Zealand. Reforms implemented in Australia in 2000 eliminated price support and other measures that previously controlled the supply and distribution of milk, although some decoupled structural adjustment payments will continue to be made until 2009. The 2002 Organization for Economic Co-operation and Development (OECD) Producer Support Estimates (PSEs) were 15 percent for Australia, and less than 1 percent for New Zealand. Most government assistance to both the Australian and New Zealand dairy industries is from Federal funding of research and development.

In contrast, there is significant government support in the dairy markets in the EU with a 2002 OECD PSE of 48 percent. Commission analysis indicated that U.S. imports of MPC from the EU during 1998-2002 were influenced strongly by dairy policies in both the EU (export refunds and casein production aids) and the United States (the DPSP). In particular, returns (economic rents) resulting from U.S. and EU policy generated from U.S. imports of a low-protein, blended MPC from the EU, provided substantial incentives to trade during 1998-2000. However, policy changes in 2001 and 2002 significantly reduced the return on EU exports of MPC, and contributed to the sudden drop in U.S. imports of MPC from the EU in 2001 and 2002. As a result of anticipated dairy policy changes in the EU, it is unlikely that the conditions that contributed to the increase in imports from 1998-2000 will be repeated in the future.

What Was the Protein Content and Production Method of U.S. Milk Protein Imports?

Data relating to the protein concentration of U.S. imports of casein and caseinate are readily available. The protein concentration of U.S. imports of casein fluctuates in a narrow range, approximately 85-90 percent, and the protein concentration of caseinate imports is about 90 percent. However, the protein content of U.S. MPC imports can vary widely and data on the protein concentration are not readily available. The Commission sent questionnaires to 122 importers. The volume of MPC, casein, and caseinate imports reported in questionnaire responses accounted for over 99 percent of U.S. imports of these products in 2002 based on official U.S. Department of Commerce data. Data collected from this questionnaire provided information relating to the protein concentration of MPC imports. The results are summarized in table ES-3 below.

Table ES-3
Milk protein concentrate: Quantity of U.S. imports by protein concentration and major supplier, 1998-2002

Country/product	1998	1999	2000	2001	2002
	1,000 metric tons				
European Union:					
MPC 40-69	6.9	15.0	17.8	3.6	7.1
MPC 70 or greater	7.3	5.3	3.1	1.9	2.7
Total	14.2	20.2	20.9	5.5	9.9
New Zealand:					
MPC 40-69	2.8	3.3	4.2	2.7	1.2
MPC 70 or greater	6.2	11.8	14.1	18.8	21.8
Total	9.0	15.2	18.3	21.5	23.0
Australia:					
MPC 40-69	0.5	3.8	3.6	2.5	0.2
MPC 70 or greater	0.8	1.3	3.1	0.9	3.8
Total	1.4	5.1	6.7	3.4	4.0
All countries:					
MPC 40-69	12.1	25.9	29.1	10.1	12.9
MPC 70 or greater	14.8	18.6	20.7	21.7	28.4
Total	26.9	44.5	49.8	31.8	41.3

Source: Compiled from data submitted in response to Commission questionnaires.

Key observations with regard to U.S. imports of MPC include:

- The three largest categories of U.S. imports of MPC are MPC with a protein concentration of 40-49 percent (MPC 40-49), almost exclusively imports of MPC 42; MPC 70-79; and MPC 80-89. There were relatively few imports of MPC 50-69.
- The significant increase in U.S. imports of low-protein MPC (mainly MPC 40-49) in 1999 and 2000 was primarily driven by imports from the EU.
- The protein content of MPC imports changed during the 1998-2002 period. In 1999 and 2000 there was a sharp increase in imports of low-protein MPC. However, in 2001 and 2002 imports of low-protein MPC declined significantly.
- During 1998-2002, imports of high-protein MPC (especially MPC 70-79) increased consistently.
- In 1998, the EU accounted for about one-half of U.S. MPC imports, and New Zealand for about one-third. In 2001, New Zealand surpassed the EU as the largest supplier of MPC to the United States, and by 2002, about 55 percent of all U.S. imports of MPC were supplied by New Zealand.

The production process used to produce MPC varies by country. MPC produced in the EU is manufactured using either a blending or co-precipitation method. MPC with a protein concentration of less than 90 percent produced in Australia and New Zealand is produced via the ultrafiltration method, whereas MPC with a protein concentration of 90 percent or greater is produced using the co-precipitation method.

Questionnaire data indicate that on a protein basis, U.S. imports of MPC increased from 39 million pounds of protein in 1998 to 63 million pounds of protein in 2000. Imports of

MPC on a protein basis declined to 47 million pounds in 2001 and then increased to 60 million pounds in 2002. Imports of MPC on a protein basis were less volatile than imports of MPC on a product basis. This is because of the significant increase in the average protein content of imports in 2001 and 2002 as a result of the decline in low-protein imports (mainly MPC 40-49) from the EU. U.S. casein imports on a protein basis increased substantially from 118 million pounds in 1998 to 168 million pounds in 2000, before declining sharply in 2001 and again in 2002 to 131 million pounds. U.S. caseinate imports on a protein basis were generally stable during the 1998-2002 period, ranging from 40 to 50 million pounds of protein.

What Factors Influence a Processor's Choice of Imported and Domestic Milk Protein Products?

The degree to which milk protein products can substitute for one another is primarily driven by three factors: regulatory restrictions, technical substitutability, and economic substitutability. Regulatory restrictions refer primarily to FDA standards of identity that limit the use of MPC, casein, and caseinate in food applications. Technical substitutability refers to the ability of different milk proteins to provide the same functional and/or nutritional attributes. Factors affecting economic substitutability include price, switching costs, and availability.

Regulatory restrictions play a key role in the choice of imported and domestic milk protein products. FDA standards of identity do not permit the use of MPC in products with a standard of identity. Highly processed cheese products, however, fall outside the standards and therefore may contain MPC. Standards of identity also impact MPC use in yogurt and ice cream. Although the standards of identity for yogurt allow for the use of MPC, regulations require that dairy ingredients used in yogurt be Grade A, and currently MPC does not have Grade A status. No standards of identity cover the specialty nutrition industry.

According to industry and academic experts consulted by Commission staff, the degree of technical substitutability between imported milk protein products (primarily MPC) and SMP in many dairy applications is very high. In particular, experts reported that MPC is highly substitutable for SMP in the production of processed cheese products, and would be a superior ingredient to SMP in the production of natural cheese because of its high-protein content, low lactose level, solubility, color, and flavor characteristics. Experts also indicated that MPC would be a superior ingredient to SMP in the production of ice cream and yogurt, mainly because of its low lactose levels. Specialty nutrition products typically require a much higher protein concentration ingredient than SMP. High-protein concentrations of WPC and MPC, as well as caseinates and soy protein isolates, can all provide high levels of protein.

Economic substitutability among protein sources concerns both the price of the product and the cost of switching between products in the manufacturing process. Several cheese and specialty nutrition product manufacturers indicated that price is a very important factor when selecting the protein source. An analysis of the relative price of protein in SMP and MPC indicates that imported MPC provides a lower cost source of protein than both U.S.-produced SMP and U.S.-produced UF milk. Use of MPC in cheese manufacturing can increase both yield and throughput, thereby increasing production efficiency. The improved production efficiency, in combination with lower protein costs, result in significant substitution from SMP to imported milk protein products.

Although processed cheese products are produced using SMP, UF milk, and ingredient cheese, U.S. manufacturers indicated that MPC provides two important economic advantages—a lower cost protein source and functional characteristics (e.g., low lactose). Processed cheese manufacturers stated that their use of MPC in the production of processed cheese products is necessary in order to remain competitive. Academic and industry experts consulted by Commission staff and responses to Commission questionnaires indicated that processed cheese products are produced using either SMP or MPC with little or no change in equipment, employees, or manufacturing process. This suggests that the switching costs of producing processed cheese products with SMP versus MPC are low. Thus, it appears that the substitution of MPC for SMP, UF milk, and ingredient cheese in processed cheese product manufacturing, is primarily the result of the economic and technical advantages of MPC.

In the specialty nutrition market, caseinate is generally preferred as a source of protein because of cost and functionality compared with SMP and MPC. However, for a specific segment of the sports nutrition market, WPC and WPI are preferred protein sources. As many of the specialty nutrition products require milk protein products with a high-protein concentration, imported products that have a lower price per pound have a significant advantage over domestically produced protein sources.

How Much U.S.-Produced Milk Protein Has Been Displaced by Imports?

Estimates were generated on the amount of imported milk protein products that might have substituted for domestic milk proteins, based on use, purchase, and import data compiled from Commission purchasers' and importers' questionnaires. On a protein basis, imports of MPC, casein, and caseinate may have displaced 318 million pounds of U.S.-produced milk proteins between 1998 and 2002. Annual estimates of the volume of U.S.-produced milk proteins displaced by imports ranged from a low of 41 million pounds in 1998 to a high of 82 million pounds in 2000. In 2002, imports are estimated to have displaced 66 million pounds of domestically produced milk protein, which represents about 28 percent of total U.S. imports of MPC, casein, and caseinate on a protein basis in that year. The 66 million pounds of milk protein is equivalent to the protein content of about 183 million pounds of SMP.

What Has Been the Effect of Imported Milk Protein Products on Farm-Level Milk Prices?

Farm-level milk prices are determined in the U.S. market through a highly complex process. Imports of milk protein products affect U.S. milk prices through dairy product prices, which are used in the FMMO formulas to construct milk component prices (butterfat, protein, other solids, and nonfat solids) that feed into the formulas for Class I-IV milk prices. The class prices are used to calculate a weighted-average blend price. Finally, the blend price is the major determinant of the farm-level milk price.

The effect of imported milk proteins on farm-level prices depends on whether the market price for SMP is at, or above, the support price. Since SMP market prices were generally equal to the support price over the study period, most of the effect of imported milk protein was through U.S. Government purchases of SMP and the resulting increase in Commodity Credit Corporation (CCC) stocks that reached 1 billion pounds in 2002. In response to mounting CCC stocks, the USDA twice reduced the support price of SMP (May 2001 and November 2002) and raised the butter support price. These tilt adjustments are significant policy changes, because lowering the support price for SMP reduces FMMO class milk prices, which in turn lowers farm-level prices.

The Commission estimated that imported milk proteins may have contributed about 25-35 percent to the growth in CCC stocks during 1996-2002; however, it is not clear the extent to which these imports influenced the USDA decisions to adjust the butter/SMP tilt. A Commission review of studies undertaken by various academic researchers who have used detailed economic models that capture relationships between milk protein imports, government support prices, CCC stocks, and farm-level prices generally found that most of the impact of milk protein product imports is on CCC stocks, not on farm-level prices.

CHAPTER 1
INTRODUCTION

On May 14, 2003, the U.S. International Trade Commission (Commission) received a request from the Senate Committee on Finance (Committee), under section 332(g) of the Tariff Act of 1930 (19 U.S.C. 1332(g)) that the Commission conduct an investigation regarding U.S. market conditions for milk proteins (appendix A). The Committee specifically asked the Commission to examine the competitiveness of a variety of milk proteins in the U.S. market, focusing on milk protein concentrate (MPC), casein, and caseinate; and the market for those products compared with other milk proteins, including whole milk, skim milk, dried whole milk, dried skim milk, whey, dried whey, and whey protein concentrates (WPC). The Committee requested that the investigation cover the period 1998-2002 to the extent possible, and that the Commission provide its completed report 12 months from the receipt of the request. In its letter, the Committee requested the Commission to transmit a report that can be fully disclosed to the public, that is, containing no confidential business information.

Background

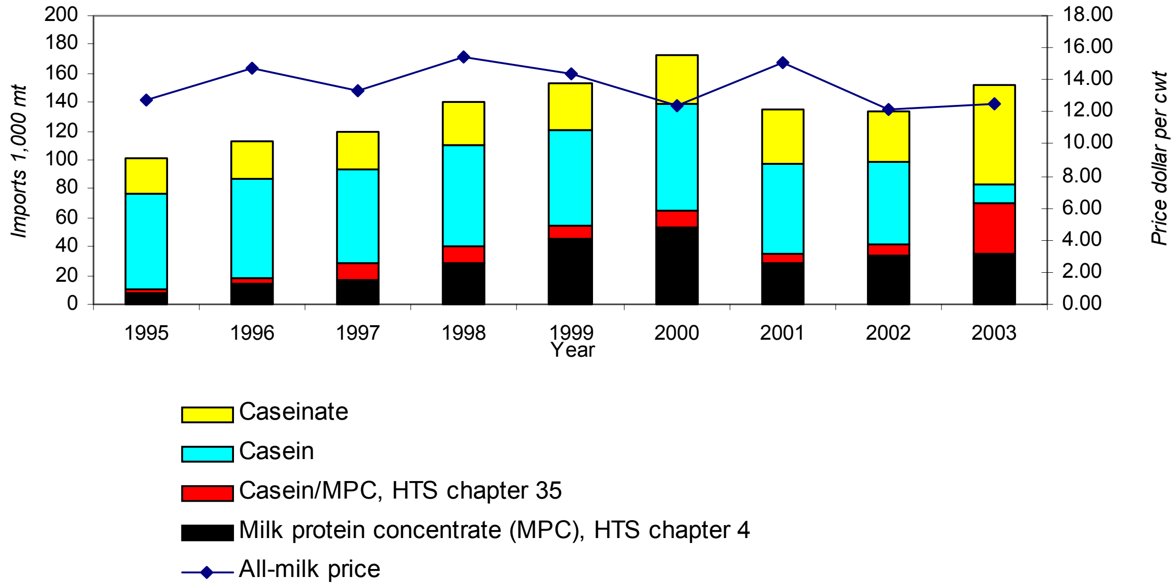
Interest in U.S. imports of milk protein products was sparked by the rapid increase in imports of MPC (Harmonized Tariff Schedule of the United States (HTS) subheading 0404.90.10) that began in the mid-1990s.[1] In the 1980s, U.S. MPC imports were less than 1,000 metric tons (mt) annually. During the early-1990s, imports started to increase and reached 7,300 mt by 1995 (figure 1-1). Imports grew more rapidly to a peak of 52,000 mt in 2000, fell to about 28,000 mt in 2001, and then stabilized at around 35,000 mt in 2002 and 2003. The 1990s was also a decade of significant milk price volatility. During 1998-2000, the rapid growth of MPC imports coincided with a dramatic decline in milk prices, with the all-milk price[2] falling from $15.46 per hundredweight (cwt) in 1998 to $12.40 per cwt in 2000 (a drop of 20 percent). In 2001, as MPC imports almost halved, milk prices rebounded to $15.05 per cwt, while a modest rise in MPC imports in 2002 coincided with milk prices falling to $12.19 per cwt, the lowest level in more than 20 years.[3] While it is clear that MPC import growth during 1998-2002 coincided with a period of low milk prices, there are different views on the causal relationship between these trends.

[1] Although the scope of this investigation covers all forms of milk protein, including casein and caseinate, rapid import growth was experienced only in MPC under HTS subheading 0404.90.10. Imports of other milk protein products were relatively stable during the mid- and late-1990s.

[2] The all-milk price (published monthly in USDA, NASS, *Agricultural prices*, and found at *http://usda.-mannlib.cornell.edu/reports/nassr/price/pap-bb*) is the average price of all the milk sold to plants and dealers. It covers the whole country, including California and other milk not under the control of Federal Milk Marketing Orders.

[3] The 2003 all-milk price was $12.51/cwt.

Figure 1-1
U.S. imports of milk protein products and the all-milk price, 1995-2003



Sources: U.S. Department of Agriculture, National Agricultural Statistics Service; U.S. Department of Commerce.

One reason for the debate over the impact of MPC imports stems from the fact that imports of MPC with significantly different protein levels are classified under HTS subheading 0404.90.10. For instance, MPC imports may have a low- or high-protein content. Both types of MPC are classified in the same subheading, yet MPCs with different protein content are sometimes used in different end-use applications. For example, MPC with relatively low-protein content typically contain large amounts of lactose, which makes it unsuitable for applications in lactose-free products. Medical nutrition products also may require MPC with high-protein and low-lactose content. However, because the HTS makes no distinction between low and high protein MPC there are no separate trade statistics for each category.

The National Milk Producers Federation (NMPF), representing U.S. milk producers, is concerned that most of the increase in MPC imports has been product with low-protein content that substitutes for domestically produced skim milk powder (SMP) in many end-use applications, such as cheesemaking.[4] According to the NMPF, MPC imports, as well as imports of other milk protein products, directly affect farm milk prices by increasing domestic protein availability and substituting for domestically produced milk protein

[4] NMPF, prehearing submission, Dec. 1, 2003, p. 9.

products.[5] Owing to this displacement, the NMPF alleges that U.S. market prices of SMP fell to the support level during the late-1990s and government purchases reached record levels. Mounting government stocks resulted in adjustments to the SMP price support level by the U.S. Department of Agriculture (USDA) that led to a decline in farm-level milk prices and incomes.[6] Further, the NMPF argues that imports of MPC increased as a result of the deliberate circumvention of the tariff-rate quota (TRQ) on SMP by traders.[7] Specifically it is alleged that suppliers of imported MPC are mixing SMP (which is about 36 percent protein) with products with high-protein concentrations, such as casein, to create a blended milk powder with a protein content of 40 percent or more. This blended product is classified under HTS subheading 0404.90.10 and subject to negligible duty treatment ($3.70 per mt, or about 0.1 percent ad valorem equivalent (AVE)).[8]

The U.S. Coalition for Nutritional Ingredients (CNI), representing foreign producers, importers, and users of MPC, argues that MPC imports do not substitute for domestically produced SMP in most uses.[9] It points out that high-protein MPC is not largely available from U.S. producers and yet is crucial for the production of many food and specialty nutrition products.[10] MPC users say that the real reason for the growth of imports is that the U.S. support price for SMP is set above the world price.[11] This makes U.S.-produced milk proteins in the form of SMP higher priced and uncompetitive compared with imported protein in the form of MPC.[12] The CNI notes that the buildup of government stocks during the 1998-2002 period was the result of an over supply of domestically produced milk protein and weakness in dairy demand.[13] Therefore, lower milk prices and dairy farmer incomes should not be attributed to imports of milk protein products.[14]

In early May 2001, bills were introduced in Congress (H.R. 1786 and S. 847) to impose TRQs on MPC, caseinate, and certain casein for food use. Under the bills, imports of these products would be limited to about 50 percent of recent trade volumes, beyond which imports would become subject to an over-quota tariff of about 50 percent AVE. On March 6, 2003, new bills were introduced in the House (H.R. 1160) and Senate (S.560) that were almost identical to the May 2001 bills.[15]

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[5] Dr. Peter Vitaliano, NMPF, testimony before the USITC, Dec. 11, 2003, transcript p. 28; Mr. Jerry Kozak, NMPF, in testimony before the Subcommittee on Department Operations, Oversight, Nutrition, and Forestry, Committee on Agriculture, House of Representatives, May 20, 2003, transcript p. 161.

[6] NMPF, posthearing submission, Jan. 15, 2004, p. 7.

[7] NMPF and Dairy Producers for Fair Trade, "Straight talk on imported dairy proteins: The need to Pass S. 560/H.R. 1160," (Mar. 2003).

[8] NMPF and Dairy Producers for Fair Trade, "The impact of imported milk protein concentrates on U.S. dairy producers," (July 2001).

[9] Mr. Paul Rosenthal, CNI, testimony before the USITC, Dec. 11, 2003, transcript p. 228; CNI, "Exploding the Myths about MPC, Casein, and Caseinates," (May 2003).

[10] CNI, prehearing submission, Dec. 1, 2003, p. 2.

[11] Ibid.

[12] For example, in 1999 U.S. MPC imports rose more than 55 percent from the previous year's level, while the U.S. SMP prices were close to double those in the international market.

[13] Mr. Paul Rosenthal, CNI, testimony before the USITC, Dec. 11, 2003, transcript p. 228; CNI, "Exploding the myths about MPC, casein, and caseinates," May, 2003.

[14] CNI, prehearing submission, Dec. 1, 2003, pp. 11-12.

[15] The text of H.R. 1160 and S. 560 can be found at *http://www.gpoaccess.gov/bills/index.html*.

Purpose

As requested by the Committee, this report provides:

- an overview of the global market for milk proteins in their various forms, including such factors as consumption, production, and trade during the period 1998-2002;

- profiles of the milk protein industries of the United States and major dairy exporting countries, and in particular, the industries of Australia, New Zealand, and the European Union (EU);[16]

- information on the overall level of government support and other government intervention affecting producers of milk proteins in the United States and in each of the above-referenced trading partners together with a discussion of competitive factors, including government policies, that impact U.S. production, use, and trade in milk protein products in their various forms;

- information on U.S. imports and exports of milk protein in its various forms with data broken down, to the extent possible, by protein content, end use, and manufacturing processes;

- a history of U.S. tariff classification of milk proteins and tariff treatment of these products, including any fees or quotas imposed under section 22 of the Agricultural Adjustment Act, tariff-rate quotas (TRQs) established pursuant to the Uruguay Round Agreements, and U.S. Customs Service classification decisions;

- a qualitative and, to the extent possible, quantitative assessment of how imported milk proteins affect farm-level milk prices in the United States; and,

- other information relating to competitive factors affecting: (1) the U.S. industry that imports and consumes milk proteins; (2) the U.S. industry that supplies competitive products; and, (3) the competitive factors, including government policies, that impact potential U.S. production of milk proteins in their various forms.

The Commission instituted investigation No. 332-453, *Conditions of Competition for Milk Protein Products in the U.S. Market*, on June 9, 2003. Notice of the investigation and hearing was given by posting copies of the notice at the Office of the Secretary, U.S. International Trade Commission, and by publishing the notices in the *Federal Register* on

[16] For the purpose of this report, the European Union refers to Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and United Kingdom (i.e., EU-15).

June 11, 2003 (68 F.R. 35004) and November 13, 2003 (68 F.R. 64368).[17] A public hearing in connection with this investigation was held on December 11, 2003, in Washington, D.C.[18]

Scope

The primary focus of this report is on U.S. imports of MPC, casein, and caseinate, and the production and markets for these products in the United States and major foreign producing countries. As requested by the Committee, the report also includes information on other milk protein products, such as whole milk, skim milk, whole milk powder (WMP), SMP, whey, dried whey, and WPC. These products are included for the purpose of comparing the markets for these products to the markets for MPC, casein, and caseinate, and analyzing the impact of imported milk protein products on U.S. farm-level prices. The report primarily focuses on U.S. imports of milk protein products from the EU, New Zealand, and Australia.

Milk protein products are derived from the raw components of milk. These products provide protein in many food products, as well as certain functional attributes. The following sections provide more information on the products covered in this investigation, their extraction from raw milk, and their functional qualities. Major milk protein products and production processes are described in box 1-1.

Milk Components

Dairy processors are increasingly using milk as a raw material from which individual components can be extracted. Processors are refining raw milk and isolating its individual components in a manner analogous to the refinement of crude petroleum into its various individual component products.[19] The components of milk are presented in figure 1-2.

Cow's milk is made up of about 87 percent water and 13 percent milk components, or milk solids. The milk solids consist of a fat portion, accounting for 3.7 percent of the milk, and a solids-not-fat (SNF) portion, accounting for 8.9 percent of the milk. SNF consists of three broad categories: lactose, minerals, and proteins. Lactose is the sugar component of milk, while minerals (or "ash") include elements, such as calcium and potassium, and vitamins, such as A, B_1, B_2, C, and D. The two major forms of milk protein are casein and whey. Casein accounts for 80 percent of the proteins in milk, with whey proteins making up the remaining 20 percent. Highly formulated food products are being developed that incorporate very specific types of proteins with specialized chemical and functional attributes. The five specific types of casein protein are: α_{s1}-casein, α_{s2}-casein, β-casein, κ-casein, and γ-

[17] Copies of the Federal Register notices of the Commission investigation are included in appendix B.

[18] The hearing calendar and summaries of the positions of interested parties are provided in appendix C.

[19] The Northeast Dairy Foods Research Center at Cornell University and the Center for Dairy Research at the University of Wisconsin have developed the initial economic and technological research promoting the "milk refinery" approach to dairy processing.

Box 1-1
Milk protein products and production processes and technology used in the milk protein industry

Milk Protein Products

Casein: Casein is the primary protein found in milk, accounting for approximately 80 percent of the total protein content. It is also a milk protein product produced by separating the casein protein in milk from all other milk components. Casein is typically produced using one of two processes. Rennet casein is produced using enzymes which cause the casein to coagulate and congeal into a solid mass. Acid casein is produced from the application of acid which causes the casein protein to precipitate from the milk at a pH of 4.6.

Caseinate: Caseinate is a derivative of casein produced by neutralizing acid with alkali and drying the final product. The alkali treatments result in caseinates being more soluble in water than casein. The two most common neutralizing agents are sodium hydroxide (which results in sodium caseinate) and calcium hydroxide (which results in calcium caseinate).

Milk protein concentrate (MPC): A concentrated milk protein product that contains both casein and whey protein. MPC is often referred to in conjunction with its protein content. For example, MPC with a protein concentration of 42 percent is commonly referred to as MPC 42.

Nonfat dry milk (NFDM or NDM): A synonym for skim milk powder commonly used in the United States.

Skim milk powder (SMP): SMP is produced by removing water from pasteurized skim milk, resulting in a product containing proteins, lactose, and minerals. The production process consists of evaporation and drying, usually via a spray dryer, to remove all but 4-5 percent of the water content. SMP is also commonly referred to as nonfat dry milk (NFDM or NDM).

Whey: Whey is one of the two proteins found in milk and accounts for approximately 20 percent of the total protein content. Whey is typically a by-product formed after the fat and casein have been removed from the milk in cheese and casein production. There are several whey products, including dry sweet whey, dry acid whey, reduced lactose whey, reduced mineral whey, whey protein concentrate (WPC), and whey protein isolate (WPI).

Whey protein concentrate (WPC): WPC is typically produced using an ultrafiltration process. After the ultrafiltration process, the concentrated liquid whey passes through an evaporator and a spray dryer to remove all but 4-5 percent of the water. WPC is often referred to in conjunction with its protein concentration. For example, WPC with a protein concentration of 34 percent is commonly referred to as WPC 34.

Whey protein isolate (WPI): WPI denotes WPC with very high protein concentrations, 90 percent or more. The production of WPI requires additional processing steps compared with WPC. Two different processes can be used to produce WPI: ion exchange or microfiltration. The ion exchange process separates the components based on their electrical charge. The microfiltration process is analogous to the ultrafiltration process except that it utilizes ceramic filters instead of polymeric filters.

Production Processes and Other Terms

Co-precipitation: A production process in which skim milk undergoes a moderate to severe heat treatment followed by precipitation with acid or calcium salts.

Denaturation: The process that proteins undergo when subjected to certain physical or chemical treatments (e.g., heating) that cause disruption of bonds that maintain the protein's structure. Denaturation causes profound changes in functional properties.

Diafiltration: A process used in conjunction with ultrafiltration and microfiltration whereby water is added to the retentate before it passes through the ultrafiltration membrane as a means of decreasing viscosity and increasing the rate of permeate flow through the filter.

Dry blending: A process in which dried, powdered milk fractions are blended together to form a composite milk component product, such as mixing casein and WPC to produce MPC.

Evaporation: Process of drying liquid milk or milk fractions by heating the liquid (generally under a vacuum) to remove some of the water of the liquid.

Electrodialysis: A process that uses electric charge to separate substances in solution, such as removing minerals from whey or milk fractions.

Homogenization: The process of subdividing the fat globules in liquid dairy products to a smaller, more uniform size by forcing them under pressure through a membrane.

Box 1-1—*Continued*
Milk protein products and production processes and technology used in the milk protein industry

Production Processes and Other Terms—*Continued*

Ion exchange: A form of chromatography where ions held on absorbent beads are exchanged for the ions in the solution. Different milk components have different charges allowing the ion exchange to separate components with different charges.

Microfiltration: See definition of ultrafiltration. Pores in a microfiltration membrane are larger than ultrafiltration pores, which allows the passage of larger molecules into the permeate.

Pasteurization: The process of heating liquid milk or milk fractions to a given temperature for a specified period of time such that any pathogenic microorganisms present are destroyed.

Permeate: The by-product of the ultrafiltration process consisting of the milk fractions that are allowed to pass through the filter and be separated out from the retentate.

Precipitation: An acid and heat treatment process through which casein proteins are separated from other milk fractions.

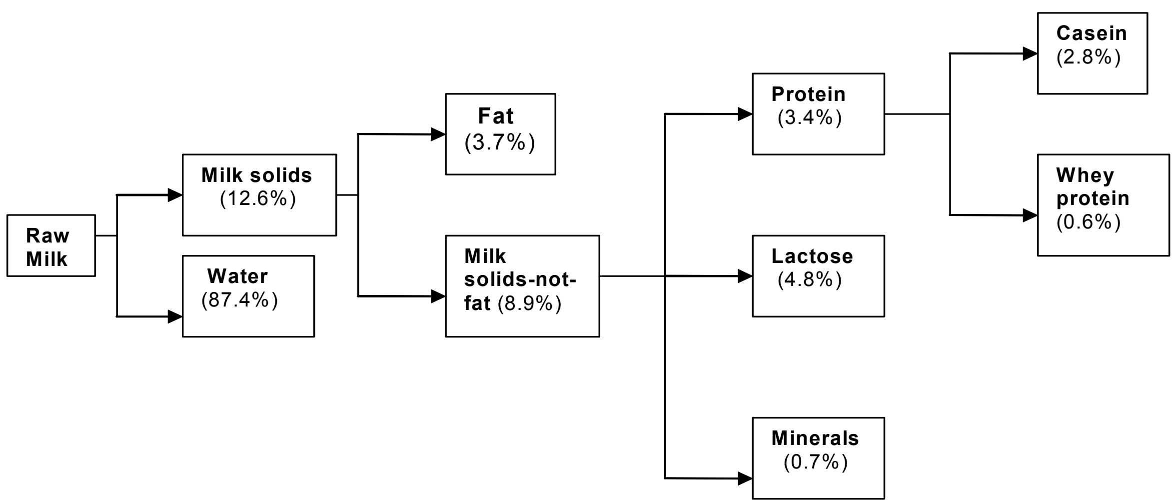
Retentate: The milk fractions captured, or retained, during the ultrafiltration process.

Roller drying (or drum drying): A process where fluid dairy products are dried by conveying them over the surface of two heated, revolving drums.

Spray drying: A process in which milk or milk fractions are atomized into a chamber where extremely hot air is used to dry the milk or milk fractions. The powder is then collected from the drying chamber.

Ultrafiltration: A process that uses a semipermeable membrane to separate milk fractions based on molecular size.

Figure 1-2
Raw milk: Composition by major constituent and share (by weight) of total

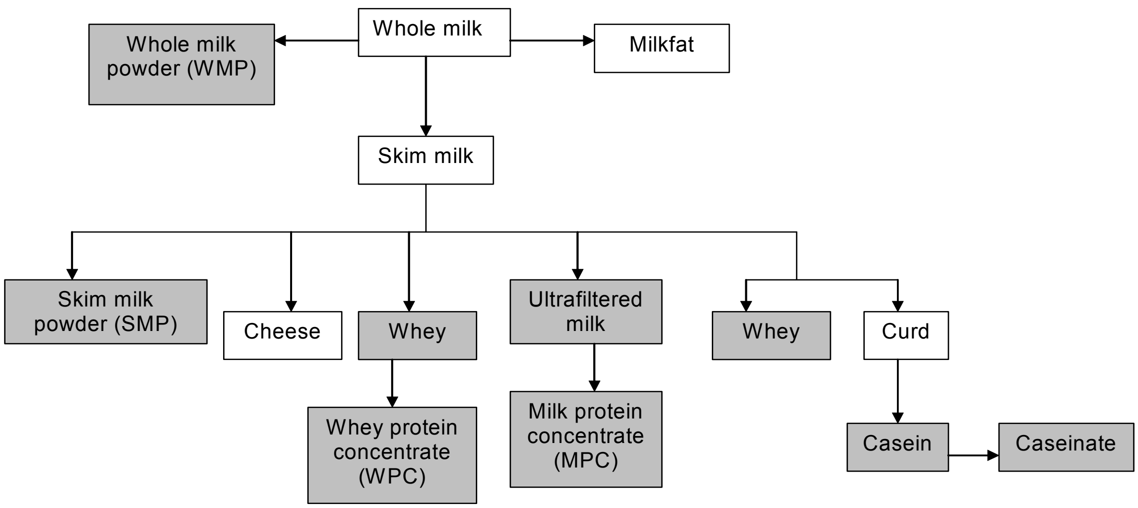


Source: Chardan Ramesh, *Dairy-Based Ingredients*, American Association of Cereal Chemists (Eagan Press Handbook, 1997).

casein.[20] Whey protein primarily consists of two types of protein, β-lactoglobulin and α-lactalbumin, but includes five other important proteins as well: serum albumin, immunoglobulins, glycomacropeptide, lactoferrin, and peptide fragments.[21] Food processors, particularly those involved in the specialty nutrition sector, may use specific casein or whey proteins for highly formulated products.[22]

The shaded boxes in figure 1-3 indicate the major milk protein products relevant to this study. Five of these products are central to the analysis requested by the Committee: SMP, MPC, casein, caseinate, and WPC. Figure 1-3 presents how each of these products are derived from raw milk; their composition in terms of water, fat, protein, lactose, and minerals is shown in table 1-1.[23]

Figure 1-3
Milk and milk derivative products



Source: Wisconsin Center for Dairy Research.

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[20] Pieter Walstra, et al., "Dairy Technology: Principles of Milk Properties and Processes," *Food Science and Technology*, vol. 90 (May 1999).

[21] Srinivasan Damodaran, et al., *Food Proteins and Their Applications* (Marcel Dekker, 1997).

[22] An example is lactoferrin, an iron-binding and transport protein found in whey. Lactoferrin has antibacterial and antioxidant attributes that provide resistance against nonspecific diseases. Recently, technology has been developed to isolate lactoferrin and it is now produced on a commercial basis (requiring 10,000 units of milk for every one unit of lactoferrin). Owing to its specific properties, the product is used in infant formulas, sports foods, personal care products, and in veterinary medicines. Lactoferrin is also used as an antipathegen cleaning agent in the meat sector. International Dairy Federation, *World Dairy Situation 2003*, Bulletin 384/2003 (Aug. 2003).

[23] A more detailed description of these products and their functional attributes is presented in appendix D.

Table 1-1
Composition of selected milk protein products

Product	Water	Fat	Protein	Lactose	Minerals
	Percent				
Skim milk powder	3.5	0.8	35.9	52.3	8.0
Milk protein concentrate-42	3.5	1.0	40.5	46.0	7.9
Milk protein concentrate-80	3.8	2.5	77.2	5.5	8.5
Acid casein	9.0	1.0	90.0	0.1	2.2
Rennet casein	11.0	1.0	85.0	0.1	4.0
Calcium caseinate	3.5	1.0	90.9	0.1	4.5
Sodium caseinate	3.5	1.0	91.4	0.1	4.0
Whey protein concentrate-34	4.0	3.0	32.6	51.0	6.0
Whey protein concentrate-50	4.0	4.0	48.0	35.0	7.0
Whey protein concentrate-80	4.0	5.0	76.8	4.0	4.0
Whey protein isolate-91	3.5	0.5	93.0	1.0	2.0

Notes.—Compositions are approximate and may vary.

Sources: Chardan Ramesh, *Dairy-Based Ingredients*, American Association of Cereal Chemists (Eagan Press Handbook, 1997); Brian W. Gould and Hector J. Villarreal, "A Descriptive Analysis of Recent Trends in the International Market for Dry Milk Products," Babcock Institute Discussion Paper No. 2002-2 (University of Wisconsin, 2002).

Skim Milk Powder

SMP is produced by removing water from pasteurized skim milk. The production process consists of evaporation and drying, usually via a spray dryer, to remove all but 4 to 5 percent of the water content. SMP has a protein content of approximately 36 percent. SMP is often referred to as nonfat dry milk (NDM or NFDM). SMP is produced extensively in the United States. SMP is classified under subheadings 0402.10.05, 0402.10.10, and 0402.10.20 of the HTS. Relatively little SMP is imported into the United States because imports are subject to a TRQ that allows up to 5,261 mt to enter at a rate of 3.3 cents per kilogram (about 2 percent AVE), whereas imports over that amount are subject to tariff of 86.5 cents per kilogram (about 50 percent AVE).

Milk Protein Concentrate

MPC is a concentrated milk protein product that contains both of the major forms of protein found in milk: casein and whey. The protein content of MPC can vary considerably, from 42 percent to over 90 percent. MPC is often referred to by its protein concentration. For example, MPC with a protein concentration of 42 percent is commonly referred to as MPC 42.

MPC is produced using one of three different production processes: ultrafiltration, blending, or co-precipitation. The ultrafiltration process uses a semipermeable membrane to separate milk components based on molecule size. The production of MPC with a protein concentration of 60 percent or higher generally requires an additional filtration step, diafiltration. Diafiltration is an extension of the ultrafiltration process whereby water is added to the milk during the filtration process as a means of increasing the rate of flow through the filter. The blending process involves mixing, either in a dry or liquid form, different milk protein products to obtain MPC with a specific protein, lactose, and other milk component profile. SMP and casein can be blended to produce a low-protein MPC, while

WPC and casein can be blended to produce a high-protein MPC. In the co-precipitation production process, skim milk undergoes a heat and acid treatment that concentrates the amount of protein in the product. The co-precipitation process results in MPC with a high-protein concentration. Milk protein isolate (MPI) is a term sometimes used to differentiate MPC with a protein concentration of 90 percent or more from other forms of MPC.

MPC is classified under HTS subheadings 0404.90.10 and 3501.10.10. MPC is defined by U.S. Bureau of Customs and Border Protection (Customs) as "any complete milk protein (casein plus lactalbumin) concentrate that is 40 percent or more protein by weight." Imports of MPC are subject to a minimal duty of $3.70 per mt (about 0.1 percent AVE). The MPC market in the United States is served primarily from imports. However, in 2003 commercial production of MPC began in the United States. Limited commercial production of liquid MPC has been undertaken in the United States since the late-1990s. Liquid MPC is commonly referred to as ultrafiltered (UF) milk. In this report, UF milk will refer to a liquid product, while MPC will refer to a dry, powder product.

Casein

Casein is a form of concentrated casein protein (one of the two major proteins found in milk) and is derived from skim milk. Depending on the method of manufacture, casein is classified as rennet casein or acid casein. In the production of rennet casein, skim milk is treated with an enzyme that causes the casein to coagulate and separate from other milk components. Acid casein is produced when skim milk is exposed to an acid treatment which causes the protein to precipitate out from other milk components. Both rennet and acid casein are high-protein products with protein concentrations from 85 to 90 percent. Both rennet and acid casein also contain very little whey protein and therefore cannot be classified as MPC.

All forms of casein are classified under HTS subheading 3501.10.50.[24] Imports of casein enter the United States free of duty. The U.S. market for casein is served almost exclusively by imports. Casein production recently began in the United States, although is not yet commercially significant. Unlike imported casein, which is produced from fresh, liquid skim milk, U.S. production of casein uses reconstituted SMP as the starting ingredient.

Caseinate

Caseinate is a further derivative of acid casein produced by neutralizing acid with an alkali. Common forms of caseinate are calcium caseinate and sodium caseinate. All forms of caseinate are very high-protein products with protein concentrations of approximately 90 percent. All forms of caseinate are classified under HTS subheading 3501.90.60, and imports are subject to a minimal duty of $3.70 per mt (about 0.1 percent AVE). The U.S. market for caseinate is served primarily by imports. Several U.S. firms produce caseinate from imported dry casein. The flavor and functionality of this product can differ from imported caseinate produced from fresh, liquid casein.

[24] Casein glues, classified under HTS subheading 3501.90.20, are not covered by this report.

Whey Protein Concentrate

WPC is produced by applying the ultrafiltration process to whey. The whey is produced as a by-product of cheese or casein manufacturing. WPC is defined as any whey protein concentrate with a protein concentration of 25 percent or more. In a manner analogous to MPC, WPC is referred to by its protein concentration. For example, WPC 34 has a protein concentration of 34 percent. The production of WPC with a protein concentration of 60 percent or more requires diafiltration as well as ultrafiltration. Whey protein isolate (WPI) is WPC with a protein concentration of 90 percent or more. The production of WPI requires additional processing beyond the ultrafiltration and diafiltration processes. WPI can be produced using either microfiltration or an ion exchange process.

WPC is classified under HTS subheading 0404.10.05 and WPI is classified under subheading 3502.20.00. Imports of WPC are subject to a tariff of 8.5 percent, while imports of WPI are free of duty. The United States is a significant producer and exporter of both WPC and WPI. The U.S. market is served primarily by U.S. producers, however, the United States also imports significant volumes of WPC and WPI.

Other Forms of Milk Protein

Other types of liquid milk protein products include whole milk, skim milk, and fluid whey. These products are produced extensively in the United States, but are not imported in meaningful quantities because of their highly perishable nature. Other forms of dry milk protein products include WMP and dry whey. The United States does not import significant quantities of these products and the U.S. market is served primarily by domestic production.

Functional Attributes of Milk Protein Products

Milk protein products do more than just increase the protein content of the foods in which they are present. In many processed foods, milk proteins are used because they also deliver "functionality." Functionality refers to "any property of a substance, besides its nutritional ones, that affects its utilization."[25] Many of the functional properties of milk products are derived from the protein content of the product, in combination with the protein's interaction with other milk components such as fat, lactose, and salts. Several milk protein products have similar functional properties and applications when used in food processing. Some of the more commonly referenced functional characteristics include solubility, viscosity, water-binding, emulsifying, whipping and foaming, heat stability, and gelation/coagulation.[26] Additionally, individual functional characteristics are strongly interrelated (for example, a protein's solubility affects foaming, gelation, and emulsifying characteristics) and processes undertaken to enhance one particular characteristic can impact other functional characteristics. A milk protein product's functional attributes can vary based on the amount and type of protein in the product and the manufacturing process. The degree to which a milk protein product possesses certain functional characteristics may determine how it is used in a finished product. For example, WPC and caseinate are more soluble than casein, therefore,

[25] A. Pour-El, *World Soybean Research* (Interstate Publishing, 1976).

[26] A more detailed description of the functional attributes of milk proteins is presented in appendix D.

for many applications which require a soluble protein (such as diet or energy drinks), WPC and caseinate are used instead of casein.

Approach

Data and information for this report were obtained from existing sources, fieldwork in the United States and foreign countries, and through questionnaires. Much of the information requested by the Committee was available from existing, wide-ranging, sources. Industry profiles for the United States and major exporting countries were developed from published sources, as well as through extensive interviews by Commission staff of industry representatives, government officials, and academics in the United States, Ireland, Belgium, Australia, and New Zealand. Information on the technical and economic substitutability of various milk proteins was also obtained from published reports, as well as through interviews with dairy scientists at research centers in the United States.

A qualitative analysis on the impact of milk protein imports on farm-level prices was undertaken following a detailed review of market relationships and pricing mechanisms for milk under the Federal Milk Marketing Orders (FMMO). The analysis was based on how changes in U.S. Government price support levels for SMP impact farm-level prices, using Commission analysis and results from questionnaires. Additionally, the Commission reviewed the results of dairy industry modeling analysis published by leading academic experts. The results of these models regarding the quantitative affect of milk protein imports on farm-level prices are reported.

Questionnaire data covering U.S. imports and purchases were used to provide an estimate of the protein content of U.S. imports of milk protein products, as well as identification of the uses and manufacturing processes of imported milk proteins. Using the questionnaire results, an evaluation was made of the substitutability of imported and domestically produced milk proteins.

Questionnaire Process

Certain information requested by the Committee for this investigation was not available from existing published sources. This information included the protein content of imported milk proteins, utilization of milk proteins, technical and economic substitutability among milk proteins in their various forms, recent advances in processing and production technology, and the potential impact of these factors on demand for the various products. To collect these data, the Commission conducted an industry-wide survey of the U.S. market for milk protein products, covering importers, purchasers, and foreign producers.[27] Questionnaires were sent to the vast majority of market participants for SMP, MPC, casein, caseinate, and WPC.

[27] Industry questionnaires were developed by the Commission in close collaboration with industry representatives, including the National Milk Producers Federation and International Dairy Foods Association. Questionnaires were fully field tested and issued following the approval of the Office of Management and Budget.

The Commission sent nearly 600 questionnaires: 122 to firms that imported MPC, casein, and caseinate between 1998 and 2002; 450 to firms likely to have purchased MPC, casein, caseinate, SMP, and WPC; and 18 to foreign manufacturers that export MPC, casein, caseinate, and WPC to the United States. The Commission received responses from 68 importers, of which 47 provided usable data. These responses accounted for the vast majority of U.S. imports of MPC, casein, and caseinate during the 1998-2002 period. For example, data reported for 2002 accounted for 99.5 percent of all U.S. imports of MPC. Purchasers' questionnaires were issued to firms that produce cheese, ice cream, yogurt, and other dairy products, as well as manufacturers of bakery, meat, confectionary, snack food, soups, sauces, animal feed, and specialty nutrition products. The Commission received 280 responses to purchasers' questionnaires, of which 135 provided usable data. The Commission received responses with usable data from all 18 foreign producers.

Organization of the Report

The organization of the report follows closely the format of the request letter. Chapter 2 provides an overview of the global market for milk protein products. It discusses recent trends in world production, consumption, trade, and prices for the major milk protein products, identifying the major country participants in the global market. Chapter 3 presents a profile on the U.S. industry for milk protein products, tracing domestically produced and imported proteins through the processing, marketing, and distribution channels to final consumption. Chapter 4 includes industry profiles for the major exporting countries—the EU, New Zealand, and Australia. Chapter 5 summarizes the conditions of competition for milk protein products, focusing on how product availability and price are affected by production costs and government intervention in the United States and major exporting countries. Chapter 6 presents data obtained from the Commission importers' questionnaires, including the protein content of imports of MPC and the production processes used for imports of MPC, casein, and caseinate. Chapter 7 presents data from the Commission purchasers' questionnaires on the uses and substitutability of different milk proteins. Chapter 7 also presents the Commission's analysis of the degree to which imported and domestically produced milk protein may substitute for one another. Chapter 8 discusses tariff treatment for milk protein products in the United States, and includes a brief history of tariff classification for these products, as well as a discussion of the current tariff structure. Recent Customs classification rulings concerning imported milk proteins are also covered. Chapter 9 presents a qualitative assessment of the impact of imported milk proteins on U.S. milk prices. It also summarizes some of the results of recent quantitative studies on the impact of milk protein imports on farm-level prices.

CHAPTER 2
OVERVIEW OF THE GLOBAL MARKET FOR MILK PROTEIN PRODUCTS

Introduction

This chapter provides an overview of the global market for milk proteins in their various forms, including such factors as consumption, production, and trade during the period 1998-2002. The focus of this chapter is on markets for standardized, commodity-type products, such as skim milk powder (SMP), whole milk powder (WMP), dry whey, and casein, although information is also presented on the international trade of more specialized milk protein products, such as milk protein concentrate (MPC), caseinate, and whey protein concentrate (WPC). The chapter also highlights the importance of the European Union (EU), New Zealand, and Australia as major milk protein product exporting countries in the global market (discussed in detail in chapter 4).

On a milk-equivalent basis, global trade in all dairy products accounted for 5-7 percent of global milk production in 2002.[1] Raw milk and other fresh dairy products are highly perishable and expensive to transport, consequently the vast majority of the world's dairy production is consumed domestically.[2] Once domestic demand for fluid and fresh dairy products has been satisfied, countries typically turn surplus milk into processed dairy products, such as cheese, butter, SMP, and WMP. These products can be stored and transported at relatively low cost compared to their value. As a result, global trade as a share of world production is much greater for processed dairy products than for raw milk. The Food and Agriculture Organization (FAO) estimated that in 2002, world exports of SMP and WMP accounted for 35 percent and 64 percent, respectively, of world production of these products.[3]

Traditionally, the most widely traded milk protein products have been in the form of standardized, commodity-type products, such as SMP, WMP, dry whey, and casein. More recently, the world market has changed with the development of modern filtration and blending technologies that have drastically reduced the costs and increased production of a range of more specialized dairy products.[4] These products are individual milk components

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[1] Organization for Economic Co-operation and Development (OECD), *Agricultural Outlook: 2003/2008* (Paris: July 2003).

[2] International Dairy Federation, *2002 World Dairy Situation*, Bulletin 378/2002 (Aug. 2002). The Dairy Companies Association of New Zealand (DCANZ) noted that trade is also limited owing to severe restrictions on trade by many developed countries. DCANZ prehearing submission, Dec. 1, 2003, p. 15.

[3] Food and Agriculture Organization (FAO) of the United Nations, FAOSTAT database, Jan. 2004 update.

[4] Brian W. Gould and Hector J. Villarreal, "A descriptive analysis of recent trends in the international market for dry milk products," Babcock Institute Discussion Paper No. 2002-2 (University of Wisconsin, 2002).

or blends of individual milk components tailored to the specific needs of customers, and include such products as MPC, WPC, whey protein isolates (WPI), and specialized casein products and caseinates. Generically referred to as "dairy-based ingredients," these products are increasingly being used by industries for processed foods, animal feed, and pharmaceutical products.[5] Global trade in these highly specialized protein products has been growing, benefitting from low levels of global tariffs and quota protection, as well as relatively high prices of competing, traditionally traded milk protein products.[6]

Discussion of global market trends for milk proteins is constrained by data availability and reliability. Data sources that cover world markets for SMP, WMP, dry whey, and casein include the FAO and the Foreign Agricultural Service (FAS) of the U.S. Department of Agriculture (USDA).[7, 8] Although global markets for dairy-based ingredients are increasing in importance, a detailed discussion is not possible owing to insufficient worldwide data. Consequently, this chapter focuses mainly on SMP, WMP, and dry whey.[9] However, the chapter concludes with some information on global trade trends in dairy ingredients, including MPC, WPC, and caseinates, from fieldwork and published data sources in the major supplying countries.

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[5] U.S. Dairy Export Council, "The global market for dairy blends," *World Dairy*, vol. 7, No. 1 (Mar. 2001); U.S. Dairy Export Council, "Global Dairy Blends. 2002 Update," report prepared by Landell Mills (Nov. 2002).

[6] OECD, "OECD Agricultural Outlook," (Apr. 15-16, 2003).

[7] For a comprehensive database of available global dairy trade statistics, see U.S. Dairy Export Council, *World Dairy Trade Trends, 2003 Edition*.

[8] The FAS compiles its data from published sources in major markets and from local market intelligence provided by USDA attaches posted in U.S. embassies throughout the world. Therefore, FAS data are generally considered accurate. However, not all countries are covered, especially many developing countries that are not significant participants in world dairy markets. FAO data, on the other hand, cover a much wider spectrum of countries than FAS, including many developing countries, but are considered less reliable than FAS data. This report uses FAO data in order to provide as broad an overview of global trends as possible, and because FAS and FAO data were found to be identical for many major markets. FAS official, interview by USITC staff, Sept. 6, 2003; Edward V. Jesse, "World trade in dairy products and the U.S. role: an illustrated primer," Babcock Institute Discussion Paper No. 2003-2 (University of Wisconsin, 2003).

[9] Recent studies for the Babcock Institute include, Edward V. Jesse, "World trade in dairy products and the U.S. role: an illustrated primer," Babcock Institute Discussion Paper No. 2003-2 (University of Wisconsin, 2003), and Brian W. Gould and Hector J. Villarreal, "A descriptive analysis of recent trends in the international market for dry milk products," Babcock Institute Discussion Paper No. 2002-2 (University of Wisconsin, 2002).

Global Production of Milk Protein Products

Raw Milk

Global milk production reached 506 million metric tons (mt) in 2002, produced from about 226 million dairy cows, with an average annual yield of 2.2 mt per cow (table 2-1). Between 1998 and 2002, world milk supply increased about 6 percent, mainly the result of technology-driven improvements in yields, since the number of dairy cows worldwide has remained stable during this time frame.

Milk production in the EU (24 percent) plus U.S. production (15 percent) accounted for about 39 percent of world production in 2002, a share that has remained stable since 1998. Milk production in the EU has changed little over the past 5 years owing to production quotas (see chapter 4),[10] while the 8 percent growth in U.S. production between 1998 and 2002 can be attributed to growth in productivity. India ranks third among leading milk producing countries with 35 million mt of milk produced in 2002, accounting for 7 percent of world supply. With close to 38 million cows, India has over 4 times as many cows as the United States. However, India's productivity is low by world standards, with annual yields about one-eighth of those in the United States.

Russia is the fourth-largest milk producing country in the world with a share of about 6-7 percent of global output. Brazil is the world's fifth-largest milk producing country; production increased there by 17 percent during 1998-2002. This is the result of a 30-percent growth in yields over the 5-year period, reflecting improved on-farm management and private investment in dairy processing.[11] Several of the world's major milk producing countries are in Central Europe and the former Soviet Union; and Ukraine and Poland together accounted for 5 percent of world milk production in 2002. In both countries, the number of cows fell between 1998 and 2002, offset by increases in productivity. Ukraine, for example, improved its cow yields by 30 percent between 1998 and 2002. China emerged as a major milk producing country with output almost doubling between 1998 and 2002.

The major dairy exporting countries of New Zealand and Australia are not significant milk-producing countries in the context of world production. For example, New Zealand produced 14 million mt in 2002, accounting for less than 3 percent of world supply, and Australia's share of world production was just 2 percent. However, these countries experienced strong production growth between 1998 and 2002—24 percent in New Zealand and 19 percent in Australia—in both cases owing to increases in both cow numbers and improvements in cow productivity.

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[10] International Dairy Federation, *Structural Change in the Dairy Sector*, Bulletin 360/2001 (Nov. 2000).

[11] USDA, FAS, "Brazil Dairy and Products Annual 2002," Gain Report No. BR2614 (Oct. 25, 2002).

Table 2-1
Cow's milk production, cow numbers, and yield per cow, by major producing countries, 1998-2002

Country	1998	1999	2000	2001	2002	Change 1998-2002
	Fresh, whole cow's milk *(1,000 metric tons)*					*–Percent–*
European Union	121,735	122,801	123,279	122,198	121,687	0
United States	71,414	73,804	76,023	74,980	77,248	8
India	31,600	32,800	34,000	34,400	35,300	12
Russia	32,955	32,001	32,000	32,600	33,100	0
Brazil	19,273	19,661	20,380	21,146	22,635	17
Ukraine	13,532	13,140	12,436	13,169	14,142	5
New Zealand	11,380	10,881	12,235	13,162	14,079	24
China	6,960	7,514	8,632	10,601	13,356	92
Poland	12,596	12,284	11,889	11,884	11,873	-6
Australia	9,732	10,494	11,183	10,872	11,620	19
Other	145681	147,707	148,700	150,552	151,428	4
Total	476,857	483,088	490,758	495,563	506,467	6
	Dairy cattle *(1,000 head)*					
European Union	21,489	21,297	20,556	20,350	20,051	-7
United States	9,158	9,156	9,210	9,115	9,141	0
India	34,200	34,700	36,000	36,600	37,600	10
Russia	13,837	13,158	12,790	12,297	11,729	-15
Brazil	17,281	17,396	17,885	18,194	15,600	-10
Ukraine	5,952	5,549	5,159	4,710	4,771	-20
New Zealand	3,467	3,358	3,337	3,557	3,749	8
China	4,729	4,814	4,936	5,021	5,143	9
Poland	3,202	3,077	2,785	2,758	2,741	-14
Australia	2,060	2,155	2,171	2,176	2,123	3
Other	108127	108,776	111,197	112,424	113,316	5
Total	223,502	223,435	226,027	227,202	225,963	1
	Productivity *(kilograms per cow)*					
European Union	5,665	5,766	5,997	6,005	6,069	7
United States	7,798	8,061	8,254	8,226	8,451	8
India	924	945	944	940	939	2
Russia	2,382	2,432	2,502	2,651	2,822	19
Brazil	1,115	1,130	1,140	1,162	1,451	30
Ukraine	2,274	2,368	2,410	2,796	2,965	30
New Zealand	3,282	3,241	3,666	3,700	3,755	14
China	1,472	1,561	1,749	2,111	2,597	77
Poland	3,933	3,992	4,269	4,309	4,332	10
Australia	4,724	4,870	5,151	4,996	5,473	16
Other	1,347	1,358	1,337	1,339	1,336	-1
Total	2,134	2,162	2,171	2,181	2,241	5

Source: Food and Agriculture Organization of the United Nations, FAOSTAT database Feb. 3, 2004 update.

Skim Milk Powder

Global production of SMP increased from 3.1 million mt in 1998 to 3.5 million mt in 2002 (table 2-2), an increase of almost 10 percent. Production is highly concentrated in a few major producing countries, and is generally considered a residual product, manufactured once the demand for skim milk for other uses has been met.[12] In 2002, the EU accounted for 31 percent of world skim milk production, while the United States accounted for 21 percent. The next three countries—New Zealand, Australia, and Russia—together accounted for another 22 percent of production. Thus, almost three-quarters of world SMP production was from just five countries in 2002; the top-ten countries accounted for more than 90 percent.

During 1998-2002, production of SMP in the EU remained fairly stable at about 1 million mt. In contrast, production in the United States and New Zealand grew by more than 35 percent over this period, while growth in Australia and Poland exceeded 20 percent. In the case of the United States, growth in SMP production resulted from increased milk supplies, combining with stagnant milk demand and government price guarantees.[13] Growth in SMP production in New Zealand and Australia reflected growth in the overall level of milk production in these countries. Production in Russia has remained stable over the past 5 years,[14] but production in Japan (the world's sixth-largest SMP producing country) has declined owing to changes in government dairy policy.[15]

Whole Milk Powder

Between 1998 and 2002, global production of WMP increased at approximately the same rate as SMP (table 2-2), reaching about 2.7 million mt in 2002. Like SMP, world production of WMP is concentrated in a few major countries. The EU produced about 26 percent of WMP supplies in 2002, while another 20 percent came from New Zealand. These countries, together with Brazil, Australia and Argentina, produced three-quarters of world supply in 2002, whereas the top-ten producing countries accounted for 88 percent. The United States produced less than 1 percent of world output in 2002.

Production trends among the top WMP producing countries have been diverse in recent years. Production in the EU declined by 13 percent during 1998-2002, as a result of strong demand and higher producer prices for cheese.[16] Similarly, production dropped in the United States, with supplies in 2002 about one-third of what they were in 1998, as greater returns were available for alternative products that benefit from government price supports.

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[12] International Dairy Federation, *2003 World Dairy Situation*, Bulletin 384/2003 (Aug. 2003).

[13] USDA, ERS, *Livestock, Dairy and Poultry, Situation and Outlook*, LDP-M-105 (Mar. 23, 2003), found at *http://www.ers.usda.gov/publications/ldp/Mar03/LDPM105F.pdf*.

[14] Much of the Russian dairy processing sector has stagnated in recent years owing to macroeconomic instability, high costs of capital, and weak consumer demand for dairy products. International Dairy Federation, *The Global Dairy Industry Today*, Bulletin 361/2001 (Nov. 2000).

[15] USDA, FAS, "Japan Dairy and Products Annual 2002," Gain Report No. JA3042 (July 2, 2003).

[16] European Dairy Association, *Major Issues Since July 2000* (Brussels, 2001).

Table 2-2
Production of skim milk powder, whole milk powder, dry whey, and casein and caseinate, by major producing countries, 1998-2002

Product/country	1998	1999	2000	2001	2002	Change 1998-2002
	1,000 metric tons					*Percent*
Skim milk powder:						
European Union	1,079	1,104	1,047	949	1,068	-1
United States	517	627	661	645	715	38
Australia	215	255	247	244	261	21
New Zealand	178	173	187	251	255	44
Russia	261	252	248	252	252	-3
Japan	202	191	194	175	183	-10
Poland	123	109	139	151	150	22
Ukraine	117	115	113	115	122	4
Canada	70	78	75	90	81	17
Czech Republic	60	60	60	60	60	0
Other	327	330	318	306	314	-4
Total	3,148	3,294	3,287	3,239	3,461	10
Whole milk powder:						
European Union	821	795	787	730	718	-13
New Zealand	396	382	449	516	540	36
Brazil	240	244	256	345	355	48
Australia	128	145	187	205	239	87
Argentina	203	224	202	185	180	-11
Mexico	91	97	102	104	105	15
Russia	76	84	75	85	95	25
Chile	71	61	59	72	69	-3
Japan	53	54	52	51	54	1
Poland	37	32	31	34	40	8
Other	308	309	310	308	316	3
Total	2,425	2,426	2,509	2,635	2,711	12
Dry whey:						
European Union	1,160	1,145	1,154	1,298	1,252	8
United States	528	534	539	474	506	-4
Australia	56	60	60	60	60	8
Canada	60	51	59	45	45	-25
Switzerland	4	10	14	18	18	357
New Zealand	22	22	23	16	16	-29
Ukraine	6	6	8	14	11	88
Czech Republic	1	3	7	11	11	900
Slovenia	-	-	5	6	6	([1])
Lithuania	3	3	7	6	6	100
Other	36	41	51	14	14	-60
Total	1,875	1,876	1,927	1,961	1,944	4
Casein and caseinate:						
New Zealand	104	87	97	110	([2])	([1])
Australia	9	8	9	8	14	56
European Union	140	154	157	171	144	3
Poland	7	5	4	7	([2])	([1])
Ukraine	19	19	([2])	([2])	([2])	([1])

[1] Not applicable.
[2] Not available.

Sources: Food and Agriculture Organization of the United Nations, FAOSTAT database Feb. 3, 2004 update; Casein and caseinate production from ZMP, *Dairy Review 2003.*

Argentina also experienced lower WMP production in 2002 compared with 1998, owing largely to the decline in that country's supply of raw milk following increasing production costs, weak domestic demand, and declining exports to Brazil.[17] In contrast, between 1998 and 2002, WMP production in New Zealand rose by 36 percent, in Brazil production grew by close to one-half, and Australian production almost doubled. Production growth in these markets reflected the increased availability of raw milk, as well as increased demand for these products in the major export markets for these countries, particularly in Southeast Asia and Latin America.[18]

Whey

Whey is a product derived from casein and cheesemaking so that the world's major whey producing countries are also countries with significant cheese and casein production.[19] Global production of dry whey reached 1.9 million mt in 2002, a small increase from the level in 1998 (table 2-2). World whey production is dominated by the EU which accounted for 64 percent of world supplies in 2002. The United States accounted for an additional 26 percent of world production in the same year. The next most important producing country, Australia, produced just 60,000 mt in 2002, representing about 3 percent of world production. Trends in whey production reflect cheese production. For instance, the 8 percent growth in whey production in the EU between 1998 and 2002 generally reflects the 6 percent growth in EU cheese production over the same time frame.[20]

Casein and Caseinate

World casein and caseinate production are dominated by New Zealand and the EU.[21] Together these countries account for over 90 percent of reported production. Based on OECD data, the EU produced about 140,000 mt of casein during 1998-2000, and New Zealand produced between 90,000 and 95,000 mt.[22] Other important casein and caseinate producing countries include Australia, Poland, Ukraine, India, and Russia.

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[17] USDA, FAS, "Argentina Dairy and Products Annual 2002," Gain Report No. AR1066 (Oct. 26, 2001).

[18] Representatives of New Zealand and Australia a dairy industries, interviews by USITC staff, Nov. 2-16, 2003.

[19] International Dairy Federation, *2003 World Dairy Situation*, Bulletin 384/2003 (Aug. 2003).

[20] USDA, FAS, *Dairy: World Markets and Trade* (July 2003), found at *http://www.fas.usda.-gov/dlp/circular/-2003/03-07Dairy/toc.htm*.

[21] Casein and caseinate production data in table 2-2 were reported by ZMP. The FAO does not report data on these products. The ZMP data, however, are not consistent with production data collected from responses to the USITC foreign producer questionnaire in terms of production volumes.

[22] OECD data from *http://www.sourceoecd.com,* reported by Brian W. Gould and Hector J. Villarreal, "A descriptive analysis of recent trends in the international market for dry milk products," Babcock Institute Discussion Paper No. 2002-2 (University of Wisconsin, 2002), p. 18.

Global Consumption of Milk Protein Products

The FAO does not report data for global consumption of milk protein products. However, consumption for individual countries can be approximated by adding domestic production and imports, and then subtracting exports. Although this approach does not account for beginning and ending stocks (there may be significant stockholding for some countries, such as stocks of SMP in the United States and Japan), it does provide broad consumption estimates for the major consuming countries and trends in consumption patterns (table 2-3).

Skim Milk Powder

With the exception of New Zealand and Australia, the world's major SMP consuming countries are also the world's major producing countries. The EU and United States account for about 47 percent of global consumption, whereas Russia and Japan combine for an additional 14 percent (table 2-3). Australia and New Zealand, major exporting countries, account for just 5 percent of world consumption. Major importing countries are also among the world's leading consumers of SMP. For instance, 4 percent of global SMP is consumed by Mexico, almost all of which is imported. Algeria, the Philippines, Thailand, and Indonesia are also major SMP importing and consuming countries.

Whole Milk Powder

Brazil is by far the world's largest user of WMP with a 20 percent share of global consumption. Brazil's consumption comprises both large domestic production and significant imports. The EU exports most of its WMP production, but still consumes significant amounts, and its consumption has been steadily increasing over time. Mexico and Algeria rank third and fourth among the world's leading WMP importers and consumers, while Russia also consumes significant amounts of domestically produced WMP (table 2-3). China, Sri Lanka, and Chile are also important consumers of WMP in the global market. The United States is not among the top-ten WMP consuming countries in the world.

Dry Whey

The EU and United States, the world's leading whey producing countries, are also the world's leading consumers of dry whey, accounting for 59 percent of the market (table 2-3), although consumption in both these markets declined during 1998-2002. Many of the remaining top-ten whey consuming countries are Asian countries, such as China, Japan, Thailand, the Philippines, and South Korea, where much of the product is imported for use as animal feed.[23]

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[23] U.S. Dairy Export Council, "The World Dairy Outlook 2001-2006," *World Dairy*, vol. 12, No. 1 (Feb. 2002).

Table 2-3
Estimated consumption of skim milk powder, whole milk powder, and dry whey, by major consuming countries, 1998-2002

Product/country	1998	1999	2000	2001	2002	Change 1998-2002
	1,000 metric tons					*Percent*
Skim milk powder:						
European Union	969	904	775	867	977	1
United States	451	516	572	552	650	44
Russia	277	354	230	257	246	-11
Japan	259	248	246	228	227	-12
Mexico	117	142	146	157	150	28
Algeria	87	71	91	97	114	31
Philippines	78	87	111	96	99	28
Ukraine	96	92	63	44	79	-18
Thailand	53	55	53	59	76	44
Indonesia	33	98	54	62	71	113
Other	962	933	974	876	782	-19
Total	3,381	3,501	3,316	3,295	3,472	3
Whole milk powder:						
Brazil	373	390	364	387	450	21
European Union	240	227	224	272	256	7
Mexico	132	121	124	147	136	3
Algeria	104	106	96	122	120	16
China	57	75	73	65	97	69
Russia	111	118	81	91	93	-16
Sri Lanka	57	58	60	62	64	11
Chile	71	55	64	69	61	-14
Malaysia	32	43	47	53	57	76
Japan	53	54	52	51	54	2
Other	975	928	999	894	823	-16
Total	2,205	2,173	2,183	2,213	2,211	0
Dry whey:						
European Union	1,046	1,011	949	1,084	785	-25
United States	407	398	340	306	328	-20
China	68	83	123	120	138	101
Mexico	57	56	55	74	52	-8
Canada	60	62	68	52	51	-16
Japan	37	41	39	44	42	13
Thailand	16	23	32	37	40	147
Philippines	20	24	29	32	36	79
South Korea	24	31	39	39	35	47
Brazil	27	26	33	29	33	22
Other	118	144	184	161	346	193
Total	1,881	1,899	1,891	1,976	1,886	0

Source: Commission estimates based on Food and Agriculture Organization of the United Nations, FAOSTAT database Jan. 2004 update.

Global Trade in Milk Protein Products

Global trade in milk protein products is dominated by a relatively few major exporting countries (figure 2-1).[24] New Zealand and Australia are leading exporters, benefitting from highly efficient domestic production and processing, as well as sophisticated international sales and marketing infrastructures.[25] The EU is also a major exporter of milk protein products, although its competitiveness is strongly influenced by the level of domestic and export assistance provided under the Common Agricultural Policy (see chapter 4).[26] Although the top-three exporters dominate world markets, other countries, including Argentina and Poland, are playing an increasing role in international markets. These emerging countries typically supply neighboring countries or operate within their own region.[27] With the exception of whey, the United States is not a major player in global exports of milk protein products.

In contrast to exports, global imports of milk protein products are dispersed among a number of countries. Many of these countries are located in tropical regions of Latin America, North Africa, the Middle East, and Asia where climatic conditions are unfavorable to efficient production of milk and dairy products. These dairy deficit countries tend to be middle- or middle-to-low-income developing countries with rapid income and population growth, and where consumer tastes and diets are being increasingly influenced by Western-style retail and fast food chains.[28] Milk protein imports tend to be primarily SMP and WMP, which are reconstituted for local consumption as beverage milk or as infant formula.[29] Also, in many low- and middle-income countries, significant amounts of imported milk protein products, particularly whey, are used in animal feed for developing livestock industries.[30] Import demand by these countries has also been spurred by increased foreign direct investment by multinational dairy companies and co-operatives, such as Nestlé and Fonterra, that process and package imported milk protein products in these markets for wholesale and retail consumption.[31]

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[24] U.S. Dairy Export Council, "The Outlook for U.S. Dairy Export Competition," *World Dairy*, vol. 12, No. 2 (July 2002).

[25] Representatives of the New Zealand and Australia dairy industries, interview by USITC staff, Nov 2-16, 2003; USDA, FAS, "New Zealand Dairy and Products Annual 2002," Gain Report No. NZ2035 (Oct. 22, 2002).

[26] Representatives of the EU dairy industry, interviews by USITC staff, Oct. 6-16, 2003.

[27] International Dairy Federation, *2002 World Dairy Situation*, Bulletin 378/2002 (Aug. 2002).

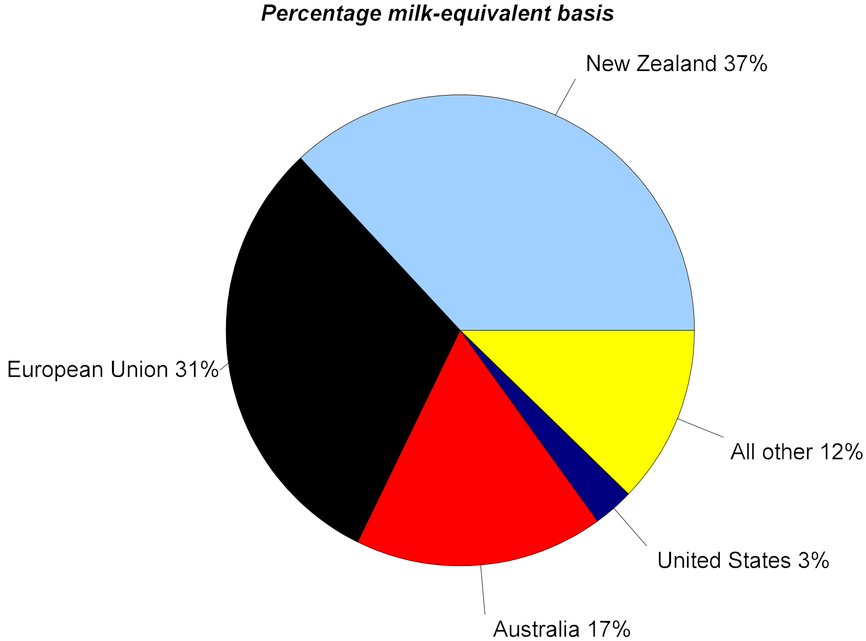
[28] OECD, *Agricultural Outlook: 2003/2008* (Paris: July 2003).

[29] USDA, ERS, "International Dairy Markets and the WTO," *Livestock, Dairy and Poultry, Situation and Outlook*, LDP-M-74 (Aug. 29, 2000), found at *http://jan.mannlib.cornell.edu/-reports/erssor/livestock/ldp-mbb/2000/ldp-m74.pdf*; Dairy Australia, prehearing submission, Dec. 1, 2003, p. 63.

[30] U.S. Dairy Export Council, "The World Dairy Outlook 2001-2006," *World Dairy*, vol. 12, No.1 (Feb. 2002).

[31] International Dairy Federation, *Structural Change in the Dairy Sector*, Bulletin 360/2001 (Nov. 2000).

Figure 2-1
Share of global dairy exports by major countries, 2002



Source: Dairy Australia, prehearing submission, Dec. 1, 2003, p. 59, based on data from the Food and Agriculture Organization.

Although trade in various dairy ingredients has been increasing, most trade continues to be in standardized, commodity-type products. As a result, importers tend to purchase product from countries offering the lowest price, so long as the quality of the product is assured. Consequently, international trade tends to be regional rather than global. Australia and New Zealand are the major suppliers to the Asian market, Argentina mainly serves the South American market, whereas Central and Eastern European countries largely supply the EU and Middle East.

Finally, global trade in milk protein products is increasingly influenced by multilateral and regional trade agreements. The World Trade Organization (WTO) Agreement on Agriculture, in particular, has lowered export subsidies and increased market access for dairy products by reducing tariffs and increasing quota volumes. Lower WTO export subsidy limits have been a major factor in the decline of the EU's share of global exports and provided export opportunities to countries with little or no government intervention.[32] Although tariffs on dairy products remain relatively high in many countries (e.g., Japan and several African countries), the WTO Agreement on Agriculture has led to greater market access in many dairy importing countries. Regional trade agreements are also important. For instance, in 2000, agreements lowered EU tariffs on dairy products imported from Central and Eastern European countries that had applied for EU membership.[33, 34] The North American Free Trade Agreement (NAFTA) has also provided market access opportunities for certain U.S. dairy exports to Mexico.[35]

Skim Milk Powder

SMP is the third-most-widely traded dairy product worldwide in terms of both volume and value (behind cheese and WMP). World exports reached about 1.2 million mt in 2002, an increase of 27 percent since 1998 (table 2-4). Export suppliers are concentrated among a few major countries, and about 86 percent of all exports in 2002 were supplied by the top-ten countries. New Zealand and Australia, which export without benefit of subsidies, combine for about 46 percent of world exports, with both counties increasing their exports significantly since 1998. The EU is the world's third-leading exporter of SMP, with a 13-percent share of the world market in 2002. EU export trends are driven by export subsidies,[36] which were reduced prior to 2001 under the WTO.[37] The United States is the world's fifth-leading exporter of SMP. U.S. exports declined in the late-1990s as a result of limits on export subsidies allowable under WTO commitments, as well as factors in the domestic market for SMP.[38] Other major SMP exporting countries include Poland, Canada, Ukraine, the Czech Republic, Belarus, and Argentina. Many of these countries, particularly Ukraine and Belarus, have experienced rapid growth in exports over the past 5 years.

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[32] U.S. Dairy Export Council, "The Outlook for U.S. Dairy Export Competition," *World Dairy*, vol. 12, No. 2 (July 2002).

[33] USDA, FAS, "European Union Dairy and Products Annual 2001," Gain Report No. E21042 (Mar. 30, 2001).

[34] Upon accession to the EU on May 1, 2004, all trade between new members and previous EU-15 members became duty free.

[35] U.S. Dairy Export Council, "Love Thy Neighbor," *World Dairy*, vol. 12, No. 4 (Oct. 2002); William D. Dobson and Richard Proctor, "How Mexico's Dairy Industry has Evolved Under the NAFTA—Implications for U.S. Dairy Exporters and U.S. Investors in Mexico's Dairy-Food Business," Babcock Institute Discussion Paper No. 2002-1 (University of Wisconsin, 2002).

[36] Roughly 80 percent of global allowable export subsidies under the WTO are allocated to the EU.

[37] International Dairy Federation, *2002 World Dairy Situation*, Bulletin 378/2002 (Aug. 2002).

[38] USDA, ERS, "International Dairy Markets and the WTO," *Livestock, Dairy and Poultry, Situation and Outlook*, LDP-M-74 (Aug. 29, 2000), found at *http://jan.mannlib.cornell.edu/-reports/erssor/livestock/ldp-mbb/-2000/ldp-m74.pdf*.

Table 2-4
Skim milk powder: Exports and imports by major countries, 1998-2002

Exporter/importer	1998	1999	2000	2001	2002	Change 1998-2002
	1,000 metric tons					*Percent*
Exporter:						
New Zealand	166	179	166	218	316	90
Australia	210	225	219	181	241	15
European Union	175	272	357	141	160	-9
Poland	101	83	86	108	94	-7
United States	73	121	101	96	74	2
Canada	34	41	29	46	49	42
Ukraine	21	23	49	71	43	103
Czech Republic	27	32	29	36	30	8
Belarus	7	11	21	28	27	269
Argentina	12	28	22	20	21	82
Other	134	135	220	152	165	23
Total	960	1,150	1,299	1,096	1,220	27
Importer:						
Mexico	103	125	129	140	132	29
Algeria	87	71	91	97	114	31
Philippines	78	87	111	96	100	28
Thailand	53	56	53	59	76	44
Indonesia	33	98	83	74	72	118
European Union	65	73	84	58	69	5
China	45	51	57	52	66	47
Malaysia	60	72	75	50	55	-7
Singapore	29	40	39	46	55	87
Japan	57	56	52	53	44	-22
Other	584	627	553	427	447	-24
Total	1,193	1,357	1,328	1,152	1,230	3

Source: Food and Agriculture Organization of the United Nations, FAOSTAT database Jan. 2004 update.

In contrast to exports, global imports of SMP are shared over a large number of countries, with the top-ten importers accounting for only 64 percent of all trade in 2002. Much of the world's major SMP markets are developing countries with low tariffs.[39] Mexico, with an applied tariff of zero, ranked as the world's largest importer in 2002, with imports of 132,000 mt, up from 103,000 mt in 1998. Much of Mexico's imported SMP is rehydrated and distributed to low income households under Mexican Government social welfare programs.[40] Algeria was the world's second-leading importing country in 2002, supplied primarily by subsidized product from the EU, as well as by unsubsidized product from New Zealand.[41] The remaining top-ten SMP importing countries were in Asia, including the Philippines (with an applied tariff of 3 percent),[42] Thailand, and Indonesia. Asian markets for SMP generally increased during 1998-2002, particularly in Indonesia (118 percent increase), Singapore (87 percent), Thailand (44 percent), and China (47 percent). Although a major exporter, the EU is also the world's sixth-leading importer of SMP. This is because some EU

[39] DCANZ, prehearing submission, Dec. 1, 2003, p. 21.
[40] USDA, FAS, "Mexico Dairy and Products Annual 2002," Gain Report No. MX2146 (Oct. 16, 2002).
[41] USDA, FAS, "Algeria Dairy and Products Annual 2002," Gain Report No. AG2006 (Nov. 25, 2002).
[42] DCANZ, prehearing submission, Dec. 1, 2003, p. 21.

countries re-export SMP, some product is transhipped through the EU,[43] and the EU has minimum-access import requirements under the WTO Agreement on Agriculture.

Whole Milk Powder

Global exports of WMP are dominated by New Zealand, the EU, and Australia (table 2-5). In 2002, about 1.7 million mt of WMP were exported globally, of which New Zealand supplied 529,000 mt, the EU 481,000 mt, and Australia 245,000 mt. Thus, the top-three exporters supplied 72 percent of the world market that year. Other important exporting countries included Argentina and the United States. Between 1998 and 2002, WMP exports increased by about 23 percent, largely the result of increased exports by New Zealand (48 percent) and Australia (67 percent), although exports from the EU and United States declined by about 18 percent during this time period. Singapore and Oman do not have significant dairy operations, yet appear among the top-ten exporting countries. These exports reflect imported powders that were re-exported to neighboring countries.[44]

As with SMP, world WMP imports are spread among a large number of countries, mostly developing countries. The top-ten importing countries accounted for about one-half of total world imports in 2002. During 1998-2002, annual global imports remained fairly stable at between 1.1-1.2 million mt, although there have been significant changes in import levels over time among individual countries. Algeria ranked as the world's largest importing country of WMP in 2002, with imports of 120,000 mt, representing a global share of about 10 percent. Until 2000, Brazil had been by far the world's largest WMP importing country. However, Brazilian imports dropped by more than 100,000 mt between 1999 and 2001, owing to rapid growth in domestic production and government restrictions on imports.[45] Brazil imports recovered in 2002 to reach 96,000 mt. Brazil was followed by China (76,000 mt), Malaysia (64,000 mt), Saudi Arabia (52,000 mt), and Sri Lanka (50,000 mt). With the exception of Brazil, imports by all top-five countries grew significantly during 1998-2002, generally reflecting strong population and per-capita income growth in these countries.[46]

Dry Whey

World exports of dry whey rose significantly between 1998-2002, increasing by about 70 percent from 361,000 mt to 615,000 mt over this period (table 2-6). Global exports are dominated by the EU and United States, which together accounted for approximately 64 percent of world exports in 2002, a share that has fluctuated over time. Australia ranked

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[43] Brian W. Gould and Hector J. Villarreal, "A descriptive analysis of recent trends in the international market for dry milk products," Babcock Institute Discussion Paper No. 2002-2 (University of Wisconsin, 2002).

[44] Industry representative of European dairy industry, interview by USITC staff, Brussels, Oct. 15, 2003.

[45] USDA, FAS, "Brazil Dairy and Products Annual 2002," Gain Report No. BR2614 (Oct. 25, 2002).

[46] International Dairy Federation, *The Global Dairy Industry Today*, Bulletin 361/2001 (Nov. 2000).

Table 2-5
Whole milk powder: Exports and imports by major countries, 1998-2002

Exporter/importer	1998	1999	2000	2001	2002	Change 1998-2002
	1,000 metric tons					*Percent*
Exporter:						
New Zealand	358	390	426	502	529	48
European Union	589	577	574	478	481	-18
Australia	147	172	204	190	245	67
Argentina	99	141	98	85	136	38
United States	51	18	29	52	42	-19
Singapore	3	5	5	6	37	972
Oman	1	23	13	29	29	1,961
Uruguay	14	17	14	17	29	107
Philippines	0	0	7	15	21	([1])
Indonesia	2	2	2	17	17	661
Other	143	158	157	179	165	15
Total	1,409	1,502	1,529	1,570	1,732	23
Importer:						
Algeria	104	106	96	122	120	16
Brazil	134	146	109	43	96	-28
China	20	41	51	41	76	276
Malaysia	45	54	58	61	64	43
Saudi Arabia	34	70	43	45	52	53
Sri Lanka	49	48	49	46	50	3
Nigeria	59	59	37	37	49	-18
Mexico	47	35	34	55	43	-9
Oman	10	11	9	32	41	294
Venezuela	84	52	65	55	40	-52
Other	603	627	652	612	602	0
Total	1,189	1,250	1,203	1,148	1,232	4

[1] Not applicable.

Source: Food and Agriculture Organization of the United Nations, FAOSTAT database Jan. 2004 update.

Table 2-6
Dry whey: Exports and imports by major countries, 1998-2002

Exporter/importer	1998	1999	2000	2001	2002	Change 1998-2002
	1,000 metric tons					–Percent–
Exporter:						
European Union	116	139	20	223	214	84
United States	121	136	199	169	178	48
Australia	40	43	39	38	66	66
Switzerland	10	11	16	19	37	253
Poland	13	16	15	-	31	136
Czech Republic	2	4	7	11	19	1,066
Canada	24	22	30	24	18	-22
Slovenia	-	-	3	7	8	([1])
Lithuania	3	2	6	7	6	133
Slovakia	4	4	6	5	6	52
Other	29	29	28	34	33	9
Total	361	406	568	537	615	70
Importer:						
China	69	83	123	120	138	100
Mexico	57	56	55	74	52	-8
Japan	37	41	40	44	42	13
Thailand	16	23	32	37	40	148
Philippines	20	24	29	32	36	79
South Korea	24	31	39	39	35	47
Brazil	27	26	33	29	33	23
Canada	24	33	39	31	21	-14
Indonesia	8	25	17	20	20	164
Malaysia	12	14	18	16	15	25
Other	72	73	109	111	124	71
Total	367	429	532	552	557	52

[1] Not applicable.

Source: Food and Agriculture Organization of the United Nations, FAOSTAT database Jan. 2004 update.

third among leading dry-whey exporting countries in 2002 with 66,000 mt, or 11 percent of the world exports. Unlike other milk protein products, New Zealand is not a major exporter of dry whey, supplying less than 2 percent of the world exports in 2002.

World imports of dry whey are dispersed among several countries, most of which are developing countries. China ranked as the world's leading importing country of dry whey, importing 138,000 mt in 2002, accounting for 25 percent of global imports. Between 1998 and 2002, China's imports doubled and China was responsible for much of the growth in world imports over the period. Significant volumes of imported dry whey are used for pork and poultry feed in China's rapidly developing livestock industry.[47] Other importing countries were centered in either Asia (Japan, Thailand, the Philippines, South Korea, Indonesia, and Malaysia) or the Americas (Mexico, Brazil, and Canada).[48]

[47] U.S. Dairy Export Council, "U.S. Export Outlook for China, Taiwan and S.E. Asia," *World Dairy*, vol. 12, No.3 (Nov. 2002).

[48] U.S. Dairy Export Council, "The World Dairy Outlook 2001-2006," *World Dairy*, vol. 12, No.1 (Feb. 2002); and, "U.S. Export Outlook for China, Taiwan and S.E. Asia," *World Dairy*, vol. 12, No. 3 (Nov. 2002).

Casein

World trade in casein remained fairly stable during 1998-2001 at about 300,000 mt annually (table 2-7). Global exports are highly concentrated among the top-five countries that account for over 85 percent of the market. New Zealand was by far the world's leading exporting country with a 40 percent share of world exports. The EU, Ukraine, Poland, and Russia are among other leading exporting countries of casein. Importing countries are fairly concentrated, with the top five accounting for more than three-quarters of global imports. The United States was the world's leading casein importing country (see chapter 3 for more detail), with a world import share of about 40 percent. The EU was also a significant importer of casein, sourced mainly from Central and Eastern Europe. Poland, Mexico, and Japan make up the remainder of the top-five world casein importing countries.

Table 2-7
Casein: Exports and imports by major countries, 1998-2001[1]

Exporter/importer	1998	1999	2000	2001	Change 1998-2001
	1,000 metric tons				–Percent–
Exporter:					
New Zealand	104	100	111	117	13
European Union	85	62	70	66	-22
Ukraine	18	17	27	36	100
Poland	8	9	11	18	125
Russia	42	19	24	16	-62
Australia	11	17	14	9	-18
Belarus	5	3	6	7	40
United States	10	8	8	7	-30
Latvia	3	3	2	3	0
Lithuania	5	3	2	2	-60
Other	21	20	21	10	-52
Total	312	262	295	292	-6
Importer:					
United States	111	108	120	107	-4
European Union	57	46	51	51	-11
Poland	9	11	13	20	122
Mexico	13	15	18	18	38
Japan	17	19	19	17	0
Canada	10	8	12	13	30
South Korea	4	5	5	5	25
Hungry	2	2	3	4	100
China	2	2	2	4	100
Lativa	2	2	2	3	50
Other	39	35	36	36	-8
Total	268	254	282	278	4

[1] Data for 2002 are not available.

Source: U.S. Dairy Export Council, *World Dairy Trade Trends, 2003 Edition*.

Milk Protein Concentrate, Caseinate, and Whey Protein Concentrate

Global trade in MPC, caseinate, and WPC differs from the standardized, commodity-type milk protein products discussed previously in that these products are typically tailored for specific end uses by customers, and manufactured to deliver highly specific functional and nutritional attributes.[49] These products have wide-ranging applications, such as in infant formula, processed cheese, imitation cheese, and specialty sports and medical nutrition products. Data on these products are generally not available. However, information on global trade in these products was compiled from miscellaneous published sources, submissions to the U.S. International Trade Commission (Commission) in connection with this investigation, and staff fieldwork.

Milk protein concentrate

Most of the world's MPC is produced in New Zealand and the EU. In 2002, New Zealand produced 48,000 mt of MPC, more than double the production level in 1998. MPC from the EU is produced through blending other protein sources, such as caseinate, dried whey, and SMP. Data for EU MPC production do not exist. However, based on Commission fieldwork and questionnaires, it is estimated that annual production during 1998-2002 averaged 30,000 mt, with production varying considerably from one year to the next.[50] The major EU members producing MPC are Ireland, the Netherlands, Denmark, and Germany. Australia is not a major MPC producing country with annual output at about 2,000-5,000 mt during 1998-2002.[51] Small volumes of MPC are also produced in Eastern Europe, Canada, and India. Combining production for all countries, the Commission estimates global production at not more than 100,000 mt. Thus, when compared with other forms of milk protein, MPC production accounts for a very small share of world milk protein output (see table 2-2).

World exports of MPC are dominated by New Zealand, Australia, and the EU. In 2002, New Zealand exported 45,000 mt (compared with 21,000 mt in 1998),[52] whereas Australia exported almost all of its production (2,000-5,000 mt).[53] EU exports were highly volatile during 1998-2002, mostly driven by EU support programs for casein and SMP, although more recently some EU manufacturers are exporting customized MPC driven by market demand.[54] The United States is the world's largest market for MPC, where it is consumed in a wide range of dairy and nondairy applications. Other major markets for MPC include

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[49] Specialized products quickly become commodity-type products. For example, WPC 34 which once was considered a specialized product today is considered more like a standardized commodity. Industry officials have stated that typically new products become commodity-type products as quickly as 3 years from being first introduced. The reason why many manufacturers invest in research and development is to keep ahead of the commodity curve, so that their products continue to be specialized and thus able to command price premiums in the market place. Mr. Edward Farrell, DCANZ, testimony before the USITC, Dec. 11, 2003, transcript pp. 427-28.

[50] Commission estimate based on information compiled from the foreign producers' questionnaires.

[51] Ibid.

[52] Ibid.

[53] Ibid.

[54] Industry representatives, European dairy industry, interviews by USITC staff, Oct. 6-16, 2003.

Japan and other East Asian countries, the EU, and Mexico. Minor markets for MPC include Central America and the Caribbean Basin countries.

Caseinate

There are no official estimates for caseinate production,[55] although one estimate puts global production at 130,000 mt.[56] Like MPC, caseinate production is dominated by the EU and New Zealand. Other global suppliers include Australia, Poland, Ukraine, and China. The EU is the world's largest producer of caseinate, and the Commission estimates production at about 70,000-80,000 mt annually during 1998-2002, based on responses to the foreign producers' questionnaires. EU output is dominated by a few very large dairy manufacturers in the Netherlands, Denmark, and France.[57] In 2002, New Zealand produced about 25,000 mt of caseinate, compared with 22,000 mt in 1998.[58] Thus, caseinate production grew in New Zealand during 1998-2002, although not nearly to the extent of MPC production growth. Australia produced about 5,000 mt of caseinate in 2002.[59] The world's major caseinate producing countries are also leading exporters. Most caseinate produced in New Zealand and Australia is exported, whereas the EU exports about one-half of its production, with exports estimated at 35,000-40,000 mt annually during 1998-2002. Like MPC, major world importing countries of caseinate include the United States, Japan, and other East Asian countries.

Whey protein concentrate

Global production of WPC and WPI is dominated by the EU and United States. In 2001, world WPC production was estimated at 340,000 mt.[60] Of this amount about 240,000 mt was used for human consumption, made up of 170,000 mt of WPC with a protein content range of 35 to 65 percent (WPC 35-65), and 70,000 mt with a protein content of 65 to 90 percent (WPC 65-90).[61] The United States accounts for over one-half of the world production of WPC 35-65, with the EU supplying most of the remainder. For WPC 65-90, the United States and Oceania each account for about 40 percent of global production, and the EU accounts for the remaining 20 percent.[62] In 2002, New Zealand produced 21,000 mt of WPC with a protein content above 55 percent,[63] and Australia produced about 15,000 mt.[64] As with production, global exports of WPC are dominated by the United States, EU, and Oceania. U.S. exports of WPC (HTS Schedule B 3502.20.0000) reached 28,383 mt in 2002, valued

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[55] In some sources, data for caseinate are combined with data for casein.
[56] DCANZ, prehearing submission, Dec. 1, 2003, p. 23.
[57] Commission estimate based on information compiled from the foreign producers' questionnaires.
[58] DCANZ, prehearing submission, Dec. 1, 2003, p. 25.
[59] Commission estimate based on information compiled from the foreign producers' questionnaires.
[60] International Dairy Federation, *2003 World Dairy Situation*, Bulletin 384/2003 (Aug. 2003).
[61] Ibid.
[62] Ibid.
[63] DCANZ, prehearing submission, Dec. 1, 2003, p. 25.
[64] Commission estimate based on information compiled from the foreign producers' questionnaires.

at $80 million,[65] while EU exports amounted to about 50,000 mt.[66] In 2002, most of the WPC produced by New Zealand and Australia was exported.[67]

World Prices of Milk Protein Products

Several factors are at play in determining price trends in world markets for milk proteins. Given that much of international trade in milk proteins consists of SMP, prices of other protein products, especially lower-protein, commodity-type products, are influenced heavily by the world SMP price. However, the world SMP price is less important in determining prices of more tailored and specialized dairy products. For these products, prices reflect both the functionality as well as their protein content. The world price trends for SMP are influenced by a complex set of interrelated factors, including supply and demand conditions in major producing and consuming countries, exchange rates, and government policy.[68]

During 1998-2002, prices of milk powders were highly volatile, in the case of SMP ranging from about $1,301 per mt in 1999 to almost $2,012 per mt in 2001 (table 2-8). Price volatility largely reflected changing supply and demand conditions in the world's major importing and exporting markets,[69] and the fact that markets have become increasingly concentrated over time.[70] Between January 1998 and June 1999, the SMP price dropped about 24 percent, resulting mainly from weakness in demand for milk powders in several Asian markets in response to financial and economic instability.[71] This was followed by higher prices over the next 18 months during which the SMP price increased from $1,213 per mt in May/June 1999 to $2,213 per mt in December 2000 (an increase of more than 80 percent). This rise in price was in response to a recovery of demand in Asia, as well as

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[65] The unit value of U.S. exports of WPC was about $2,800 per mt, roughly 5 times the U.S. export price of dry whey powder, reflecting the high value added of these products.

[66] Commission estimate based on information compiled from the foreign producers' questionnaires.

[67] Ibid.

[68] According to the NMPF, EU production and exports subsidies on SMP establish the world market price for proteins. Other exporters, such as New Zealand and Australia, have to match that EU price, so that whether or not other exporting countries themselves have subsidies, they follow whatever subsidized, trade distorting mechanisms the Europeans have. (Dr. Peter Vitaliano and Mr. Jaime Castenada, NMPF, testimony before the USITC, Dec. 11, 2003, transcript pp. 61-62). DCANZ argues that the EU subsidy practices do not set prices for MPC sales from New Zealand. The focus of New Zealand is not on commodity-type products, but rather exports of specialized products that extract premiums and provide a return to research and development investments. (Mr. Edward Farrell, DCANZ, testimony before the USITC, Dec. 11, 2003, transcript pp. 408-09).

[69] This is because milk powders tend to be residual products in that their production increases during periods of milk surplus, and declines during periods of milk deficit. Company representative New Zealand Milk Products, interview by USITC staff, Oct. 24, 2003.

[70] Brian W. Gould and Hector J. Villarreal, "A descriptive analysis of recent trends in the international market for dry milk products," Babcock Institute Discussion Paper No. 2002-2 (University of Wisconsin, 2002); International Dairy Federation, *2002 World Dairy Situation*, Bulletin 378/2002 (Aug. 2002).

[71] USDA, ERS, *Livestock, Dairy and Poultry, Situation and Outlook*, LDP-M-61 (July 27, 1999), found at *http://jan.mannlib.cornell.edu/reports/erssor/livestock/ldp-mbb/1999/ldp-m61-.pdf*.

Table 2-8
Milk protein products: International prices and U.S. import unit values, by major source, 1998-2002

Product	1998	1999	2000	2001	2002
	Dollars per metric ton				
International prices:					
Skim milk powder[1]	1,453	1,301	1,880	2,012	1,312
Whole milk powder[1]	1,764	1,502	1,869	1,951	1,340
Dry whey[2]	638	503	527	526	439
U.S. import unit values:					
MPC Chapter 4[3]					
European Union	3,897	2,551	2,402	3,879	2,798
Australia	3,586	2,789	3,190	3,694	3,707
New Zealand	3,463	3,082	3,431	3,593	3,647
Total	3,427	2,724	2,902	3,550	3,409
MPC Chapter 35[4]					
European Union	3,248	2,530	3,333	5,078	3,926
Australia	4,101	1,163	4,893	4,400	3,384
New Zealand	4,261	3,946	4,246	4,779	4,400
Total	3,483	2,939	3,675	4,829	4,004
Casein[5]					
European Union	4,517	3,711	4,138	4,799	4,388
Australia	4,157	3,745	4,152	5,182	3,996
New Zealand	4,082	3,601	4,170	4,949	3,863
Total	4,199	3,620	4,079	4,787	4,001
Caseinate[6]					
European Union	4,452	4,301	4,403	5,054	4,678
Australia	3,026	3,727	4,435	0	0
New Zealand	4,321	4,034	4,643	5,397	4,384
Total	4,390	4,175	4,493	5,142	4,512

[1] Average North Europe.
[2] Europe Export prices.
[3] HTS 0404.90.10.
[4] HTS 3501.10.10.
[5] HTS 3501.10.50.
[6] HTS 3501.90.60.

Sources: International prices complied from U.S. Department of Agriculture, Agricultural Marketing Service, *Dairy Market News*, various issues; U.S. import unit values compiled from official statistics of the U.S. Department of Commerce, see appendix F.

tight supplies from the EU following low milk production and strong demand for milk by the European cheese industry.[72] Also, production in Oceania during this time frame was constrained by unfavorable weather.[73] Following the peak in January 2001, prices dropped, especially during the fourth quarter of 2001, to reach a 5-year low of $1,163 per mt in August 2002. Thereafter prices quickly rebounded to reach $1,750 per mt in January 2003. The sharp drop in prices during 2001 resulted from strong production in the EU owing to favorable spring weather, as well as weak demand in the EU for butter and milk powder.

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[72] USDA, ERS, *Livestock, Dairy and Poultry, Situation and Outlook*, LDP-M-75 (Sept. 28, 2000), found at *http://jan.mannlib.cornell.edu/reports/erssor/livestock/ldp-mbb/2000/ldp-m75.-pdf*.
[73] USDA, ERS, *Livestock, Dairy and Poultry, Situation and Outlook*, LDP-M-78 (Dec. 27, 2000), found at *http://jan.mannlib.cornell.edu/reports/erssor/livestock/ldp-mbb/2000/ldp-m78.-pdf*.

Production also increased in Oceania, while demand fell in Asia owing to economic weakness and political unrest.[74]

During 1998-2002, WMP prices tended to follow SMP prices, with a small margin reflecting the higher value of WMP vis-à-vis SMP in several uses, particularly for reconstitution into liquid milk in developing country markets. Compared with other prices, the dry whey price was relatively stable, especially during 1999-2001. This may reflect differences in market demand between dry whey and SMP, such as the widespread use of whey in the animal feed industry. The world price of dry whey provides a floor for the world price of SMP, for if the SMP price were to fall below the dry whey price,[75] consuming countries would switch from using whey products to SMP.[76]

U.S. import unit values for MPC, casein, and caseinate provide a rough estimate of world prices of these products (table 2-8). Unit value trends during 1998-2002 are similar to those of SMP and WMP, that is, unit values generally fell between 1998 and 1999, increased between 1999 and 2001, then fell again between 2001 and 2002.[77] There are important exceptions, however, with the most notable being the unit values for Chapter 4 MPC imports from Australia and New Zealand which increased annually between 1999-2002, including between 2001 and 2002 when other protein prices fell significantly.[78] This indicates that factors generating price trends in MPC unit values from these countries (e.g., protein product functionality) may be different from factors generating trends in SMP prices.

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[74] USDA, ERS, *Livestock, Dairy and Poultry, Situation and Outlook*, LDP-M-96 (June 25, 2002), found at *http://jan.mannlib.cornell.edu/reports/erssor/livestock/ldp-mbb/2002/ldp–m96f.-pdf*.

[75] While the dry whey price provides a floor to world SMP prices, the U.S. support price provides a ceiling to the SMP price. As soon as the international SMP price reaches the U.S. support price, CCC stocks would be released onto the world market thereby preventing any price increase beyond the support level.

[76] USDA, ERS, "International Dairy Markets and the WTO," *Livestock, Dairy and Poultry, Situation and Outlook*, LDP-M-74 (Aug. 29, 2000), found at *http://jan.mannlib.cornell.edu/-reports/erssor/livestock/ldp-mbb/-2000/ldp-m74.pdf*.

[77] This does not necessarily mean that price changes in SMP cause the changes in import unit values. The data merely show that protein prices tend to move together.

[78] Chapter 4 MPC unit values for imports from the EU are highly correlated with international SMP prices.

CHAPTER 3
THE MILK PROTEIN INDUSTRY OF THE UNITED STATES

Introduction

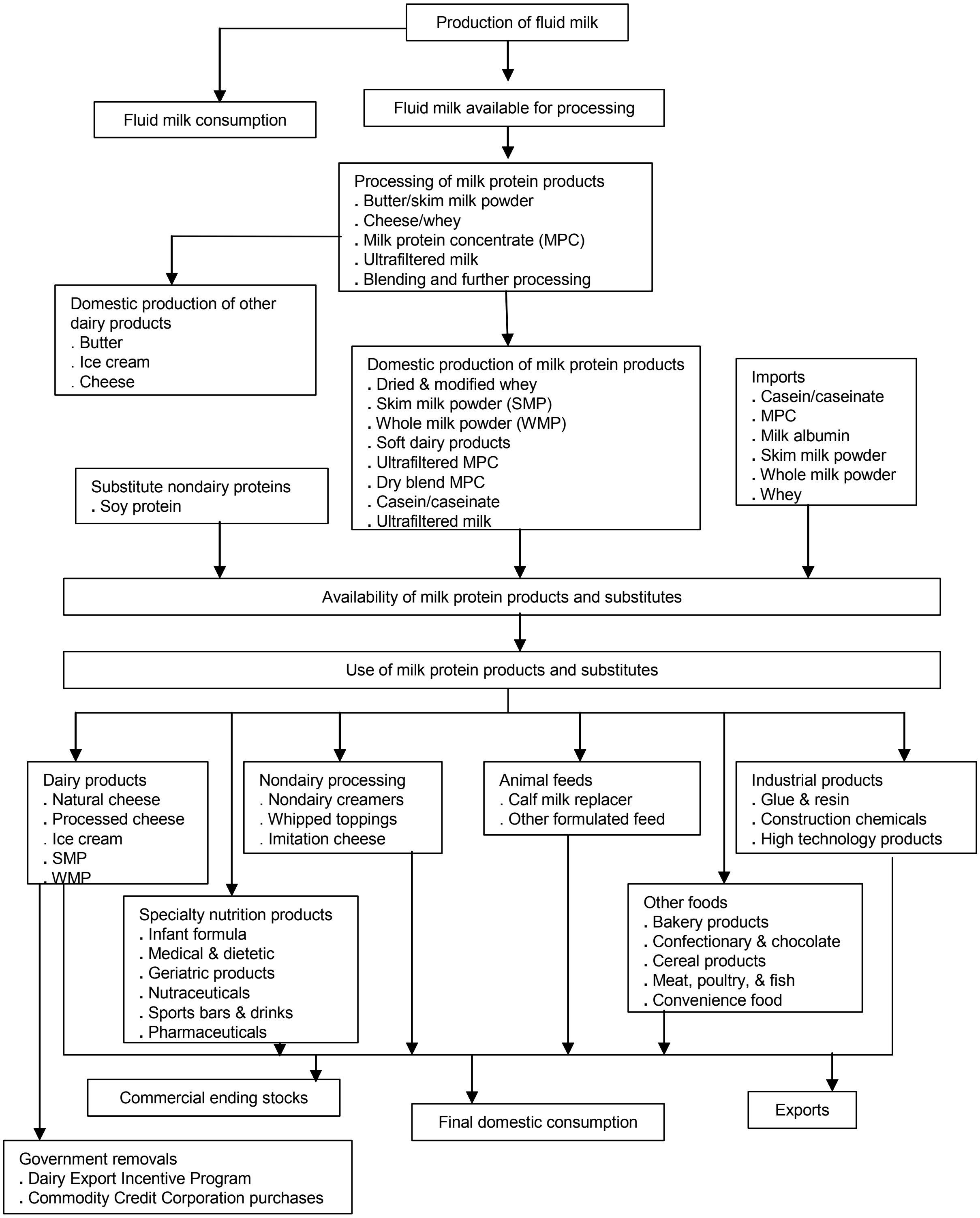
This chapter provides a profile of the milk protein industry for the United States. As requested by the Senate Committee on Finance, the profile focuses on government support and other competitive factors that impact U.S. production, use, and trade in milk protein products. The profile covers the production, price, and cost trends for raw milk, as well as information on production of milk protein products, including milk protein concentrate (MPC), casein, and caseinate. Detailed discussion is presented on how government intervention, and particularly the Dairy Price Support Program, has influenced the U.S. production of milk protein products in their various forms. The profile also includes a brief discussion of U.S. imports of milk protein products, although a more detailed description is provided in chapter 6 covering results from the Commission's importers' questionnaires. The discussion on how milk protein products are used in the U.S. market is reserved for chapter 7, which provides detailed results from the Commission's purchasers' questionnaires.

This chapter discusses the key components and linkages in the U.S. milk protein industry that are shown in figure 3-1. It covers the U.S. supply of milk proteins, including domestically produced raw milk and processed milk protein products and imports, as well as the domestic uses of milk protein products for domestic consumption, exports, and stocks. As shown in figure 3-1, government intervention affects several aspects of the supply and use of milk proteins in the U.S. market.

Overview

Of the 170 billion pounds of milk produced in the United States in 2002, about 55 billion pounds went into beverage use (accounting for about one-third) and 1.4 billion pounds were consumed on farms. The remainder (113 billion pounds) was available for use in dairy processing, which translates into domestic milk protein supply of about 2.5 million metric tons (mt). U.S. production of milk proteins has largely been limited to the production of skim milk powder (SMP) and whey, including dry whey, whey protein concentrate (WPC), and whey protein isolate (WPI), and condensed and evaporated milk products. In addition, milk protein products are increasingly competing with substitute nondairy proteins, such as soy proteins. In the United States, milk protein products are processed in several types of operations (figure 3-1). These include more traditional operations, such as butter/powder operations, cheese/whey facilities, and fluid milk processing plants. Recently, other types of milk protein processing facilities have emerged, such as domestic MPC operations, as well

Figure 3-1
Major distribution channels for milk protein products



Source: Compiled by the Commission based on fieldwork and industry surveys.

as ultrafiltered (UF) milk plants. There are also protein facilities that concentrate on blending and further processing milk proteins.

In the United States, milk proteins are used in a diverse set of food, animal feed, and industrial products. Milk protein products in the U.S. market are sourced from U.S. product (produced with domestic milk) and imports (figure 3-1). The United States is not a major dairy exporting country. With a few exceptions, this is largely because U.S. Government support programs provide greater returns from domestic sales than from exports.

Production of Fluid Milk

Production Systems

Dairy operations that produce milk in the United States range from relatively small, high-cost, inefficient operations to industrial-type operations that are among the largest, most efficient, and technologically advanced in the world. Production systems differ according to feeding practices, housing, labor usage, waste management, milking methods, and the level of technological sophistication. Climate and topography are also important in determining dairying methods.

Broadly, modern dairy operations in the United States are of two types—free-stall housing operations, which are found throughout the United States, and drylot operations, which are most often found in the West and Southwest.[1] On free-stall operations, pasture grazing is limited and cows are kept in well-ventilated barns and fed a total mixed ration (where forages and concentrates are fed in one ration). Typically, cows are milked in highly automated milking parlors that allow rapid milking with low labor input.[2] Flush waste systems also allow barns to be cleaned with minimal labor.[3] Many such operations grow most of their own feed, rely heavily on family labor, and are diversified into other livestock products, such as beef and poultry. On drylot operations, cows are kept outdoors in paddocks, and moved inside for milking either two or three times per day. Many of these operations are factory-type farms, that concentrate on feeding and milking cows by purchasing most of their feed and employing hired labor. They are typically very large, low-cost operations, that benefit from economies of scale.[4]

A small amount of milk in the United States is produced using a system of rotational grazing. However, climatic conditions limit the areas where this method is feasible. Often rotational grazing is part of a dual system with cows fed mixed rations during times of the year when grass growth is insufficient.

[1] Kenneth W. Bailey, *Marketing and Pricing of Milk and Dairy Products in the United States* (Ames IA: Iowa State University Press, 1997).

[2] On some operations located in cold regions where it is important to limit time spent outside the barn, cows are housed, fed, and milked in a single barn. Because milking equipment is moved from cow to cow, such operations are highly labor intensive.

[3] USITC staff farm visit, Bellefonte, Pennsylvania, July 22, 2003.

[4] USITC staff farm visit, Magic Valley region, ID, Oct. 8, 2003, and Select Farms, NM, Oct. 22, 2003.

Milk Production, Price, and Industry Structure Trends

U.S. milk production reached almost 170 billion pounds in 2002, the highest level ever recorded and almost 8 percent higher than production in 1998 (table 3-1). The United States accounts for about 15 percent of world milk supply and is the world's largest single milk producing country (the combined production of EU countries is significantly larger than that of the United States).[5] During 1998-2002, the average value of cash receipts in the dairy sector was about $23 billion annually. This represented almost 12 percent of total cash receipts for the entire U.S. agricultural sector, and placed dairy second only to the meat industry in terms of agricultural sector value added.

Trends in U.S. milk production are dominated by three major phenomena.[6] First is the steady increase in production and productivity over time. Between 1980 and 2002, U.S. milk production grew from 128 billion pounds to almost 170 billion pounds, an annual average increase of 1.3 percent, with growth at a slightly higher annual rate during 1998-2002 (1.5 percent).[7] Meanwhile, there has been a steady downward trend in dairy cow numbers, dropping from 10.8 million in 1980 to 9.1 million in 2002 (a decline of 16 percent), with a significant reduction during 1985-1990, partially in response to the Dairy Termination Program.[8] Between 1998 and 2002, cow numbers stabilized at around 9.1 million head. Production growth throughout the period therefore was driven by significant increases in milk production per cow, resulting from technological developments and research into cow genetics and nutrition.[9] In 1980, annual production per cow was less than 12,000 pounds, but by 2002, yields reached more than 18,600 pounds, an increase of more than 50 percent, or 2 percent per annum. Productivity growth has been fairly stable over the long term, with output per cow growing at 1.6 percent annually during 1998-2002. As a result of productivity gains, the United States is producing 32-percent more milk with 15-percent fewer cows when comparing 1980 with 2002.

The second trend in U.S. milk supplies is production concentration. An increasing share of U.S. milk supplies is being sourced from a relatively few, very large dairy operations.[10] This is illustrated by trends in the number of operations, cow numbers, and milk production according to farm size (table 3-1). In 2002, small dairy farms (those with fewer than 50 cows) accounted for about one-half of U.S. dairy operations, yet contributed less than 8 percent of the nation's milk supply. In contrast, large operations (those with more than 500 cows) accounted for only 3 percent of dairy operations, yet supplied 42 percent of U.S.

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[5] USDA, FAS, *Dairy: World Markets and Trade* (July 2003), found at *http://www.fas.usda.-gov/dlp/circular/-2003/-03-07Dairy/toc.htm,* retrieved Aug. 6, 2003.

[6] For more information on structural change in the U.S. dairy industry, see USDA, ERS, *The Changing Landscape of U.S. Milk Production*, Statistical Bulletin No. 978 (June 2002); USDA, ERS, *Structure, Management, and Performance Characteristics of Specialized Dairy Farm Businesses in the United States*, Agricultural Handbook No. 720 (Sept. 2000); William D. Dobson and Paul Christ, "Structural Change in the U.S. Dairy Industry: Growth in Scale, Regional Shifts in Production and Processing, and Internationalism," *International Dairy Federation Bulletin*, No. 360/2001 (Nov. 2001), pp. 10-19.

[7] USDA, NASS, *Milk Production*, various years.

[8] U.S. General Accounting Office, *Dairy Termination Program. An Estimate of Its Impact and Cost-Effectiveness*, GAO/RCED-89-96 (July, 1989).

[9] USDA, ERS, *The Changing Landscape of U.S. Milk Production*, Statistical Bulletin No. 978 (June 2002).

[10] USDA, NASS, *U.S. Dairy Herd Structure*, Da 1-1(9-02) (Sept. 2003).

Table 3-1
U.S. milk production: Trends in industry structure, 1998-2002

Trends	1998	1999	2000	2001	2002
	Million pounds				
Production trends:					
Production of milk	157,348	162,559	167,559	165,497	169,758
	Billion dollars				
Cash receipts	24.1	23.2	20.6	24.7	21.0
	1,000 head				
Number of cows	9,154	9,156	9,206	9,114	9,141
	Pounds				
Yield per cow	17,189	17,772	18,201	18,159	18,571
	Operations				
Farm size trends:					
Number of operations	117,180	111,000	105,170	97,510	91,990
	Percent				
Farms with fewer than 50 cows:					
Share of total U.S. dairy operations	52.6	51.3	50.3	49.2	48.0
Share of total U.S. milk production	11.2	10.5	9.5	8.3	7.6
Farms with more than 500 cows:					
Share of total U.S. dairy operations	2.1	2.3	2.5	2.9	3.2
Share of total U.S. milk production	30.4	33.8	35.8	39	41.9
Farms with more than 2,000 cows:					
Share of total U.S. dairy operations	0.2	0.2	0.3	0.3	0.4
Share of total U.S. milk production	8.4	9.3	10.5	12.3	15.0
	Million pounds				
State trends:					
California	27,654	30,459	32,273	33,217	34,884
Wisconsin	22,842	23,071	23,259	22,199	22,074
New York	11,750	12,082	11,921	11,780	12,217
Pennsylvania	10,847	10,931	11,156	10,849	10,775
Minnesota	9,275	9,478	9,493	8,812	8,458
Idaho	5,765	6,453	7,223	7,757	8,155
New Mexico	4,354	4,724	5,236	5,561	6,316
	Percent				
Share of U.S. milk production:					
Upper Midwest and Northeast	44	43	42	41	40
West	33	34	36	37	38
	Dollars per hundredweight of milk				
Price trends:					
All-milk price	15.46	14.38	12.40	15.05	12.19

Sources: U.S. Department of Agriculture, Agricultural Marketing Service, *Dairy Market News Annual Summary*, various issues; U.S. Department of Agriculture, National Agricultural Statistical Service, *Milk Production*, various years (Feb. issue); U.S. Department of Agriculture, National Agricultural Statistical Service, *Agricultural Prices Annual Summary*, various years.

production. Very large operations (with more than 2,000 cows) made up only 0.4 percent of dairy operations, but accounted for 15 percent of milk supplies. The increased concentration of dairy production reflects capital investment in modern technology for milking, feeding, and waste management, which has facilitated production efficiency by promoting specialization and increasing scale of operations.[11]

The third trend is a regional shift in milk production. Milk is produced throughout the United States, however, production is concentrated in a few states. In 2002, one-third of U.S. milk was produced in California and Wisconsin, and the top-five states (California, Wisconsin, New York, Pennsylvania, and Minnesota) produced 52 percent of the nation's milk (table 3-1). Since the mid-1980s, production has shifted to the Southwest and West, where very large (2,000 or more cows) and specialized dairy farms have developed.[12] The number of U.S. dairy operations fell from about 117,000 in 1998 to 92,000 in 2002 (a decline of more than 20 percent).[13] As the number of operations fell in all regions of the country, some regions experienced sharper reductions than others. Nearly 10,000 operations closed in the Upper Midwest, and 7,000 in the Central Region (mainly Missouri, Texas, and Ohio), compared with only 1,600 in the West.[14] Between 1998 and 2002, the total number of dairy cows in the United States remained more or less unchanged (table 3-1). However, there was an increase in dairy cow numbers in the West of about 500,000 head, offset by a decline of similar magnitude in the rest of the country. Similarly, the 12.4 billion pounds of additional milk supplied nationally between 1998 and 2002 was accounted for by an increase of 13.8 billion pounds in the West, offset by a 1.4 billion pound decline in the rest of the country.

The regional shift in production can be associated with several supply and demand factors. In general, the westward movement of milk production resulted from the abundance of land and labor, and a climate favorable to the production of high-quality feed.[15] Also, recent analysis by the U.S. Department of Agriculture (USDA) indicates that total average costs of production are lower in the West and Southwest than in the Northeast and Upper Midwest.[16] At the same time, population growth in the West and Southwest has increased demand for milk and dairy products in these regions.[17] As production has moved westward, new milk processing facilities (e.g., cheese plants) have been built, whereas relatively little remodeling

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[11] David P. Anderson, Joe L. Outlaw, and Robert B. Schwart, "Structural Change in the Dairy Industry," *10th Annual Workshop for Dairy Economists and Policy Analysts*, Memphis, TN (April 23-24, 2003), pp. 75-79.

[12] USDA, ERS, *The Changing Landscape of U.S. Milk Production*, Statistical Bulletin no. 978 (June 2002).

[13] A dairy operation is defined as any place having one or more head of milk cows on hand at any time during the year. USDA, NASS, *Cattle* (Feb. 1997).

[14] USDA, NASS, *Milk Production*, various years.

[15] USDA, ERS, *Structure, Management, and Performance Characteristics of Specialized Dairy Farm Businesses in the United States*, Agricultural Handbook No. 720 (Sept. 2000).

[16] USDA, ERS, *Commodity Costs and Returns: Monthly Costs of Production*, found at *http://www.ers.usda.gov/-data/costsAndReturns/monthlymilkcosts.htm*, retrieved Jan. 7, 2004; Edward V. Jesse and Bruce Jones, "Cost of Producing Milk: A Comparison by State," Marketing and Policy Brief Paper No. 84, Department of Agricultural and Applied Economics (University of Wisconsin-Madison, Nov. 2003).

[17] USDA, ERS, "Dairy Policy to Build on Market Orientation," *Agricultural Outlook* (July, 1995).

or expansion in processing capacity has taken place in the Upper Midwest.[18] Although dairy production will probably continue to move toward Western states, factors that may slow this trend over time include lower average milk prices, competition for forage, water scarcity, increased environmental scrutiny, and the slowing of technologically induced increases in cow yields.[19]

During 1998-2002, farm-level milk prices were highly volatile, ranging from a record high in 1998 ($15.46 per hundredweight (cwt)) to a record low in 2002 ($12.19 per cwt). USDA analysts associate such price movements with changes in the supply and demand for milk and dairy products.[20] USDA reports that the high price in 2001 can be associated with the sharp decline in milk production between 2000 and 2001, whereas the record low prices in 2002 resulted from increased production per cow, owing to favorable weather and forage conditions, and to weak demand for dairy products.[21]

Cost of Production

A key factor determining the competitiveness of the U.S. dairy industry is the cost of raw milk production. U.S. production costs and returns for 2000-2002 are reported in table 3-2, based on nationwide surveys conducted by the USDA.[22] Cost of production data for milk are published for six regions of the country and separated into operating costs (such as feed, veterinary expenses, fuel, and waste disposal) and allocated overhead (such as hired labor, depreciation on capital, taxes, and insurance).

As shown in table 3-2, between 2000 and 2002, average operating costs of milk production in the United States were $9.56 per cwt of milk produced, of which feed costs accounted for $6.75 (70 percent). Of the total feed costs, two-thirds covered feed grains, hay, silage, and complete feed mixes. Other feed costs include vitamins, minerals, and protein supplements, with only about 8 cents per cwt spent on grazed pasture and cropland. Average allocated expenses amounted to $8.86 per cwt, most of which was accounted for by the opportunity cost of unpaid labor and capital recovery (depreciation) of machinery and equipment. Combining operating and allocated overhead results in a total production cost of $18.42 per cwt. However, $7.16 per cwt of this amount reflects opportunity costs so that total paid costs were on average $11.26 per cwt during 2000-02.

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[18] William D. Dobson and Paul Christ, "Structural Change in the U.S. Dairy Industry: Growth in Scale, Regional Shifts in Production and Processing, and Internationalism," *International Dairy Federation* Bulletin No. 360/2001 (Nov. 2001), pp. 10-19.

[19] Edward V. Jesse, "Facing up to the western dairy boom," *Rethinking Dairyland*, No. 3 (Sept. 2002), found at *http://www.aae.wisc.edu/www/pub/dairyland/rd3.pdf,* retrieved Jan. 8, 2004.

[20] USDA, ERS, *Livestock, Dairy and Poultry, Situation and Outlook*, various years.

[21] USDA, Informational Memorandum for the Secretary (Jan. 2003).

[22] For more information of the USDA survey, see USDA, ERS, *Briefing Room: Agricultural Resource Management Survey*, found at *http://www.ers.usda.gov/Briefing/ARMS* .

Table 3-2
U.S. milk production: Costs and returns, 2000-2002

Cost/return	2000	2001	2002	Average 2000-02
	—Dollars per hundredweight of milk produced—			
Gross return of production:				
Milk	12.63	15.35	12.44	13.47
Other[1]	1.62	1.86	1.61	1.70
Total, gross return of production	14.25	17.21	14.05	15.17
Operating costs:				
Feed:				
Feed grain	1.22	1.27	1.48	1.32
Hay and straw	1.51	1.67	1.67	1.62
Complete feed mixes	1.43	1.50	1.56	1.50
Other	2.33	2.28	2.33	2.31
Total, feed costs	6.49	6.72	7.04	6.75
Other operating costs[2]	2.89	2.83	2.70	2.81
Total, operating costs	9.38	9.55	9.74	9.56
Allocated overhead:				
Hired labor	1.14	1.19	1.25	1.19
Opportunity cost of unpaid labor	3.54	3.58	3.64	3.59
Capital recovery of machinery and equipment[3]	3.23	3.42	3.38	3.34
Other	0.73	0.74	0.75	0.74
Total, allocated overhead	8.64	8.93	9.02	8.86
Total costs listed	18.02	18.48	18.76	18.42
Total unpaid costs[4]	7.09	7.22	7.16	7.16
Total cost less unpaid costs	10.93	11.26	11.6	11.26
Return less operating costs	4.87	7.66	4.31	5.61
Return less operating costs and allocated overhead	-3.77	-1.27	-4.71	-3.25

[1] Income from cattle sales, renting or leasing dairy stock to other operations; renting space to other dairy operations; co-op patronage dividends associated with the dairy; assessment rebates, refunds, and other dairy-related resources; and manure production.

[2] Includes veterinary and medicine expenses, bedding and litter, marketing, customs services, fuel and electricity, repairs, manure handling, and interest on operating capital.

[3] Machinery, equipment, housing, manure handling, feed storage structures, and dairy breeding herd.

[4] Unpaid costs include: interest on operating capital, opportunity of unpaid labor, capital recovery of machinery and equipment, and opportunity cost of land.

Sources: U.S. Department of Agriculture, Economic Research Service, *Commodity Costs and Returns,* found at *http://www.ers.usda.gov/data/costsandreturns/monthlymilkcosts.htm*, retrieved Jan. 8, 2004.

The USDA survey revealed considerable differences between farms of various size and among regions of the country. Small dairy operations (those with fewer than 50 cows) had operating and ownership costs (capital recovery plus taxes and insurance) of $15.51 per cwt, but operations with more than 500 cows had costs of only $10.46 per cwt.[23] Similarly, in 2002, total costs (operating plus allocated overhead costs) ranged from $13.77 per cwt in

[23] Based on the 2000 dairy Agricultural Resource Management Survey, reported in USDA, ERS, *Agricultural Income and Finance Outlook*, AIS-79 (Sept. 26, 2002), p. 39, found at *http://www.ers.usda.gov/publications/so/-view.asp?f=economics/ais-bb/*, retrieved Jan. 8, 2004.

the Fruitful Rim region (California, Arizona, Idaho, and Washington) to $26.46 per cwt in the Eastern Uplands (Appalachia).[24]

Other data on costs of production are provided by the International Farm Comparison Network (IFCN).[25] Each year IFCN surveys "typical" farms in several countries and provides comparisons, including operation size, productivity, and production costs. In its 2003 report, the IFCN reported data for a 135-cow operation in Wisconsin, a 700-cow operation in Wisconsin, and a 2,100-cow operation in Idaho. All three farm types reported similar productivity (about 21,000 to 22,000 pounds of milk per cow per year) and used no grassland in their operations. For the Wisconsin operations, the report indicated costs of production of about $12.70 per cwt for the 135-cow operation and $12.50 per cwt for the 700-cow operation. For the 2,100-cow Idaho operation, the survey reported a lower cost of about $10.60 per cwt.

Government Programs

Milk is marketed in the United States under a complex system of Federal, state, and local laws and regulations.[26] The two major Federal programs directly affecting milk and dairy product pricing are the dairy price support program (DPSP), established under the Agricultural Act of 1949 (63 Stat. 1051), as amended; and the Federal Milk Marketing Orders (FMMOs), provided for under the Agriculture Marketing Agreement Act of 1937 (50 Stat. 246), as amended. These two programs are the primary price-determining mechanisms in the U.S. dairy sector. In addition to these programs, the Milk Income Loss Contract (MILC) Program, a direct income support program, was introduced in the 2002 Farm Bill.

Several other government programs directly and indirectly impact dairy markets in the United States. There are programs that provide farmers with additional risk management tools to deal with price volatility, such as the Forward Pricing Pilot Program[27] and the Dairy Indemnity Program.[28] The USDA also provides incentives to farmers for conservation and environmentally sustainable management practices. Many of the USDA's environmental and conservation programs benefit dairy producers, such as the Environmental Quality Incentive

[24] USDA, ERS, *Commodity Costs and Returns: Monthly Costs of Production*, found at *http://www.ers.usda.gov/data/costsAndReturns/monthlymilkcosts.htm*, retreived Jan. 7, 2004; Edward V. Jesse and Bruce Jones, "Cost of Producing Milk: A Comparison by State," Marketing and Policy Brief Paper No. 84, Department of Agricultural and Applied Economics (University of Wisconsin-Madison, Nov. 2003), found at *http://www.aae.wisc.edu/www/pub/pbpapers/mpb84.-pdf,* retrieved Jan. 7, 2004.

[25] International Farm Comparison Network, *Dairy Report 2003*, found at *http://www.ifcnnet-work.org.*

[26] USDA, ERS, *Briefing Room: Dairy Policy*, found at *http://www.ers.usda.gov/Briefing/-Dairy*, retrieved May 6, 2003.

[27] USDA, AMS, *Forward Pricing Pilot Program*, found at *http://www.ams.usda.gov/dairy/-for_contr_pilot.htm,* retrieved July 30, 2003.

[28] USDA, FSA, *Fact Sheet: Dairy Indemnity Program*, found at *http://www.fsa.usda.gov/pas/-publications/facts/html/dipp03.htm*, retrieved June 17, 2003.

Program (EQIP)[29] and the Agricultural Management Assistance (AMA) program.[30] Several government programs also try to influence the consumption of dairy products in the United States. The Fluid Milk Processors Promotion Program funds research and promotion activities through a 20 cent per cwt assessment on fluid milk products that are processed and sold commercially in packages suitable for sale in retail outlets.[31] Similarly, the National Dairy Promotion and Research Program imposes an assessment of 15 cents per cwt (so-called checkoff) on all milk produced in the United States to promote the consumption of dairy products through promotion, research, and nutrition education.[32] Also, the Special Milk Program for Children is aimed at encouraging fluid milk consumption by children.[33]

While these programs influence the marketing and pricing of milk and dairy products in the United States, for the purpose of this investigation, discussion of government intervention in the U.S. dairy industry is limited to programs that directly impact prices and incomes.

Dairy Price Support Program

The price support system for milk and dairy products was first introduced under the Agricultural Act of 1949. Since then it has been frequently amended, most commonly under multiyear ominbus farm acts and budget reconciliation acts.The purpose of the Dairy Price Support Program (DPSP) is to maintain a floor price for milk received by dairy farmers.[34] This is achieved by the government intervention agency, the Commodity Credit Corporation (CCC), purchasing any domestic surpluses of butter, cheddar cheese, and SMP at prespecified prices.[35] The support prices are set so that processors are able to earn enough revenue from milk used to produce CCC-purchased products to pay dairy farmers a certain minimum support price for their milk.[36] The support level for milk of $9.90 per cwt (with 3.67 percent butterfat) was established under the 1996 Farm Bill, and is authorized to remain at this level until 2007 under the 2002 Farm Bill.[37] As of May 2004, the support prices for

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[29] USDA, NRCS, *The Environmental Quality Incentive Program*, found at *http://www.nrcs.-usda.gov/programs/-eqip/,* retrieved July 25, 2003

[30] The AMA is authorized under the Agricultural Risk Protection Act of 2000. For more detail on the program, see USDA, NRCS, *Agricultural Management Assistance. Program Information Sheet*, found at *http://www.nrcs.-usda.gov/programs/ama/amainfo.html,* retrieved July 25, 2003.

[31] Report to Congress on the National Dairy Promotion and Research Program and the National Fluid Milk Processor Promotion Program (July 1, 2002), found at *http://www.ams.usda.gov/-dairy/prb/rtc_2002/total_rtc_-2002.pdf,* retrieved July 17, 2003.

[32] USDA, AMS, *National Dairy Promotion and Research Program*, found at *www.usda.ams.-gov/dairy/ndb.htm,* retrieved July 17, 2003.

[33] Catalogue of Federal Domestic Assistance, Special Milk Program for Children, found at, *http://www.cfda.gov/-public/viewprog.asp?progid=89,* retrieved July 28, 2003.

[34] For a detailed history of U.S. dairy programs, see USDA, ERS, *Dairy. Background for 1995 Farm Legislation*, Agricultural Economic Report No. 705 (Apr. 1995), pp. 11-15; Kenneth W. Bailey, *Marketing and Pricing of Milk and Dairy Products in the United States* (Ames IA: Iowa State University Press, 1997), pp. 170-93.

[35] USDA, ERS, *Briefing Room: Dairy Policy*, found at *http://www.ers.usda.gov/Briefing/-Dairy/Policy.htm,* retrieved Jan. 9, 2004.

[36] Edward V. Jesse, "Flooring the Support Price for Milk," Marketing and Policy Brief Paper No. 81, Department of Agricultural and Applied Economics (University of Wisconsin-Madison, Mar. 2003), found at *http://www.aae.wisc.edu/-www/pub/mpbpapers/mpb72.pdf,* retrieved May 6, 2003.

[37] Section 1501 of the Farm Security and Rural Investment Act of 2002 (P.L. 107-171 omnibus 2002 farm bill).

manufactured dairy products were as follows: $1.05 per pound for butter, $1.13 per pound for 40-pound block cheese, and $0.80 per pound for SMP.[38]

The DPSP has had a significant impact on the U.S. market for SMP in recent years.[39] During 1998-2002, production of SMP increased from about 515,000 mt to 712,000 mt (table 3-3). With little or no growth in domestic disappearance (consumption) over this period, market prices dropped toward the government support level,[40] necessitating large CCC purchases to prevent market prices from falling below the support price level. Between 1998 and 2002, price support purchases increased from 51,800 mt to 308,300 mt, and government stocks of SMP increased more than tenfold from 43,200 mt to 474,800 mt. In 2002, government stocks were equivalent to two-thirds of domestic production and exceeded annual domestic disappearance by more than 30 percent.

Table 3-3
Skim milk powder: U.S. supply/demand balance, government stocks, and U.S. prices, 1998-2002

Item	1998	1999	2000	2001	2002
	1,000 metric tons				
Supply:					
Domestic production	515	617	659	650	712
Beginning commercial stocks	47	25	63	54	55
Imports	5	6	4	4	7
Total	567	648	726	699	774
Demand:					
Ending commercial stocks	25	63	54	55	46
Government removals:					
Price support purchases	52	108	253	161	308
DEIP removals[1]	104	138	61	64	74
Unrestricted sales[2]	7	0	0	0	8
Net government removals[3]	148	245	314	225	374
Commercial disappearance[4]	394	334	350	429	360
Government stocks	43	61	234	352	475
	Dollars per metric ton				
Market price	2,351	2,281	2,240	2,223	2,052
Government support price	2,296	2,227	2,227	2,080	1,947

[1] Skim milk powder used in the Dairy Export Incentive Program.
[2] Sales of skim milk powder from government stocks.
[3] Equal to price support purchases plus DEIP removals minus unrestricted sales.
[4] Equal to total supply minus ending commercial stocks minus net government removals.

Sources: U.S. Department of Agriculture, Economic Research Service, *Livestock, Dairy, Poultry Outlook* LDP-M-110 (Aug. 26, 2003); U.S. Department of Agriculture, Agriculture Marketing Service. *Annual Summary of Market Statistics*, various issues; U.S. Department of Agriculture, Foreign Agricultural Service, *Dairy World Markets and Trade,* various issues.

[38] USDA, AMS, *Dairy Market News*, found at *http://www.ams.usda.gov/dairy/mncs/weekly.-htm*.

[39] USDA, ERS, *An Analysis of the Economic Effects of U.S. Dairy Policy and An Analysis of an Alternative Milk Pricing Approach*, prepared for the Senate Committee on Agriculture, Nutrition and Forestry and the House Committee on Agriculture (2004).

[40] Based on monthly data during 1998-2002, the market price of SMP was on average 3.6 percent higher than the government support price.

Typically, dairy products acquired by the government under the DPSP are predominantly disposed of through domestic welfare outlets and sales or donation abroad.[41] However, these traditional outlets for CCC purchases were insufficient to dispose of the huge stocks that had accumulated during 2000-2002. In response, the USDA launched several new programs to move existing product out of storage.[42] For example, the 2002 Cattle Feed Program[43] and the 2003 NonFat Dry Milk Livestock Feed Assistance Program[44] were two such initiatives that made CCC surplus SMP available for livestock feed. Another initiative was to make CCC funds available to subsidize the domestic production of edible casein and caseinate using up to 300 million pounds of CCC stocks of SMP.[45] The USDA also made up to 441 million pounds of nonfortified, low-heat SMP available to U.S. private voluntary organizations and the World Food Program for overseas humanitarian assistance,[46] and in March 2003, the USDA announced a program that exchanges CCC stocks of SMP for American and mozzarella cheese used in the school lunch program.[47] There was also consideration of a National Milk Producers Federation (NMPF) proposal to use CCC funds to support the domestic production of casein.[48]

Another key action by the USDA to moderate CCC purchases of SMP has been adjusting the support prices of butter and SMP (the so-called butter-powder tilt).[49] By law, the Secretary of Agriculture can change the tilt twice annually,[50] and two such tilts have been implemented since May 2001 in response to the growth in inventories and the increasing purchase and storage costs accruing to the Federal budget.[51] The first tilt occurred on May 31, 2001, when the USDA reduced the SMP support price from $1.0032 per pound to $0.90 cents per pound and increased the butter price from $0.65 to $0.85 per pound. A second tilt occurred on November 15, 2002, when the USDA reduced the SMP support price further to $0.80 per pound and increased the butter price to $1.05 per pound. Adjusting the

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[41] Domestic disposal has been to welfare recipients, school lunch programs, military and veterans' hospitals, and penal institutions. Disposal abroad has mostly been through government-to-government sales at world prices, sales to the U.S. military overseas, and humanitarian assistance through donations, mostly under the Agricultural Trade Development and Assistance Act of 1954.

[42] USDA, Press release (Nov. 15, 2003), found at *http://www.usda.gov/news/releases/2002/-11/0476.htm,* retrieved Jan. 9, 2004.

[43] USDA, FSA, *2002 Cattle Feed Assistance Program. Fact Sheet* (Oct. 2002), found at *http://www.fsa.usda.gov/-pas/publications/facts/html/cattlefeed02.htm*, retrieved Jan. 21, 2004.

[44] USDA, FSA, *2003 Livestock Feed Assistance NonFat Dry Milk Program (SMP)*, found at *http://disaster.fsa.-usda.gov/SMP.htm,* retrieved June 6, 2003; USDA, FSA, *Fact Sheet: Surplus Sales of Nonfat Dry Milk* (Apr. 2003), found at *http://www.fsa.usda.gov/pas/publications/facts/-NFDM03.pdf,* retrieved June 6, 2003.

[45] USDA, FSA, Notice to the Dairy Industry, D&DOD-148, found at *http://www.fsa.usda.gov/-daco/DDO-Dnotices/PDFs/-ddod119.pdf*, May 10, 2002.

[46] USDA, Press release (Nov. 15, 2003), found at *http://www.usda.gov/news/releases/2002/-11/0476.htm,* retrieved Jan. 9, 2004.

[47] USDA, FSA, Notice to Cheese Suppliers, D&DOD-148, found at *http://www.fsa.usda.gov/-daco/DDOD-notices/PDFs/-DDOD148.pdf*, retrieved Mar. 31, 2003.

[48] NMPF, in letter to J.B. Penn, USDA Under Secretary for Farm and Foreign Agricultural Services (May, 14, 2003); NMPF, posthearing submission, Jan. 15, 2004.

[49] Changing butter and SMP prices is referred to as a tilt because if the support price of one product is lowered, then the price of the other must be increased in order for the farm price for milk of $9.90 per cwt to be supported.

[50] Congressional Research Service, *Dairy Policy Issues*, CRS Issue Brief IB97011 (Apr. 18, 2003).

[51] NMPF, prehearing submission, Dec.1, 2003, p. 13.

tilt has been highly controversial because tilt changes ultimately mean lower farm-level prices for milk.[52] This is because under the FMMO pricing formulas, lowering the support price for SMP results in reductions in both the Class IV and Class II prices (the method of milk pricing under the FMMOs is discussed in detail in chapter 9).[53] Further, during months when the Class IV price is greater than the Class III price, a reduction in the Class IV price leads to a drop in the Class I price.[54] Analysis of recent studies by the USDA and the NMPF on the impact of these tilts is discussed in chapter 9 of this report.

Milk marketing orders

Federal Marketing Orders for milk date back more than 70 years to the time of the Great Depression, when the Federal Government implemented the Agricultural Adjustment Act (AAA) of 1933 aimed at increasing farm income through processor taxes, parity pricing, and marketing agreements. The legislation affected dairy farmers by establishing marketing agreements that determined prices and conditions of sale for milk.[55] In 1937, the AAA marketing agreements were replaced by marketing orders established in the Agricultural Marketing Agreement Act (AMAA).[56] This Act (as amended) authorizes the Secretary of Agriculture to establish FMMOs, which are legal documents requiring "handlers" (processors) of fluid (Grade A)[57] milk in a specified area to pay dairy farmers minimum prices for their milk.

The stated purpose of the FMMO, as outlined in the AMAA, is to "stabilize market conditions, benefit producers and consumers by establishing and maintaining orderly marketing conditions, and assure consumers of adequate supplies of pure and wholesome

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[52] Edward V. Jesse and Robert Cropp, "The Butter-powder Tilt," Marketing and Policy Brief Paper No. 72, Department of Agricultural and Applied Economics (University of Wisconsin-Madison, June 2001), found at *http://www.aae.wisc.edu/www/pub/mpbpapers/mpb72.pdf,* retrieved May 6, 2003.

[53] Currently, four classes and prices for each are established from economic formulas that evolved out the recent Federal order reform. Under this system, Class I milk is used for fluid (beverage) consumption. It is the highest value use and milk is channeled to fluid use before use in manufactured products. Class II milk is used to produce so-called soft dairy products. These include items such as yogurt, cottage cheese, and ice cream. Class II prices are set below Class I prices reflecting the lower value of Class II products compared with beverage use. Production of cheese is made with Class III milk, while butter and SMP are produced with Class IV milk. Both Class III and IV milk prices are below Class I and II prices.

[54] NMPF, posthearing submission, Jan. 15, 2004, p. 3.

[55] Kenneth W. Bailey, *Marketing and Pricing of Milk and Dairy Products in the United States* (Ames IA: Iowa State University Press, 1997).

[56] USDA, ERS, *An Analysis of the Economic Effects of U.S. Dairy Policy and An Analysis of an Alternative Milk Pricing Approach*, prepared for the Senate Committee on Agriculture, Nutrition and Forestry and the House Committee on Agriculture (2004).

[57] Grade A milk is produced under sanitary conditions that ensure its safety for fluid consumption. Only Grade A milk is regulated under Federal milk marketing orders. Grade B milk is manufacturing grade, which does not meet the fluid grade standards and less stringent standards generally apply. Today, almost all milk produced in the United States meets the requirements for Grade A.

milk at all times."[58] Over time, government regulation of milk prices has continued, owing to the specific characteristics of milk, such as its perishability, expense to transport, the market concentration of buyers relative to sellers, the fluctuation of supply and demand throughout the year, and differences between markets for fluid and manufactured dairy products.[59] Today, the overall purpose of the FMMO system continues to be the creation of an "orderly marketing" system such that there is movement of products through the marketing system at the desired time and quantities, and without major fluctuations in prices.[60]

Currently there are 11 Federal orders (one-third as many as in 2000)[61] covering specific geographic areas, and any milk sold within the region must be sold through the order. These areas are defined according to where processors are competing for sales of packaged fluid milk, and not the areas from which it is procured. In 2002, about three-quarters of all milk processed in the United States was subject to FMMO, with another 20 percent covered by state orders, most of which by the California state order. About 5 percent of all milk marketed in the United States is unregulated and not subject to Federal or state orders.[62]

Classified pricing

Federal milk marketing orders are built upon two key principles—classified pricing and revenue pooling.[63] Under classified pricing, milk is priced according to its end use.[64] Currently, the four classes and prices for each class are established by economic formulas that evolved out of recent Federal order reform. Under this system, Class I milk is used for fluid (beverage) consumption. It is the highest-value use and milk is channeled to fluid use before use in manufactured products. Class II milk is used to produce so-called soft dairy products. These include items such as yogurt, cottage cheese, and ice cream. Class II prices are set below Class I prices, reflecting the lower value of soft dairy products compared with beverage use. Cheese is produced using Class III milk, whereas butter and SMP are produced with Class IV milk. Both Class III and IV milk prices are below Class I and II prices.

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[58] The 1962 Federal Milk Order Study Committee of 1962 (Nourse Report) noted that the major purposes of FMMO at the time of establishment was to " bring all handlers in a prescribed marketing area under the scope of the regulatory mechanism; to place all handlers in the same competitive position by requiring the use of minimum prices for milk entering the same use (classified pricing); to provide for a uniform price for all producers (marketwide pooling); and to extend classified pricing and pooling plans to all handlers and producers in a prescribed marketing area in order to overcome instability in fluid milk pricing."

[59] USDA, ERS, *An Analysis of the Economic Effects of U.S. Dairy Policy and An Analysis of an Alternative Milk Pricing Approach*, prepared for the Senate Committee on Agriculture, Nutrition and Forestry and the House Committee on Agriculture (2004).

[60] International Dairy Foods Association, *Milk Procurement Workshop*, Dallas, TX (Mar. 26, 2003).

[61] Under the 1996 Farm Bill, the number of FMMO was required to be reduced from the existing number of 31 to at least 10 but no more than 14. Consolidation to 11 Orders became effective Jan. 1, 2000.

[62] USDA, ERS, *An Analysis of the Economic Effects of U.S. Dairy Policy and An Analysis of an Alternative Milk Pricing Approach*, prepared for the Senate Committee on Agriculture, Nutrition and Forestry and the House Committee on Agriculture (2004).

[63] USDA, ERS, *Milk Pricing in the United States*, Agriculture Information Bulletin No. 761 (Feb. 2001), found at *http://www.ers.usda.gov/publications/AIB761,* retrieved Jan 8. 2004.

[64] USDA, ERS, *Briefing Room: Dairy Definitions*, found at *http://www.ers.usda.gov/Briefing/-Dairy/defini-tions.htm*, retrieved Jan. 10, 2004.

Over time, the formulas that determine class prices have changed. The most recent change was in January 2000, when new class-price formulas were introduced that significantly changed producer incentives. Under this latest system, order prices depend on the market prices of manufactured dairy products, including cheddar cheese, butter, SMP, and dry whey, and are derived from national surveys of processing plants conducted weekly by the USDA. These product prices are then used in combination with an economic formula to determine the value of milk components. Specifically, the price of butterfat is derived from the price of butter, the price of protein is derived from the price of cheddar cheese, and other nonfat solid prices are derived from the prices of SMP and dry whey. The component prices are then fed into formulas determining class prices.[65] The aim of pricing milk based on component values is to provide producers incentives to respond to market demand.

Revenue pooling

The second principle of the FMMO system is revenue pooling.[66] This involves collecting all the receipts from all the different processors in an order and putting them into a single account (pool). These receipts are then divided by the total weight of milk sold, giving an average uniform price (or blend price) that is paid back to the producers. The blend price is a weighted average of the class prices, with weights equal to the portion of milk sold in each class.[67] Through this mechanism, all farmers in an order receive the same uniform price, regardless of the class use of milk produced by any individual farmer, thereby allowing all farmers to benefit from the higher-value Class I and II uses.

The uniform price and the milk component prices are used to determine an individual farmer's monthly milk check. The production of components by individual farmers is known through testing at delivery, and with component prices, the value of components produced by the farm is determined. To this is added a producer price differential (based on the difference between the blend price and Class III value of milk), and finally adjusted for the farm location differential, premiums (such as over-order premiums, and quality and volume premiums) less deductions (such as hauling fees, promotion assessments, and cooperative fees).[68] The mechanisms used to determine farm-level prices are presented in detail in chapter 9.[69]

State milk marketing orders

In 2002, about 25 percent of the U.S. milk supply was regulated outside the FMMO system, most of which was subject to state orders. Similar to Federal regulations, state rules for

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[65] These formula are discussed in more detail in chapter 9 of this report.

[66] USDA, ERS, *Milk Pricing in the United States*, Agriculture Information Bulletin No. 761 (Feb. 2001), found at *http://www.ers.usda.gov/publications/AIB761,* retrieved Jan 8. 2004.

[67] NMPF, prehearing submission, Dec.1, 2003, p. 13.

[68] Kenneth W. Bailey, *Understanding Your Milk Check*, Department of Agricultural and Rural Sociology, (Pennsylvania State University, 2000), found at *http://pubs.cas.psu.edu/FreePubs/pdfs/ua341.pdf,* retrieved July 10, 2003.

[69] It is worth noting what FMMOs do not do. FMMOs do not set minimum prices at the wholesale or retail level, and while they set minimum Class prices this does not necessarily guarantee farmers a profit. FMMOs do not limit production, nor do they guarantee a market for producers' milk. FMMOs do not place limits on producers from selling to any handler.

buying and selling of milk were developed during the Great Depression of the 1930s.[70] This was partly because in the early days of regulation, milk markets tended to be highly localized and there was limited movement of milk over wide areas. State milk marketing orders operate in nine states.[71] By far the largest is California with roughly 20 percent of the nation's milk supply. Other state orders operate in parts of Maine, Montana, Nevada, and Virginia. A very small share of the nation's milk production is unregulated.[72] The state orders operate independently (for example, California) or jointly (for example, Pennsylvania) with the Federal order system so that dairy farmers are subject to overlapping sets of regulation.[73] Milk prices in California are established under a complicated system of reference prices and price formulas.[74] Other states have orders in areas covered by Federal orders that typically set minimum prices higher than those dictated under the Federal order. More recently, state regulation of milk has become increasingly difficult to administer as interstate movement of milk has grown, making it harder to maintain higher state prices when restrictions on interstate commerce are limited by the Interstate Commerce Clause of the U.S. Constitution.[75]

Direct income support

Until the 2002 Farm Bill, the more traditional methods of direct income support involving target prices and deficiency payments were not used to support dairy incomes.[76] However, as part of the emergency farm spending during FY1999-2001, which was aimed at offsetting the effects of low agricultural prices and natural disasters, dairy producers received payments under the Dairy Market Loss Assistance (DMLA) program.[77] Supplemental payments made to dairy farmers under this program amounted to $200 million in FY1999 (P.L. 105-277), $125 million in FY2000 (P.L. 106-78), and a further $675 million in FY2001 (P.L. 106-387). Under the DMLA program for FY2001, payments per cwt were set at $0.6468, based on the difference between current market prices and a target price (based on a 5-year average of

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[70] Alden C. Manchester, *The Public Role in the Dairy Economy: Why and How Governments Intervene in the Milk Business*, Westview Special Studies in Agricultural Science (Boulder: Westview Press, 1983).

[71] Virginia, Pennsylvania, New York, New Jersey, Nevada, North Dakota, Maine, Montana, and California.

[72] Daniel A. Sumner, and Joseph Balagtas, "United States' Agricultural Systems: An Overview of U.S. Dairy Policy," *Encyclopedia of Dairy Sciences* (2002), found at *http://aic.ucdavis.edu/-research1/DairyEncyclopedia_-policy.pdf*, retrieved July 30, 2003.

[73] Kenneth W. Bailey, *Marketing and Pricing of Milk and Dairy Products in the United States* (Ames IA: Iowa State University Press, 1997).

[74] For more information on California's milk pricing system, see California Department of Food and Agriculture, Dairy Marketing Branch, *Milk Pricing in California*, DMB-SP-101, found at *http://www.cdfa.ca.gov/dairy/milk-pricing.pdf*, retrieved July 31, 2003; USDA, ERS, "An Analysis of the Economic Effects of U.S. Dairy Policy" and "An Analysis of an Alternative Milk Pricing Approach," prepared for the Senate Committee on Agriculture, Nutrition and Forestry and the House Committee on Agriculture (2004); Leslie J. Bulter, "An Overview of the California Dairy Industry," Department of Agricultural and Resource Economics, University of California, Davis.

[75] International Dairy Foods Association, *Milk Procurement Workshop*, Dallas, TX (Mar. 26, 2003).

[76] Congressional Research Service, *Dairy Policy Issues*, CRS Issues Brief IB97011 (Dec. 19, 2003).

[77] USDA, FSA, *Fact Sheet: Dairy Market Loss Assistance Program* (Mar. 1999), found at *http://www.fsa.usda.gov/pas/publications/facts/dairy99.pdfs,* retrieved Jan. 13, 2004.

past prices), and payments were made up to 39,000 cwt of an individual producer's production (capping payments to individual producers at about $25,000).[78]

Separately, prior to the 2002 Farm Bill, direct income payments were also made to milk producers in the Northeast under the Northeast Dairy Compact. Introduced in July 1997 under provisions of the 1996 Farm Bill, the law required fluid milk processors in the Compact area (covering Maine, New Hampshire, Vermont, Massachusetts, Connecticut, and Rhode Island) to pay a minimum of $16.94 per cwt for Class I milk (milk for fluid use).[79] The Compact was not Federally funded and was ultimately financed by consumers in the form of higher fluid milk prices. The Compact was highly controversial, because producers in non-Compact areas, such as the Upper Midwest, argued that the Compact would lead to production increases in the Compact region and to lower milk prices nationally. Opponents also feared the precedent that the Compact could set for the creation of regional dairy compacts in other parts of the country. The Compact expired on September 30, 2002, and was not reauthorized in the 2002 farm legislation.[80]

The 2002 Farm Bill authorized the National Dairy Market Loss Payment Program (more commonly referred to as the Milk Income Loss Contract Payments program, or MILC Payments program),[81] that provides permanent direct income support to dairy producers as an alternative to ad-hoc emergency payments and dairy compacts. This program contains elements of the DMLA in that it is national, caps individual producer payments, and is Federally funded. It also contains features of the Compact, particularly the target price and payment rate parameters of MILC. Under the MILC program, dairy farmers receive a payment from the USDA whenever the monthly Class I price of milk in Boston falls below $16.94 per cwt, with a payment rate of 45 percent[82] of the difference.[83] The program is targeted mainly to small dairy operations by limiting individual farm payments to the first 2.4 million pounds of production each fiscal year (roughly equivalent to a 133-cow herd producing 18,000 pounds per year).[84] The program was retroactive to December 1, 2001, and is due to expire on September 30, 2005.

During 2002, about 93 billion pounds of milk was eligible for payment[85] and the average payment was $1.20 per cwt,[86] increasing the all-milk prices from about $12.19 to about

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[78] Ibid., (Nov. 2000), found at *http://www.fsa.usda.gov/pas/publications/facts/html/dairy-mar00.htm*, retrieved Jan. 13, 2004.

[79] USDA, ERS, *Milk Pricing in the United States*, Agricultural Information Bulletin No. 761 (Feb. 2001).

[80] Congressional Research Service, *Dairy Policy Issues*, CRS Issues Brief IB97011 (Aug. 3, 1998).

[81] Section 1502 of the Farm Security and Rural Investment Act of 2002 (P.L. 107-171).

[82] 45 percent is the average Class I utilization rate for the Northeast.

[83] USDA, FSA, *Fact Sheet: Milk Income Loss Contract Program* (Nov. 2002), found at *http://www.fsa.usda.-gov/pas/-publications/facts/html/milc02.htm,* retrieved Jan. 13, 2004.

[84] Kenneth W. Bailey, and Charles Abdalla, "Dairy Title to the 2002 Farm Bill: Implications for Dairy Producers in the Northeast," Department of Agricultural Economics and Rural Sociology, Staff Paper No. 352 (Pennsylvania State University, May 2002).

[85] Equal to 170 billion pounds of milk production times 55 percent (the portion milk production eligible for payment, based on a 2.4 million pound per farm cap). See, USDA, ERS, *The 2002 Farm Act: Provisions and Implications for Commodity Markets*, Agriculture Information Bulletin No. AIB778. 67 (Nov. 2002).

[86] Congressional Research Service, *Dairy Policy Issues*, CRS Issues Brief IB97011 (Dec. 19, 2003).

$13.39 for eligible milk. Although payments are reported to be of great benefit to small dairy producers,[87] they may have forestalled some less-efficient operations from exiting the industry thereby prolonging the period of low milk prices.[88] In addition to maintaining small and medium producers in business, the program probably will increase milk supply, thereby lowering the Boston Class I price relative to the target price of $16.94, and thus increasing the payment rate.[89] Other research points to a rather small supply response to the program, since the program payments would likely be less than 3 percent of the total value of milk sales.[90]

Processing of Milk Protein Products

Industry Structure

As shown in figure 3-1, milk protein products are processed in several types of operations in the United States. These include more traditional operations, such as butter/SMP operations, cheese/whey facilities, and fluid milk processing plants. Recently, other types of milk protein processing facilities have emerged, including domestic MPC operations, UF milk operations, and facilities that specialize in the blending and processing of milk proteins.

In recent years, the U.S. dairy processing industry has become much more concentrated. Through mergers and acquisitions, the U.S. industry has increasingly become dominated by a few very large firms and cooperatives, including Suiza, Dean Foods, Dairy Farmers of America, and Land O'Lakes.[91] Two important factors affecting this trend are technological advances in transportation and manufacturing, and the large volume purchase requirements of many retail accounts, that has increased the minimum efficient plant size for milk, SMP, and cheese manufacturing.[92] Trade sources also report that large retail customers generally prefer to deal with a small number of suppliers.

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[87] Dr. Keith Collins, Chief Economist, U.S. Department of Agriculture, in testimony before the U.S. House of Representatives Agriculture Subcommittee on Department Operations, Oversight, Nutrition, and Forestry, May 20, 2003.

[88] Dr. Robert Cropp, professor, University of Wisconsin-Madison, in testimony before the U.S. House of Representatives Agriculture Subcommittee on Department Operations, Oversight, Nutrition, and Forestry, May 20, 2003.

[89] Edward V. Jesse and Robert Cropp, "Dairy Title: Farm Security and Rural Investment Act of 2002," Marketing and Policy Brief Paper No. 76, Department of Agricultural and Applied Economics (University of Wisconsin-Madison, May 2002), found at *http://www.aae.wisc.edu/-www/pub/mpbpapers/mpb76.pdf,* retrieved May 6, 2003; David P. Anderson, Joe L. Outlaw, and Robert B. Schwart, "Structural Change in the Dairy Industry," *10th Annual Workshop for Dairy Economists and Policy Analysts*, Memphis, TN (Apr. 23-24, 2003), pp. 75-79.

[90] Kenneth W. Bailey and Charles Abdalla, "Dairy Title to the 2002 Farm Bill: Implications for Dairy Producers in the Northeast," Department of Agricultural Economics and Rural Sociology, Staff Paper No. 352 (Pennsylvania State University, May 2002).

[91] USDA, ERS, *The Structure of Dairy Markets. Past, Present, Future*, Agricultural Economic Report No. 757 (Sept. 1997).

[92] William D. Dobson and Paul Christ, "Structural Change in the U.S. Dairy Industry: Growth in Scale, Regional Shifts in Production and Processing, and Internationalism," *International Dairy Federation* Bulletin No. 360/2001 (Nov. 2001), pp. 10-19.

Industry concentration is indicated by trends in the number of processing plants and production between 1998 and 2002 (table 3-4). During this period, the number of SMP plants fell from 48 to 44, while average production per plant increased from 24 million pounds to almost 36 million pounds. This compares with 113 SMP plants in 1980 producing about 10 million pounds annually. Further, in 1997,[93] almost 70 percent of production of dry, condensed, and evaporated dairy products (SIC/NAICS code 2023) was accounted for by the top-four largest processors, compared with 35 percent of production by the top four in 1982. The number of cheese plants remained fairly stable during 1998-2002 at about 400, while annual production per plant increased from 19 million pounds to 21 million pounds. This compares with about 740 cheese plants in 1980 each producing on average about 5 million pounds of cheese.[94]

Table 3-4
Skim milk powder and cheese: Manufacturing plant numbers and production in the United States, 1998-2002

Plants/production	1998	1999	2000	2001	2002
	Number of plants				
Number of plants:					
Skim milk powder	48	47	46	44	44
Cheese	398	398	402	407	403
	Million pounds				
Production:					
Skim milk powder	1,135	1,360	1,452	1,414	1,569
Cheese	7,492	7,894	8,258	8,261	8,599
Production per plant:					
Skim milk powder	24	29	32	32	36
Cheese	19	20	20	20	21

Sources: U.S. Department of Agriculture, National Agricultural Statistical Service, *Production of Manufactured Dairy Production,* various issues; U.S. Department of Agriculture, National Agricultural Statistical Service, *Dairy Products. Annual Summary*, various years.

Foreign direct investment (FDI) in the U.S. milk proteins industry has increased significantly over the past 20 years.[95] Irish firms have invested in U.S. production of milk proteins in the United States, partly in response to limited expansion opportunities in European markets owing to quotas that restrict access to milk.[96] The Kerry Group (headquartered in Tralee) has been a major presence in the U.S. dairy ingredient business through a series of acquisitions since 1987 with the purchase of a food ingredient manufacturing facility in Wisconsin and the subsequent acquisition of the Beatreme Food Ingredient Co. in 1988.[97] More recently,

[93] Information based on data from the Census of Manufacturers. 1997 is the most recent data available.

[94] Donald Blayney and James Miller, "Concentration and Structural Change in Dairy Processing and Manufacturing," *10th Annual Workshop for Dairy Economists and Policy Analysts*, Memphis, TN (Apr. 23-24, 2003).

[95] William D. Dobson and Paul Christ, "Structural Change in the U.S. Dairy Industry: Growth in Scale, Regional Shifts in Production and Processing, and Internationalism," *International Dairy Federation* Bulletin No. 360/2001 (Nov. 2001), pp. 10-19.

[96] William D. Dobson, "Competitive strategies of leading world dairy exporters," Babcock Institute Discussion Paper No. 95-1(University of Wisconsin, 1995).

[97] William D. Dobson, Jeffrey Wagner and Rodney Hintz, "When will U.S. firms become major dairy exporters and bigger direct investors in foreign dairy-food businesses?" Babcock Institute Discussion Paper No. 2001-3 (University of Wisconsin, 2001).

Glanbia Ingredients (headquartered in Kilkenny) has invested in three large facilities in Idaho (Twin Falls, Gooding, and Richfield) to produce cheese and whey products.[98] The investments include state-of-the-art technology for the production of high-value whey products, including specialized WPC and WPI. Glanbia has also announced it will begin work on a major new cheese and whey facility in Clovis, NM, in a joint venture with Dairy Farmers of America (DFA), Select Milk Producers, and other dairy cooperatives in the Southwest. The plant is expected to be one of the largest and most efficient facilities in the world, using 2.4 billion pounds of milk annually to produce more than 250 million pounds of cheese and about 7,500 mt of high-value whey protein products.[99] A further example of FDI is the formation of Dairiconcepts, a joint venture between the DFA and Fonterra, to produce MPC 70 at a facility in Portales, NM.[100] Production began in 2002, and once fully operational, the facility will process 900 million pounds of milk annually,[101] and produce up to 16,000 mt of MPC.[102]

Milk Protein Product Production

The supply of domestically produced milk proteins available for use is determined by the total supply of milk, less a small amount of on-farm use. Milk production in the United States reached 170 billion pounds in 2002, of which about 1.4 billion pounds were consumed on farms and 55 billion pounds consumed as beverage milk (accounting for about one-third). The remaining 113 billion pounds was available for use in dairy processing (table 3-5). During the 1998-2002 period, fluid milk available for processing increased about 13 percent, as fluid consumption and on-farm use remained fairly stable and total fluid milk production increased. Although the protein content of raw milk changes seasonally, year-to-year changes are small. USDA's nutrient database reports a 3.3-percent protein content of raw whole milk.[103] Thus the 113 billion pounds of raw milk translates into a supply of about 2.5 million mt of domestic milk protein.

Skim milk powder, whole milk powder, and whey

U.S. production of milk proteins has largely been limited to the production of SMP and whey (including dry whey), WPC, and WPI. U.S. production of these products is reported in table 3-6. SMP production reached almost 1,570 million pounds in 2002, nearly 40-percent higher than production in 1998. Over the same period, U.S. production of whole milk powder dropped to 47 million pounds in 2002, about 100 million pounds below the 1998 level. U.S. production of WPC was about 325 million pounds in 2002, of which close to 90 percent was used for human consumption and 10 percent for animal feed. Production of dry whey is

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[98] USITC staff fieldwork, Twin Falls, ID, Oct. 2003.

[99] Glanbia, press release, "Work begins on new $190m USA cheese and whey products facility being built by Glanbia in joint venture with DFA and Select," found at *http://www.glanbia.ie/-applications/presscentre/press_item.asp?return_year=2004&item_id=3074&press_code=1*, retrieved Jan. 2004

[100] Dairy Farmers of America, prehearing submission, Dec. 1, 2003.

[101] Dairy Companies Association of New Zealand, prehearing submission, Dec. 1, 2003, p. 28.

[102] Dairiconcept officials, interview by USITC staff, Portales, NM, Sept. 2003.

[103] USDA, Food and Nutrition Information Center, Nutrient Data Laboratory, found at *http://www.nal.-usda.gov/fnic/foodcomp/Data/SR16/wtrank/sr16a203.pdf*, retrieved Aug. 14, 2003.

Table 3-5
U.S. fluid milk: Production and availability for processing, 1998-2002

Product	1998	1999	2000	2001	2002
	Million pounds of fluid milk				
Fluid milk	157,348	162,559	167,559	165,497	169,758
Milk used where produced	1,406	1,328	1,303	1,212	1,414
Fluid milk consumed fluid	55,267	55,712	55,517	55,105	55,262
Fluid milk available for processing	100,675	105,519	110,739	109,180	113,082
	1,000 metric tons of milk protein				
Fluid milk available for processing[1]	2,335	2,433	2,508	2,477	2,541

[1] Assumes 3.3 percent protein. U.S. Department Agriculture, Nutrient database.

Sources: U.S. Department of Agriculture, National Agricultural Statistical Service, *Milk Production, Disposition, and Income, Annual Summary*, various years; U.S. Department of Agriculture, National Agricultural Statistical Service, *Dairy Products Annual Summary*, various years.

Table 3-6
Milk protein products: U.S. production by product type, 1998-2002

Product	1998	1999	2000	2001	2002
	1,000 pounds				
Dry milk:					
Skim milk powder, human	1,135,383	1,359,660	1,451,751	1,413,777	1,568,991
Skim milk powder, animal	4,660	4,817	5,567	5,507	7,565
Dried whole milk	142,523	117,991	111,377	41,201	47,411
Dry buttermilk	50,093	52,107	56,245	51,712	54,886
Whey:					
Protein concentrate, human	265,893	315,653	290,462	290,127	287,513
Protein concentrate, animal	40,286	42,794	43,676	46,094	39,059
Solids in wet blends, animal	37,341	36,119	36,217	39,851	37,656
Dried whey:					
Human	1,095,383	1,067,023	1,105,057	978,795	1,052,685
Animal	82,878	80,365	82,846	66,860	63,087
Concentrated whey:					
Sweet type, human	99,186	106,183	101,565	68,824	108,250
Sweet type, animal	22,720	16,204	13,659	12,660	([1])

[1] Not reported.

Source: U.S. Department of Agriculture, National Agricultural Statistical Service, *Dairy Products Annual Summary*, various issues.

about 1 million pounds annually, with most being used for human consumption. U.S. production of most whey products remained rather stable during 1998-2002. There is very little domestic production of casein, caseinates, and MPC; and no data on production are reported by USDA.

Casein

Casein was produced in the United States from 1940 through the mid-1960s. However, there has been almost no domestic production since then, largely because the DPSP made casein relatively less profitable to manufacture than SMP.[104] Although casein use was historically concentrated in the production of industrial products, today it is commonly used in a wide variety of food products for its favorable flavor characteristics and high protein content. U.S. casein production remains generally uncompetitive because of the DPSP, exacerbated by strong competition from casein manufacturers in the EU (that benefit from an EU casein production subsidy) and in New Zealand and Australia (that benefit from low production costs). Thus, most domestic casein consumption is furnished by imports.

In May 2002, the USDA announced its intention to accept bids for CCC-owned SMP on a competitive-offer basis for the manufacture of edible casein or caseinate. The CCC has made available up to 300 million pounds of SMP, 24 months or older, for this purpose by issuing periodic invitations for bids.[105] Under this program, U.S. companies have been awarded a total of 7.9 million pounds of SMP from CCC stocks at an average price of $0.22 per pound. In 5 of 12 bid invitations,[106] the USDA rejected all bids because the bid offers were considered to be too low. Dairy Farmers of America (DFA) is one of the few companies that successfully purchased SMP from the USDA.[107] DFA began production of casein from SMP in 2002 and currently produces over 200,000 pounds of rennet casein per month in its facility in Wellsville, UT, and plans to increase monthly production to 280,000 pounds per month in the near future.[108] Just two companies actively bid for the program's SMP during 2003: DFA, through its entity Northern Utah Manufacturing, and Bluegrass Dairy and Food, Glasgow, KY. Several other companies are currently working with the USDA in manufacturing trials, but may be hesitant to commit to future production absent long-term contracts for SMP.[109]

Observers have noted some technical difficulties of converting SMP to casein.[110] Trials conducted in the 1970s indicated that the heat treatment applied to skim milk during the manufacture of SMP denatures the whey proteins and makes them adhere to the casein protein. Protein denaturing reportedly interfers with the casein production process in which, through acidulation and cooking, the casein protein is completely separated from the rest of the milk components, including the whey proteins. Early trials of casein production from SMP were plagued by very soft curds breaking up into fine curd particles, that complicated the washing and drying of the pure casein curd. These problems reportedly resulted in excessive losses and casein of poor quality and functionality.

The two companies that currently produce casein and caseinates through the USDA program have not reported any technical difficulties with their manufacturing processes,[111] and both

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[104] USDA, ERS, *Effects of Casein Imports*, Staff report AGES860321 (Apr. 1986); U.S. International Trade Commission, *Casein and its Impact on the Domestic Dairy Industry*, Inv. No. 332-105, USITC Pub. 1025 (Dec. 1979).

[105] Announcement RSCS1, "Sale of Nonfat Dry Milk for the Manufacture of Casein or Caseinate," USDA, Kansas City Commodity Office (Apr. 26, 2002).

[106] As of Jan. 2004.

[107] "Nonfat Dry Milk Sales Contract Awards," found at *www.fsa.usda.gov/public/dairy/-defautl.hts,* and Dairy Farmers of America, prehearing submission, Dec. 1, 2003, p. 18.

[108] Dairy Farmers of America, prehearing submission, Dec. 1, 2003, p. 18.

[109] According to the current terms of sale, U.S. companies are required to complete the conversion of SMP to casein/caseinate within 120 days of purchase. Farm Services Agency official, USDA, telephone interview by USITC staff, Jan. 9, 2004.

[110] Dairy Australia, prehearing submission, Dec. 1, 2003, pp. 28-30; Foreign industry official, interview by USITC staff, Victoria, Australia, Nov. 11, 2003.

[111] Farm Services Agency official, USDA, telephone interview by USITC staff, Jan. 9, 2004

are making commercial sales.[112] The USDA reports that the casein is generally sold to manufacturers of coffee-creamers and powdered baking mixes.[113] The USDA program requires producers to manufacture casein to a dry state and therefore may limit its potential end uses.[114]

Thus far, the USDA program provides only for the production of casein and/or caseinates, although some groups have encouraged Congress to extend the SMP sales to MPC production as well.[115] Trials by some U.S. dairy food manufacturers have shown that conversion of SMP to MPC is technically viable.[116]

Caseinate

All caseinate produced in the United States is manufactured by a few firms from imported casein. Erie Foods, in Erie, IL, produces a variety of caseinates mostly from imported casein purchased from Murray Goulburn Cooperative Co. Ltd. in Australia.[117] New Zealand Milk Products has a facility in Allerton, IA, that manufactures caseinate and other highly specialized protein products mostly from casein produced in New Zealand.[118] The American Casein Co. also produces a range of caseinate products from casein sourced throughout the world.[119] The U.S. industry's ability to target small, highly customized caseinate markets and a faster delivery time, allows U.S. caseinate producers to be competitive with foreign suppliers in these markets. Delivery times from Australia and New Zealand are approximately 8-10 weeks, while delivery time runs 6-12 weeks for shipments from the EU.[120] However, although these factors provide some competitive advantage for production of caseinate in the United States, they are not sufficient to overcome all the previously noted advantages realized by foreign producers of casein. Consequently, the majority of caseinate consumed in the United States is imported.

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[112] Ibid.
[113] Ibid.
[114] Ibid.
[115] James E. Tillison, CEO, Alliance of Western Milk Producers, letter to U.S. Representative Philip Crane, June 6, 2002 found at *www.waysandmeans.house.gov/legacy/trade/107cong/-tradebills/hr1786westernmilkprod.pdf*.
[116] U.S. industry officials, interviews by USITC staff, Oct. 10-11, 2003.
[117] Erie Foods International, Inc., *Past, Present & Beyond*, found at *http://www.eriefoods.com*.
[118] U.S. industry official, interview by USITC staff, Jan. 29, 2004.
[119] American Casein Company, "Custom powder blending," found at *http://www.american-casein.com/docs/-blending%208-01.pdf.*
[120] U.S. and European industry official, inteview by USITC staff, Oct. 5-17, 2003.

Ultrafiltered milk

Commercial production of UF milk in the United States began in the late-1990s. In 1996, the U.S. Food and Drug Administration (FDA) approved a patented technology for the ultrafiltration of cold, unpasteurized milk.[121, 122] This process results in UF milk, either whole or skim, that has not been heat treated and is considered a fresh milk product by end users. UF milk is not dried and is shipped in liquid form, primarily to other dairy producers. It also is referred to as liquid MPC (sometimes called "wet" MPC). The patented technology involves a single-pass, cold-filtered process, as opposed to a hot, recirculated process that is typical of commercial dry MPC production.[123] Single-pass filtration has been designed to take place adjacent to the dairy farm that supplies the raw milk for the operation, and therefore has also come to be known as "on-farm ultrafiltration."

Despite differences in production processes, UF milk and MPC can be used in many of the same food processing applications. However, current FDA regulations allow for the use of UF milk in a wider array of dairy products than MPC. Whole UF milk is sold mainly to cheesemakers who prefer cold, fresh UF milk to MPC since UF milk has not been pasteurized. Such customers report that ultrafiltered milk provides a better yield for cheese production while maintaining quality, and does not have to be reconstituted.[124] Skim UF milk has been sold mainly to yogurt manufacturers.[125]

Currently two UF milk facilities in the United States use the single-pass, cold-filtered production process: the Select Dairies facility in Dexter, NM, and the California Dairies facility in Tipton, CA.[126] A third facility in Southeastern Georgia is being developed. The Select Dairies facility produces UF milk from both whole and skim milk, but the California Dairies facility produces UF milk using only whole milk.[127] Both facilities produce UF milk to a 3.0 to 3.5 concentration (3X or 3.5X).[128]

Until recently, Select Milk Producers operated additional on-farm facilities in Lake Arthur, NM, El Paso, TX, and Commanche, TX. Currently the Dexter facility is undergoing an expansion that will double its plant capacity, whereas the Commanche and El Paso facilities

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[121] The FDA subsequently approved a process by which cold milk can be filtered using existing recirculation UF technology. This approval became effective following the April 2003 meeting of the National Conference of Interstate Milk Shippers, a group of dairy industry representatives and FDA staff that meets biannually, and is currently a part of the Pasteurized Milk Ordinance. The FDA had prohibited recirculation of cold milk owing to concerns that unpasteurized milk could become contaminated if permitted to recirculate within the machinery. The FDA now allows the recirculation process because existing regulations permit milk to be stored in a silo for up to 72 hours and that maintaining milk temperature at 45 degrees will keep staph bacteria from surviving.

[122] North American Milk Products, a joint venture comprised of T.C. Jacoby, a dairy broker, Select Dairies, and Membrane Systems Specialists, holds the patent on the single-pass ultrafiltration technology used in the United States.

[123] U.S. industry official, interview by USITC staff, Oct. 20, 2003.

[124] Mr. Mike McCloskey, Select Milk Producers, testimony before the USITC, Dec. 11, 2003, transcript p. 186.

[125] USITC fieldwork, Dexter, NM, Oct. 23, 2003.

[126] U.S. industry officials, interviews by USITC staff, Oct. 22, 2003; Mr. Richard Cotta, California Dairies, testimony before the USITC, Dec. 11, 2003, transcript p. 142.

[127] U.S. industry officials, interviews by USITC staff, Oct. 22, 2003, and Oct. 27, 2003.

[128] On a dry matter basis, 3X UF skim milk is approximately equivalent to MPC 60.

are being dismantled. As a result, Select Milk Producers' total production capacity will remain essentially unchanged at 15 million pounds per year of UF milk on a dry-weight basis.[129] Select Milk Producers report that the Dexter facility is currently running at, or near, full capacity.[130]

California Dairies processes approximately 52 million pounds of raw milk per month at its Tipton facility.[131] California Dairies representatives have noted a diminishing interest on the part of dairy farmers in California to invest in on-farm ultrafiltration technology. They attribute this to the considerable capital investment involved, the need for technical expertise, and the questionable ability to justify the transportation costs of shipping a liquid product over short to medium distances.[132] In addition, California Dairies representatives reported that they are currently experiencing a softening of demand for their UF milk, which they attribute to cheaper MPC imports.[133] In 2003, California Dairies conducted a trial production of MPC, but was not able to produce at a price competitive with imports.[134] California Dairies currently reports that its UF facilities are operating at between 50 and 60 percent capacity.[135]

A third U.S. facility produces UF milk using an alternative production system. O-AT-KA Milk Products in Batavia, NY, is a joint venture between the Dairylea Cooperative, the Niagara Milk Cooperative, and Upstate Farms Coopeative. The O-AT-KA facility uses a two-stage filtration system to produce UF milk rather than the patented single-pass, cold-filtered process.[136] The facility produces some UF milk for use in down-stream products (such as meal replacers, protein drinks, and medical nutritional products) that are also produced by the company.[137] The O-AT-KA facility experimented with producing dry MPC, but does not consider such production to be feasible at current MPC prices.[138] O-AT-KA Milk Products reports that its UF facility is running at, or near, capacity.[139]

It is important to note that the production facilities of all three U.S. producers (Select Farms, California Dairies, and O-AT-KA Milk Products) are certified as Grade A facilities. This certification permits the UF milk produced in these facilities to be used in the production of dairy products that require Grade A ingredients. While current FDA standards of identity permit the use of MPC in the production of yogurt, yogurt is considered a Grade A product

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[129] Mr. Michael McCloskey, Select Milk Producers, testimony before the USITC, Dec. 11, 2003, transcript p. 137.

[130] NMPF, posthearing submission, Jan. 15, 2004.

[131] Richard Cotta, California Dairies, testimony before the USITC, Dec. 11, 2003, transcript p. 142.

[132] Ibid.

[133] Ibid., pp. 142-43.

[134] Ibid., p. 141.

[135] NMPF, posthearing submission, Jan. 15, 2004.

[136] C.A. McCampbell, O-AT-KA Milk Products Cooperative, letter to the USITC, Nov. 26, 2003.

[137] C.A. McCampbell, O-AT-KA Milk Products Cooperative, letter to the USITC, Nov. 26, 2003 and Mr. Timothy R. Harner, O-AT-KA Milk Products Cooperative, testimony before the USITC, Dec. 11, 2003, transcript p. 179.

[138] Company officials, O-AT-KA Milk Products Cooperative, interview by USITC staff, Jan. 21, 2004.

[139] Ibid.

and therefore only milk proteins produced in a Grade A facility may be used in the production of yogurt.[140]

Milk protein concentrate

The production of MPC in the United States is generally confined to a few firms that produce blended MPC using imported and domestically produced milk proteins, and one facility that produces MPC using the ultrafiltration method. A small number of firms in the United States produce blended MPC using imported casein and caseinate, domestic SMP, and domestic WPC. The American Casein Co. reported in 2001 that its facilities were available for contract blending of milk proteins for the food, nutrition, and technical industries.[141]

MPC production using the ultrafiltration process in the United States is limited to the Dairiconcepts plant in Portales, NM. The Dairiconcepts facility is a joint-venture between the DFA, one of the largest U.S. dairy marketing cooperatives, and Fonterra (successor entity to the New Zealand Dairy Board, see chapter 4). Prior to the joint-venture, the Portales facility was wholly owned by DFA and served as a balancing plant, producing SMP and cream. The facility was not profitable, but continued to operate to handle the excess fluid milk supply in the Southwest, which was not marketed outside the region owing to prohibitive transportation costs.[142]

In 2002, the Portales facility was modified to produce MPC by installing ultrafiltration equipment to the existing evaporation and drying equipment at the plant. The facility was uniquely suitable for MPC production because its physical infrastructure differed from what is typically found in a butter/powder plant. These differences limited the need for significant additional capital investment to enable the production of MPC.[143] With completion of an expansion to the plant in February 2004, the facility has the capacity to produce approximately 16,000 mt of MPC 70 annually.

The MPC produced at Portales may have an important advantage over MPC imported from other countries. Dairiconcepts has applied for Grade A status, and if granted, the MPC produced at the facility could be used in any other Grade A facility or in the production of Grade A products, in which the FDA standard of identity does not prohibit the use of MPC. Should the facility receive Grade A status, MPC produced in that facility could be used in the production of yogurt and other cultured products, and ice cream and frozen desserts.

[140] FDA officials, interview by USITC staff, Dec. 8 2003; Mr. Michael Reinke, Kraft Foods, testimony before the USITC, Dec. 11, 2003, transcript pp. 315-16.
[141] American Casein Company, "Custom powder blending," found at *http://www.american-casein.com/docs/-blending%208-01.pdf.*
[142] Dairiconcepts official, interview by USITC staff, Oct. 22, 2003.
[143] Ibid.

Government Programs Affecting Processed Milk Protein Products

Pasteurized Milk Ordinance

Processors of milk protein products in the United States are subject to strict sanitation requirements that ensure the milk supply is safe for fluid consumption and for manufacture into dairy products.[144] Federal rules governing how milk should be produced, processed, handled, pasteurized, sampled, labeled, and distributed are provided in the Grade A Pasteurized Milk Ordinance (PMO) with orgins dating back to 1924. With changing technology and the development of new products and production techniques, the PMO has been revised every 2 years since the early-1990s, and as many as 24 revisions have been implemented since 1924. The most recent revision was published in May 2002.[145] The PMO is published by the FDA based on recommendations of the National Conference on Interstate Milk Shipments (NCIMS) that includes milk, sanitation, and regulatory agencies in all levels of government, as well as dairy industry representatives and scientists from education and research organizations.[146] Not only does the PMO provide measures against milk-borne diseases, but it also facilitates interstate and intrastate trade of milk produced in accordance with the Ordinance without concerns regarding milk safety. Thus the PMO represents a national standard for sanitary control for milk,[147] and facilitates the marketing and distribution of dairy products throughout the country.

U.S. Food and Drug Administration standards of identity

Processed milk protein products in the United States are subject to standards of identity for food products. These were introduced under the 1938 Federal Food, Drug, and Cosmetic Act and are enforced by the FDA.[148] Standards of identity provide definitions for food products by establishing requirements on what ingredients must or may be used in the food manufacturing process, as well as the quantity of such ingredients. Standards of identity are contained in the Code of Federal Regulations (CFR), Title 21 Food and Drugs; Part 131 covers milk and cream (including nonfat dry milk, whole milk powder, evaporated and condensed milk, and yogurt),[149] Part 133 covers cheese and related cheese products,[150] and Part 135 covers frozen deserts.[151] The standard for cheddar cheese (133.113) sets minimum requirements for milkfat and moisture content, as well as allowable ingredients, such as milk, nonfat milk, cream, rennet, and other clotting enzymes. Cheese covered by standards of

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[144] Congressional Research Service, *Milk Standards: Grade A vs.Grade B*, CRS Report 91-589 ENR (Aug. 5, 1991).

[145] U.S. Food and Drug Administration, Center for Food Safety & Applied Nutrition, Grade "A" Pasteurized Milk Ordinance, 2001 Revision (May 15, 2002), found at *http://www.cfsan.fda.gov/-~ear/pmo01.html,* retrieved June 20, 2003.

[146] The NCIMS began in the early-1950s, with the objective of developing rules for movement of milk between states without concern for different state standards of milk sanitation.

[147] Kenneth W. Bailey, *Marketing and Pricing of Milk and Dairy Products in the United States* (Ames IA: Iowa State University Press, 1997).

[148] Food safety regulation and enforcement of all products (except for meat, poultry, and eggs which are covered by USDA) are under the jurisdiction of the FDA, which is part of the Department of Health and Human Services' Public Health Service.

[149] See, *http://www.access.gpo.gov/nara/cfr/waisidx_03/21cfr131_03.html*.

[150] Ibid.

[151] Ibid.

identity cannot be produced using MPC as an ingredient. However, the standards of identity allow MPC to be used in starter cultures, which generally account for less than 5 percent of the total milk content.

Although the FDA standards of identity do not explicitly provide for the use of fluid UF milk as an ingredient in standardized cheese, filtration technology is used in U.S. cheesemaking under the "alternate make" procedures authorized in certain cheese standards.[152] The FDA has indicated that milk that has been ultrafiltered "as an integral part of the cheesemaking process" is acceptable in the production of standardized cheeses. This permits cheese manufacturers that conduct the ultrafiltration process on-site during the cheese manufacturing process to use UF milk. However, the FDA has exercised enforcement discretion with respect to cheddar and mozzarella plants that procure UF milk produced outside their own cheesemaking plants.[153] In 2001, the General Accounting Office (GAO) reported that the majority of the ultrafiltered milk transported from ultrafiltration facilities was destined for use in the cheesemaking operations of related companies.[154]

Several types of cheese are not covered by standards of identity, such as ricotta and feta. Also, highly processed cheese products (such as Kraft Velveeta cheese and Kraft Singles) do not have standards of identity. These products have no restrictions on the ingredients and therefore MPC can be used legally in their production processes.[155]

The standard of identity for ice cream, under 135.110 (b) Optional dairy ingredients, allows for the use of "skim milk, that may be concentrated, and from which part or all of the lactose has been removed by a safe and suitable procedure." Since milk protein concentrate is not defined, this standard could allow for the use of both UF milk and MPC in the manufacture of ice cream.[156] However, the FDA standards limit the share of total milk solids that optional ingredients can account for in the ice cream. This may restrict or limit the use of optional ingredients, including MPC, in the production of ice cream.[157]

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[152] "Alternate make" provisions allow for deviation from the prescribed method of manufacture, as long as the procedure results in a cheese with the same physical and chemical properties.

[153] U.S. General Accounting Office, *Dairy Products: Imports, Domestic Production, and Regulation of Ultra-filtered Milk*, GAO-01-326 (Mar. 2001), p. 12; Officials of Food Standards & Labeling Office, Center for Food Safety and Applied Nutrition, Food and Drug Administration, interview by USITC staff, Dec. 8, 2003.

[154] U.S. General Accounting Office, *Dairy Products: Imports, Domestic Production, and Regulation of Ultra-filtered Milk*, GAO-01-326 (Mar. 2001), p. 11.

[155] In December 2002, the FDA sent a letter to Kraft (See, *http://www.fda.gov/foi/warning_-letters/g3740d.pdf,* retrieved July 17, 2003) indicating that inspections of three plants found MPC being used as an ingredient in the production of cheese products subject to standards of identity, and Kraft had listed MPC as an ingredient in its labels for packaged American cheese slices. In response, Kraft changed the name of Kraft Singles from "Pasteurized Process Cheese Food" to "Pasteurized Prepared Cheese Product." "Kraft to change label on American singles," *Wisconsin State Journal* (Dec. 10, 2002). Because there is no standard of identity for pasteurized prepared cheese product, Kraft is able to continue using MPC as an ingredient.

[156] Staff, Food Standards & Labeling, Center for Food Safety and Applied Nutrition, and Milk Safety Branch, Food and Drug Administration, interviews by USITC staff, Dec. 8, 2003 and May 3 and 4, 2004; U.S. General Accounting Office, *Dairy Products: Imports, Domestic Production, and Regulation of Ultra-filtered Milk,* GAO-01-326 (Mar. 2001), p. 11; and responses to Commission questionnaires.

[157] The International Ice Cream Association, *A White Paper on Modernizing Federal Ice Cream Standards*, April 2, 2003.

Additionally, the FDA standards appear to permit the use of MPC in the production of yogurt. The standard of identity for yogurt lists specific permissible milk-derived ingredients under 131.200 (d)(1), 131.203 (d)(1), and 131.206 (d)(1). Interested parties objected to this list and argued that the regulation should instead allow for the use of any safe and suitable milk-derived ingredient. In response to the objections, those portions of the standard were stayed, pending a hearing on the matter.[158] As a result, yogurt manufacturers are permitted, under the standard, to use any safe and suitable milk-derived ingredient in yogurt, including MPC.[159] However, a Notice was published in the Federal Register and the Code of Federal Regulations in which the stayed portions of the standard were not identified.[160] Subsequent printings of the CFR have not been corrected.[161] As a result, it is not widely known in the U.S. industry that the standard has been stayed.

Further, yogurt is a Grade A product, which requires that all ingredients used in the production of yogurt also must be Grade A products. Currently, neither imported nor U.S.-produced MPC is considered a Grade A product. As noted above, Dairiconcepts, the sole U.S. producer of MPC, is applying for Grade A status.

Imports of Milk Protein Products

Import Trends[162]

In addition to domestic production, the supply of milk protein products in the U.S. market is furnished by imports (figure 3-1). In 2002, U.S. imports of milk protein products were valued at about $630 million, and accounted for about 40 percent of the value of all U.S. imports of dairy products.[163] Milk protein imports that year totaled 193,000 mt (roughly 10 percent higher than imports in 1998); about 70 percent were casein, caseinates, and MPC, and about 20 percent were whey protein products of various types (table 3-7). Other milk protein imports, such as SMP and fluid products, make up a smaller share of imports, largely because they are subject to tariff-rate quotas (TRQs) with high over-quota tariffs. During 1998-2002, imports of casein, caseinate, and high-protein MPC (HTS 3501.10.10) fluctuated considerably, but did not exhibit any appreciable upward or downward trend. In contrast, imports of MPC in the 40 to 90 percent protein range (HTS 0404.90.10) increased from 29,000 mt in 1998 to almost 53,000 mt in 2000, before falling to roughly 34,000 mt in 2002. U.S. imports of whey generally increased during 1998-2002, including imports of WPI (reported under milk albumin in table 3-7) and WPC.

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[158] 47 Federal Register 41519 (Sept. 21, 1982).

[159] Staff, Food Standards & Labeling, Center for Food Safety and Applied Nutrition, Dec. 8, 2003; and Leslie G. Sarasin, President, National Yogurt Association, Citizen petition on yogurt standards of identity, Feb. 18, 2000.

[160] Staff, Food Standards & Labeling, Center for Food Safety and Applied Nutrition, Dec. 8, 2003.

[161] Ibid.

[162] Detailed data on U.S. imports and exports of milk protein products are provided in appendix F.

[163] USDA, FAS, *U.S. imports of dairy products for consumption*, found at, *http://www.fas.-usda.gov/dlp/circular/-2003/03-07Dairy/ustimp.pdf*, retrieved Jan.15, 2004.

Table 3-7
Milk protein products: U.S. imports by product type,[1] 1998-2002

Product	1998	1999	2000	2001	2002
	Metric tons of product				
Casein	70,394	65,960	74,230	61,577	57,559
Caseinate	29,929	32,460	34,200	38,234	34,709
Milk protein concentrate	28,929	44,877	52,677	28,468	33,626
Milk albumin	10,916	9,535	12,579	10,834	15,594
Whey	5,832	4,376	8,171	13,362	13,444
Whey protein concentrate	4,642	6,818	7,610	6,990	9,236
Casein/Milk protein concentrate	10,919	9,849	11,921	6,934	7,815
Fluid whole milk	5,977	7,392	3,550	3,283	7,337
Skim milk powder	4,957	5,731	4,207	3,889	6,828
Whole milk powder	3,265	4,826	4,270	4,204	4,586
Concentrated unsweetened milk	421	895	1,748	3,226	1,963
Dried whey	152	9	93	375	520
Fluid skim milk	42	136	239	346	137
Food preparations	37	41	52	9	44
Total	176,412	192,905	215,549	181,731	193,399

[1] Casein 3501.10.50; caseinate 3501.90.60; milk protein concentrate 0404.90.10; milk albumin 3502.20.00, 3502.90.00; casein/MPC 3501.10.10; skim milk powder 0402.10.05, 0402.10.10, 0402.10.50, 0402.21.02, 0402.21.05, 0402.21.25; whey protein concentrate 0404.10.05; whole milk powder 0402.21.27, 0402.21.30, 0402.21.50, 0402.21.73, 0402.21.75, 0402.21.90, 0402.29.05, 0402.29.10, 0402.29.50; whey 0404.10.08, 0404.10.11, 0404.10.15, 0404.10.20, 0404.90.28, 0404.90.30, 0404.90.50, 0404.90.70; fluid whole milk 0401.20.20, 0401.20.40; concentrated unsweetened milk 0402.91.03, 0402.91.06, 0402.91.10, 0402.91.30, 0402.91.70, 0402.91.90; dried whey 0404.10.48, 0404.10.50, 0404.10.90; fluid skim milk 0401.10.00; food preparations (derived from dried milk, buttermilk, or whey of chapter 4) 2106.90.03, 2106.90.06, 2106.90.09.

Source: Compiled from official statistics of the U.S. Department of Commerce.

The EU and New Zealand are the major countries supplying milk proteins to the U.S. market. Together they account for two-thirds of all such imports (table 3-8). During 1998-2002, imports from New Zealand were rather stable, ranging from about 65,000-71,000 mt annually, whereas imports from the EU were more volatile. Canada is the third-most important U.S. supplier; however U.S. imports consist mainly of whey, SMP, and fluid milk products. Australia ranks fourth among leading import suppliers, although considerably less important than the EU and New Zealand. Other countries that supply the U.S. market with milk proteins include Poland, India, and certain members of the former Soviet Union.

U.S. imports of the major milk protein products from the EU, New Zealand, and Australia are shown in table 3-9. Major suppliers of casein to the U.S. market include the EU (40 percent market share), New Zealand (30 percent), and Australia (10 percent). Other significant U.S. suppliers of casein are India and Poland. New Zealand is the largest supplier of U.S. imports of MPC (60-percent share in 2002) with imports steadily trending up at about 23 percent annually between 1998 and 2002. In contrast, U.S. MPC imports from the EU have been highly volatile, increasing from 10,000 mt in 1998 to 21,000 mt in 2000, before plummeting to less than 3,000 mt in 2001. Other countries, including Australia, supplied smaller volumes of MPC to the U.S. market during 1998-2002. The EU and New Zealand are also the largest suppliers of U.S. imports of caseinates, accounting for 92 percent of the total volume in 2002. Imports from Poland are relatively modest but have increased rapidly in the last several years. Finally, casein/MPC (HTS 3501.10.10) is almost exclusively supplied to the United States by the EU, New Zealand, and Australia.

Table 3-8
Milk protein products:[1] U.S. imports by principal suppliers, 1998-2002

Country	1998	1999	2000	2001	2002
	Metric tons				
European Union	62,381	74,377	87,400	56,267	65,637
New Zealand	67,629	64,611	69,292	70,699	65,021
Canada	18,267	21,576	20,938	26,289	28,196
Australia	9,988	16,399	17,414	9,588	14,130
India	3,861	4,621	5,369	4,445	6,774
Poland	4,257	2,580	1,282	4,393	3,560
Russia	5,176	3,788	4,804	1,845	2,368
Ukraine	1,038	1,887	2,632	2,230	2,169
Israel	600	514	0	600	1,154
Hungary	730	845	1,934	1,627	949
Mexico	317	396	870	897	622
Norway	468	118	183	791	438
Estonia	180	540	580	401	406
Lithuania	423	109	185	20	380
China	54	37	430	392	200
Other	1,042	508	2,236	1,245	1,393
Total	176,412	192,905	215,549	181,731	193,399

[1] Casein 3501.10.50; caseinate 3501.90.60; milk protein concentrate 0404.90.10; milk albumin 3502.20.00, 3502.90.00; casein/MPC 3501.10.10; skim milk powder 0402.10.05, 0402.10.10, 0402.10.50, 0402.21.02, 0402.21.05, 0402.21.25; whey protein concentrate 0404.10.05; whole milk powder 0402.21.27, 0402.21.30, 0402.21.50, 0402.21.73, 0402.21.75, 0402.21.90, 0402.29.05, 0402.29.10, 0402.29.50; whey 0404.10.08, 0404.10.11, 0404.10.15, 0404.10.20, 0404.90.28, 0404.90.30, 0404.90.50, 0404.90.70; fluid whole milk 0401.20.20, 0401.20.40; concentrated unsweetened milk 0402.91.03, 0402.91.06, 0402.91.10, 0402.91.30, 0402.91.70, 0402.91.90; dried whey 0404.10.48, 0404.10.50, 0404.10.90; fluid skim milk 0401.10.00; food preparations (derived from dried milk, buttermilk, or whey of chapter 4) 2106.90.03, 2106.90.06, 2106.90.09.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 3-9
Milk protein products:[1] U.S. imports by major protein product and principal suppliers, 1998-2002

Product/country	1998	1999	2000	2001	2002
	Metric tons of product				
Casein:					
European Union	28,003	28,210	31,085	25,382	22,006
New Zealand	27,799	21,704	23,969	21,829	16,984
Australia	3,698	5,697	5,248	4,898	6,415
Other	10,894	10,349	13,928	9,468	12,154
Total	70,394	65,960	74,230	61,577	57,559
Milk protein concentrate:					
European Union	9,832	20,197	21,300	2,720	8,392
New Zealand	11,243	14,601	19,352	21,192	20,610
Australia	2,246	4,967	6,936	2,154	2,564
Other	5,608	5,112	5,089	2,402	2,060
Total	28,929	44,877	52,677	28,468	33,626
Caseinate:					
European Union	15,563	17,985	20,546	20,303	20,093
New Zealand	14,034	13,501	12,995	14,811	11,971
Australia	127	607	139	0	0
Other	205	367	520	3,120	2,645
Total	29,929	32,460	34,200	38,234	34,709
Casein/Milk protein concentrate:					
European Union	6,476	5,409	7,270	1,960	3,235
New Zealand	3,135	2,971	3,263	4,081	2,681
Australia	244	320	20	117	1,453
Other	1,064	1,149	1,368	776	446
Total	10,919	9,849	11,921	6,934	7,815

[1] Casein 3501.10.50; milk protein concentrate 0404.90.10; caseinate 3501.90.60; casein/MPC 3501.10.10.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Import Penetration in the Domestic Market

An alternative way of expressing milk protein imports is in metric tons of protein (protein equivalent), rather than tons of product. Converting imports into protein equivalents allows imports to be summed across a heterogenous range of products. Import volumes of protein can then be compared with domestic production of milk protein to provide a meaningful estimation of the contribution of imports to overall domestic supply.[164] Imports of product can be converted into protein equivalents using conversion factors that indicate the percentage of protein contained in each product. These protein percentages are reported by the USDA's Nutrient Data Laboratory. Table 3-10 reports the volume of U.S. milk protein imports by product type from import quantities previously reported in table 3-7.

During 1998-2002, U.S. imports of milk proteins were equivalent to about 139,300 mt of protein annually. Major components of the total included casein (40 percent), caseinate (22 percent), and MPC (18 percent), milk albumin (7 percent), and casein/MPC (6 percent). Domestic production of protein can be calculated by converting total U.S. milk production to a protein basis using a factor of 3.3 which represents an average of the protein content of fluid milk. The resulting domestic protein supply estimate ranges from 2.4 to 2.5 million mt per year during 1998-2002. Imports of milk protein products therefore represented about 5 to 6 percent of domestic production over this period. Import penetration ratio estimates for milk proteins reported by other researchers are of similar magnitude.[165]

Government Import Programs

U.S. imports of milk protein products are subject to tariff and nontariff measures. Tariff treatment of U.S. imports of milk proteins is discussed at length in chapter 8 of this report. Nontariff measures generally address health and sanitary issues relating to imported dairy products. For example, imports into the United States of fluid milk products are prohibited unless they are accompanied by a valid permit issued by the U.S. Secretary of Health and Human Services under the provisions of the Import Milk Act of 1927.[166]

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[164] Kenneth W. Bailey, "Impact of Dairy Imports on the U.S. Dairy Industry: A Component Analysis," Department of Agricultural Economics and Rural Sociology, Staff Paper No. 367 (Pennsylvania State University, July 2003), found at *http://dairyoutlook.aers.psu.edu/-reports/Pub2003/-staffpaper367.pdf*, retrieved Aug. 2003

[165] NMPF, prehearing submission, Dec. 1, 2003, figure 3, p. 10; Dairy Companies Association of New Zealand, prehearing submission, Dec. 1, 2003, pp. 36-43; Kenneth Bailey, Grigorios Emvalomatis, and Zhen Wu, prehearing submission, Dec. 11, 2003.

[166] For more information on the Milk Import Act, see *http://www.fda.gov/opacom/laws/-fimilkat.htm*.

Table 3-10
Milk protein products: U.S. imports by product on a protein basis, 1998-2002

Products[1]	1998	1999	2000	2001	2002
	Metric tons of protein[2]				
Casein	61,243	57,385	64,580	53,572	50,076
Caseinate	27,235	29,539	31,122	34,793	31,585
Milk protein concentrate	18,804	29,170	34,240	18,504	21,857
Milk albumin	8,733	7,628	10,063	8,667	12,475
Casein/Milk protein concentrate	9,827	8,864	10,729	6,241	7,034
Whey protein concentrate	2,646	3,886	4,338	3,984	5,265
Skim milk powder	1,785	2,063	1,515	1,400	2,458
Whey	752	565	1,054	1,724	1,734
Whole milk powder	849	1,255	1,110	1,093	1,192
Fluid whole milk	197	244	117	108	242
Concentrated unsweetened milk	33	71	138	255	155
Dried whey	20	1	12	48	67
Fluid skim milk	1	5	8	12	5
Food preparations	0	0	0	0	0
Total	132,125	140,675	159,026	130,401	134,145
U.S. milk production	2,355,295	2,433,297	2,508,141	2,477,275	2,541,057
Import share (*percent*)	5.6	5.8	6.3	5.3	5.3

[1] Casein 3501.10.50; caseinate 3501.90.60; milk protein concentrate 0404.90.10; milk albumin 3502.20.00, 3502.90.00; casein/MPC 3501.10.10; skim milk powder 0402.10.05, 0402.10.10, 0402.10.50, 0402.21.02, 0402.21.05, 0402.21.25; whey protein concentrate 0404.10.05; whole milk powder 0402.21.27, 0402.21.30, 0402.21.50, 0402.21.73, 0402.21.75, 0402.21.90, 0402.29.05, 0402.29.10, 0402.29.50; whey 0404.10.08, 0404.10.11, 0404.10.15, 0404.10.20, 0404.90.28, 0404.90.30, 0404.90.50, 0404.90.70; fluid whole milk 0401.20.20, 0401.20.40; concentrated unsweetened milk 0402.91.03, 0402.91.06, 0402.91.10, 0402.91.30, 0402.91.70, 0402.91.90; dried whey 0404.10.48, 0404.10.50, 0404.10.90; fluid skim milk 0401.10.00; food preparations (derived from dried milk, buttermilk, or whey of chapter 4) 2106.90.03, 2106.90.06, 2106.90.09.

[2] Protein content of imports are taken from USDA Nutrient Data Laboratory, found at *http://www.nal.usda.gov/-fnic/foodcomp/Data/SR14/sr14.html.* Percentage protein of products: Casein, 87; caseinate, 91; milk protein concentrate, 65; milk albumin, 80; casein/MPC, 90; skim milk powder, 36; whey protein concentrate, 57; whole milk powder, 26; whey, 12.9; fluid whole milk, 3.3; concentrated unsweetened milk, 7.9; dried whey, 12.9; fluid skim milk, 3.4; food preparations, 0.

Sources: Commission estimates based on official statistics of the U.S. Department of Commerce; USDA, Nutrient Data Laboratory; USDA, National Agricultural Statistical Service, *Milk Production*, various issues.

Exports of Milk Protein Products

Export Trends[167]

U.S. exports of milk protein products were valued at $361 million in 2002,[168] accounting for about one-third of all U.S. dairy exports.[169] In 2002, the United States exported 320,000 mt of milk protein products, about 22 percent higher than in 1998, although below the peak of 355,000 mt in 2000 (table 3-11). In terms of volume, dry whey is the most important export, accounting for about one-half of all milk protein exports, followed by SMP (23 percent),

[167] Detailed data on U.S. imports and exports of milk protein products is provided in appendix F.

[168] This compares with milk protein product imports of $633 million in 2002.

[169] USDA, FAS, *U.S. Dairy Exports*, found at *http://www.fas.usda.gov/dlp/circular/2003/-03-12Dairy/ust.pdf*.

Table 3-11
Milk protein products: U.S. exports by product type,[1] 1998-2002

Product	1998	1999	2000	2001	2002
	Metric tons				
Dried whey	100,214	121,402	181,744	146,226	154,846
Skim milk powder	72,916	120,858	101,048	96,159	74,063
Whole milk powder	51,294	17,605	25,440	46,070	37,826
Whey protein concentrate	20,362	16,869	18,363	26,587	28,383
Fluid whole milk	20,942	9,967	14,795	13,492	14,063
Concentrated milk	2,767	1,003	1,166	3,868	4,166
Milk protein concentrate	2,605	2,977	4,540	2,843	2,323
Whey	2,577	2,368	625	1,060	1,211
Fluid skim milk	5,363	2,477	2,175	1,032	969
Caseinate	4,951	3,698	2,853	2,278	1,971
Casein	1,504	15,177	2,121	1,072	448
Total	285,495	300,671	354,871	340,688	320,269

[1] Skim milk powder 0402.10.0000; dried whey 0404.10.0850, 0404.10.4000; whey protein concentrate 3502.20.0000, 3502.90.0000, 0404.10.0500; whole milk powder 0402.21.0000, 0402.29.0000; fluid whole milk 0401.20.0000; caseinate 3501.90.2000 and 3501.90.6000; milk protein concentrate 0404.90.0000; concentrated milk 0402.91.0000; casein 3501.10.0000; whey 0404.10.2000; fluid skim milk 0401.10.0000.

Source: Compiled from official statistics of the U.S. Department of Commerce.

WMP (12 percent), and WPC (9 percent). U.S. exports of SMP declined during 1999-2002, largely because of limits on the export volume that can receive export assistance under the World Trade Organization (WTO) Agreement on Agriculture. U.S. exports of WPC have grown significantly since 1999, and the United States is highly competitive in the international market for WPC without government support.[170]

U.S. exports of milk protein products are focused on North American Free Trade Agreement countries and Asia (table 3-12). In 2002, Mexico accounted for one-quarter of all milk protein product exports, consisting mainly of SMP,[171] as well as dried whey and fluid whole milk (appendix F). China overtook Canada to become the second most important destination for U.S. milk protein exports in 2002, the majority of which is dried whey, with exports increasing from 11,600 mt in 1998 to almost 40,000 mt in 2002. U.S. exports of milk protein products to Canada consist mostly of dried whey and WPC, with both products increasing significantly between 1998 and 2002. Other major purchasing countries of U.S. milk protein products include Thailand, Japan, the Philippines, and South Korea.

[170] U.S. Dairy Export Council, *2002 Annual Report*, found at *http://www.usdec.org/publications/PubDetail.-cfm?ItemNumber=653*.

[171] In the last 5 years, the majority of U.S. SMP exports have been shipped to Mexico under the DEIP (see full discussion of the DEIP below). Inefficiencies in the Mexican milk industry and limited processing facilities necessitate the import of dried milk products. Although Mexican tariffs on most dairy products were eliminated on Jan. 1, 2003, under the North American Free Trade Agreement, U.S. exports of SMP to Mexico are still subject to a tariff-rate quota until 2008. USDA, FAS, "Mexico Dairy and Products Semi-Annual," Gain Report No. MX3064 (May 9, 2003).

Table 3-12
Milk protein products: U.S. exports by destination,[1] 1998-2002

Markets/Country	1998	1999	2000	2001	2002
	Metric tons				
Mexico	89,829	88,715	87,471	92,243	80,451
China	13,794	14,975	18,513	30,532	43,704
Canada	29,902	37,859	44,052	42,641	38,267
Thailand	8,807	13,484	15,966	12,639	18,715
Japan	22,386	19,200	18,308	15,635	18,314
Philippines	11,488	18,982	21,804	22,776	17,888
South Korea	14,095	12,987	16,080	21,469	12,679
Taiwan	9,407	8,875	11,852	14,299	12,328
Indonesia	1,258	7,733	6,138	5,177	7,361
Yemen	17	0	3,108	2,767	6,587
Other	84,513	77,862	111,577	80,511	63,975
Total	285,496	300,672	354,869	340,689	320,269

[1] Skim milk powder 0402.10.0000; dried whey 0404.10.0850, 0404.10.4000; whey protein concentrate 3502.20.0000, 3502.90.0000, 0404.10.0500; whole milk powder 0402.21.0000, 0402.29.0000; fluid whole milk 0401.20.0000; caseinate 3501.90.2000 and 3501.90.6000; milk protein concentrate 0404.90.0000; concentrated milk 0402.91.0000; casein 3501.10.0000; whey 0404.10.2000; fluid skim milk 0401.10.0000.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Government Export Programs

The Dairy Export Incentive Program (DEIP)[172] was introduced in the Food Security Act of 1985 and has been reauthorized since then in successive farm bills. Most recently, the Farm Security and Rural Investment Act of 2002 extends the program to 2007. Under the DEIP, U.S. exporters of dairy products receive cash payments (bonuses) from the USDA that allow them to export products profitably when international prices are below domestic market prices.[173] The original intent of the program was to enable U.S. exporters to compete in foreign markets served by heavily subsidized product from the EU.[174] In addition, it has been argued that the DEIP provides the United States leverage in negotiations over multilateral agricultural trade liberalization within the WTO.[175]

Since 1995, the DEIP has been subject to quantity and budgetary outlay restrictions as part of the export subsidy discipline of the WTO Agreement on Agriculture.[176] Under the Agreement, the quantity of subsidized exports had to be reduced by 21 percent and the value by 36 percent over the 6-year implementation period 1995-2000. Beyond 2000, subsidy levels have been fixed at the final implementation levels, and will remain at these levels until

[172] 15 USC 713a-14.

[173] USDA, FAS, *Fact Sheet: Dairy export incentive program* (Jan. 2001), found at *http://www.fas.usda.gov/-info/factsheets/deip.html,* retrieved Jan. 20, 2004.

[174] USDA, FAS, "The impact of the Uruguay Round on global trade of nonfat dry milk," *International Agricultural Trade Report* (Jan. 29, 2001), found at *http://www.fas.usda.gov/dlp2/-highlights/2001/iatr9_01.pdf*, retrieved June 9, 2003.

[175] Mr. Tom Suber, president, U.S. Dairy Export Council, in testimony before the U.S. House of Representatives Agriculture Subcommittee on Specialty Crops and Foreign Agricultural Programs, June 28, 2001.

[176] USDA, ERS, *Briefing Room: WTO, Uruguay Round Agreement on Agriculture,* found at *http://www.ers.-sda.gov/Briefing/WTO/exptsubs.htm,* retrieved June 11, 2003.

a new WTO agreement on agriculture is reached. The specific commitments made by the United States for limits of dairy export subsidies are shown in table 3-13. In the case of SMP, the quantity of subsidized product was reduced from about 86,331 mt to 68,201 mt, while the budgetary reductions were from $128.8 million to $82.5 million.

Table 3-13
Dairy Export Incentive Program (DEIP): Maximum allowable subsidies under the World Trade Organization Agreement on Agriculture, by DEIP year (July 1 to June 30)

Product	Base[1]	1995	1996	1997	1998	1999	2000-03
Skim milk powder:							
Value (*dollars million*)	128.8	121.1	113.4	105.7	97.9	90.2	82.5
Quantity *(metric tons)*	86,331	108,227	100,222	92,217	84,212	76,207	68,201
Butter:							
Value (*dollars million*)	47.7	44.8	41.9	39.1	36.2	33.4	30.5
Quantity *(metric tons)*	26,705	42,989	38,611	34,232	29,854	25,475	21,097
Cheese:							
Value (*dollars million*)	5.7	5.3	5.0	4.7	4.3	4.0	3.6
Quantity *(metric tons)*	3,836	3,829	3,669	3,510	3,350	3,190	3,030
Other milk products:							
Value (*dollars million*)	32.8	14.4	11.5	8.6	5.8	2.9	0
Quantity *(metric tons)*	43	12,456	9,971	7,487	5,003	2,518	34

[1] Base is average subsidy level during 1986-90.

Source: WTO, *U.S. Schedule of Commitments* (1995), pp. 7717-19.

During most of 1998-2002, the DEIP has supported exports of SMP to the maximum level allowed under WTO commitment limits (table 3-14), and these limitations are significantly impacting the U.S. market for SMP milk, as well as other milk protein products.[177] In some years, actual subsidized shipments appear to exceed the WTO maximum, such as in 1998 and 1999.[178] This is because of "roll-over" provisions that enabled unused quantity from previous years to be rolled over into future years. In 2001, the expenditure on subsidized exports dropped to just $6.7 million (or $121 per mt) owing to international prices increasing above U.S. market prices. In fact, an estimated 25,000-30,000 mt of SMP were exported without subsidies that year. In recent years, about 70 percent of SMP exports under DEIP went to Mexico, with 10-15 percent shipped to Asia.[179] In addition to SMP exports, over the past 5 years, the USDA has used the DEIP to export cheese, butter, and WMP. Since 2001, no awards have been granted to butterfat and WMP exports, largely because of tight supply in the U.S. market with little product available for export.

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[177] USDA, FAS, "The impact of the Uruguay Round on Global Trade of nonfat dry milk," International Agricultural Trade Report (Jan. 29, 2001), found at *http://www.fas.usda.gov/-dlp2/highlights/2001/iatr9_01.pdf*, retrieved June 9, 2003.

[178] Also, the discrepancy between DEIP use and limitations may result from the DEIP year being June to July, and DEIP allocations from Oct.-Sept.

[179] Converting the quantity of SMP exports under DEIP into protein equivalent, shows that the United States exported significantly more protein under the DEIP than it imported in the form of MPC during the 1998-2002 period. Assuming a protein content of SMP of 36 percent, on average about 31,500 mt of protein were exported annually under the DEIP, compared with 24,500 mt imported as MPC (HTS subheading 0404.90.10), assuming a 65 percent protein content of imports.

Table 3-14
Dairy Export Incentive Program (DEIP): Awards by fiscal year (October 1 to September 30)

Product	1998	1999	2000	2001	2002
Skim milk powder:					
Value (*dollars million*)	88.8	133.3	45.3	6.7	53.7
Quantity *(metric tons)*	100,070	127,808	67,862	55,451	85,251
Bonus per metric ton *(dollars)*	887	1,043	668	121	630
Butter:[1]					
Value (*dollars million*)	8.9	0.5	6.1	-	-
Quantity *(metric tons)*	6,959	395	5,298	-	-
Bonus per metric ton *(dollars)*	1,272	1,144	1,157	-	-
Cheese:[2]					
Value (*dollars million*)	3.9	4.2	5.6	1.8	0.9
Quantity *(metric tons)*	4,017	2,779	6,012	3,030	1,222
Bonus per metric ton *(dollars)*	972	1,498	926	581	763
Other milk products[3]**:**					
Value (*dollars million*)	8.6	7.4	20.3	-	-
Quantity *(metric tons)*	7,028	5,340	15,832	-	-
Bonus per metric ton *(dollars)*	1,224	1,387	1,282	-	-

[1] Butter and anhydrous milkfat.
[2] Includes cheddar, Monterey Jack, cream cheese, mozzarella, and processed American cheese.
[3] Whole milk powder.

Source: U.S. Department of Agriculture, Foreign Agricultural Service.

Allocation of DEIP expenditures was concentrated among a few major firms, and in fiscal 2002 the top-three recipient firms received 95 percent of all DEIP expenditures ($54.6 million).[180] The largest recipient was DairyAmerica, Inc. which received $26.5 million in DEIP bonuses. DairyAmerica is a federated marketing cooperative association organized for the purposes of marketing dairy products,[181] and its members account for three-quarters of the U.S. SMP production. DairyAmerica is responsible for marketing the SMP production of these cooperatives domestically and internationally.[182] As of 2002, New Zealand Milk Products (part of the Fonterra Cooperative Group, previously the New Zealand Dairy Board)[183] entered into an agreement with DairyAmerica to be the exclusive seller of SMP internationally, thus enabling DairyAmerica to take advantage of Fonterra's international marketing and sales network.[184] James Farrell & Co., which markets and exports a range of dairy products out of the Northwest region of the United States, received $18 million under the DEIP in 2002 (one-third of the total amount).[185] The third-largest DEIP recipient is Hoogwegt, U.S., Inc. (partnered with the Dutch company Hoogwegt),[186] which received 13 percent of DEIP expenditures in 2002.

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[180] USDA official, interview by USITC staff, Dec. 2003.

[181] Its members include Agri-Mark, Inc., California Dairies Inc., Dairy Farmers of America, Land O'Lakes, Inc., Maryland & Virginia Milk Producers Association, O-AT-KA Milk Producers, Inc., and United Dairymen of Arizona. DairyAmerica website, found at *http://www.dairyamerica.-com/index.html*.

[182] Mr. Rich Lewis, Chief Operating Officer, DairyAmerica, testimony before the USITC, Dec. 11, 2003, transcript p. 166.

[183] The New Zealand Dairy Board was a long time critic of the DEIP.

[184] Rich Lewis, Chief Operating Officer, DairyAmerica, in e-mail to USITC staff, Jan. 26, 2004.

[185] James Farrell website, found at *http://www.jfarrell.com/Default.asp*.

[186] Hoogwegt, U.S., Inc., found at *http://www.hoogwegtus.com/companies/us*.

In addition to the DEIP, U.S. dairy exports are affected by two USDA export-promotion programs—the Foreign Market Development Assistance Program (FMD)[187] and the Market Access Program (MAP). Aimed at establishing new markets and expanding existing ones, the FMD program involves a partnering of nonprofit trade associations (referred to as cooperators) and the USDA through which CCC funds assist the cooperator in funding promotion of U.S. products in overseas markets.[188] Promotion is typically through market research, trade shows, generic advertising, and trade servicing. The U.S. Dairy Export Council (USDEC)[189] received $818,000 in fiscal 2002 (out of a total program of $33.6 million).[190] The MAP operates in a similar way, involving USDA-private sector cooperation to promote and service existing and potential markets for U.S. agricultural products.[191] Fiscal year allocation for 2003 was $110 million (under the 2002 Farm Bill, funding for the program doubles to $200 million by FY2006), of which the USDEC received $2.16 million.[192]

[187] The FMD was established under the authority of PL480 and reauthorized under Title VII of the Agricultural Trade Act of 1978.

[188] USDA, FAS, *Foreign Market Development Program: Frequently Asked Questions*, found at *http://www.fas.usda.gov/mos/programs/fmdfaq.html#Foreign%20Market%20Development%20Program*, retrieved Jan. 20, 2004.

[189] The U.S. Dairy Export Council is a nonprofit independent membership organization that represents the interests of U.S. milk producers, dairy cooperatives, proprietary processors, export traders ,and industry suppliers. Its mission is to assist U.S. dairy suppliers increase the volume and value of their exports. USDEC website, found at *www.USDEC.org*.

[190] USDA, FAS, *Fact Sheet: Foreign Market Development Program* (Jan. 2002), found at *http://www.fas.usda.-gov/info/factsheets/coopertr.html,* retrieved June 12, 2003.

[191] USDA, FAS, *Market Access Program: Frequently Asked Questions*, found at *http://www.fas.usda.gov/mos/-programs/mapfaq.html#Market%20Access%20Program*, retrieved Jan. 20, 2004.

[192] USDA, FAS, *Fact Sheet: Market Access Program* (June 2003), found at *http://www.fas.-usda.gov/info/-factsheets/mapfact.html,* retrieved June 12, 2003.

CHAPTER 4
THE MILK PROTEIN INDUSTRIES OF MAJOR EXPORTING COUNTRIES

Introduction

This chapter provides profiles of the milk protein industries of the European Union (EU), New Zealand, and Australia. Jointly, these suppliers accounted for about 85 percent of U.S. milk protein imports during 1998-2002, with the EU the largest supplier, followed by New Zealand and Australia.[1] The chapter focuses on how government policy and market intervention influence dairy farmers and milk protein product processors in the EU, New Zealand, and Australia, as well as on other factors affecting the competitiveness of milk protein products supplied to the U.S. market, such as production costs, production technology, and research and development. Much of the information and data provided below were collected through extensive fieldwork in the EU, New Zealand and Australia, where Commission staff met with several government officials and industry participants, and through Commission foreign producers' questionnaires.

The European Union[2]

Overview

The EU is by far the world's largest producer of cows' milk, accounting for about one-quarter of global supply in 2002 (table 2-1). The EU is also the world's leading exporter of whey (table 2-6), and ranks second behind New Zealand among major whole milk powder (WMP) and casein exporting countries (tables 2-5 and 2-7), and third behind New Zealand and Australia in skim milk powder (SMP) exports (table 2-4). The total value of dairy exports by the EU was $5 billion in 2001, of which the United States accounted for about 16 percent.[3] The EU is the leading supplier of milk protein product imports to the U.S. market, accounting for 40 percent of the total value in 2002 (appendix F).

Factors affecting the competitiveness of EU milk protein products differ greatly among member states, reflecting the significant diversity of geographic, climatic, demographic, and policy conditions in the region. Based on value, milk is the most important agricultural product in the EU, accounting for 14 percent of total agricultural production during

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[1] Other countries supplying the United States with milk protein products include India, Canada, and Poland. However, these countries are not considered major milk protein exporting countries.

[2] For the purpose of this report, the European Union refers to Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and United Kingdom.

[3] U.S. Dairy Export Council, *World Dairy Trade Trends, 2003 Edition*, p. VII-Exporters-18.

1999-2001.[4] Total EU milk production has been effectively cappedby the production quota system and averaged 122 million metric tons (mt) annually during 1998-2002 (table 4-1). Over the period, about 6 percent of EU milk production was consumed on farms or processed on farms for direct sale to consumers, with the remaining 94 percent delivered to processing plants. About 70 percent of milk sent to plants (including excess cream separated from liquid milk) was manufactured into products, such as butter, cheese, condensed milk, WMP, SMP, and casein, and about 30 percent went to liquid drinking milk, milk-based drinks, and other fresh and fermented dairy products. With the delivery quotas effectively capping the quantity of milk available for processing, increased production of one product requires production cut backs of other products. Thus, milk processors are constantly seeking a product mix that provides the highest rate of return from a fixed quantity of milk.[5] In terms of milk protein exports, the most important member countries are Ireland, France, Netherlands, Germany, and Denmark, which together accounted for 95 percent of U.S. imports of MPC and casein from the EU (table 4-1).

Table 4-1
European Union: Milk protein overview, 1998-2002

Item	Germany	France	Netherlands	Ireland	Denmark	EU total
	5-year averages: 1998-2002					
Total milk production *(1,000 metric tons)*	28,222	24,887	11,040	5,259	4,663	121,629
Protein production *(1,000 metric tons)*[1]	964	792	382	171	159	4,028
Protein consumption *(1,000 metric tons)*[2]	784	606	158	34	49	3,299
Excess protein *(1,000 metric tons)*[3]	180	186	224	137	110	729
EU exports of milk protein to the U.S. *(metric tons)*[4]	8,249	11,780	9,693	27,922	2,433	63,193
Milk protein self-sufficiency *(percent)*	123	131	241	505	321	122
Milk price *(euros per 100 kilogram)*	30	29	31	28	32	30
Value share of milk production (percent)[3]	20	12	17	25	18	14

[1] Milk production times average protein content of milk.
[2] Protein consumed through dairy products including fluid milk, cheese, yogurt, and other fermented dairy products. This estimate does not include milk protein consumed through other processed food products.
[3] 3-year average: 1999-2001.
[4] Includes HTS subheadings 0404.90.10, 3501.10.10, 3501.10.50, and 3501.10.60.

Sources: U.S. Customs; Bureau of Census; ZMP, *Dairy Review 2003*; European Commission; Commission estimates.

[4] 1998 data were not comparable with later data because the method used to calculate the published value shares was changed between 1998 and 1999; 2002 data are not yet available. European Commission, Directorate-General for Agriculture, *Agriculture in the European Union: Statistical and Economic Information,* various issues.

[5] European Dairy Association, selected members of the Casein Production Committee, interview by USITC staff, Brussels, Belgium, Oct. 15, 2003.

Production of Fluid Milk

Production systems

Milk is produced in the EU under a variety of production systems. The most prominent production system is classified as intensive grassland production, in which herd sizes ypically range from 30 to 60 cows.[6] This system accounts for about two-thirds of total milk delivered to EU dairy processors.[7] The intensive grassland production system, like other high-input, high-output systems,[8] provides a relatively stable year-round supply of milk for drinking and manufacturing purposes in most of the major EU milk protein exporting countries.[9]

In contrast, milk production in Ireland is dominated by the permanent lowland grassland system that provides a highly seasonal pattern of milk production.[10] Farms using this system typically range from about 30 to 100 cows, with annual milk yields ranging from 4,000 to 6,000 liters per cow. Dairy cows are calved in early spring (to correlate peak milk production (May) with peak grass growth), grazed and milked during spring, summer, and fall, and dried off in mid- to late-December.[11] Irish milk production is at its lowest point in January. A limited number of Irish dairy farms produce year-round to supply the market for fresh fluid milk. These suppliers moderate the overall countrywide peak-to-trough production ratio to about 6:1, whereas many plants manufacturing processed dairy products may operate at a ratio as high as 16:1.[12]

Other production systems are used extensively by some of the primary protein exporters. For example, nearly 45 percent of France's milk production takes places on intensive maize

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[6] This system consists primarily of specialized dairy farms above average in size. Land used for grazing and forage crop production is intensively managed. In northern latitudes, high-quality grass silage is produced for long winter-feeding periods. The use of total mixed rations is increasing and supplementary feeding of concentrates is common. The primary objective is to provide a constant year-round supply of milk for processing demand.

[7] The Centre for European Agricultural Studies and The European Forum on Nature Conservation and Pastoralism, *The Environmental Impact of Dairy Production in the EU: Practical Options for the Improvement of the Environmental Impact, Final Report,* European Commission (Apr. 2000).

[8] Cows are fed rations of between 1,000 and 3,000 kilogram per cow per year, and annual milk yields range from 6,000 to 8,000 liters per cow.

[9] During 2001-2002, the peak-to-trough ratio in the Netherlands, Germany, and Denmark ranged from 1.15 to 1.21; but was slightly higher in France, ranging from 1.31 to 1.33. The peak-to-trough ratio is defined as the largest quantity of monthly milk delivered divided by the smallest quantity of monthly milk delivered and was calculated based on monthly milk deliveries reported in Agra Europe, *Milk Products*, No. 149 (May/June 2003).

[10] This system consists of specialized dairy farms that vary in size. Permanent pastures are intensively grazed and managed because land and climate make crop cultivation difficult. Supplementary feeding is limited, so that milk output can be highly seasonal.

[11] USITC staff farm visit, Cork County, Ireland, Oct. 7, 2003.

[12] Glanbia Ingredients, interview by USITC staff and site visit, Ballyragget, Ireland, Oct. 8, 2003; Lakeland Dairies, interview by USITC staff, Dublin, Ireland, Oct. 10, 2003; TEAGASC (the Irish Agriculture and Food Development Authority) Rural Economy Research Centre, interview by USITC staff, Dublin, Ireland, Oct. 9, 2003.

(corn) silage operations,[13] and sections of Germany are dominated by the industrial production system.[14,15]

Milk production and industry trends

EU milk production trends are dominated by the delivery quota system that stabilized output during 1998-2002 at about 122 million mt annually (table 4-2).[16] Milk production per cow in the EU increased at an average annual rate of about 2.6 percent, from 5,653 kilogram per cow in 1998 to 6,241 kilograms per cow in 2002 (table 4-2). Of the top-five protein exporters, only Denmark and the Netherlands ranked among the top-five members in yield per cow, while Ireland, the leading milk protein exporting country, had the lowest yield per cow among all EU members.[17] Because of EU quotas limiting milk production, increases in milk yields over time have required a decline in the number of dairy cows. Between 1998 and 2002, EU dairy cow numbers decreased from 21.4 million to 19.5 million, an average annual decline of 2.2 percent (table 4-2). The distribution of cow numbers among EU members has not changed appreciably over time because production quotas are not transferable among member states.

Long-term trends in the EU dairy sector were discussed in a 2001 report on EU quota policies by the European Court of Auditors (COA).[18] This report noted that between 1985 and 1997, milk production per farm increased by 119 percent (annual average of 9.9 percent). This increase was the result of the combined effect of a 29 percent increase in production per cow (annual average of 2.4 percent) and a 74 percent increase in the number of cows per farm (annual average of 6.2 percent).[19] During 1998-2002, the trend toward fewer, larger farms continued (table 4-2). The total number of EU dairy farms decreased at an average annual rate of 6.3 percent between 1998 and 2002, although there were significant differences among EU member states. For example, farm numbers in France decreased at a 2.5-percent average annual rate, whereas the rate of decrease in dairy farm numbers in the other major protein exporting member states was above the EU average of 6.3 percent (table 4-2).

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[13] These specialized dairy farms are located where land and climate allow intensive cultivation of maize (corn). High-quality corn silage is supplemented with concentrates to produce high yields. The primary objective is to provide a constant year-round supply of milk for processing demand.

[14] Highly specialized milk production enterprises produce milk for the industrial market. Herds are very large (up to 500 cows). Cows do not graze and are fed total mixed rations of purchased ingredients.

[15] The Centre for European Agricultural Studies and The European Forum on Nature Conservation and Pastoralism. *The Environmental Impact of Dairy Production in the EU: Practical Options for the Improvement of the Environmental Impact, Final Report,* European Commission (Apr. 2000).

[16] The United Kingdom and Italy are among the top five milk producers and accounted for 11.4 and 10.3 percent of total EU milk production, respectively.

[17] The competitiveness of the Irish dairy industry is based on its grass-based, low-input, low-cost production system rather than high milk yields per cow.

[18] Court of Auditors, "Special Report No 6/2001 on milk quotas," *Official Journal of the European Communities,* C 305 (Oct. 30, 2001).

[19] Ibid., p. 9.

Table 4-2
European Union: Milk production trends, by primary protein exporters, 1998-2002

Trend/country	1998	1999	2000	2001	2002
	1,000 metric tons				
Total milk production:					
Germany	28,378	28,334	28,331	28,191	27,874
France	24,793	24,614	24,975	24,879	25,173
Netherlands	10,995	11,174	11,155	11,079	10,797
Ireland	5,141	5,320	5,260	5,373	5,200
Denmark	4,668	4,656	4,717	4,618	4,656
Total European Union	121,191	122,264	121,197	121,662	121,831
	1,000 animals				
Cow numbers:					
Germany	4,833	4,710	4,564	4,475	4,373
France	4,432	4,424	4,153	4,195	4,133
Netherlands	1,600	1,570	1,532	1,551	1,546
Ireland	1,199	1,174	1,153	1,148	1,129
Denmark	680	681	644	628	613
Total European Union	21,400	21,024	20,313	20,068	19,520
	Kilograms per animal per year				
Milk per cow:					
Germany	5,872	6,016	6,207	6,300	6,374
France	5,594	5,564	6,014	5,931	6,091
Netherlands	6,872	7,117	7,281	7,143	6,984
Ireland	4,288	4,532	4,562	4,680	4,606
Denmark	6,865	6,837	7,325	7,354	7,595
Total European Union	5,653	5,788	5,955	6,094	6,241
	1,000 metric tons				
National quotas for milk delivery:[1]					
Germany	27,768	27,768	27,769	27,769	27,769
France	23,794	23,816	23,832	23,884	23,854
Netherlands	10,992	10,991	10,993	11,001	10,995
Ireland	5,237	5,237	5,332	5,386	5,386
Denmark	4,455	4,454	4,455	4,455	4,455
Total European Union	115,738	116,007	116,989	117,562	117,606
	1,000 farms				
Farm numbers:[2]					
Germany	171	153	144	130	125
France	140	135	134	131	126
Netherlands	36	35	30	28	26
Ireland	36	34	29	28	27
Denmark	12	11	10	9	8
Total European Union	830	749	681	645	621
	Kilograms				
Per farm quota:					
Germany	162,386	181,490	192,838	213,774	222,154
France	169,352	176,417	177,852	182,323	189,316
Netherlands	305,331	314,020	372,641	394,312	416,466
Ireland	143,468	154,024	183,876	192,364	202,492
Denmark	371,217	404,945	459,237	512,034	549,975
Total European Union	139,443	154,883	171,765	182,295	189,352
	Number of animals				
Cows requried to fill per farm quota:					
Germany	28	30	31	34	35
France	30	32	30	31	31
Netherlands	44	44	51	55	60
Ireland	33	34	40	41	44
Denmark	54	59	63	70	72
Total European Union	25	27	29	30	30

[1] Figures represent the actually available delivery quotas; changes can result from conversion of direct-to-consumer quotas to delivery quotas; the quota year runs from April to March.
[2] 1998 farm numbers were extrapolated from 1997 and 1999 numbers.

Sources: ZMP, *Dairy Review 2003*; Commission estimates.

A primary factor that contributes to the differing structural changes among EU members is the method for reallocating production quotas between farmers in a particular country. France, which has a highly restrictive transfer method, had the slowest decrease in farm numbers during 1998-2002, the slowest increase in quota per farm, and virtually no change in the number of cows needed to fill the average quota (table 4-2).[20] Conversely, Denmark, with a much less restrictive reallocation scheme, recorded the greatest rate of increase in the quota per farm and number of cows needed to fill that quota.

Milk prices

During 1998-2002, the weighted average milk price in the EU varied by 8.9 percent, ranging from a low of €28.83 per 100 kilogram ($12.95 per hundredweight (cwt))[21] in 1999 to a high of €31.40 per 100 kilogram ($14.10 per cwt) in 2001 (table 4-3).[22] Among primary protein exporters, price variability (as measured by the percent difference between the highest and lowest price recorded during 1998-2002) ranged from 5 percent in Denmark to 15 percent in Germany. Large price differences were also observed between individual EU members. For example, the 5-year average price in Italy was 21 percent higher than the 5-year average price in Ireland. Price data reported for individual milk processors also show wide variations in prices paid for milk in different countries.[23] Price variations among member states arise owing to differences in local supply and demand situations, as well as the types of products produced. For example, in Italy (a milk deficit country), processors are willing to pay high prices for milk for the production of high-value, aged Italian cheeses.[24] Conversely, Ireland (a milk surplus country) produces large amounts of butter, which historically has been in excess supply, and highly dependent on intervention programs for price support.[25]

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[20] Court of Auditors, "Special Report No 6/2001 on milk quotas," *Official Journal of the European Communities,* C 305 (Oct. 30, 2001); Dairygold Food Ingredients Division, interview by USITC staff, Cork County, Ireland, Oct. 7, 2003; Glanbia Ingredients, interview by USITC staff and site visit, Ballyragget, Ireland, Oct. 8, 2003; Kerry Group, interview by USITC staff, Dublin, Ireland, Oct. 9, 2003; Lakeland Dairies, interview by USITC staff, Dublin, Ireland, Oct. 10, 2003; Erie Europe, interview by USITC staff, Paris, France, Oct. 17, 2003.

[21] Dollar values are based on 5-year average exchange rate of 0.9903 US$/Ecu or Euro.

[22] Prices are for whole milk with a 3.7 percent fat content; these prices do not necessarily reflect actual prices paid to producers because they do not reflect adjustments for butterfat content, volume bonus payments, inclusion of cooperative dividend payments, and currency conversion. ZMP, *Dairy Review 2003*.

[23] For example, prices ranged from the €25.80 per 100 kilograms paid by First Milk in the United Kingdom to €38.14 per 100 kilograms paid by Parmalat in Italy, a difference of 48 percent. LTO Netherlands, *LTO International Milk Price Comparison* (July 2003), found at *www.milkprices.nl.*

[24] Ibid.

[25] Ibid.

Table 4-3
European Union: Milk prices by selected member states, 1998-2002[1]

Member state	1998	1999	2000	2001	2002	5-year average
	Euros per 100 kilograms					
Italy	35.0	34.2	34.1	34.5	33.9	34.3
Denmark	31.5	30.8	31.0	32.5	32.4	31.6
Netherlands	31.1	29.2	30.0	32.6	31.0	30.8
Germany	29.5	28.5	30.0	32.8	30.0	30.2
France	28.6	28.1	28.9	30.2	29.2	29.0
Ireland	28.4	27.6	28.4	29.6	27.3	28.3
United Kingdom	26.6	26.1	26.2	29.8	24.6	26.6
EU weighted average	30.5	28.8	29.2	31.4	29.5	29.9

[1] Whole milk with 3.7 percent fat content; price comparisons have to be treated with caution because of possible incompatibility of the data and sources; e.g., butterfat adjustments, payment of bonuses, inclusion of cooperative profit payment, and currency conversion.
[2] Weighted by member state milk production.

Source: ZMP, *Dairy Review 2003.*

Costs of production

In 1998, the total cost of producing milk in the EU was 244 ECU per mt ($10.96 per cwt) (table 4-4), with costs ranging significantly among EU members.[26] For example, the cost in Ireland was 195 ECU per mt ($8.76 per cwt) (20 percent below the EU average), but the cost in Denmark was 298 ECU per mt ($13.39 per cwt) (22 percent above the average).[27] France, Germany, and the Netherlands were within 5 percent of the average EU cost of production. Feed costs were a major expenditure for all EU producers, accounting for nearly one-third of the total cost of milk production, of which 68 percent consisted of purchased feedstuffs (concentrates and fodders).[28] Dairy producers in Denmark and the Netherlands were the most reliant on purchased feedstuffs, accounting for 77 and 74 percent of total feed costs, respectively, whereas German, French, and Irish producers relied more on farm-grown sources of feed. High forage costs in France are probably related to the intensive production of maize silage. Overhead costs accounted for 26 percent of total cost in 1998, and were fairly consistent among EU members, and external factors of production (such as hired labor, interest, and rent) accounted for 16 percent of total milk costs. There were substantial

[26] The last year for which these estimates are currently available is 1998. European Commission, *Cost of Production for Milk in the European Union Period 1998/90 - 1998/99 (revised methodology)*, Brussels, Belgium (May 7, 2001), found at *http://europa.eu.int/comm/agriculture/rica/index_en.cfm,* retrieved on Feb. 9, 2004.

[27] Estimates by TEAGASC place the average cost of production for a spring-milk Irish dairy producer at €151 per mt, and at €134 per mt for the top one-third of producers. This result, while not directly comparative to the FADN results reported above, suggest that Irish production costs were probably reasonably stable between 2002 and 1998. Trevor Dunwoody and George Ramsbottom, "Monitor Farms – Are we prepared for the challenges ahead?," *TEAGASC National Dairy Conference 2003*, Caven County, Ireland (Nov. 2003), found at *http://www.teagasc.ie/publications/2003/20031112/paper4.htm,* retrieved on Feb. 10, 2004.

[28] Concentrates are sources of energy and protein, such as grains and meals, while fodders are sources of roughage, such as hay and silage.

Table 4-4
European Union: Milk costs and returns, by primary protein exporters, 1998

Item	Germany	France	Netherlands	Denmark	Ireland	EU total
	ECUs per metric ton					
Receipts from milk	307	314	322	339	288	318
Variable cost:						
Feed cost:						
Purchased concentrates	37	38	37	60	31	47
Purchased fodder	3	4	13	11	2	7
Farm production	15	11	4	9	12	10
Specific forage costs	13	26	13	12	18	15
Total feed costs	68	79	67	92	64	79
Other variable costs[1]	22	16	16	20	22	20
Total variable costs	90	94	83	111	85	98
Overhead costs	74	79	65	64	56	64
Total cash expenditures	164	173	148	175	142	163
External factors:						
Hired labor	8	2	3	20	9	9
Interest	10	10	30	58	12	15
Rent paid	19	16	16	9	13	14
Total	37	28	49	86	34	39
Depreciation	49	43	38	36	19	43
Total cost	251	244	235	298	195	244
Return to management and labor	56	70	88	41	93	74

[1] Includes veterinary medical fees, breeding fees, and other variable costs

Source: European Union Commission, Directorate General Agriculture, Farm Accountancy Data Network.

cost differences among member states. For example, external costs in Denmark were significantly higher than for other members, accounting for 29 percent of total production cost, largely owing to high labor and interest costs. Conversely, labor, rent, and interest costs in Ireland were well below the EU average.

Government assistance

Common Organization of the Market for Milk and Milk Products

Government intervention in the EU dairy sector is part of the Common Agriculture Policy (CAP), which is a complex set of interacting legislation and policies. The initial legislation regulating EU dairy markets was passed in 1964 (Council Regulation 13/64), which established the basic policies that support dairy farmers to this day. These basic policies included: target prices for milk, intervention prices for butter, and threshold prices for imported dairy products.[29] The target price is a theoretical price, which the EU Commission aims to achieve through market intervention, consumption subsidization, and restricted imports. Intervention prices are used to determine when the appropriate member state agencies should enter the market to purchase dairy products (butter and SMP) to support the

[29] European Commission, "Regulation (EEC) No. 804/68 of the Council of 27 June 1968 on the common organization of the market in milk and milk products," *Official Journal,* L 148 (June 28, 1968), pp. 13-23, found at *http://europa.eu.int/eur-lex/en/index.html,* retrieved Jul. 15, 2003.

price of milk. Threshold prices were minimum import prices used to establish variable levies.[30] Initially, these prices were country specific. However, common community-wide prices were established in 1968 by Council Regulation 804/68. This regulation also established an intervention price for SMP, production aids for skim milk and SMP used in animal feeds, production aids for skim milk processed into casein, and export subsidies (refunds) for several dairy products.[31] In 1999, regulation 804/68 and its amendments were consolidated into Council Regulation 1255/1999, defining the basic elements of the CAP as applied to milk and dairy products,[32] including fresh, concentrated, and powdered milk and cream; butter; cheese and curd; certain lactose preparations; and certain animal feedstuffs containing milk products.[33]

The primary goal of EU dairy policy is to manage dairy product markets, such that milk producers obtain the target price for raw milk. During 1998-2002, the target price for milk with 3.7 percent butterfat content was €30.98 per 100 kilograms ($14.05 per cwt).[34,35] The primary instruments to maintain the target price are: government purchases and subsidized storage of butter and SMP; restrictive import policies; processing subsidies for skim milk used to make casein; processing subsidies for skim milk and SMP used in animal feed; and processing subsidies on butter used in food manufacturing.

Milk delivery quotas[36]

By 1974, the CAP had led to self sufficiency in EU milk production,[37] and continued to stimulate growth in supply of 2.5 percent annually, but consumption increased at the rate of only 0.5 percent annually.[38] By 1984, milk supply exceeded internal demand by 20 percent,[39] and gross expenditure on export refunds, storage, consumption aids, and processing aids consumed 30 percent of the total CAP budget (equivalent to 17 percent of the total budget

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[30] During implementation of the Uruguay Round Agreement on Agriculture, variable levies were converted to tariff-rate quotas.

[31] European Commission, "Regulation (EEC) No. 804/68 of the Council of 27 June 1968 on the common organization of the market in milk and milk products," *Official Journal,* L 148 (June 28, 1968), pp. 13-23, found at *http://europa.eu.int/eur-lex/en/index.html,* retrieved Jul. 15, 2003.

[32] Council Regulation 1255/1999 defines the CAP as applied to milk and dairy products during the period of this investigation, 1998-2002.

[33] The regulation specifically includes the following products by CN code: 0401, 0402, 0403.10.11 to .39, 0403.90.11 to .69, 0404, 0405 (part of), 0406, 1702.19.00, 2106.90.51, and 2309 (part of).

[34] Agra Europe, *CAP Monitor* (London: 2002), p. 17.1.

[35] During 1998-2002, the average price paid to EU farmers exceeded the target price in only 2001, and the 5-year average price paid to farmers was 3.5 percent below the target price (table 4-3). The 5-year average price paid to farmers exceeded the target price in only five members (Italy, Greece, Sweden, Denmark, and Finland) representing 18.4 percent of milk delivered to dairies.

[36] The description of the quota system herein is generally based on Council Regulation (EEC) No. 3950/92, which was in effect during the period of this investigation. In 2003, Council Regulation No 3950/92 was replaced by Council Regulation No 1788/2003, which significantly altered various segments of the system.

[37] Court of Auditors, "Special Report No. 2/87 on the quota/additional levy system in the milk sector," *Official Journal of the European Union,* C 266 (Oct. 10, 1987).

[38] Court of Auditors, "Special Report No. 6/2001 on milk quotas," *Official Journal of the European Communities,* C 305 (Oct. 30, 2001).

[39] Ibid.

of the European Community).[40] This imbalance between supply and demand was deemed unsustainable, and in 1984, milk supply control was implemented through a system of delivery quotas.

In March 1984, the EU established a milk quota system to reduce both CAP expenditures and the surplus milk supply.[41] The legislation establishing the quotas was originally set to expire in 1993, but it was extended several times, most recently until March 31, 2015.[42] Council Regulation (EEC) No. 3950/92, as amended, was the primary legislation in effect during 1998-2003.[43] This legislation established milk reference quantities (i.e., quotas), split between a direct sales quota and a wholesale delivery quota, for each EU member country.[44] The quotas are enforced by a levy of 115 percent of the target price imposed on milk production in excess of the member's reference quantity.[45] However, the levy is assessed only if the member state as a whole exceeds the reference quantity, so that individual milk producers may exceed their farm-specific reference quantities without penalty, provided the member state as a whole does not exceed its total reference quantity. Overall, the quotas succeeded in controlling production, with milk deliveries exceeding the quota by less than 1 percent every year during 1998-2002 (table 4-5).[46]

Implementation of the quota system is delegated to the individual member states, and methods of quota allocation to individual farmers differ across member states. Quota allocation and reallocation methods play an important role in the overall farm structure of the EU dairy industry, and international competitiveness of the individual member states.[47] During 1998-2002, quotas were generally tied to a specific piece of land. However, several members, (e.g., the United Kingdom, the Netherlands, and Germany) developed programs by which quota can be traded separately from the land,[48] so that quotas have become

[40] Court of Auditors, "Special Report No. 2/87 on the quota/additional levy system in the milk sector," *Official Journal of the European Union,* C 266 (Oct. 10, 1987), p. 3.

[41] Ibid.

[42] European Commission, "Council Regulation (EC) No 1788/2003 of 29 September 2003 establishing a levy in the milk and milk products sector," *Official Journal of the European Union*, L 270/123-136 (Oct. 21, 2003).

[43] EU Regulation No. 3509/92 sets the basic policies that govern the common market for milk and milk products, including the quota and intervention systems. Other regulations outline the specific details by which these policies are implemented.

[44] Direct sales quota cover milk production for products sold off the farm; wholesale delivery quotas cover milk delivered to a plant for processing.

[45] Actual quantities produced are adjusted to a standard fat content.

[46] During the 1990s, Italian producers regularly exceeded their reference quantities without penalty because the levies were paid by the Italian Government. Recently, the Italian Government negotiated with the European Commission to allow Italian producers up to 14 years to repay €1.3 billion of allocated levies. In effect, this is an additional subsidy to Italian producers. Guerrera Francesco, "Europe: EU agrees savings tax deal to start in 2005," *Financial Times* (June 4, 2003).

[47] Promar International, *Strategic Development Plan for the Irish Dairy Sector* (Mar. 2003).

[48] U.K. Ministry of Agriculture, Fisheries and Food, et.al., *Economic Evaluation of the U.K. Milk Quota System,* found at *http://www.defra.gov.uk/farm/schemes/milkeval/milk.htm*, retrieved Feb. 12, 2004.

Table 4-5
European Union: National quota for milk delivery and quota utilization, by primary protein exporters, 1998-2002[1]

Exporters	1998	1999	2000	2001	2002
	1,000 metric tons				
Germany	27,768	27,768	27,769	27,769	27,769
France	23,794	23,816	23,832	23,884	23,854
Netherlands	10,992	10,991	10,993	11,001	10,995
Ireland	5,237	5,237	5,332	5,386	5,386
Denmark	4,455	4,454	4,455	4,455	4,455
Total European Union	115,738	116,007	116,989	117,562	117,606
	Fat-adjusted milk deliveries as a percent of the available quota				
Germany	100.7	100.6	100.9	100.5	99.7
France	99.6	99.6	99.3	99.9	100.1
Netherlands	100.5	100.5	99.2	100.5	100.2
Ireland	99.8	100.3	99.7	100.2	100.8
Denmark	100.2	100.4	100.4	100.1	100.5
Total European Union	100.8	100.9	100.7	100.7	100.6

[1] Figures represent the actually available delivery quotas; changes can result from conversion of direct-to-consumer quotas to delivery quotas; the quota year runs from April to March.

Source: ZMP, *Dairy Review 2003.*

valuable assets in themselves.[49] In those countries with more restrictive reallocation schemes (e.g., France), quota values have become capitalized into land values.[50] In most countries, when land with the quota tied to it is sold, a certain portion of the quota reverts to a national reserve. Member states reallocate quota from this reserve according to priority of specific farmer groups (e.g., young farmers, organic producers, new producers, existing producers, etc.) or regions (e.g., less-favored areas, mountain areas, etc.).

Butter market intervention[51]

Government intervention in the butter market supports the farm-gate milk price and occurs primarily through purchase and public storage.[52] Butter is purchased when the market price in a member state falls below 92 percent of the intervention price (equal to €3,282 ($3,250) per mt during 1998-2002) for two consecutive weeks. When this condition occurs, butter is purchased twice a month through a tendering process. The purchase price must be at least 90 percent of the intervention price. During 1998-2002, the EU developed

[49] Court of Auditors, "Special Report No. 6/2001 on milk quotas," *Official Journal of the European Union,* C 305 (Oct 30, 2001).

[50] Ibid.

[51] Chapter II of Council Regulation 1255/1999 outlines the basic measures for market intervention programs. EU Commission Regulation No. 2771/1999 provides detailed rules for intervention in the butter and cream markets.

[52] Private storage of cream and butter is also subsidized. Private storage aid may be paid on butter placed in storage between March and August for a minimum of 90 days and a maximum of 210 days. The private storage aid rate is a fixed €24 per mt plus €0.35 per day plus 3 percent interest paid on 91 percent of the intervention price.

a chronic surplus of butter and resorted to consumption and export subsidies to dispose of about one-third of the available supply during the period.[53]

Skim milk powder market intervention[54]

Intervention in the SMP market is used to support farm-gate milk prices. Under the regulations, SMP may be purchased into intervention stocks between March 1 and August 31 of each year, with the intervention price during 1998-2002 being €2,055 ($2,035) per mt.[55] When intervention purchases reach 109,000 mt in any given year, further purchases at the intervention price are suspended, although private storage aid may be paid on SMP at the rate of €0.35 ($0.347) per mt per day (€0.44 ($0.436) per mt per day in Spain and Portugal).[56]

During 1998-2002, EU intervention in the SMP market was highly volatile (table 4-6). Month-end SMP intervention stocks increased from 130,700 mt in January 1998, peaking at 273,500 mt in August 1999, and falling to zero by October 2000.[57] The EU held no SMP in intervention stocks during all of 2001. Purchases resumed in March 2002, with intervention stocks peaking at 146,000 mt in September.[58]

The drop in intervention stock levels to zero in 2000 and 2001 resulted from several factors. First, to satisfy increased EU demand for cheese in that period, milk was diverted away from SMP production toward the production of cheese. Second, a drought in Oceania reduced the global supply of SMP and increased world prices, so that there was less need for intervention buying during this period. Third, after July 2000, unused export subsidy commitments under the WTO Agreement on Agriculture could no longer be carried over to future years. This motivated the EU Commission to use carried-over export subsidy commitments to deplete intervention stocks.[59] Export refunds were €680 ($673) per mt in January 1998, peaking at €900 ($891) per mt when SMP intervention stocks peaked in August 1999, and dropped to €150 ($149) per mt by the time intervention stocks were depleted in October 2000.[60] After 2001, stocks increased as supply increased by more than consumption.

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[53] ZMP, *Dairy Review 2003*.

[54] Chapter II of Council Regulation 1255/1999 outlines the basic measures for market intervention programs. EU Commission Regulation 214/2001 provides detailed rules for intervention in the SMP market.

[55] To qualify for intervention, SMP must be top quality, produced by spray drying within 30 days of being offered for intervention, and have a minimum protein content of 35.6 percent.

[56] When intervention buying is suspended purchases may continue under a tender system at prices less than the intervention price. Intervention purchases have only been suspended once. This occurred in 2002, during which four tenders were accepted at 95.5 to 98.5 percent of the intervention price.

[57] ZMP, *Dairy Review 2003*.

[58] Ibid.

[59] EU Commission, Agriculture Directorate, Dairy Division, interview by USITC staff, Brussels, Belgium, Oct. 14, 2003.

[60] SMP exports to the United States were not eligible for export refunds during 1998-2002.

Table 4-6
European Union: Skim milk powder (SMP) demand/supply balance and prices, 1998-2002

Item	1998	1999	2000	2001	2002
	1,000 metric tons				
Opening stocks[1]	166	270	266	123	200
Production	1,148	1,191	1,116	1,000	1,140
Imports	66	73	78	57	69
Available supply	1,380	1,534	1,460	1,180	1,409
Exports[2]	174	272	357	142	154
Domestic consumption	936	996	980	502	520
Domestic consumption at market prices	464	498	504	502	520
Subsidized consumption in feed	472	498	476	336	435
Intervention purchases	102	95	0	0	148
Intervention stock (December)	204	180	0	0	140
Closing stocks[1]	270	266	123	200	300
	Euros per metric ton				
Export refunds[3]	748	848	[4]541	100	[5]562
Intervention price	2,055	2,055	2,055	2,055	2,055
Netherlands price	2,050	2,060	2,530	2,320	1,990
	U.S. dollars per metric ton				
World price	1,453	1,301	1,880	2,012	1,312

[1] Includes intervention stocks and subsidized private storage.
[2] Nearly all SMP exports are subsidized by export refunds.
[3] Simple average of refund in effect during year.
[4] During 2000, the refund dropped from 810 to 150.
[5] During 2001, the refund ranged from 200 to 850.

Source: ZMP, *Dairy Review 2003.*; U.S. Department of Agriculture, Agricultural Marketing Service, *Dairy Market News*, various issues.

Common Agricultural Policy reform

During the mid-1990s, the EU Council of Agriculture Ministers began consultations to reform the CAP. These consultations resulted in the Agenda 2000 reforms, which were fully incorporated into EU regulations in May 1999. Under the Agenda 2000, provisions affecting the dairy sector included lower intervention prices and decoupled payments, which were scheduled to begin implementation in 2004.[61] However, nearly all of the Agenda 2000 dairy product reforms were altered before being implemented as a result of the Mid-Term Review (MTR) in June 2003. Implementation of the new reforms under the MTR, which begin in July 2004, are expected to alter the competitiveness of EU milk protein products in world markets significantly.[62]

The main provisions of the MTR for dairy are as follows: (1) the target price for milk will be abolished; (2) the intervention price for butter will be cut by 25 percent in four stages

[61] European Commission, Directorate-General for Agriculture, "The CAP reform: milk and milk products," Brussels, Belgium (Nov. 1999), found at *http://europa.eu.int/comm/agriculture/-publi/fact/milk/milk_en.pdf*.

[62] Irish Dairy Board, "The Likely Consequences of the Luxembourg Agreement for the Dairy Market," staff paper received during USITC fieldwork, Oct. 10, 2003.

starting in July 2004;[63] (3) the intervention price for SMP will be cut by 15 percent in three annual installments beginning in 2004; (4) the quota system will be extended to the 2014/2015 marketing year;[64] and, (5) dairy producers will be compensated for about 60 percent of the decreased milk price through direct payments that are decoupled from milk production by 2007.[65]

Lower intervention prices are anticipated to have an immediate impact on farm milk prices,[66] which may decrease by as much as 21 percent once the reforms have been fully implemented.[67] Lower milk prices should result in lower prices to consumers of dairy products resulting in increased consumption of cheese and fresh dairy products.[68] Industry and EU Commission officials anticipate that lower farm prices will increase the competitiveness of EU milk protein products in world markets by reducing, and possibly eliminating, the need for export subsidies and production aids.[69]

Processing of Milk Protein Products

Industry structure

The European dairy industry is rapidly consolidating.[70] During 1998-2002, 42 mergers, acquisitions, takeovers, joint ventures, and alliances in the global dairy industry involved EU

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[63] Butter intervention purchases will be limited to the period of Mar. 1 to Aug. 31 and will be limited to 70,000 mt in 2004. The limit on butter purchases will be reduced by 10,000 mt annually, to 30,000 mt in 2008 and thereafter. Beyond this limit, butter must be purchased by tender.

[64] The 1.5 percent quota increase for those members that did not receive an increase in 2000/01 will be implemented at 0.5 percent annually beginning in the 2006/07 quota year. Several countries received immediate increases during initial implementation of the Agenda 2000.

[65] Andrew Slade, *Dairy CAP Reform and the UK's Policy Options,* U.K. Department for Environment, Food, and Rural Affairs (Dec. 1, 2003).

[66] Irish Dairy Board, "The Likely Consequences of the Luxembourg Agreement for the Dairy Market," staff paper received during USITC fieldwork, Oct. 10, 2003.

[67] Mr. Patrick Ivory, testimony before the USITC, Dec. 11, 2003, transcript p. 368.

[68] Ibid.

[69] Irish Dairy Industry Association, interview by USITC staff, Dublin, Ireland, Oct. 10, 2003; EU Commission, Agriculture Directorate, Dairy Division, interview by USITC staff, Brussels, Belgium, Oct. 14, 2003.

[70] The European milk protein industry can be divided into three segments. (1) Primary processors collect milk from farmers and process it into a variety of consumer-branded dairy products and high-value, dairy-based food ingredients. Many of these companies are large firms and are owned or controlled by farmer cooperatives. (2) Secondary processors do not process raw milk but reprocess and repackage dairy ingredients purchased from primary processors. These companies tend to be small to medium-sized firms that compete on price. They may provide specialized manufacturing, blending, and packaging services to the trader/broker segment or to smaller primary processors that operate single-function plants with limited capacity. (3) Traders primarily operate based on market arbitrage opportunities and may or may not trade on their own behalf. They may trade bulk commodities or they may purchase bulk commodities for reprocessing or repackaging into consumer-ready packaging. They may also provide marketing services to smaller primary processors that lack sufficient scale to develop a sales force for marginal products. European Dairy Association, selected members of the Casein Production Committee, interview by USITC staff, Brussels, Belgium, Oct. 15, 2003; Eucolait, interview by USITC staff, Brussels, Belgium, Oct. 14, 2003; Erie Europe, interview by USITC staff, Paris, France, Oct. 17, 2003.

primary processors.[71] Nonetheless, no individual firm controls more than 7 percent of the total EU milk supply (table 4-7). Concentration of dairy processing varies among the primary protein exporting EU members. For example, Arla Foods in Denmark, the largest dairy processor in the EU based on milk processed, controls at least 80 percent of the Danish milk supply,[72] whereas Campina and Friesland Coberco in the Netherlands, the EU's third- and fourth-largest dairy processors, control at least 80 percent of the Dutch milk supply.[73] Ireland is less concentrated with 6 companies (including Glanbia, Dairygold, Kerry, and Lakeland) controlling at least 80 percent of the nation's milk supply.[74]

Table 4-7
European Union: Industry concentration, top-ten dairy companies by milk processed, 2001

Company/Base location	Milk Processed	Each	Cumulative
	–Million liters–	*Percent*	
Arla Foods (Denmark and Sweden)	7,200	6.4	6.4
Lactalis (France)	7,000	6.3	12.7
Campina (Netherlands)	5,750	5.1	17.8
Friesland Coberco DF (Netherlands)	5,600	5.0	22.9
Nordmilch (Germany)	4,200	3.8	26.6
Bongrain/CLE (France)	4,100	3.7	30.3
Nestle (Switzerland)	2,800	2.5	32.8
Dairy Crest (United Kingdom)	2,700	2.4	35.2
Humana Milckunion (Germany)	2,460	2.2	37.4
Glanbia (Ireland)	2,450	2.2	39.6
Total European Union milk deliveries	111,765		

Source: LTO International Milk Price Comparison, 2002.

The milk protein processing industry is more concentrated than the overall dairy processing industry. In 2000, Zentrale Markt und Preisberichtstelle (ZMP) reported 82 companies producing milk powder in the major protein exporting members with 3 in Denmark, 43 in Germany, 15 in France, 11 in Ireland (1997), and 10 in the Netherlands.[75] The Danish Dairy Board reports that 6 of Arla's 23 plants produce preserved dairy products.[76] ATLA, a French dairy processors' association, reported that about 10 companies in France manufacture casein.[77] DMV International is the only producer of casein in the Netherlands,[78] and the Irish Dairy Board markets casein from 7 manufacturers.[79] Limited information is available on the structure of secondary processors and traders. Eucolait, representing the European dairy trade, indicated that they have about 1,000 members, including primary processors,

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[71] Danish Dairy Board, *Facts & Figures, Global Key Information, Merger Timeline,* found at *http://www.mejeri.-dk/view.asp?ID=589,* retrieved Feb. 12, 2004.

[72] Promar International, *Strategic Development Plan for the Irish Dairy Processing Sector,* reported prepared for the Irish Department of Agriculture and Food, Irish Co-operative Organization Society, and Irish Dairy Industries Association (Mar. 2003).

[73] Ibid.

[74] Ibid.

[75] ZMP, *Dairy Review 2003*.

[76] Preserved dairy products include milk powders, condensed and evaporated milk, and casein.

[77] ATLA (French Dairy Processors Association,) interview by USITC staff, Brussels, Belgium, Oct. 15, 2003.

[78] DMV International, interview by USITC staff, Veghel, The Netherlands, Oct. 13, 2003.

[79] Irish Dairy Board, interview by USITC staff, Dublin, Ireland, Oct. 10, 2003.

secondary processors, and traders; about 80 percent of these members are small and medium-size firms with 3 to 50 employees.[80]

Milk protein for processing

The supply of milk available for processing depends on total milk production, delivery rate, and quantities used for fluid consumption. EU milk production averaged about 122 million mt annually during 1998-2002 (table 4-2). About 7 million mt (or 6 percent) is consumed on farms or sold directly to consumers (either in the form of fluid milk or farm-processed dairy products), with 115 million mt (94 percent) of EU milk production is delivered to plants for processing. Close to 29 million mt go into fluid milk, leaving about 86 million mt of milk for manufactured products, which is equivalent to about 3 million mt of protein.

Milk protein product production

As noted above, delivery quotas have effectively capped the quantity of EU milk available for processing. Consequently, the production of dairy protein products is a zero-sum game: increased production of one product necessitates decreased production of another product. Thus, milk processors are constantly seeking a product mix that yields the highest rate of return.[81] Effects of delivery quotas on milk allocation are demonstrated by reviewing changes in production during 1999-2002. From 1999 to 2001, in response to increased cheese demand, EU cheese production rose by 6 percent, and in response to higher casein prices, skim milk used to produce casein increased by 11 percent. At the same time, butter and SMP production decreased by 3 and 17 percent, respectively. Following higher cheese and casein production, the supply of whey also rose, increasing by 16 percent during the period. Conversely, between 2001 and 2002, as the price of casein dropped by 65 percent,[82] the quantity of skim milk used to make casein dropped by 16 percent. Less casein production translated into less whey production, so whey powder production dropped by 14 percent. The excess skim milk was then diverted to SMP production, which increased by 14 percent.

During 1998-2002, EU processors of milk protein products focused on the production of condensed milk, milk powders (whole, partly skimmed, and skimmed), and casein (table 4-8). During this period, small quantities of MPC were produced, typically by blending other dairy ingredients, rather than through the ultrafiltration of milk.[83] In the EU, the decision to manufacture MPC by blending was driven by several factors. First, blended

[80] Eucolait, interview by USITC staff, Brussels, Belgium, Oct. 14, 2003.

[81] European Dairy Association, selected members of the Casein Production Committee, interview by USITC staff, Brussels, Belgium, Oct. 15, 2003.

[82] The German price of edible casein dropped from €6,120 per mt to €4,100 per mt. ZMP, *Dairy Review 2003*.

[83] Low-protein MPC is typically produced using casein and skim milk powder. High-protein MPC is typically produced using casein and whey protein concentrate. MPC may be wet blended or dry blended depending on the customer specification. Functionality increases with protein level, therefore, low-protein blended MPC tends to be a commodity product, whereas high-protein blended MPC tends to be a functional customized food ingredient. European Dairy Association, selected members of the Casein Production Committee, interview by USITC staff, Brussels, Belgium, Oct. 15, 2003.

Table 4-8
European Union: Production of milk protein products, by product type, and primary protein exporters, 1998-2002

Product	1998	1999	2000	2001	2002
	1,000 metric tons				
Condensed milk:					
Germany	557	564	567	589	525
Netherlands	290	289	274	305	291
France	37	31	32	36	29
Total European Union	1,284	1,258	1,249	1,317	1,203
Whole milk powder:[1]					
France	264	259	258	241	240
Germany	205	200	183	167	154
Netherlands	115	110	97	108	99
Denmark	106	97	97	88	81
Ireland	32	36	40	34	26
Total European Union	926	895	879	836	794
Skim milk powder:					
Germany	326	331	322	290	306
France	325	302	279	245	308
Ireland	91	84	79	86	97
Netherlands	61	87	69	70	64
Denmark	22	35	38	40	42
Total European Union	1,074	1,122	1,038	950	1,080
Whey powder:[2]					
France	559	586	623	649	611
Netherlands	261	240	242	220	230
Germany	203	196	228	236	250
Denmark	33	34	37	40	([3])
Total European Union	1,320	1,355	1,420	1,450	1,465
Casein and caseinates:					
Ireland	42	46	46	50	45
France	38	43	45	48	38
Germany	13	12	13	13	10
Denmark [4]	12	14	11	14	15
Netherlands [4]	36	36	43	39	38
Total European Union	140	154	157	171	144

[1] Includes partly skimed milk powder.
[2] Includes buttermilk powder.
[3] Not reported.
[4] Quantities for Denmark and the Netherlands were estimated based on quantities of subsidized skim milk.

Source: ZMP, *Dairy Review, 2003.*

MPC could be manufactured using existing plants and equipment, whereas producing ultrafiltered MPC generally required new investment. Second, skim milk manufactured into casein was eligible for casein production aids, whereas MPC manufactured through ultrafiltration was not eligible for any EU aid programs. Third, SMP blended into a MPC product qualified for export refunds as an ingredient in a manufactured product, whereas SMP exported directly to the United Stated did not qualify for export refunds.[84] According to representatives of several major EU dairy processing companies, production of

[84] European Dairy Association, selected members of the Casein Production Committee, interview by USITC staff, Brussels, Belgium, Oct. 15, 2003.

low-protein blended MPC was driven by short-term arbitrage opportunities, whereas the production of high-protein MPC is a strategic decision, based on long-term profit potential.[85]

WMP production has steadily decreased by 3.6 percent annually during 1998-2002. WMP is an export-oriented product; 62 percent of 794,000 mt produced in 2002 was sold abroad. The major EU milk-protein exporting countries accounted for 77 percent of total WMP production during 1998-2002. Production of SMP (an intervention product) varies from year to year as producers switch to and from SMP, depending on returns on other dairy products. In 2002, close to 14 percent of EU SMP production was purchased into intervention stocks, whereas 40 percent was subsidized for use in milk replacers for animal feed. The production of whey powder varied with the production of cheese and casein, increasing by 2.7 percent annually during 1998-2002, and totaling more than 1.46 million mt by 2002, of which almost 60 percent was used in milk replacers for animal feed.

Government assistance

Aid for disposal of skim milk powder in casein and caseinate production

To offset the negative impact of high internal milk prices, the EU provides production aids for the use of skim milk in the production of casein and caseinates.[86] To qualify for aid, casein or caseinates must be produced from skim milk of EU origin and meet composition and packaging requirements. Processors requesting production aid must submit written applications indicating the quantity and quality of casein and caseinates produced and production dates; the total aid is calculated based on official rates of conversion between casein production and SMP use (i.e., the mt of skim milk used per mt of casein manufactured) and the aid rate in effect on the date of production. The actual subsidy per mt of casein or caseinates produced varied during 1998-2002, owing to differences in the conversion rates based on product quality and changes in the aid rate per mt of skim milk converted to casein or caseinates (table 4-9).

The average subsidy rate on casein during 1998-2002 was €1,686 ($1,670) per mt of Annex I acid casein, based on a conversion of 1 mt of casein to 32.17 mt of skim milk, and a payment of €52.4 ($51.9) per mt of skim milk.[87] Subsidies ranged considerably during 1998-2002. For example, the subsidy on Annex II rennet casein and caseinate ranged from

[85] Ibid.

[86] EU Commission Regulation (EEC) No. 2921/90 was passed on Oct. 10, 1990, and replaced Regulation No. 756/70 as the basic legislation regulating aid for the production of casein and caseinates. The consolidated text of the legislation, which includes subsequent amendments, is found in CONSLEG:1990R2921 — 17/08/2002, Office for Official Publications of the European Communities.

[87] Annex I and Annex II refer to those sections of the regulation that define the minimum quality standards for casein and caseinates to receive production aid. Quality is based on moisture content, fat content, free acid content, ash content, protein content, and bacterial count. Annex II casein and caseinate would generally be considered higher quality than Annex I casein and caseinate.

Table 4-9
European Union: Production aid for the conversion of skim milk into casein and caseinates, 1998-2002

Range	Aid rate	Subsidy rate on casein or caseinate ([1])	([2])	([3])	([4])	Casein prices: Germany	United States[5]
	Euros per metric ton of skim milk	*Euros per metric ton casein or caseinate*				*Euros per metric ton*	*Dollars per metric ton*
Average	52.4	1,686	1,780	1,874	1,497	4,660	4,687
High	69.0	2,220	2,344	2,468	1,971	6,120	5,592
Low	32.0	1,029	1,087	1,145	914	3,710	3,984

[1] Conversion rate applied to Annex I acid casein: 32.17 metric tons of skim milk per metric ton of casein.
[2] Conversion rate applied to Annex I rennet casein, Annex I acid casein, Annex II acid casein: 33.97 metric tons of skim milk per metric ton of casein.
[3] Conversion rate applied to Annex II rennet casein, Annex II caseinates: 35.77 metric tons of skim milk per metric ton of casein.
[4] Conversion rate applied to Annex III caseinate: 28.57 metric tons of skim milk per metric ton of casein.
[5] Acid casein.

Note.—Annex I, Annex II, and Annex III define quality standards for acid casein, rennet casein, and caseinates in terms of whey protein content, moisture content, fat content, acid content, ash content, and bateria count.

Sources: Office for Official Publications of the European Union Communities, Consolidated: CONSLEG: 1990R2921 --- 17/08/2002; ZMP, *Dairy Review 2003*; U.S. Department of Agriculture, Agricultural Marketing Service, *Dairy Market News*, various issues.

€1,145 ($1,134) per mt to €2,468 ($2,444) per mt. These subsidies account for a large share of the overall product price. For instance, during 1998-2002, the average subsidy paid on Annex II casein production represented close to 40 percent of the price received by German casein manufacturers (table 4-9). From 1998 to 2001, the quantity of skim milk that received subsidies for conversion into casein increased by 7 percent annually (table 4-10). During the same time, domestic prices of casein increased by 19 percent annually. After peaking in 2001, the amount of skim milk subsidized for the production of casein dropped by 16 percent when the domestic casein price dropped by 49 percent.

Table 4-10
European Union (EU): Quantity of subsidized skim milk used in the production of casein and caseinates, by EU total and primary milk protein exporters, 1998-2002

Exporter	1998	1999	2000	2001	2002
	1,000 metric tons				
European Union	4,789	5,265	5,345	5,829	4,912
France	1,300	1,539	1,648	1,675	1,304
Ireland	1,416	1,553	1,394	1,670	1,304
Netherlands	1,211	1,224	1,300	1,317	1,218
Denmark	413	464	358	492	496
Germany	444	401	432	438	325

Sources: ZMP. *Dairy Review 2003.*

Aid for disposal of skim milk powder in animal feed production

In order to make milk protein competitive with vegetable proteins, production aids are provided for the use of skim milk and SMP in the production of animal feed. Regulation 2799/1999 outlines the rules to qualify for this aid and requires that the end product contain at least 50 percent SMP, but no more than 80 percent.[88] In December 1999, the aid rate was set at €715.1 ($708.2) per mt of SMP of at least 35.6 percent protein, and was decreased to €610.0 ($604.1) per mt in October 2000. During 1998-2002, 47 percent of domestic SMP was consumed through subsidized animal feed (table 4-6).

Milk Protein Imports

Import trends

The total quantity of milk protein products imported into the EU reached 150,000 mt in 2002, an increase of 14 percent over import levels in 1998 and 1999 (table 4-11). SMP accounted for about one-half of the milk protein products imported during 1998-2002, but an additional one-third consisted of casein and caseinates. Between 7 to 20 percent of the imports over this period were WMP and whey powder (table 4-11). However, imports represent a small amount of domestic dairy consumption. For example, when converted into skim-milk equivalents, dairy imports increased from about 3.98 million mt in 1998 to 4.35 million mt in 2002, representing about 4 percent of total EU consumption of dairy products (table 4-11).

EU import values fluctuated considerably during 1998-2002. For example, the import value of milk protein was about €195 ($193) million in 1999, increasing to €268 ($265) million in 2001, before declining to €213 ($211) million in 2002 (table 4-11). Over this time frame, import values were evenly split between milk powders and condensed milk (HS 0402) and casein and caseinates (HS 3501). In 2002, 32 percent of EU imports of milk protein products by value were from New Zealand, which supplied mostly casein and caseinates. EU imports of SMP are dominated by sources in Central and Eastern European countries ascending to EU membership. Poland, Estonia, Ukraine, and the Czech Republic held nearly 75 percent of this market in 2002.

Import programs

EU tariff treatment for milk protein product imports varies considerably among products. Casein and caseinates (HS Chapter 35) entering the EU face relatively low tariffs, ranging from a rate of “free” to 9 percent ad valorem. In contrast, milk protein product imports classified in HS Chapter 4 are subject to TRQs with prohibitively high over-quota tariffs. For SMP, 68,000 mt are allowed to enter at an in-quota duty of €475 ($470) per mt, with an

[88] The incorporation rate was temporarily reduced from July 2000 to December 2001 because of a SMP shortage. Agra Europe, *CAP Monitor* London (2002).

Table 4-11
European Union: Milk protein imports by primary suppliers and products,[1] 1998-2002

Primary suppliers/products	1998	1999	2000	2001	2002
	Million euros				
Primary suppliers:					
New Zealand	58	48	53	59	68
Poland	35	33	28	27	26
Estonia	14	9	15	18	23
Ukraine	25	17	41	58	18
Czech Republic	16	16	25	13	13
Russia	19	15	26	25	13
Hungary	3	6	7	13	12
Lithuania	22	11	11	14	6
Latvia	10	9	8	9	4
China	5	2	6	6	3
Others	18	27	34	25	24
Total	225	195	255	268	213
Products:					
Milk powders and condensed milk (CN 0402)	91	90	130	118	105
Whey products (CN 0404)	4	4	8	7	5
Casein and caseinates (CN 3501) [2]	131	101	117	143	104
Total	225	195	255	268	214
	1,000 metric tons				
Skim milk powder	66	73	78	57	69
Casein and caseinates	56	45	49	49	49
Whole milk powder	8	8	8	19	18
Whey powder	2	5	9	6	14
Total	132	131	145	131	150
	1,000 metric tons of skim milk equivalent				
Total imports	3,980	4,250	4,333	4,333	4,350
Domestic consumption	98,460	101,030	101,180	101,160	102,550
	Percent				
Import penetration on skim milk equivalent	4.0	4.2	4.3	4.3	4.2

[1] Does not include milk albumins.
[2] Includes casein glues.

Sources: Quantities: ZMP, *Dairy Review 2003*; Values: European Union Commission, Market Access Database.

over-quota rate of €1,118 ($1,107) per mt applied to additional quantities.[89] Within the World Trade Organization (WTO) quota amount of 68,000 mt, Central and Eastern European countries ascending to EU membership were granted preferential market access beginning in 2000. Consequently, about three-quarters of the import value of concentrated milk products (CN Heading 0402, including SMP) was supplied by countries such as Poland, Estonia, Ukraine, the Czech Republic, and Lithuania during 1998-2002.[90] Preferential duties

[89] During 1998-2002, the over-quota tariff of €1,118 was equivalent to an ad valorem tariff equivalent of between 47 and 58 percent, based on domestic SMP price in Germany.
[90] Commission estimate based on data from the European Commission, Market Access Database, available at *http://mkaccdb.eu.int*.

for countries ascending to EU membership were bilaterally negotiated between the EU and each individual ascending country in two steps—July 2000 and July 2002.[91]

Milk Protein Exports

Export trends

The total quantity of milk protein products exported by the EU remained stable during 1998-2002, ranging from 1.1 million mt in 2002 to 1.4 million mt in 2000 (table 4-12). WMP was by far the most important exported product, accounting for about 40 percent of milk protein product exports during 1998-2002, followed by condensed milk, SMP and whey powder. Trends in SMP exports were closely connected with EU policy on export refunds, which resulted in significant export increases from 1998 to 2000, but declined in 2002. When exports of all dairy products are converted into skim-milk equivalents, they amounted to about 12.1 million mt in 2002, compared with total deliveries to processors of 111 million mt (or 11 percent) (table 4-12).

In terms of values, EU exports have fluctuated considerably during 1998-2002, ranging from €2.1 ($2.08) billion in 2002 to €2.7 ($2.67) billion in 2000 (table 4-12). In 2002, about 80 percent of the total value of EU milk protein exports were accounted for by milk powders and condensed milk, whereas whey and casein/caseinate each accounted for an additional 10 percent. Milk protein products are exported to several countries and there is no single dominant export market for EU products. In 2002, Algeria was the leading market for EU milk protein exports with a share of 11 percent, followed by Saudi Arabia (9 percent) and the United States (7 percent).

Export assistance

Export refunds

Export refunds are payments designed to compensate exporters for the difference between internal EU market prices and world prices.[92] The procedures by which exporters apply for refunds differ slightly based on two broad product categories: (1) basic dairy products, as defined in Annex I to the Treaty that established the EU, and (2) manufactured and processed

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[91] *Official Journal of the European Union*, Commission Regulation No. 2335/2001. The first set of preferences are also known as the zero-zero agreements and the second set are also known as the zero-profit agreements.

[92] An EU Court of Auditors found a correlation, but not a direct link, between refund rates set by the Commission and the calculated difference between the average price in selected member states and the world price. For example, between February 14, 2001, and May 21, 2001, the Court of Auditors found that the EU price of SMP, net the export refund, was €17 to €143 per mt below the world price. Court of Auditors, "Special Report No 9/2003 concerning the system for setting the rates of subsidy on exports of agricultural products (export refunds), together with the EU Commission replies," *Official Journal of the European Union,* C 211 (Sept. 5, 2003).

Table 4-12
European Union: Milk protein exports by primary destinations and products,[1] 1998-2002

Primary destinations/products	1998	1999	2000	2001	2002
	Million euros				
Primary destinations:					
Algeria	261	248	321	294	230
Saudi Arabia	165	167	178	192	185
United States	123	136	189	175	147
Nigeria	52	47	77	142	144
United Arab Emirates	71	73	85	92	84
Mexico	74	64	140	27	49
China	50	47	58	49	48
Japan	40	56	54	50	48
Oman	33	47	41	89	37
Iraq	18	62	68	27	30
Others	1,273	1,270	1,483	1,376	1,098
Total	2,160	2,217	2,694	2,514	2,101
Products:					
Milk powders and condensed milk (CN 0402)	1,845	1,846	2,216	2,037	1,660
Whey products (CN 0404)	144	177	228	235	217
Casein and caseinates (CN 3501)[2]	171	194	250	242	224
Total	2,160	2,217	2,694	2,514	2,101
	1,000 metric tons				
Whole milk & partly skimmed milk powder	590	576	575	478	490
Condensed milk	323	315	276	318	251
Skim milk powder	174	272	357	143	160
Whey powder	96	119	167	188	170
Casein and caseinates	59	63	70	61	69
Total	1,242	1,344	1,445	1,187	1,141
	1,000 metric tons of skim milk equivalent				
Total exports	13,010	13,570	14,880	11,920	12,130
Deliveries to processors	108,800	110,300	109,820	110,550	110,850
	Percent				
Export penetration on skim milk equivalent	12.0	12.3	13.5	10.8	10.9

[1] Does not include milk albumins.
[2] Includes casein glues.

Sources: Quantities: ZMP, *Dairy Review 2003*; Values: European Union Commission, Market Access Database.

food products that use basic dairy products as ingredients.[93] Refunds for basic dairy products are destination specific, whereas refunds for processed products are based on the proportion of the products' value-added derived from basic dairy ingredients used in its manufacture.

[93] Manufactured and processed food products that are eligible for export refunds are referred to in the industry as Non-Annex I products, referring to Annex I of the Treaty that established the EU. The export refund is based on the value-added by the basic dairy products used to manufacture the processed product. For example, the cream used to manufacture Irish Cream Liqueurs for export is eligible for an export refund. European Dairy Association, selected Casein Industry Committee representatives, interview by USITC staff, Brussels, Belgium, Oct. 15, 2003; Erie Europe, interview by USITC staff, Paris, France, Oct. 17, 2003.

For example, SMP exported to the United States is not eligible for an export refund, however, SMP blended into MPC and exported to the United States is eligible for a refund.

Exporters applied for refunds based on the product that they expected to export during a specific time period. For each application period, the EU Commission could accept all applications, reject all applications, or apply a reduction coefficient that awarded some portion of all applications.[94, 95] In some instances, the coefficient rate was applied when the total amount of applications would result in exports that exceeded maximum volume and value levels negotiated under the WTO Agreement on Agriculture.[96] Furthermore, exporters receiving refunds must post a deposit, which was forfeited if the product was not shipped within the designated time period (4 months for most products).[97] Therefore, when applying for refunds, exporters were uncertain whether they would receive coverage for the entire volume they planned to ship. Such uncertainty does not lend itself to long-term contracting, and as a result, many primary processors of milk protein products contacted for this investigation indicated that their use of the export refund system was limited to that period of time when reduction coefficients did not apply to export refunds on processed products.[98]

Inward processing

Another program to promote exports of milk protein is the use of customs procedures for inward processing (IP). IP refers to the provision for which certain imports receive duty-free treatment provided they are used as inputs to products that are later exported (referred to as "compensating products").[99] To qualify, the imported inputs need not necessarily be manufactured into a highly processed food product. Processes such as blending or repackaging are sufficient to quality for duty-free treatment under the IP guidelines. During 1998-2002, EU imports of casein and caseinate under IP arrangements accounted for 30 percent of total EU casein and caseinate imports in 1998, and increased to 42 percent in 2002 (table 4-13).

The extent to which individual member states can take advantage of the IP arrangements is influenced by national laws governing the domestic content requirements in product country of origin labeling regulations.[100] Typically, processors in member states with less stringent domestic content requirements may be able to take greater advantage of IP procedures. For example, when packaging SMP for retail sale, French content laws require 100-percent

[94] For example, if exporters apply for 100,000 mt of product licenses subject to the refund, the EU Commission may apply a coefficient of 0.5, and award a total of 50,000 mt of licenses; in which case, applicants are awarded 50 percent of their application amount.
[95] Prior to January 2001, the reduction coefficient did not apply to applications for refunds on processed (Non-Annex I) products.
[96] Under its World Trade Organization Agreement on Agriculture commitments, the EU must limit its annual export refunds on SMP to 273,000 mt and €276 million.
[97] European Dairy Association, selected Casein Industry Committee representatives, interview by USITC staff, Brussels, Belgium, Oct. 15, 2003; Erie Europe, interview by USITC staff, Paris, France, Oct. 17, 2003.
[98] Ibid.
[99] Irish Revenue, *Inward Processing, Guidelines for Traders*, found at *http://www.revenue.ie/-pdf/ip_guide03.pdf.*
[100] Erie Europe, interview by USITC staff, Paris, France, Oct. 17, 2003.

Table 4-13
European Union: Milk protein imports under inward processing (IP) procedures, 1998-2002

Inward processing imports	1998	1999	2000	2001	2002
	1,000 metric tons				
Whey, powdered	0.8	4.2	5.1	2.6	10.0
Whey, not powdered	31.6	34.4	50.8	62.6	60.4
Casein and caseinate:					
Germany	8.3	7.4	13.7	14.1	17.0
All other	8.4	5.3	5.7	4.7	3.7
Total casein and caseinate	16.7	12.7	19.4	18.8	20.7
	Percent				
Share of imports under IP:					
Casein and caseinate	29.6	28.3	40.6	38.6	42.0

Sources: European Union Dairy Association; ZMP, *Dairy Review 2003*.

French origin for a product to be labeled as a "Product of France." The Netherlands, on the other hand, only requires that more than 50 percent be of Dutch origin for the product to be labeled "Product of the Netherlands."[101] Germany's proximity to major suppliers of casein imports, including Russia and other Central and Eastern European countries, may also contribute to Germany's large share of casein imported under IP procedures. During under 1998-2002, Germany accounted for almost 70 percent of the casein and caseinates imported under IP procedures in the EU (table 4-13).[102]

New Zealand

Overview

In 2002, New Zealand was the world's seventh-largest milk-producing country, with output of 14.1 million mt of milk, equivalent to about 2.8 percent of world production (table 2-1). New Zealand is a dominant world exporting country of dairy products, being the world's largest exporter of SMP, WMP (tables 2-4 and 2-5) and casein (table 2-7). New Zealand milk protein products are sold throughout the world through a highly sophisticated global marketing and distribution network. The United States is the most important market for New Zealand's dairy products, accounting for about 20 percent of total exports in 2001.[103] Between 1998 and 2002, U.S. imports of milk protein products from New Zealand fell from $259 million to $240 million (7-percent decrease) and from 67,600 to 65,000 mt (4 percent decrease) (appendix F).

[101] Ibid.
[102] European Dairy Association, data collected during European fieldwork, Oct. 5-17, 2003.
[103] U.S. Dairy Export Council, *World Dairy Trade Trends, 2003 Edition*, p. VII-Exporters-25.

The dairy industry is a crucial sector of New Zealand economy, accounting for almost one-quarter of its total export receipts in the year ending June 2002.[104] In 2003, dairy exports were NZ$4.7 ($2.26) billion compared with total agricultural exports of NZ$14.4 ($6.9) billion, and merchandise exports of NZ$28.2 ($13.6) billion.[105] With a population of 4 million people, only about 6 percent of milk production is consumed domestically in various forms.[106] Similarly, most milk (approximately 97 percent) produced in New Zealand is used for manufacturing purposes, with the remainder destined for the domestic fluid milk market. The industry is highly concentrated with three farmer-owned, co-operative dairy processing companies purchasing nearly all milk produced and providing an integrated supply of products from farm to consumer.[107] It is also highly efficient and low-cost, with returns to farmers largely based on export revenues. The dairy industry receives virtually no government assistance beyond limited funding in support of research.

Production of Fluid Milk

Production system

New Zealand has a temperate climate, with milk production based on intensive, rotational grazing on pasture land. The preponderance of New Zealand dairy herds supply milk seasonally for manufacturing,[108] with cows milked in spring through autumn, but dried off in winter when pasture production is lower. Peak production is around late-October and early-November, with almost no milk produced in June and July. A small number of herds (approximately 3 percent of milk supply) provide milk year-round for the domestic liquid milk industry.

New Zealand's seasonal milk production system relies primarily on highly productive, rotationally grazed pasture and herds of high genetic merit. Just over one-half of all cows in New Zealand (52 percent) are the Holstein-Friesian breed, which produces a large volume of milk with a high protein content.[109] The North Island provides 72 percent of the nation's milk, although production in the South Island has been increasing significantly, rising 270 percent between the 1992/93 and 2002/03 seasons,[110] reflecting, in part, the conversion of sheep and beef operations to dairy farms. The majority of New Zealand dairy farmers are

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[104] Ministry of Agriculture and Forestry (MAF), *Contribution of the Land-based Primary Industries to New Zealand's Economic Growth*, Wellington (June 2003).

[105] MAF, *Situation and Outlook for New Zealand Agriculture and Forestry 2003,* found at *http://www.maf.govt.nz/mafnet/rural-nz/statistics-andforecasts/-sonzaf/2003/sonzaf-2003/pdf*, table 5, p. 103.

[106] MAF officials, interview by USITC staff, Wellington, Nov. 4, 2003.

[107] Other dairy companies purchase milk from these three major suppliers.

[108] MAF, *Agriculture and Forestry in New Zealand*, Wellington, July 2000, found at *http://www.maf.govt.nz/mafnet/publications*, Jan. 12, 2003.

[109] "Livestock Improvement," *Dairy Statistics, 2002/03*, found at *http://www.lic.co.nz/main.-cfm?menuid=1&sub_-menuid=113*.

[110] Dairy Companies Association of New Zealand (DCANZ) prehearing submission, Dec. 1, 2003, p. 11.

owner-operators. However, 37 percent of all New Zealand milkers are sharemilkers[111] with about two-thirds of the sharemilkers being 50/50 sharemilkers.[112]\

Milk production and industry trends

New Zealand's dairy industry grew significantly in the 1990s,[113] with milk production increasing by 67 percent, or 4.6 percent annually, between 1990 and 2000. During 1997/98 to 2002/03,[114] milk production increased at an average annual rate of 5 percent, reaching 14.3 million metric tons in 2002/03 (table 4-14), largely reflecting improved livestock genetics, better farm practices, and the conversion of sheep and beef operations into dairy farms.[115] According to New Zealand's Ministry of Agriculture and Forestry (MAF), the future rate of growth of milk production is expected to slow as new conversions have slowed, owing to increased profitability of other farm operations.[116] The U.S. Department of Agriculture (USDA) also reported that the number of farms converting to dairy production has slowed in New Zealand, with conversations in the 2003/04 season estimated at 42 compared with more than 80 in 2002/03.[117]

Similar to other major dairy producing countries, as the number of dairy farms in New Zealand has declined over time, average operation size has increased. Between 1997/98 and 2002/03, the number of dairy farms fell by 10 percent from 14,643 farms to 13,140 farms, but the average herd size rose by 30 percent from 220 to 285 cows.[118] Roughly 10 percent of herds have 500 or more cows, with herds of between 500-599 cows having the highest production per cow.[119] Average milk production per cow rose by an average rate of 2 percent annually during 1997/98 to 2002/03, reflecting improvements in productivity noted above. In 2002/03, an average of 2.6 cows were maintained per hectare of pasture, a slightly higher stocking rate than the 2.2 cows per hectare in the early-1980s.[120]

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[111] A sharemilker is a person who operates a dairy farm on behalf of the farmer-owner for an agreed share of the receipts.

[112] "Livestock Improvement," *Dairy Statistics, 2002/03*, found at ***http://www.lic.co.nz/main.-cfm?menuid=1&sub_-menuid=113***. A report by the Australian Bureau of Agricultural and Resource Economics (ABARE) comparing the New Zealand and Australian dairy industries noted that while both industries are low-cost milk producers, one difference between the industries is the higher proportion of share-farmers in New Zealand compared to Australia. ABARE, *Australia's Dairy Industry-Productivity and Profit*, Dec. 2002, p. 7.

[113] DCANZ, prehearing submission, Dec. 1, 2003, p. 9; "Livestock Improvement," *Dairy Statistics, 2001/02*, found at *http://www.lic.co.nz/main.cfm?menuid=1&sub_menuid=113*.

[114] Split-year season ending May 31 of the year shown.

[115] MAF officials, interview by USITC staff, Wellington, Nov. 4, 2003; DCANZ, prehearing submission, Dec. 1, 2003, p. 9.

[116] Ibid

[117] USDA, FAS, "New Zealand Dairy and Products Annual 2003," Gain Report No. NZ3019 (Sept. 29, 2003).

[118] DCANZ, prehearing submission, Dec. 1, 2003, p. 11.

[119] "Livestock Improvement," *Dairy Statistics, 2002/03*, found at ***http://www.lic.co.nz/main.-cfm?menuid=-1&sub_-menuid=113***.

[120] Ibid.

Table 4-14
New Zealand: Structure of milk production sector, 1997/98-2002/03[1]

Item	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	Growth per year[2]
							Percent
Number of dairy cows *(1,000 head)*	3,223	3,289	3,269	3,486	3,693	3,741	3
Milk production *(1,000 metric tons)*	11,430	10,881	12,235	13,153	13,925	14,346	5
Milk processed *(1,000 metric tons of milk solids)*	893	850	970	1,045	1,110	1,150	5
Yield per cow *(kilograms/cow)*	3,546	3,308	3,743	3,773	3,771	3,835	2
Number of dairy farms	14,643	14,362	13,861	13,892	13,649	13,140	-2
Average herd size	220	229	236	251	271	285	5
Average milk payment *(NZ $/kg milk solids)*	3.42	3.58	3.78	5.01	5.32	3.62	3
Cash farm expenditure *(NZ $/cow)*			874	783	882	966	4
Net profit after tax *(NZ $/cow)*	-	-	288	670	470	101	8
Number of dairy processing companies	8	7	7	4	3	3	-16

[1] June-May split year.
[2] Annual average growth 1997/98-2002/03.

Sources: Ministry of Agriculture and Forestry, *Situation and Outlook for New Zealand Agriculture Forestry, 2002, 2003*; Livestock Improvement, *2002/03 Dairy Statistics Annual.*

Costs of production

Costs of production for milk in New Zealand are among the lowest in the world,[121] mainly because favorable climate and productive pastures enable herds to graze in pasture year-round, thereby avoiding the need for indoor housing and feed supplements. Important costs for New Zealand milk farmers include payments for interest, fertilizer for growing fodder, permanent and casual wages, feed (largely maize silage), and repairs and maintenance.[122] Many farmers report that it is difficult to find skilled labor, and wages and salary rates have been climbing in recent years.[123] MAF reports that milk profitability growth slowed in 2002/03 owing to lower payments from the milk supply companies.[124]

Milk prices

Payments to seasonal milk supply farmers are based upon the "A+B-C" system, which incorporates payments for milkfat (A) and protein (B), with penalties for milk volume (C). The payment system for suppliers to town-supply dairy companies[125] varies.[126] During 1997/98-2001/02, the average milk payout rose steadily from NZ$3.42 ($1.65) per kilogram of milk solids to NZ$5.32 ($2.56) per kilogram of milk solids (table 4-14). The payout fell

[121] An international comparison of production costs is provided in chapter 5 of this report.
[122] MAF, *Dairy Monitoring Report*, Wellington, New Zealand (July 2002), p. 51, found at *http://www.maf.govt.nz/statistics/primaryindustries/farm-monitoring/dairy/htm*, Jan. 12, 2003; MAF officials, interview by USITC staff, Wellington, Nov. 4, 2003.
[123] Ibid.
[124] Ibid.
[125] Companies that supply drinking milk for the domestic market all year around.
[126] Some town supply payment systems are based on the milk volume only, whereas other payment systems are similar to seasonal supply payment systems, which incorporate components of milkfat, protein, and volume. MAF, interview by USITC staff, Wellington, Nov. 4, 2003.

in 2002/03 to NZ$3.62 ($1.74) per kilogram of milk solids, reflecting lower world dairy commodity prices and the appreciation of the New Zealand dollar.[127]

Up until the end of the 2000/01 season, New Zealand dairy farmers received payment for milk from the New Zealand Dairy Board (NZDB) through a system of advance and final payouts via dairy companies. The seasonal supply companies[128] passed on the NZDB advance payout to their suppliers, along with a margin based on dairy company efficiency, product mix and investment policies, together known as the total payout. Following the implementation of the Dairy Industry Restructuring Act 2001 (DIRA), Fonterra Co-operative Group Ltd., Tatua Co-operative Dairy Co., and Westland Co-operative Dairy Co., the three major dairy processing companies, established separate commercial arrangements for pricing and sale of dairy products, although the DIRA provides Tatua and Westland with the right to sell specified volumes of dairy products to Fonterra on specified terms.[129] According to the Dairy Companies Association of New Zealand (DCANZ), dairy farmers and processing companies are entirely dependent on the return they obtain from the market.[130] The companies have an incentive to get the best return for their shareholders by keeping their milk prices as high as possible to minimize financial losses.

In both the 2001/02 and 2002/03 seasons, the final Fonterra payout was lower than the payouts for Westland and Tatua. In 2001/02, Fonterra's final payout was NZ$5.30 ($2.55) per kilogram of milk solids, compared with Tatua's payout of NZ$6.80 ($3.27) per kilogram of milk solids, and Westland's payout of NZ$5.43 ($2.61) per kilogram of milk solids. In 2002/03, Fonterra's payout was NZ$3.60 ($1.73) per kilogram of milk solids, compared to payouts for Tatua of NZ$5.60 ($2.70) per kilogram of milk solids, and Westland of NZ$3.97 ($1.91) per kilogram of milk solids.[131]

Under Fonterra's co-operative structure, farmers who increase supply during a season and do not hold sufficient shares to cover that increased production, must purchase additional shares at Fonterra's fair-value share price. Similarly, if they decrease supply, they must surrender shares. In 2002/03, Fonterra's final payout was below the announced fair-value share price of NZ$3.85 ($1.85) per kilogram of milk solids.[132] For 2003/04, Fonterra announced a payout forecast of NZ$4.15 ($2.00) per kilogram of milk solids,[133] while the fair-value share price for the 2003/04 season has been set at NZ$4.38 ($2.11) per kilogram of milk solids.[134] According to the USDA, payouts less than Fonterra's fair-value share price

[127] MAF, *Situation and Outlook for New Zealand Agriculture and Forestry 2003,* found at *http://www.maf.govt.nz/mafnet/rural-nz/statistics-andforecasts/-sonzaf/2003/sonzaf-2003/pdf*.

[128] Companies that manufacture milk into processed production on a seasonal basis.

[129] MAF, *Situation and Outlook for New Zealand Agriculture and Forestry 2003,* found at *http://www.maf.govt.nz/mafnet/rural-nz/statistics-andforecasts/-sonzaf/2003/sonzaf-2003/pdf*.

[130] DCANZ, prehearing submission, Dec. 1, 2003, p. 12.

[131] MAF, *Situation and Outlook for New Zealand Agriculture and Forestry, 2002 and 2003*, found at *http://www.maf.govt.nz/mafnet/rural-nz/statistics-and-forecasts/sonzaf/2003/sonzaf-2003/pdf*.

[132] USDA, FAS, "New Zealand Dairy and Products Fonterra Payout & Growth Down," Gain Report No. NZ3006 (Mar. 11, 2003).

[133] Fonterra News, "Fonterra Lifts Payout Forecast to $4.15," (Dec. 9, 2003), found at *www.fonterra.com/content/-news/fonterranews/default..jsp*.

[134] Ibid.

result in net losses for farmers who purchase additional shares to expand production.[135] This in turn reduces incentives for increased milk production.

Fonterra shareholders are also responsible for holding a number of peak notes as determined by the Fonterra Board at the commencement of the season. Peak notes are issued at NZ$30 ($14.44) each, based on each shareholder's milk supply profile during the season.[136] The system of peak notes requires suppliers with steep milk curves (i.e., those that peak above the milk supply curve of an average supplier) to contribute more capital to finance the cost of the extra manufacturing capacity required to process the additional milk during the peak season.

Government assistance

Subsidy and payment programs for farmers were discontinued or phased out starting in 1984 as part of a general reform of the New Zealand economy. Previous assistance measures included subsidized rural credit, tax concessions, subsidized credit for marketing boards, and input subsidies. MAF officials report that assistance benefitting dairy farmers in New Zealand is currently limited to a tuberculosis control program and general competitive research grants.[137] The Organization for Economic Co-operation and Development (OECD) reports that the Producer Support Estimate (PSE) for milk in New Zealand in 2002 was 1 percent, down from 14 percent in 1986.[138]

Milk Protein Products

Industry structure

The dairy processing industry in New Zealand is highly concentrated. In 1998, eight co-operative dairy companies purchased raw milk for manufacturing; by 2003, this number had declined to three (table 4-14). From 1961 to 2001, export and marketing of all New Zealand dairy products manufactured for export was undertaken by the NZDB. The NZDB, a statutory organization established by the Dairy Board Act 1961, was jointly owned by the co-operative export dairy processing companies and, in turn, by the dairy farmers that supplied them. The NZDB purchased dairy products from manufacturing companies and sold

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[135] USDA, FAS, "New Zealand Dairy and Products Fonterra Payout & Growth Down," Gain Report No. NZ3006 (Mar. 11, 2003).

[136] Fonterra, *Annual Report 2002/03.*

[137] MAF officials, interview by USITC staff, Wellington, Nov. 4, 2003.

[138] The PSE is a measure of the ratio of transfers from consumers and taxpayers to agricultural producers arising from measures that support agriculture, regardless of their nature. The percentage PSE measures the transfers as a share of gross farm receipts. OECD, *Methodology for Measurement of Support and Use in Policy Evaluation* (Paris: 2002); OECD, *Producer and Consumer Support Estimates, OECD Database 1986-2002*, found at *http://www.oecd.org/-document/23/0,2340,en_2649_33727_4348119_1_1_1_1,00.html*. An international comparison of the OECD's PSEs for dairy is presented in chapter 5.

them either directly or through its marketing network. Net proceeds from sales were distributed to the manufacturing dairy companies and ultimately to dairy farmers.[139]

In September 2001, the Dairy Industry Restructuring Act 2001 (DIRA) was enacted, which resulted in major changes in the structure of the dairy industry. The legislation authorized the two largest co-operative milk supply companies, Kiwi Co-operative Dairy Co. (Kiwi) and New Zealand Dairy Group (NZDG), to merge with the NZDB to form Fonterra. The legislation eliminated the exclusive export status of the Dairy Board, thus allowing dairy companies to export their products directly.[140] Tatua and Westland remained independent entities.[141]

Since 2001, Fonterra has been by far the dominant milk supply company in New Zealand. It is an integrated supply and marketing company with 12,165 shareholder suppliers. In 2002/03, it produced 1.15 million mt of milk solids out of a total nationwide production of 1.19 million mt of milk solids (97 percent).[142] Fonterra is the largest dairy ingredients company in the world, producing milk powders, cheese, milk proteins, and cream products from 25 sites in New Zealand.[143] It also produces branded, consumer-ready products through its subsidiary, New Zealand Milk.[144] Westland, with 370 suppliers, accounted for 2.5 percent of New Zealand milk solids production,[145] and Tatua, with 128 farmer shareholders, accounted for 1 percent.[146] Westland's main products are milk powder and butter, with lesser amounts of milk proteins (casein and MPC).[147] Tatua has invested in scientifically advanced processing plants and is a niche manufacturer of mainly protein-based functional products.

New Zealand's domestic market has two main domestic operators: New Zealand Milk (owned by Fonterra) and New Zealand Dairy Foods, which together have 75 percent of the domestic market. In addition, approximately 70 smaller niche companies produce cheese, fresh and cultured milk, specialty milk powders, ice cream, and edible fats.[148] These companies largely source milk from Fonterra.

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[139] Ministry of Justice 1999: Directory of Official Information, found at *http://www.justice.-govt.nz/pubs/reports/-1999/dir_of_info/list_d/dairy.html*.

[140] On 1 March 2002 all shares remaining shares in the Dairy Board were transferred to Fonterra Co-operative Group. The Dairy Board converted from a statutory corporation to a company in September 2002. New Zealand Dairy Board, *Report By the New Zealand Dairy Board on its Statutory Powers Pursuant to the Dairy Board Act 1961 For the Period Commencing 1 June 2001 and Ending 26 September 2002,* found at *http://www.fonterra.com/pdfs/report_nzdb_exer_-27_-09_02.pdf,* retrieved Jan. 13, 2004.

[141] DCANZ, prehearing submission, Dec. 1, 2003, p. 11.

[142] Fonterra officials, interview by USITC staff, Wellington, Nov. 4, 2003; Fonterra, *Fonterra Annual Report 2002-2003,* found at *www.fonterra.com/pdfs/2003_annual_report.pdf*.

[143] Ibid.

[144] Ibid.

[145] DCANZ, prehearing submission, Dec. 1, 2003, p. 11.

[146] Tatua Co-operative Dairy Company, *Annual Report '03*, found at *www.tatua.com*, retrieved Jan. 13, 2004; Tatua officials, interview by USITC staff, Tatuanui, New Zealand, Nov. 6, 2003.

[147] MAF, *Contribution of the Land-based Primary Industries to New Zealand's Economic Growth*, Wellington (June 2003), p. 17; responses to Commission foreign producers' questionnaires.

[148] Ibid., p. 18; MAF officials, interview by USITC staff, Wellington, Nov. 4, 2003.

Milk protein product production

Among the milk protein products shown in table 4-15, casein has typically been the most important product produced in New Zealand by volume. Both casein and caseinate production grew during 1998-2002, but slowed in 2002, likely reflecting the decline in world casein/caseinate prices in that year.[149] New Zealand's production of MPC and whey proteins exhibited the largest growth rates during 1998-2002, increasing annually on average by 22 and 9 percent, respectively.

Table 4-15
New Zealand: Production of milk protein products, 1998-2002

Product	1998	1999	2000	2001	2002	Growth per year 1998-2002[1]
	1,000 metric tons					*Percent*
Casein	53	56	58	64	63	3
Milk protein concentrate	23	30	43	41	48	22
Caseinate[2]	22	21	23	24	25	4
Whey proteins	15	14	15	18	21	9
Total	113	121	139	147	157	5

[1] Annual average growth 1997/98-2002/03.
[2] Production from liquid milk.

Source: Commission foreign producers' questionnaires; Dairy Companies Association of New Zealand, prehearing submission, Dec. 1, 2003.

Fonterra's production of protein products includes casein (rennet and acid), caseinates, MPC, milk protein isolate (MPI), whey protein concentrate (WPC), whey protein isolate (WPI), hydrolysates, and protein combinations.[150] During 2001/02, Fonterra's production of these protein products accounted for almost 13 percent of its production of dairy products, falling slightly to 11 percent in 2002/03. Larger shifts occurred in production of cheese and milk powders (SMP, WMP, and butter milk powder), with the cheese production falling from about 20 percent to 14 percent of Fonterra's production, and milk powders increasing from 39 percent to 45 percent during this period (table 4-16). This shift reflected low international cheese prices and a recovery in milk powder prices in 2002/03, as noted by MAF.[151] As milk powder prices were higher than the prices of other products, there was a shift of production away from protein products and cheese toward milk powders.

Fonterra's manufacturing sites tend to be large multiproduct facilities, designed to accommodate the seasonal nature of New Zealand milk production and provide economies of scale.[152] Most factories are fully utilized at the peak production period (October and November) and at other times milk is allocated to different processing plants according to production schedules.[153]

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[149] As indicated by unit values of imports into the United States, based on trade data from the U.S. Department of Commerce.

[150] Fonterra, "The Ingredients to Lead in Dairy," found at *www.fonterra.com*.

[151] MAF, *Situation and Outlook for New Zealand Agriculture and Forestry 2003.*

[152] Ibid. Fonterra officials, interview by USITC staff, and site visits by USITC staff to Fonterra's Whareroa and Hautapu production facilities, Nov. 5-6, 2003.

[153] Ibid.

Table 4-16
New Zealand: Production of dairy products by Fonterra, 2001/02 and 2002/03[1]

Product	2001/02	2002/03
	1,000 metric tons	
Milk powders[2]	688	867
Butter and cream products	408	440
Cheese	342	274
Protein (including nutritional/whey)	220	217
Other (including lactose)	89	143
Total	1,746	1,940

[1] June-May split year.
[2] Includes whole milk powder, skim milk powder, and butter milk powder.

Source: Fonterra, *Fonterra Annual Report 2002-2003,* found at *www.fontera.com/pdfs/2003_ annual_report.pdf*.

Tatua's production of protein products is shown in table 4-17. Tatua sells products such as caseinates, WPC, and cream to Fonterra, and produces acid WPC 80 to customer specifications. Tatua also produces lactoferrin using the facilities of Westland Milk Products and plans to enter a manufacturing agreement with Tatura Milk Industries in Australia in 2003/04.[154] Tatua also produces such products as ultra high temperature (UHT) milk and cream products.[155]

Table 4-17
New Zealand: Tatua production of milk protein products, 1998/99-2002/03

Product	1998/99	1999/00	2000/01	2001/02	2002/03
	1,000 metric tons				
Caseinates	7	8	7	7	6
Whey protein concentrate	([1])	([1])	([1])	([1])	1
Other products	1	1	1	1	1
Total	8	10	8	9	8

[1] Less than 500 tons.

Source: Tatua, *Annual Report, 2003*.

Westland Milk Products is primarily a producer of heat-stable milk powders, butter, and small amounts of casein and MPC. Westland is currently extending its range of milk powders to include colostrum-based products and other nutraceutical ingredients and formulations.[156]

According to Fonterra officials, milk protein products are formulated to meet the characteristics ordered by consumers.[157] New Zealand's technologies include use of ultrafiltration to produce MPC (protein concentration up to 88 percent) and MPI (protein concentration of 90 percent). Fonterra also produces total milk protein (TMP), a co-precipitated MPC primarily used in energy bars. Whey protein production includes

[154] Tatua officials, interview by USITC staff, Tatuanui, New Zealand, Nov. 6, 2003.
[155] Tatua, *Annual Report'03;* DCANZ, prehearing submission, Dec. 1, 2003, p. 13.
[156] DCANZ, prehearing submission, Dec. 1, 2003, p. 13.
[157] Fonterra officials, interview by USITC staff, Wellington, Nov. 4, 2003; Officials from Fonterra Research Centre, interviews by USITC staff, Palmerston North, New Zealand, Nov. 5, 2003.

ultrafiltered WPC, and WPI, which uses an ion exchange (IE) process, and sold into the sports drink market in the United States.[158] Fonterra officials have indicated they do not produce milk proteins using casein/SMP blends.[159]

Most milk protein products produced in New Zealand are exported, with only a small fraction sold into the domestic market. Fonterra officials have indicated that the growing market for health and nutritional products in the United States has resulted in increased export sales. In addition, highly efficient U.S. food processing facilities make it more cost effective to manufacture products using milk protein ingredients in the United States.[160]

Research and market promotion

Research and development (R&D) is a key component affecting the competitiveness of New Zealand's dairy industry. The merger of Fonterra with the NZDB led to changes in the research structure affecting dairy producers and processors. Historically, dairy industry-good funding (activities that benefit the whole dairy industry) were paid for and managed by the NZDB.[161]

At the processor level, the DIRA affected the role and status of New Zealand's premier dairy products research institution, the New Zealand Dairy Research Institute (NZDRI). The NZDRI, formerly a crown trust which provided R&D services to the NZDB and dairy industry,[162] was changed to a company under the DIRA and transferred to Fonterra, along with other assets of the NZDB.[163] In 2002/03, Fonterra established its Marketing and Innovation Group (MIG), which amalgamated the Fonterra Research Centre (formerly the NZDRI) with its global ingredients marketing team and elements of its business development group.[164] According to Fonterra, the purpose of this new group is to provide scientific research and technical support to drive Fonterra's value-added business.[165] The MIG is involved in research partnerships throughout New Zealand and the rest of the world.[166] Fonterra also has a biotechnology company, ViaLactia Biosciences (NZ), whose function is to identify, discover, and commercialize genes important to the dairy industry, including those affecting pasture grasses, milk production and composition, and animal health.[167]

Fonterra is New Zealand's largest private sector investor in R&D, with an annual budget close to NZ$110 ($53) million. In 2001/02, Fonterra received government funding of

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[158] Fonterra, "The Ingredients to Lead in Dairy," found at *www.fonterra.com*, p. 9.
[159] Fonterra officials, interview by USITC staff, and site visits by USITC staff to Fonterra's Whareroa and Hautapu production facilities, Nov. 5-6, 2003.
[160] Fonterra officials, interview by USITC staff, Wellington, Nov. 4, 2003.
[161] MAF, *Situation and Outlook for New Zealand Agriculture and Forestry 2003.*
[162] The NZDRI was a specialized research institution jointly supported by the New Zealand Government and industry. DCANZ prehearing submission, Dec. 1, 2003, p. 10.
[163] Fonterra, *Annual Report 2002-2003,* found at *www.fonterra.com/pdfs/2003_annual_report.-pdf.*
[164] Ibid.
[165] Officials from Fonterra Research Centre, interviews by USITC staff, Palmerston North, New Zealand, Nov. 5, 2003.
[166] DCANZ, prehearing submission, Dec. 1,2003, p. 13; Officials from Fonterra Research Centre, interviews by USITC staff, Palmerston North, New Zealand, Nov. 5, 2003.
[167] Fonterra, *Annual Report 2002-2003,* found at *www.fonterra.com/pdfs/2003_annual_report.-pdf.*

NZ $5 ($2.4) million through the Foundation for Research Science and Technology (FRST) for work on milk protein research.[168] In May 2002, it was announced that Fonterra, through a research consortia, would receive NZ$2 ($0.96) million per year over 7 years for research aimed at discovering biomedical components in milk. Grants received from the FRST involve similar matching funds provided by Fonterra.[169]

New Zealand's two other core milk supply companies also provide strong support for R&D. DCANZ reports that Tatua spends nearly 2 percent of its annual turnover (over NZ$1 ($0.48) million per year) on R&D to support is specialty products. Similarly, Westland has recently invested NZ$73 ($35) million in laboratory, R&D facilities, as well as processing capabilities and infrastructure.[170]

At the farm level, the industry continued to fund industry-good activities formerly undertaken by the NZDB during the 2002/03 season through a fee of NZ$0.03 ($0.014) per kilogram milk solids paid by the three core milk supply companies. In May 2002, New Zealand dairy farmers voted in favor of a milk solids levy to fund industry-good activities. This levy came into effect at the start of the 2003/04 dairy season, with all farmers who produce milk from bovine animals and supply a dairy company responsible for payment of the levy. The rate of the levy is set each year, but in 2003/04 it is NZ$0.034 ($0.016) per kilogram of milk solids (plus General Sales Tax). Dairy InSight, an incorporated society, was established to coordinate projects with the collected levies, which amounted to about NZ$39 ($19) million in 2002/03. Projects funded are in the areas of R&D, farming systems, data analysis, technology transfer, industry promotion, education and training, and quality control.[171] In addition, Dairy InSight is a contributor to Dexcel, which performs farm-level research, education, and extension activities. Dexcel was initially established by the NZDB, but became funded and owned by New Zealand dairy farmers following the restructuring.[172]

Industry structure and regulations following restructuring

The merger of New Zealand's two largest dairy companies, and their amalgamation with the NZDB to form Fonterra, resulted from concerns that the previously regulated structure of the dairy industry was not in the industry's long-term interest.[173] To facilitate the merger, the New Zealand Government implemented the DIRA, which removed the NZDB's statutory powers as the single-desk exporter of dairy products, and introduced a number of regulatory interventions designed to promote competition in the markets for raw and processed milk. Provision of research, extension, and health services to dairy farmers that were previously supplied by the NZDB also changed, with farmers purchasing shares in, or paying a fee to fund, new service organizations.

The regulatory measures introduced following the formation of Fonterra were designed to promote competition within New Zealand's dairy industry and to mitigate concerns related

[168] Ibid

[169] *Fonterra News* (May 24, 2002), found at *www.fonterra.com*.

[170] DCANZ, prehearing brief, Dec. 1, 2003, p. 13.

[171] MAF, *Situation and Outlook for New Zealand Agriculture and Forestry 2003.*

[172] The revenues for Dexcel also includes contributions from FRST, commercial revenue, and farm income. Dexcel, *Annual Report 2003,* found at *http://www.dexcel.co.nz*.

[173] MAF, *Situation and Outlook for New Zealand Agriculture and Forestry 2001.*

to the dominant position that Fonterra would hold in raw milk procurement and dairy product processing. The package included elements as follows:[174]

- *Open entry and exit to Fonterra*–The DIRA requires Fonterra to offer open entry and exit to all farmers and share milkers who supply milk. The price of shares of entry and exit is the same at any given time. A supplying shareholder who wants to leave Fonterra may do so by giving notice by the end of February in any year for exit. Suppliers are paid the current value of their capital investment in Fonterra if they leave.

- *Ease of entry*–Fonterra must offer new suppliers the same terms and conditions of milk supply as it offers existing suppliers. Fonterra must offer 1 year supply contracts to all suppliers. Fonterra may offer longer-term contracts, but in any given season, at least 33 percent of milk solids produced in a 160-kilometer radius of any point in New Zealand must be supplied to someone other than Fonterra or under contracts that expire at the end of the season without penalty, to ensure that milk supply is available for other processors to acquire.

- *Supply of milk by farmers to other processors*–Farmers and sharemilkers who are shareholders and milk suppliers to Fonterra will be allowed to supply up to 20 percent of their milk to other processors without penalty.

- *Fonterra's supply of milk to other processors*–Fonterra must supply raw milk to anyone in New Zealand who seeks it, up to a maximum of 400 million liters per year (around 3 percent of Fonterra's total annual milk production) at a regulated price.[175] The price of the milk must be the payout to shareholders, less the annualized capital value of the shares and peak notes, plus transport, and reasonable additional speciality milk costs.

- *Dairy disinvestment*–The DIRA required Fonterra to divest 50 percent of its shareholding in New Zealand Dairy Foods, a supplier of fresh and processed dairy products primarily to the domestic market and owned by the New Zealand Dairy Group.

Milk Protein Exports

Export trends

New Zealand's total exports of milk protein products by volume for 1998/99 to 2002/03 are shown in table 4-18. New Zealand's exports rose from 123,000 metric tons in 1998/99 to

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[174] Summarized from MAF, *Situation and Outlook for New Zealand Agriculture and Forestry 2001*; MAF officials, interview by USITC staff, Wellington, Nov. 4, 2003.

[175] MAF officials have noted that Fonterra is currently providing 300,000 million liters of milk to independent processors, indicating there is room for a new company to enter the market and purchase milk; MAF officials, interview by USITC staff, Wellington, Nov. 4, 2003.

Table 4-18
New Zealand: Exports of milk protein products[1] to the world, the United States, and rest of world, 1998/99-2002/2003[2]

Country	1998/99	1999/00	2000/01	2001/02	2002/03
	1,000 metric tons				
United States	62	68	60	61	75
Rest of world	61	64	72	73	93
Total	123	132	131	133	167
U.S. share *(percent)*	51	51	45	46	45

[1] Casein, caseinate, milk protein concentrate, whey protein concentrate, and whey.
[2] July-June.

Source: Statistics New Zealand, Information Network for Official Statistics.

167,000 mt in 2002/03, or by 36 percent. The U.S. share of these shipments fell, however, from 51 percent to 45 percent in the latest year. The United States is the largest market for New Zealand's exports of casein and caseinates, followed by the EU, and Japan. The United States accounted for 34 percent of New Zealand's exports of casein in 2002/03 (table 4-19), and for just under one-half of its exports of casein and caseinates.[176] New Zealand's casein exports consist of rennet, acid, and other casein as further shown in table 4-19. Acid casein accounted for 63 percent of New Zealand's casein exports to the United States in 2002/03, although the share of rennet casein/other has been increasing in recent years.

Table 4-19
New Zealand: Exports of casein[1] by type to the world, the United States, and rest of the world, 1998/99-2002/2003[2]

Product/country	1998/99	1999/00	2000/01	2001/02	2002/03
	1,000 metric tons				
Acid casein:					
United States	20	19	18	10	12
Rest of world	15	13	15	17	26
Total	35	32	33	27	38
Rennet casein/other:[3]					
United States	4	4	6	5	7
Rest of world	10	10	11	8	11
Total	14	14	17	14	18
	Percent				
U.S. share:					
Acid casein	58	59	55	38	32
Rennet casein/other	32	28	36	39	40
Total	50	50	48	38	34

[1] Acid casein 3501.10.00.01; rennet casein 3501.10.00.11; other casein 3501.10.00.19.
[2] July-June.
[3] Includes rennet casein and very small amounts of casein other than acid.

Source: Statistics New Zealand, Information Network for Official Statistics.

[176] MAF, *Situation and Outlook for New Zealand Agriculture and Forestry 2003*, pp. 24- 25.

New Zealand's exports of milk proteins, as estimated through Commission foreign producers' questionnaires for calendar years 1998-2002, are shown in table 4-20. Among the milk proteins, exports of casein are the largest, followed by MPC. New Zealand's exports of MPC on a volume basis experienced the largest percentage increase during the 1998-2002 period, with the rate of increase slowing in 2002. The United States, the EU, Canada, and South American countries are the largest markets for MPC.[177] The major markets for whey protein concentrates are Japan, the EU, and the United States.[178] Trends in New Zealand's exports of milk protein products to the United States based on the Commission questionnaires are discussed in more detail in chapter 6.

Table 4-20
New Zealand: Exports of milk protein products, 1998-2002

Product	1998	1999	2000	2001	2002	Growth per year 1998-2002
	1,000 metric tons					*Percent*
Casein	50	48	49	48	54	2
Milk protein concentrate	21	28	36	44	45	21
Caseinate	27	27	26	27	29	2
Whey proteins	13	15	15	13	17	8
Total	111	118	126	132	145	6

Source: Commission foreign producers' questionnaires.

Export regulations

The DIRA restructured dairy exporting by allowing for the unrestricted export of New Zealand dairy products, except in the case of certain "designated markets."[179] Under the DIRA, the NZDB retained the exclusive right to export to the designated markets until the end of an initial period, ranging until 2007 to 2010, depending on the market.[180] These designated markets and the initial periods (in parentheses) include:

- milk powder to the Dominican Republic (June 2007);
- butter to Canada (July 2007);
- butter, cheddar cheese, and cheese for processing to the EU (December 2007);
- cheddar and low-fat cheese to the United States (December 2008);

[177] Commission foreign producers' questionnaires.
[178] DCANZ, prehearing submission, Dec. 1, 2003, p. 25.
[179] Government of New Zealand, *Dairy Industry Restructuring Act 2001*, found at *http://www.-legislation.govt.nz*.
[180] Ibid.

- NSPF (not specifically provided for) cheese (cheese substitutes), and other American-type cheese to the United States (December 2009); and,

- cheese and prepared edible fat to Japan (March 2010).

Under the DIRA, the NZDB retained the licenses to export to the designated markets until the end of the initial period for each market. More specifically, in the case of exports to the EU, the percentage share of export licenses reserved exclusively to the NZDB will be reduced in stages during 2008-2010. When the NZDB became part of Fonterra, Fonterra received the licenses to export to the designated markets. Further, the DIRA limited the ability of the NZDB to transfer any export licenses for the designated markets prior to the end of the initial periods.[181]

The designated markets were treated differently under the DIRA because these markets were deemed to generate, or have the potential to generate, significant economic rents from preferential access under TRQs or from other foreign government intervention. It was recognized that if the export supply could be controlled from New Zealand, then any economic rents from tariff preferences or foreign government intervention would more likely accrue to New Zealand dairy farmers. Thus, the DIRA reserved the right to export to these markets to the NZDB (via Fonterra) for a certain period of time for the purpose of securing the quota rents for New Zealand dairy farmers.[182]

Designated markets and quantities for export under TRQs specifically reserved for New Zealand are shown in table 4-21. The designated markets also include certain processed and natural cheese to Japan and milk powder exports to the Dominican Republic.[183] According to DCANZ, Fonterra's exports of dairy products to the designated markets amounted to 170,000 mt in 2002/03, or 7.1 percent of Fonterra's total ingredient sales in that year.[184] In 2001/02, Fonterra estimated that its payout of NZ$5.30 ($2.56) per kilogram of milk solids for raw milk included a quota return of NZ$0.15 ($0.07) per kilograms of milk solids.[185] According to Fonterra, any change in the returns received from the designated markets could impact both the milk payout and Fonterra's fair-value share.[186]

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[181] *Dairy Industry Restructuring Act 2001.*

[182] Fonterra, *Select Committee Submission: Export Regime*, found at *http://www. fonterra.com*.

[183] Fonterra, *Select Committee Submission: Export Regime*, found at *http://www.fonterra.com*. Fonterra, in its submission, noted that the cheese market in Japan is not constrained by TRQs, but domestic blending subsidies have an equivalent effect and create potential quota rents. The market for milk powder to the Dominican Republic was also included to honor New Zealand's treaty obligations.

[184] DCANZ, posthearing submission, Dec. 1, 2003, p. 8.

[185] *Fonterra Annual Report 2001/02.*

[186] Fonterra, *Select Committee Submission: Export Regime*, found at *http://www. fonterra.com*.

Table 4-21
New Zealand: Tariff-rate quota amounts for designated markets

Market/products	Metric tons
European Union:	
Butter	76,667
Cheddar cheese	7,000
Cheese for processing	4,000
United States:	
Other cheese-NSPF[1]	11,322
Cheddar cheese	8,200
American-type (including colby)	2,000
Other cheese-NSPF-Low-fat	1,000
Canada:	
Butter	11,322

[1] Not specifically provided for.

Source: Uruguay Round of Multilateral Trade Negotiations, Marrakesh, Apr.15, 1994.

Foreign exchange regime

According to New Zealand's Ministry of Agriculture and Forestry, during 2002/03, the annual trade-weighted average U.S. dollar price of New Zealand dairy exports fell by 18 percent from the previous season. At the same time, the New Zealand dollar appreciated by 21 percent against the U.S. dollar, resulting in the New Zealand- dollar-weighted price of dairy exports falling by 32 percent.[187] Owing to the appreciation in the New Zealand dollar in May 2003, Fonterra implemented a new foreign exchange hedging policy to protect 100 percent of its projected foreign exchange earnings against spot market currency movements. Under the policy, Fonterra will enter each month into standard forward exchange contracts to sell U.S. dollars (and other currencies) to the total value of Fonterra's projected earnings 15 months later. At the end of each month, all of Fonterra's projected foreign exchange earnings for the next 15 months will be protected against spot market currency movements. Fonterra's previous hedging policy provided up to 70-percent cover over 12 months and up to 30-percent cover over 13 to 24 months.[188] Fonterra's hedging policy is expected to reduce earnings volatility associated with foreign currency movements and improve the accuracy of its payout forecasts. Payouts will continue to be affected by changes in commodity prices and sales volumes. However, foreign exchange effects will be delayed until the following year.

Milk Protein Imports

New Zealand's tariffs on imported milk proteins such as MPC, WPC, casein, caseinate, and WMP and SMP range from "free" to 5 percent ad valorem.[189] New Zealand industry officials have indicated that although most of the production of milk proteins is exported, some finished products, including health, nutrition, and sports drinks and bars are imported.[190]

[187] MAF, *Situation and Outlook for New Zealand Agriculture and Forestry 2003*.
[188] USDA, FAS, "New Zealand Dairy and Products," Gain Report No. NZ3010 (May 30, 2003).
[189] New Zealand Customs Service, *The Working Tariff Document of New Zealand 2002*, found at *www.customs.-govt.nz/resources/tariff.pdf*.
[190] Officials, DCANZ, interview by USITC staff, Auckland, Nov. 7, 2003.

Australia

Overview

In 2002, Australia was the world's tenth-largest milk-producer with output of 11.6 million mt, accounting for about 2.3 percent of world production (table 2-1). Australia's share of world exports is significantly greater, ranking second among leading world exporters of SMP, third among world exporters of WMP and dry whey, and sixth among world exporters of casein (tables 2-4 through 2-7). Asia is the largest market for Australia's dairy product exports (accounting for about one-third of the total value in 2001), reflecting Australia's geographic proximity to those markets. The United States is also an important market for Australian dairy exports, accounting for about 5 percent of the total value of Australian dairy exports in 2001. Australia is the third-largest exporter of milk proteins to the U.S. market, accounting for about 7 percent of both value and volume in 2002 (appendix F).[191]

The dairy industry is Australia's third-most-important agricultural industry (behind wheat and beef), and milk production accounted for about 11 percent of the total value of Australian agricultural production in 2000/01.[192] Further, dairy products contributed about 8 percent to total agricultural exports in 2002.[193] In 2002/03,[194] about 20 percent of Australia's milk production was consumed as drinking milk and 80 percent used for processing (table 4-22). Approximately 60 percent of all dairy products manufactured in Australia are exported.[195] Australia is a low-cost milk producing country, with production largely based on seasonal pasture, although use of supplemental feeding has been increasing in recent years.[196] The pasture-based system meant that the Australian dairy industry was significantly affected by a drought in 2002/03, which reduced national milk production by 8.4 percent.[197] As in New Zealand, Australia's dairy industry is largely dominated by co-operatives which process about three-quarters of the all milk delivered to factories.[198] According to Australian Government officials, the Australian dairy industry has undergone significant deregulation since 2000, and today competes at international prices.[199]

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[191] Dairy Australia, prehearing submission, Dec. 1, 2003, p. 4.

[192] Department of Agriculture, Fisheries, and Forestry Australia (AFFA), *Australian Food Statistics 2003* (June 2003), table 1.2, pp. 37-38.

[193] Australian Bureau of Agricultural and Resource Economics, *Australian Commodities* (Dec. 2003).

[194] Australia's marketing year for milk, ending June 30.

[195] Dairy Australia, prehearing submission, Dec. 1, 2003, p. 7.

[196] Interview by USITC staff with dairy farmers in Victoria and Tasmania, Australia, and with Dairy Australia officials, Nov. 11-14, 2003.

[197] Dairy Australia, prehearing submission, Dec. 1, 2003, p. 10.

[198] Mr. Paul Kerr, Chief Operating Officer, Murray Goulburn Co-op Ltd, testimony before the USITC, Dec. 11, 2003, transcript p. 371.

[199] Ambassador Michael Thawley, testimony before the USITC, Dec. 11, 2003, transcript p. 14.

Table 4-22
Australia: Structure of milk production sector, 1997/98-2002/03[1]

Item	1997/98	1998/99	1999/2000	2000/01	2001/02	2002/03	Growth per year[2]
							–Percent–
Number of dairy cows (*1000 head*)[3]	2,060	2,155	2,171	2,176	2,123	2,095	0
Milk production (*million liters*)	9,440	10,179	10,847	10,546	11,271	10,322	2
Milk processed (*million liters*)	7,521	8,248	8,911	8,626	9,355	8,406	3
Market (drinking) milk (*million liters*)	1,919	1,931	1,936	1,920	1,916	1,916	0
Yield per cow (*liters/cow*)	4,677	4,831	4,996	4,859	5,215	4,800	1
Number of dairy farms	13,478	13,156	12,896	11,839	11,048	10,654	-5
Average herd size	153	161	170	190	215	195	5
Average milk payment (*A¢/liter*)[4]	28.3	27.9	25.6	29.0	33.0	27.1	0
Farm business profit (*A$/farm*)	([5])	([5])	15,441	13,942	60,880	[6]-76,700	34

[1] Season ending June 30 except where noted.
[2] Annual average growth 1997/98-2002/03.
[3] Number of cows at Mar. 31 until 1999/2000 and at June 30 thereafter.
[4] Prices up to 1999/2000 are weighted averages for manufacturing and drinking milk.
[5] Not available.
[6] Decline owing to the effects of drought.

Sources: Dairy Australia, *Australian Dairy Industry In Focus 2003*, Dec. 2003; Australian Bureau of Agricultural and Resource Economics, *Australian Commodities*, found at *www.abareconomics.com/ australiancommodities/ commods/dairy.html* and Abareconomics, *Australia's Dairy Industry-Productivity and Profit*, various issues.

Production of Fluid Milk

Production system

Although milk is produced in every Australian state, almost two-thirds of national production was from the state of Victoria in 2002/03.[200] Similar to New Zealand, Australia's milk production is largely based on intensive, rotational grazing on pasture lands. As a result of the pasture-based system, Australian milk production is highly seasonal, with a peak in October and November and a trough in May and June. The seasonality of milk production in states such as Queensland, New South Wales, and Western Australia is less pronounced than in Victoria, owing to a greater focus on fluid milk and fresh products, as well as to less seasonal variation in pasture growth.[201] Approximately 20 percent of milk is supplied year-round for the domestic fluid milk industry (table 4-22). The most prevalent breed of cow in Australia is the high-yielding Holstein-Friesian, which accounts for 70 percent of the nation's dairy herd.[202] Other important breeds include the Holstein/Jersey cross; the Jersey; and the Illawarra, Australia's native breed. The majority of Australia's dairy farmers are owner–operators, with approximately 15 percent being share-farmers.[203]

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[200] Dairy Australia, *Australia Dairy Industry in Focus 2003*, p. 3.

[201] Australian Bureau of Agricultural and Resource Economics (ABARE), *The Australian Dairy Industry: Impact of an Open Market in Fluid Milk Supply* (Jan. 2001), p. 27; and Dairy Australia, *Australian Dairy Industry in Focus 2003*, p. 9.

[202] Dairy Australia, *Australian Dairy Industry in Focus 2003*, pp. 5-6.

[203] A share-farmer is one who works land belonging to an owner or lessor for a share of the production or proceeds. Dairy Australia, *Australian Dairy Industry in Focus 2003*, p. 5.

Most dairy production is located in areas near the coast where pasture growth is dependent on rainfall. Inland irrigation of pastures, primarily in Victoria and southern New South Wales, provide for approximately one-quarter of Australia's milk production.[204] Water availability is increasingly becoming a constraint for many agricultural industries, and dairy farmers have invested in water-saving technology, as well as taken steps to increase the value-added of their production in order to compete with other industries.[205] Many dairy farmers have adopted computer technology, and top farmers have added improved cattle breeding among other activities to increase the value of production from their farms.[206] Adoption of new dairy shed technology has also enabled dairy farmers to raise productivity in milk production.[207] In recent years, Australia's dairy operators have increased their use of purchased feed, and as a result, grain and fodder purchase costs have increased from about 5 percent of total farm expenditures in 1978/79 to 25 percent in 2001/02.[208]

Milk production and industry trends

Australia's milk production rose from 9.4 billion liters in 1997/98 to 11.3 billion liters in 2001/02, or by 20 percent, before falling to 10.3 billion liters in 2002/03 owing to the drought (table 4-22). According to Dairy Australia, there is a long-term trend in the dairy sector toward farm consolidation and improvements in productivity. In 1980, there were about 22,000 dairy operations with an average herd of 85 dairy cows.[209] By 2001/02, the number of farms had halved to about 11,000 operations, while average herd size had more than doubled to 215 cows (table 4-22). Production per cow has also increased, by 68 percent between 1980 and 2002,[210] and by 12 percent during the more recent 1997/98-2001/02 period (table 4-22). Productivity growth has been attributed to adoption of new milking technologies, increased use of supplementary feeding, soil testing, fodder conservation, and general farm management improvements, as well as improved animal genetics. The consolidation of dairy farms and increased productivity can be attributed to financial pressures resulting from a declining trend in the ratio between prices received for milk and the prices paid for inputs.[211]

Costs of production

According to a 2002 survey, Australia's cost of production for milk averaged A$15 per 100 kilograms ($3.11 per cwt) of milk and is among the lowest in the world.[212] Average dairy

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[204] Dairy Australia, *Australian Dairy Industry in Focus 2003*, p. 3.
[205] U.S. Embassy officials, interview by USITC staff, Canberra, Nov. 10, 2003.
[206] ABARE (Abareconomics), *Australia's Dairy Industry–Productivity and Profit*, Dec. 2002, p. 3; USITC staff site visit to 300 dairy cow operation, Korumburra region of South East Victoria, Nov.11, 2003.
[207] For example, it is reported that 90 percent of dairy farmers in Victoria have rotary milkers. U.S. Embassy officials, interview by USITC staff, Canberra, Nov. 10, 2003.
[208] ABARE (Abareconomics), *Australia's Dairy Industry–Productivity and Profit* (Nov. 2003), draft.
[209] Dairy Australia, Addendum to prehearing submission, Dec 1., 2003, p. 2.
[210] Ibid.
[211] ABARE (Abareconomics), *Australia's Dairy Industry-Productivity and Profit* (Dec. 2002), p. 4.
[212] Dairy Australia, *Australian Dairy Industry in Focus 2003*, p. 4.

farm business profits[213] reached a high in 2001/02, owing to strong export prices for dairy products and increases in cow numbers and production,[214] but fell sharply in 2002/03 owing to drought (table 4-22). According to the Australian Bureau of Agricultural and Resource Economics (ABARE), the long-term trend in real (deflated) farm business profits in the dairy sector has been flat over the last decade, owing to increased investment and adoption of technology by operators that resulted in increased depreciation costs and higher levels of debt. ABARE also noted that before deregulation (July 2000), many dairy farmers opted to reduce farm debt in order to better position themselves to operate in the deregulated market.[215]

Milk prices

Farm-gate prices for milk in Australia vary among manufacturers. Most milk prices are based on the fat and solids content of fresh milk, as well as milk quality. Some farmers receive higher prices under contract arrangements to supply milk year-round for the fluid milk market. Until July 2000, farmers received significantly higher prices for fluid milk in each state, as compared to prices received for selling manufacturing (processing) milk. However, following price deregulation on July 1, 2000, such arrangements ended and most farmers now receive a "blended price" incorporating returns from both fluid and manufacturing milk.[216] Following market deregulation, farm-gate prices for milk fell in all states, but rose in the latter part of the 2000/01 marketing year. Average farm-gate prices continued to rise during 2001/02 before falling in 2002/03 (table 4-22). Trends in Australian farm-gate prices largely reflect trends in international prices for dairy products, as well as the value of the Australian dollar.[217]

Government assistance

According to testimony by officials of the Australian Government, the Australian dairy industry is completely deregulated and competes at international prices.[218] Reforms implemented at the end of June 2000 eliminated price supports and other measures that previously controlled the supply and distribution of milk.[219] Australian sources have indicated that dairy farmers in that country receive little government assistance, and that the remaining assistance will cease by 2009.[220] The most recent OECD Producer Support Estimates for milk producers in Australia show a decline from 25 percent in 1997 to 15 percent in 2002.[221] Most of the policy measures cited by the OECD for milk in 2002

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[213] Farm cash receipts plus trading stocks less cash costs, depreciation, and operator and family labor.

[214] ABARE (Abareconomics), *Australia's Dairy Industry-Productivity and Profit* (Dec. 2002), p. 6.

[215] ABARE (Abareconomics), *Australia's Expanding Dairy Industry* (Dec. 2002).

[216] Dairy Australia, *Australian Dairy Industry in Focus 2003*, p. 7; ABARE and Dairy Australia officials, interviews by USITC staff, Canberra and Melbourne, Nov.10-14, 2003.

[217] ABARE, *Australia's Expanding Dairy Industry-Productivity and Profit* (Dec. 2001), p. 7; Dairy Australia officials, interviews by USITC staff, Melbourne, Nov. 13, 2003.

[218] Ambassador Michael Thawley, testimony before the USITC, Dec. 11, 2003, transcript p 14.

[219] Government of Australia, prehearing submission, Nov. 20, 2003, p. 3.

[220] Ibid.; AFFA officials, interviews by USITC staff, Canberra, Nov. 10, 2003.

[221] OECD, *Producer and Consumer Support Estimates, OECD Database 1986-2002*, found at *www.oecd.org/- document/23/0,2340,en_2649_33727_4348119_1_1_1_1,00.html*.

involve transfers to milk producers arising from the adjustment assistance paid to producers to ease the transition to a deregulated market. In addition, in December 2002, the Australian Government announced a drought assistance package, which included interest rate subsidies and loans to help save livestock and a one-time drought assistance payment.[222]

Prior to July 2000, government support for the dairy sector was separated into two distinct jurisdictions. Production, processing and distribution of market (drinking) milk was regulated at the state level, whereas Federal programs operated to provide assistance to manufacturing milk producers. At the state level, various state-by-state arrangements provided a guaranteed producer price for market milk that was about double the price of manufacturing milk.[223] Quota or pooling arrangements were used to source market milk from farms. In states such as New South Wales, Western Australia, and Queensland, most of the dairy farm revenues were derived from market milk sales. In these states, the supply of market milk was managed through a system of individual farm supply entitlements or quotas in which each liter of market milk received an administratively-determined price. In states such as Victoria, Tasmania, and South Australia, most dairy farm revenue was derived from manufacturing milk sales and from sales on the export market. In these states, dairy farmers received a share of the administratively-determined price paid for drinking milk in each state, based on each farmer's share of total state milk production and the ratio of total state market milk sold to total state milk produced in a certain period.[224]

At the Federal level, producers of manufacturing milk received price assistance through two milk levies: (1) A$0.02 ($0.009) per liter (approximate) paid monthly by dairy farmers on drinking milk sold for domestic consumption (market milk levy); and, (2) A$0.03-$0.04 ($0.014-0.018) per liter (approximate) paid by dairy manufacturers on manufacturing milk used in products for domestic sale.[225] The funds collected from the levies were distributed to dairy farmers through a monthly Domestic Market Support (DMS) payment calculated by dividing expected DMS income by the expected volume of manufacturing milk production. Manufacturers were assumed to pass the second levy on to consumers, thus the payments provided a transfer of funds from Australian consumers and an intraindustry transfer from market milk producers to manufacturing milk producers. Manufacturing milk used in production of exported products was exempt from any levy.[226] The DMS system was subject to phased reductions of support levels and was legislated to terminate in June 2000.[227]

The dairy regulations that had existed prior to July 2000 had been previously under increasing scrutiny for a number of reasons that led industry and government officials to recognize that some changes in dairy policies were necessary. These reasons included: (1)

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[222] OECD, *Agricultural Policies in OECD Countries: Monitoring and Evaluation* (2003), p. 116.

[223] AFFA officials, interviews by USITC staff, Canberra, Nov. 10, 2003; AFFA, "Overview: Australian Dairy Industry Reform," unpublished paper. For example, the average Australian producer price for market milk in 1999 was approximately 47.4 cents per litre compared to 22.5 cents per litre for manufacturing milk.

[224] ABARE, *The Australian Dairy Industry: Impact of an Open Market in Fluid Milk Supply*, p. 6.

[225] Dairy Australia, Addendum to prehearing submission, Dec. 1, 2003, p. 20.

[226] Australian sources have noted that manufacturers largely based their farm-gate prices for manufacturing milk on actual export returns and made up any difference on domestic sales through the DMS payment. Dairy Australia, Addendum to prehearing submission, Dec. 1, 2003, p. 20.

[227] For example, support under the DMS declined from around A$180 million in 1995 to A$90 million in 2000. AFFA, *Overview: Australian Dairy Industry Reform*.

a government-wide review in 1999 of the compatibility of regulatory arrangements under the National Competition Policy;[228] (2) the planned termination of the DMS scheme in 2000; and, (3) the view of many firms that price support regulations hampered their commercial operations and restricted industry development.[229] In late-1999, major industry dairy groups in Australia secured Federal and state government agreement to the simultaneous removal of all domestic regulations relating to the supply and pricing of milk after July 2000. To assist the transition to a fully commercial environment, the Federal government introduced the Dairy Industry Adjustment Package (DIAP), which provided:

- A$1.63 ($0.75) billion under the Dairy Structural Adjustment Program (DSAP), to be paid to eligible individuals in 32 quarterly payments between July 2000 and 2008;
- A$30 ($13.7) million to individuals to exit the dairy industry under the Dairy Exit Program; and,
- A$45 ($20.6) million in grants to eligible communities adversely affected by deregulation under the Dairy Regional Assistance Program (DRAP).[230]

According to officials of the Department of Agriculture, Fisheries, and Forestry Australia (AFFA), the DSAP payments are decoupled, meaning they do not affect farmers' decisions for future milk production, because they are based on production in 1998/99.[231] Funding for these programs is through a levy on domestic sales of drinking milk. The adjustment levy was set at A$0.11 ($0.05) per liter.[232]

A study completed in January 2001 by ABARE estimated the reduction in transfers to dairy producers as a result of deregulation at approximately A$170 ($77.8) million. In addition, the study indicated that the impacts of dairy deregulation varied significantly by region, depending on the extent of the region's dairy sector income.[233] In response, the Federal government provided an additional transition package, the Supplementary Dairy Adjustment (SDA) program. This program provided:

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[228] For example, an incompatibility of regulations in dairy price support was that the price premiums for market milk could only be maintained in the absence of interstate trade in fluid milk. However, Australia's Constitution prohibits any actions that constrain free trade between the States. ABARE, *The Australian Dairy Industry: Impact of an Open Market in Fluid Milk Supply*, p, 1.

[229] Dairy Australia, Addendum to prehearing submission, Dec. 1, 2003, p. 25.

[230] Ibid., pp. 26-27.

[231] Dairy Australia, Addendum to prehearing submission, Dec. 1, 2003, p. 26; AFFA officials, interviews by USITC staff, Canberra, Nov. 10, 2003.

[232] Dairy Australia, Addendum to prehearing submission, Dec. 1, 2003, p. 26. AFFA officials noted that the DSAP payments are considered amber box policies under the WTO Agreement on Agriculture because they involve transfers from consumers to producers through the drinking milk levy.

[233] ABARE, *The Australian Dairy Industry: Impact of an Open Market*, pp. 23-24.

- $A120 ($54.9) million in additional market milk payments;

- $A20 ($9.2) million for discretionary payments to producers who were excluded from the DSAP or received unexpected low entitlements; and,

- A$20 ($9.2) million in additional DRAP funding.

Payments under the SDA program commenced in September 2001, and will be funded by a 1-year extension of the levy on domestic drinking milk sales.[234]

According to Australian sources, few farm exits followed deregulation, with most of them concentrated in the former drinking-milk states.[235] Although DSAP payments were scheduled to be paid quarterly until 2008, a large proportion of farmers converted their DSAP payment streams into lump sum payments through arrangements with commercial banks.[236] The DSAP funds were then used to repay debts and to restructure farms in order for farmers to position themselves to a more market-oriented dairy economy.[237]

Milk Protein Products

Industry structure

Milk is processed in Australia by farmer-owned co-operatives and dairy companies, both public and private. The three largest co-operatives—Murray Goulburn Co-operative Co. Ltd., Bonlac Supply Co. Ltd., and the Dairy Farmers Group—account for over 60 percent of all milk production and more than 70 percent of milk used for manufacturing. The largest milk co-operative, Murray Goulburn, is owned by 3,500 farmers and accounts for more than 30 percent of the nation's milk production and 40 percent of dairy exports.[238] Several multinational dairy companies also operate in Australia, including Fonterra, Parmalat, Nestlé, Kraft, and Snow Brand.[239]

In 1999/2000, there were approximately120 dairy processing companies, although this number is declining over time as the industry has rationalized and consolidated in an effort to improve processing efficiency.[240] In September 2003, Australia's fourth-largest dairy company, Bonlac Foods, agreed to a restructuring in which Fonterra increased its shareholding in Bonlac Foods to 50 percent. Following this restructuring, Bonlac Supply provides processed dairy products to Fonterra Australia, which markets the products through its global network of companies.[241]

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[234] Dairy Australia, Addendum to prehearing submission, Dec. 1, 2003, pp. 27-28.

[235] AFFA officials, interviews by USITC staff, Canberra, Nov. 10, 2003; Dairy Australia, Addendum to prehearing submission, Dec. 1, 2003, p. 28.

[236] AFFA officials, interviews by USITC staff, Canberra, Nov. 10, 2003.

[237] Ibid.

[238] Dairy Australia, *Australian Dairy Industry in Focus* 2003, p. 12; Murray Goulburn officials, interview by USITC staff, Melbourne, Nov. 11, 2003

[239] Dairy Australia, *Australian Dairy Industry in Focus* 2003, p. 12.

[240] AFFA, *Australian Food Statistics 2002*.

[241] Bonlac Supply officials, interview by USITC staff, Melbourne, Nov. 13, 2003.

In recent years, an increasing proportion of Australia's milk production has been destined for manufacturing and export markets. During 1997/98 to 2002/03, milk used for manufacturing increased at an annual growth rate of 3 percent, whereas milk used for fluid consumption remained stable (table 4-22). In addition, in 2002/03, it is estimated that approximately 60 percent of milk produced was exported, compared with about 35 percent in 1989/90.[242]

Production of milk protein products

In 2002/03, cheese production accounted for 42 percent of utilization of manufacturing milk, followed by butter and SMP.[243] However, there has been a movement towards increased production of cheese and WMP in line with international price trends.[244] Cheese and WMP are Australia's largest dairy exports (table 4-23).

Table 4-23
Australia: Production and exports of selected dairy products, 1997/98-2002/03[1]

Commodity	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	Growth per year[2]
	1,000 metric tons						*–Percent–*
Production:							
Cheese	310	327	376	376	413	368	4
Skim milk/buttermilk powder	231	272	264	265	257	215	-1
Whole milk powder	128	145	187	205	239	170	8
Butter	153	175	170	160	164	149	0
Whey products	56	60	66	61	85	96	13
Casein[3]	9	8	9	8	14	([4])	16
Total	887	987	1,072	1,075	1,172	([4])	7
Exports:							
Cheese	151	172	223	219	218	208	7
Whole milk powder	110	139	175	183	213	202	13
Skim milk/buttermilk powder	199	243	253	218	224	196	1
Butter	96	104	125	110	109	102	2
Whey products	44	46	47	43	50	80	15
Casein[3]	7	9	9	11	13	([4])	17
Total	607	713	832	784	827	([4])	8

[1] July-June
[2] Annual average growth 1997/98-2002/03.
[3] Calendar year data.
[4] Data not available.

Source: Dairy Australia, *Australian Dairy Industry In Focus 2003.*

Information on Australian production of milk protein products compiled from the Commission's foreign producers' questionnaires is shown in table 4-24.[245] Questionnaire data indicated that, among the products shown in the table, WPC is the largest category of

[242] Dairy Australia, *Australian Dairy Industry in Focus 2003*, chart p. 14.
[243] Dairy Australia, *Australian Dairy Industry in Focus 2003*, p. 12.
[244] Ibid.
[245] The Commission received questionnaire responses from all major dairy exporting companies in Australia.

Table 4-24
Australia: Production of milk protein products, 1998-2002

Product	1998	1999	2000	2001	2002	Growth per year 1998-2002[1]
	1,000 metric tons					*–Percent–*
Whey protein concentrate	10	15	14	13	15	13
Casein	5	6	7	7	8	13
Caseinates	1	2	1	4	5	125
Milk protein concentrate	2	4	5	3	3	17
Total	18	27	27	27	32	16

[1] Annual average growth 1997/98-2002/03.

Source: Commission foreign producers' questionnaires.

milk protein products produced on a volume basis, followed by casein, caseinates, and MPC. Production of all products increased significantly during the 1998-2002 period. WPC is produced and exported by three companies in Australia: Murray Goulburn, Bonlac Foods,[246] and Warrnambool Cheese and Butter Factory Co. Ltd.[247] Of these, only Murray Goulburn is a regular supplier of MPC, caseinates, and casein to the United States.[248] These products are produced at Murray Goulburn's Leongatha plant in Victoria.[249] MPC and WPC are produced using UF membrane technology.[250] Murray Goulburn also produces WPI using IE technology.[251]

Research and market promotion

Market promotion and research activities for the dairy industry are partially funded by farmer-paid levies imposed on the fat and protein content of milk produced. Starting in the 2003/04 season, levies that previously funded the activities of the Australian Dairy Corporation and the Dairy Research and Development Corporation (DRDC) were replaced with a single levy that funded a new organization, Dairy Australia. In 2003/04, this levy amounted to A$0.0031 ($0.0014) per liter of milk. In addition to the activities of Dairy Australia, the Federal government matches expenditure on R&D that meets established criteria.[252]

In 2001/02, the research portfolio of the DRDC included projects affecting both dairy farmers and the manufacturing industry. Projects in the farm sector were designed to

[246] Following Bonlac Food's restructuring, Bonlac's sales of dairy products are to Fonterra Australia.

[247] Dairy Australia, prehearing submission, Dec. 1, 2003, p. 3.

[248] Mr. Paul Kerr, Chief Operating Officer, Murray Goulburn Co-op Ltd, testimony before the USITC, Dec. 11, 2003, transcript p. 371.

[249] Murray Goulburn officials, interview by USITC staff, Melbourne, Nov. 11, 2003; USITC staff site visit, Leongatha production facility, Victoria, Nov. 11, 2003; Erie Foods web site for information on Murray Goulburn production at *http://www.eriefoods.com* .

[250] Murray Goulburn officials, interview by USITC staff, Melbourne, Nov. 11, 2003; Bonlac Supply official, interview by USITC staff, Melbourne, Nov. 13, 2003.

[251] Erie Foods web site, found at *http://www.eriefoods.com*.

[252] Dairy Australia, *Australian Dairy Industry in Focus 2003.* p. 30.

improve performance of dairy farmers in managing natural resources, the feed base, animal performance, and farm economics. The manufacturing portfolio included projects designed to enhance processing performance, product quality and safety, dairy product demand (including functional ingredients), utilization of whey, and product profitability for cheese making.[253]

Milk Protein Exports

Most Australian milk protein production is destined for the export market. The United States and Japan are the most important markets for casein, caseinates, and MPC.[254] Approximately 20-30 percent of Australian whey production is consumed domestically.[255] The most important export markets for Australia's whey products are countries in Asia. The United States and Japan are important markets for WPC 80 and WPI.[256] Trends in Australian exports of milk protein products to the United States based on the Commission questionnaires are discussed in more detail in chapter 6.

Murray Goulburn officials have indicated that its milk protein products are customized to meet functional and nutritional specifications of its customers. According to these officials, Murray Goulburn sells little or no product without a contract with a buyer. Products are sold to customers based on long-term relationships. Murray Goulburn sells all its milk protein products in the United States to Erie Foods International, whose corporate headquarters are in Erie, IL. Erie Foods officials report that the company only imports MPCs from Australia with a protein content of 75 percent and higher.[257]

Milk Protein Imports

Milk proteins, such as WPC, casein, caseinates, and MPC, are imported free of duty into Australia. Australian industry officials report that Australia imports some nutritional and health products that contain milk proteins from the United States.[258]

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[253] Dairy Research and Development Corporation, *Dairy Projects 2002*, Melbourne (2001).

[254] Dairy Australia, *Australian Dairy Industry in Focus 2003*, p. 26; Murray Goulburn officials, interview by USITC staff, Melbourne, Nov. 11, 2003.

[255] Ibid.

[256] Murray Goulburn officials, interview by USITC staff, Melbourne, Nov. 11, 2003; Bonlac Supply official, interview by USITC staff, Melbourne, Nov. 13, 2003; Warrnambool Cheese and Butter official, interview by USITC staff, Melbourne, Nov. 13, 2003; Warrnambool Cheese and Butter Factory Company Holdings Limited, *Annual Report 2003*.

[257] Mr. Jim Klein, Erie Foods International, Inc., testimony before the USITC, Dec. 11, 2003, transcript p. 262.

[258] Dairy Australia and dairy company officials, interviews by USITC staff, Melbourne, Nov. 11-12, 2003.

CHAPTER 5
COMPARISON OF COMPETITIVE FACTORS AFFECTING MILK PROTEIN PRODUCT MARKETS IN THE UNITED STATES AND MAJOR EXPORTING COUNTRIES

Introduction

This chapter provides information on the overall level of government support affecting producers of milk proteins in the United States, the EU, New Zealand, and Australia. Additionally, the chapter provides a discussion of competitive factors, including government intervention, that impact U.S. production, use, and trade in milk protein products in their various forms. Responses to Commission questionnaires by purchasers and importers of milk protein products, as well as fieldwork by Commission staff, indicated that factors such as price, product availability, production technology, exchange rates, and transportation costs are important in purchasing decisions.

As shown in this chapter, the most important factors affecting the competitiveness of milk protein industries are the cost of milk production and government programs. These factors affect both the price and availability of milk protein products in the U.S. market. Low-cost milk production translates into lower input costs for milk protein product producers. As discussed in the following sections, both Australia and New Zealand have significant advantages over the United States, and to a lesser extent, the EU, in milk production costs. Additionally, Organization for Economic Co-operation and Development (OECD) data indicate that the United States and the EU have the highest levels of government support for the dairy sector. This government intervention, which is primarily through price support in the United States, and production and export aid in the EU, has influenced the types of milk protein products produced in these countries, and the level of U.S. imports. At the same time, U.S. government support for SMP reduces the incentives to produce MPC and casein in the United States.

Comparison of Milk Production Costs

The most significant input into the production of milk protein products is raw milk. Thus, the cost of producing raw milk in a country or region is a key factor in determining international competitiveness in milk protein products. Harmonized data on milk production costs across countries are compiled by the International Farm Comparison Network (IFCN).[1] The annual IFCN *Dairy Report* includes costs of milk production for individual farms of varying sizes in different countries. Although each year's report covers different farms with varying herd sizes and geographic locations, the data provide a consistent comparison of the relative magnitudes of cost differences between countries over time. Despite varying yearly data sets, IFCN findings of costs of production among countries and country groups for 2002 are consistent with their findings in prior years.[2] For this reason, the summary of the IFCN analysis for the cost of milk production in table 5-1 is limited to 2002.[3]

According to IFCN analysis in 2002, the cost of milk production in the United States ranged from $10 to $13 per hundredweight (cwt) (table 5-1).[4] The 2002 data include three U.S. farms: a 2,100 cow farm in Idaho, and two farms in Wisconsin—one with 700 cows and another with 135 cows. The individual farms may represent a "typical farm" based on data from similar farms in the region, or may represent an actual farm in a region. Each of these "typical" farms results from input from a panel of experts, including dairy farmers of the region, advisors, and scientists that regularly contribute to IFCN projects.[5] In 2002, the Idaho farm with 2,100 cows benefits from economies of scale to achieve a lower cost of production than the 700 and 135 cow farms in Wisconsin.

The costs of production for the 11 EU farms in the major milk protein product exporting countries (Ireland, the Netherlands, France, Denmark, and Germany) ranged from $6 to $13 per cwt in 2002 (table 5-1). Most of the farms analyzed reported costs of $9 per cwt or less. Many EU farms in the sample were small compared with those in the United States, having fewer than 100 cows. Milk production costs for three New Zealand farms ranged from $4.50 to $5.50 per cwt in 2002. For Australia, the six reporting farms had costs of production ranging from about $3 to $9 per cwt for 2002. That year, drought raised costs for farms that depend on irrigation, including the 915 and 250 cow farms in the state of Victoria, which limited irrigation and forced farmers to purchase more feed at higher prices.

Overall, the IFCN findings show milk production costs to be lowest in New Zealand and Australia, and to a lesser extent, the EU, where cows are generally fed by rotational grazing. In this aspect of dairy farming, Australia, New Zealand, and the EU operations have a distinct competitive advantage over their counterparts in the United States, where dairy cows are fed forage and expensive concentrates.[6]

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[1] The IFCN is a global network of agricultural scientists, advisors, and farmers who produce an annual overview of the status of dairy farming worldwide. Information on the IFCN and its *Dairy Report* can be found at *www.ifcnnetwork.org*.

[2] The IFCN *Dairy Report* has been published annually since 2000.

[3] Data for 2002 are reported in IFCN's 2003 *Dairy Report*.

[4] In the United States, the use of high-cost feed results in a higher total cost of production and superior yields per cow in comparison with other major dairy exporting countries.

[5] The IFCN methodology considers dairy farms engaged in milk production, raising replacement heifers, and forage production. Milk production costs only consist of expenses from the profit and loss account of each farm, including costs for labor, land, capital, depreciation, and quota costs, if any.

[6] Dairy industry officials in the United States, Australia, New Zealand, and Ireland, interviews by USITC staff, Sept.-Nov. 2003.

Table 5-1
Cost of milk production: International Farm Comparison Network, selected farms, 2002

Country	Location	Number of cows	Cost
			Dollars per cwt
United States	Idaho	2,100	10.7
	Wisconsin	700	12.5
	Wisconsin	135	12.7
European Union	Elbe/Sachsen-Anhalt, Germany	650	12.7
	Jutland, Denmark	150	10.0
	Southeast Ireland	93	7.9
	Flevoland, The Netherlands	90	5.9
	Jutland, Denmark	80	9.8
	East Schleswig-Holstein, Germany	80	8.0
	Northeast France	70	8.2
	Flevoland, Gelderland, The Netherlands	51	7.7
	South Ireland	47	8.6
	Upper Bavaria, Germany	35	6.8
	Northwest France	31	8.6
New Zealand	Central South Island	835	5.2
	Southern South Island	447	5.4
	Waikato	239	4.5
Australia	Victoria	915	9.1
	Western Australia	518	3.9
	Victoria	250	5.4
	Western Australia	231	5.0
	Victoria	207	2.7
	Western Australia	184	5.0

Source: International Farm Comparison Network, *Dairy Report 2003*.

Comparison of Milk Prices Paid by Processors

Differences in international costs of production are reflected in the farm-gate prices paid for milk in various countries.[7] The International Dairy Federation (IDF) publishes data on worldwide dairy manufacturing, including the average milk prices paid to producers.[8] IDF data for 1998-2002 show milk prices in the United States and the EU to be nearly identical in the first 3 years of the period and diverging significantly in 2001 (table 5-2). Prices in New Zealand and Australia were approximately $7 per cwt for the period, averaging about one-half of those in the United States and the EU. This translates directly into lower production costs for producers of milk protein products in Australia and New Zealand.

[7] Dairy Australia, prehearing submission, Dec. 1, 2003, p. 58.

[8] The International Dairy Federation, headquartered in Brussels, Belgium, is an international organization that promotes communication and information exchange among the dairy industries of its 41 member countries.

Table 5-2
Average milk prices paid to producers, by country, 1998-2002

Country	1998	1999	2000	2001	2002
	Dollars per hundredweight				
United States	15.10	13.49	12.40	15.05	12.34
European Union	14.96	14.03	12.25	12.78	12.66
New Zealand	7.00	7.50	7.45	8.32	6.13
Australia	8.14	8.24	6.83	7.46	([1])

[1] Data not available at time of publication.

Source: International Dairy Federation, *World Dairy Situation*, 1999, 2000, 2001, 2003.

Comparison of U.S.-Produced and Imported Milk Protein Product Prices

Although some imported MPC and U.S.-produced ultrafiltered (UF) milk are essentially the same product, direct price comparisons are difficult because of the lack of available U.S. pricing data. However, as indicated in tables 5-1 and 5-2, U.S. producers of UF milk face higher raw milk costs than MPC producers in Australia or New Zealand. Standard pricing practice among U.S. producers of UF milk is to price products off the relevant Federal Milk Marketing Order (FMMO) class price, plus a protein premium to account for the higher protein content over SMP and to cover their cost of production.[9] If the UF milk was sold for use in cheese manufacturing then the cheese producer would be charged the FMMO Class III price plus a premium. In 2002, the Class III price averaged $1.04 per pound.[10] In contrast, the average price for MPC 70 in 2002 was $1.66 per pound.[11] The difference between the Class III price and the market price of MPC 70 in 2002 was $0.62 per pound. Based on the current pricing practices of U.S. UF milk producers (pricing at the Class III price plus a premium), it is unlikely that they would be able to produce and market MPC at a price near or below the price of imports. The range of protein premiums typically applied by U.S. UF milk producers and Class III prices in 2002 would result in a price above that of imported MPC.

Currently, the Dairiconcepts facility in Portales, NM, pays the Class IV price for milk used to produce MPC.[12] It is possible that any future MPC producer would also pay the Class IV price, which is the class price for dry, powder products. The Class IV price in 2002 was $1.08 per pound, only slightly higher than the Class III price. As a result, if potential U.S. producers of MPC applied the same protein premiums as in UF milk production, it is unlikely that the price of U.S.-produced MPC would be near or below import prices.

[9] U.S. industry officials, interviews by USITC staff, Jan. 2004.
[10] USDA, AMS, *Dairy Market News*, various issues.
[11] Prices for MPC 70 are reported in table 5-7.
[12] Company officials, Dairiconcepts, interviews by USITC staff, Dec. 2003 and Jan. 2004. For additional information on the Dairiconcepts facility, see chapter 3.

Direct comparison of the prices for imported MPC and U.S.-produced UF milk is difficult owing to the lack of U.S. price data, however, direct comparisons between the prices for imported milk protein and U.S.-produced SMP and whey protein concentrate (WPC 34) are possible. The U.S. Department of Agriculture (USDA) publishes data on the price of SMP and WPC 34 in the United States. Prices of imported MPC, casein, and caseinate were compiled from responses to Commission questionnaires. Prices for each product were converted to prices per pound on a protein basis, and are shown in table 5-3.[13]

Table 5-3
Milk protein products: Price per pound of protein, 1998-2002

Year	U.S. skim milk powder	U.S whey protein concentrate[1]	Imports: Milk protein concentrate	Imports: Casein	Imports: Caseinate
	Dollars per pound of protein				
1998	2.98	1.81	2.49	2.12	2.19
1999	2.88	1.40	2.28	1.90	2.09
2000	2.84	2.04	2.41	2.13	2.26
2001	2.81	2.39	2.55	2.60	2.63
2002	2.59	1.60	2.32	2.15	2.31
Average	2.82	1.84	2.41	2.18	2.29

[1] Whey protein concentrate 34, as reported by U.S. Department of Agriculture, Agricultural Marketing Service.

Sources: U.S. Department of Agriculture, Agricultural Marketing Service, *Dairy Market Statistics*, various issues, U.S. Department of Agriculture, Economic Research Service, *Livestock, Dairy, and Poultry Outlook* , various issues; compilation of data submitted in response to Commission questionnaires.

WPC 34 had the lowest price per pound of protein of the five products, with an average price of $1.84 per pound of protein (table 5-3). Because WPC is a by-product of cheese manufacturing and because WPC 34 is a widely produced, commodity product, it can be expected to have a lower price than any of the other milk protein products. U.S. imports of casein had the second lowest average price for the 1998-2002 period at $2.18 per pound of protein. The average price of U.S. imports of caseinate were slightly higher at $2.29 per pound. U.S. imports of MPC had an average price per pound of protein of $2.41 during the 1998-2002 period. U.S.-produced SMP had the highest average price per pound of protein of any of the milk protein products at $2.82 per pound (table 5-3), and is considerably higher than imported MPC, casein, or caseinate.

Comparison of Prices of Imported Milk Protein Products

Representatives of U.S. milk producers have alleged that the EU is a price leader in the world market for MPC because of the subsidies EU producers receive.[14] Hence, producers in Australia and New Zealand are compelled to lower their prices in order to compete in the

[13] Conversion rates for SMP and WPC 34 were 35.9 percent and 32.6 percent, respectively, and conversion rates for MPC, casein, and caseinate were based on the protein content reported in Commission questionnaires.

[14] Dr. Peter Vitaliano and Mr. Jaime Castaneda, NMPF, testimony before the USITC, Dec. 11, 2003, transcript pp. 61-62.

U.S. market.[15] Imports of MPC from the EU, Australia, and New Zealand compete primarily in the 40-49 and 80-89 percent protein ranges. Table 5-4 presents an index of average unit values (AUVs) for U.S. imports by protein concentration where all AUVs are indexed relative to the AUV of MPC 40-49 from the EU in 1998. To protect confidential business information (CBI), the index for Australia and New Zealand is presented as a combined index (Oceania) of their trade-weighted AUVs.

Table 5-4
Milk protein concentrate: Index of average unit values of U.S. imports by type and major source, 1998-2002

Description	1998	1999	2000	2001	2002
	Average unit value (index)				
40-49 percent protein:					
European Union	100	99	110	124	101
Oceania	102	91	101	119	111
All other	124	120	135	138	93
Total	105	101	111	125	98
50-59 percent protein:					
European Union	171	151	([1])	([1])	160
Oceania	149	140	138	159	141
All other	([1])	([1])	([1])	([1])	([1])
Total	149	140	138	159	147
60-69 percent protein:					
European Union	([1])	([1])	179	185	183
Oceania	([1])	([1])	([1])	([1])	([1])
All other	([1])	([1])	([1])	([1])	([1])
Total	([1])	([1])	179	185	183
70-79 percent protein:					
European Union	239	225	167	307	291
Oceania	194	175	177	188	175
All other	([1])	([1])	([1])	([1])	([1])
Total	198	177	177	189	177
80-89 percent protein:					
European Union	240	236	262	292	303
Oceania	274	262	263	260	229
All other	351	251	285	271	269
Total	252	245	264	271	251
90 percent or more protein:					
European Union	226	215	220	243	218
Oceania	([1])	([1])	([1])	([1])	([1])
All other	([1])	([1])	([1])	([1])	([1])
Total	226	215	220	243	218
Total all protein concentrations:					
European Union	172	135	131	182	159
Oceania	202	168	178	197	190
All other	167	128	150	150	98
Total	183	149	156	192	173

[1] Not applicable.

Source: Compiled from data submitted in response to Commission questionnaires.

[15] Dr. Peter Vitaliano and Mr. Jaime Castaneda, NMPF, testimony before the USITC, Dec. 11, 2003, transcript pp. 61-62.

The AUV of MPC 40-49 from the EU was lower than the AUV of imports from Oceania only in 1998 and 2002. From 1999 to 2001, the AUVs of imports from Oceania were between 5 percentage points and 9 percentage points below the AUV of imports from the EU. The AUV of U.S. imports of MPC 80-89 from the EU was lower than the AUV of imports from Oceania for the 1998-2000 period (table 5-4). However, the difference between the EU and Oceania AUVs declined in each year from 34 percentage points in 1998 to 26 percentage points in 1999 and to 1 percentage point in 2000. In 2001 and 2002, U.S. imports of MPC 80-89 from Oceania were 32 percentage points and 74 percentage points, respectively, less costly than imports from the EU.

For other protein concentrations, responses from Commission questionnaires indicated that the level of competition between the EU and Oceania was not as significant. However, where head-to-head comparisons exist, such as for MPC 50-59 and MPC 70-79, the AUV of imports from the EU was greater than the AUV of imports from Oceania in seven of the eight comparisons, often by a large margin. Overall, the AUV of U.S. imports from Oceania, particularly in 2001 and 2002, were lower than imports from the EU across all protein ranges. Thus, the Commission's questionnaire price data indicate that if price leadership exists in the U.S. MPC market, it is exercised by the Oceania countries.

Government Programs

Overall Levels of Support

OECD indicators of the degree of government intervention in the dairy sector show that dairy producers in the United States and the EU receive a much higher share of their income from government support than producers in Australia and New Zealand. Moreover, much of this support is in the form of price supports, production and export assistance, and restrictions on imports. The OECD measures the degree of government support in a manner that allows for cross-country comparisons (table 5-5). The OECD calculates three dairy industry-specific measures of support; the producer support estimate (PSE), the producer nominal protection coefficient (NPC), and the producer nominal assistance coefficient (NAC).[16] Additionally, the OECD calculates the general services support estimate (GSSE): a measure of general services, such as publically funded research, inspection services, and marketing and promotion, provided to a country's agriculture industry. The GSSE is not specific to the dairy industry.

New Zealand has the lowest percentage of dairy farm receipts from government support policies at less than 1 percent during the period (table 5-5). Producer NPCs and NACs for all years are either equal or close to one, reflecting the lack of government programs to support of the dairy sector. During 1998-2002, between 56 and 71 percent of total government expenditures for agriculture were paid under general services support.

[16] The PSE is often expressed as a ratio between the value of direct government assistance and the value of total gross farm receipts. The producer NPC is a ratio of domestic prices to world prices and indicates the degree to which domestic producers are insulated from world competition. The producer NAC is a measure of the percentage of farm income that is derived from government assistance as opposed to market returns.

Table 5-5
Organization for Economic Co-operation and Development, international comparison of support to the dairy sector, by country, 1998-2002

Country	Indicator	1998	1999	2000	2001	2002
		Percent				
Australia	PSE[1]	22.0	15.0	13.0	13.0	15.0
	GSSE[2]	28.0	32.0	35.0	39.0	41.0
		Ratio				
	Producer NPC[3]	1.2	1.1	1.0	1.0	1.0
	Producer NAC[4]	1.3	1.2	1.2	1.1	1.2
		Percent				
New Zealand	PSE[1]	0.7	0.7	0.5	0.6	0.6
	GSSE[2]	59.0	56.0	57.0	72.0	51.0
		Ratio				
	Producer NPC[3]	1.0	1.0	1.0	1.0	1.0
	Producer NAC[4]	1.0	1.0	1.0	1.0	1.0
		Percent				
European Union	PSE[1]	57.4	51.5	42.1	41.3	48.1
	GSSE[2]	8.0	8.0	8.0	8.0	7.0
		Ratio				
	Producer NPC[3]	2.4	2.1	1.7	1.7	1.9
	Producer NAC[4]	2.4	2.1	1.7	1.7	1.9
		Percent				
United States	PSE[1]	60.3	56.4	44.3	52.8	45.6
	GSSE[2]	24.0	23.0	24.0	25.0	29.0
		Ratio				
	Producer NPC[3]	2.4	2.2	1.7	2.0	1.7
	Producer NAC[4]	2.5	2.3	1.8	2.1	1.8

[1] The Producer Support Estimate (PSE) incorporates market price supports and direct payments based on production, size, input, or farm income.

[2] The General Services Support Estimate (GSSE) is the share of total government support provided across agriculture sectors in the form of general services, such as publicly funded research and development, agricultural schools, inspection services, and marketing and promotion.

[3] The Producer Nominal Protection Coefficient (NPC) measures the ratio between the average price received at the farmgate and the world price.

[4] The Producer Nominal Assistance Coefficient (NAC) measures the ratio between total farm income, including support, and production valued at world prices without support. When the NAC is equal to one, gross farm receipts are derived entirely from the market without support.

Source: OECD, *Agricultural Policies in OECD Countries Monitoring and Evaluation*, 2003.

The PSE for the Australian dairy sector fell from 22 percent in 1998 to 15 percent in 2002, owing mainly to deregulation in 2000 (table 5-5). Milk price supports were completely eliminated, as indicated by a producer NPC of 1.0 in 2001 and 2002. Gross dairy farm receipts were almost entirely derived from the market as shown by the producer NAC of just above one throughout the period.

Compared with New Zealand and Australia, the dairy sectors in the EU and the United States receive a much larger share of their income as a result of government policies. The PSE for the EU ranged between 41 to 57 percent during 1998-2002, indicating that almost one-half of dairy farm income came from government support over this period (table 5-5). Close to 90 percent of the transfers was in the form of market price support. In addition, prices received by producers and overall farm receipts throughout the period were almost double what they would have been absent government support.

Generally the PSE for the United States was the highest of all four regions during 1998-2002, ranging from 44 percent in 2000 to 60 percent in 1998 (table 5-5). Close to 90 percent of the transfers received by dairy producers as a result of government policies was in the form of market price support. This is reflected in the producer NPCs and NACs, indicating that for most of the period overall receipts were approximately double what they would have been without government policies.

Impact of Government Dairy Policies on U.S. Imports of Milk Protein Concentrate

As discussed in chapter 3, total U.S. imports of MPC (HTS 0404.90.10) increased between 1998-2000, dropped significantly in 2001, and then rebounded somewhat in 2002. U.S. imports of MPC from the EU played an important role in the volatility of total U.S. MPC imports during this period.[17]

Monthly U.S. imports of MPC from the EU increased from less than 500 metric tons (mt) in early 1998 to more than 3,000 mt in May 2000 (figure 5-1). After peaking in May 2000, imports fell abruptly to less than 100 mt in April 2001, and then recovered to more than 1,200 mt in October 2002. Data compiled from Commission importers' questionnaires (see chapter 6) indicate that U.S. imports of MPC from the EU, especially during 1998-2000, consisted mostly of low-protein MPC (40-49 percent protein), particularly MPC 42.[18] The increase in imports of MPC 40-49 from the EU during 1998-2000 accounted for almost one-half of the total change in U.S. MPC imports over this period. However, between 2000 and 2002, imports of MPC 40-49 from the EU dropped from 85 to 68 percent of total U.S.

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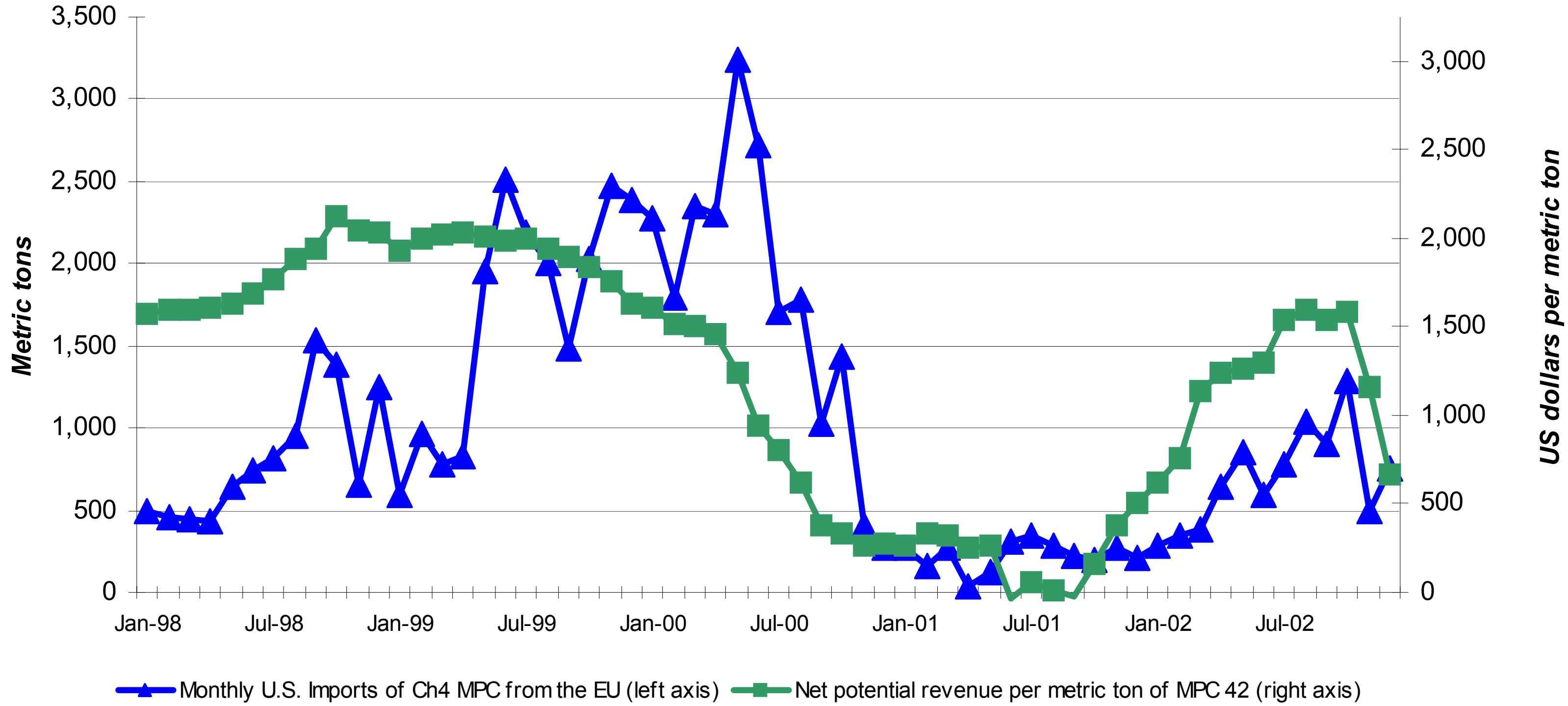
[17] Imports of other primary suppliers, primarily New Zealand and Australia, increased steadily throughout the period without sharp increases or decreases between years.

[18] Commission staff fieldwork confirmed that most EU MPC exports during 1998-2000 consisted of MPC 42 produced by dry blending. European Dairy Association, selected members of casein industry committee, interviews by USITC staff, Brussels, Belgium, Oct. 15, 2003.

Figure 5-1
U.S. imports of milk protein concentrate from the European Union and net potential revenue associated with government policies, 1998-2002



Sources: U.S. Department of Commerce and Commission estimates.

imports of MPC from the EU (tables 6-1 and 6-2). While total U.S. MPC imports dropped by 8,562 mt between 2000 and 2002, imports of MPC 40-49 percent from the EU dropped by 11,137 mt (table 6-2).

MPC 42 from the EU is generally produced as a blend of casein and SMP. Thus, it is likely that EU dairy policies effecting SMP and casein contributed to this trend in U.S. imports. These policies included government purchases of SMP, export refunds for SMP, and production aid for casein production (see chapter 4 for a description of these programs). These programs, combined with the impact of the U.S. Dairy Price Support Program (DPSP) for SMP, which maintained a U.S. price for SMP higher than the world market price for most of 1998-2002, created incentives that encouraged U.S. imports of low-protein MPC from the EU.

Impact of EU and U.S. dairy policies on U.S. imports of milk protein concentrate from the EU

According to Commission fieldwork and interviews with EU industry officials, EU and U.S. dairy policies created the potential for EU milk protein processors to increase revenues, and for U.S. milk protein users to reduce costs, by trading in MPC. Typically, an EU milk protein processor with excess SMP had two marketing options. One option was to sell SMP into EU intervention stocks, an option available only from April 1 to August 31 of each year.[19] A second option was to export the product at the world market price. However, during 1998-2002, the interaction of EU and U.S. dairy policies and world market conditions resulted in a third option, to blend the SMP with casein to produce MPC 42 and export this product to the United States. This option offered EU processors three major advantages over selling SMP into intervention stocks or onto the world market: (1) SMP used in the production of MPC was eligible for an EU SMP export refund; (2) casein used in the production of MPC was eligible for EU casein production aid; and, (3) the U.S. price of SMP was well above the world price for significant periods during 1998-2002. Thus, these three factors combined to provide U.S. end-users with incentive to seek lower cost milk protein inputs from the EU, and EU processors with an incentive to export MPC 42 to the U.S. market, rather than sell SMP into EU intervention stocks or export to the world market.

Calculations in table 5-6 provide information on the potential revenues created by selling MPC 42 to the U.S. market as compared to selling SMP on the world market.[20] The potential gross revenue from EU sales of MPC 42 in the United States (column e) was estimated as

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[19] From Feburary 1998 to August 1999, EU intervention stocks increased from 129,700 mt to 273,500 mt; only decreasing by 3,700 mt between September 1999 and February 2000. See chapter 4 for additional discussion of the EU SMP intervention system.

[20] For the purposes of this report, the values estimated for this analysis will be referred to as potential revenue. However, the use of "revenue" is not meant to imply that only the producer or exporter benefits from trade. In reality, this value represents the total potential economic rents created by the interaction of U.S. and EU policies, which can only be accessed through trade of milk protein concentrate. These total rents are divided among the EU processor/exporter and the U.S. user/importer based on negotiated prices. Data were not available in sufficient detail to estimate how total rents were divided between the EU processor/exporter and the U.S. user/importer.

Table 5-6
European Union: Variables used to calculate net potential revenue from government policies, 1998-2002

Year/quarter	U.S. SMP support price[1]	90 % of EU export refund	10 % of EU casein production aid	Shipping and import costs	Gross potential revenue	World[2] price	Net potential revenue
	a	b	c	d	e = a + b + c - d	f	g = e - f
	U.S. dollars per metric ton						
1998:							
I	2,296	665	212	144	3,029	1,457	1,572
II	2,296	677	212	136	3,050	1,433	1,617
III	2,296	752	212	82	3,178	1,340	1,838
IV	2,296	878	212	116	3,270	1,242	2,028
1999:							
I	2,227	873	227	115	3,213	1,257	1,956
II	2,227	856	234	100	3,218	1,222	1,996
III	2,227	850	234	102	3,209	1,275	1,934
IV	2,227	805	229	126	3,135	1,400	1,735
2000:							
I	2,227	683	218	123	3,005	1,463	1,542
II	2,227	540	218	104	2,881	1,653	1,228
III	2,227	375	196	110	2,688	2,067	621
IV	2,227	127	176	116	2,414	2,100	314
2001:							
I	2,217	124	167	104	2,404	2,083	321
II	2,136	86	150	157	2,214	2,033	181
III	1,984	5	129	67	2,051	2,023	27
IV	1,984	56	122	94	2,069	1,707	362
2002:							
I	1,984	269	109	110	2,252	1,400	852
II	1,984	534	109	154	2,472	1,200	1,272
III	1,984	739	176	138	2,761	1,200	1,561
IV	1,837	622	199	120	2,538	1,400	1,138

[1] According to discussions with EU industry officials, the price of MPC 42 is largely based on the U.S. skim milk powder (SMP) price; Source: European Dairy Association, selected members of the casein industry committee, interview by USITC staff, Brussels, Belgium, Oct. 15, 2003. Furthermore, the U.S. SMP support price acts as a floor on the U.S. SMP price. Therefore, to incorporate the impact of tilt changes into this analysis, the U.S. SMP support price was used as a proxy for the milk protein concentrate 42 price.
[2] Western European export price.

Sources: U.S. Department Agriculture; European Commission; U.S. Department of Commerce; Commission estimates.

the U.S. price of MPC 42 (proxied by the U.S. SMP support price (column a)),[21] plus 90 percent of the export refund on SMP (column b),[22] plus 10 percent of the casein production aid (column c), less the estimated transportation cost of shipping product from the EU to the United States (column d). The difference between the estimated potential gross revenue from MPC 42 sales to the United States (column e) and the world price of SMP (column f) represents the net potential revenue (column g) available to be divided between end-users and processors. This difference represents the combined value generated by U.S. and EU dairy policies for MPC 42 relative to the price of SMP on the world market.[23]

Relationship between U.S. imports of milk protein concentrate and EU policies, 1998-2002

The relationship between U.S. imports of MPC from the EU and the net potential revenue that stimulated U.S. end-users to demand and EU processors to supply MPC 42 to the United States is illustrated in figure 5-1.[24] During 1998, net potential revenue increased from $1,579 per mt in January to $2,123 per mt in October, driven by an increase in the export refund rate and a decrease in the world price of SMP, while the U.S. support price of SMP remained unchanged. The net potential revenue exceeded $1,700 per mt from July 1998 to August 1999, began to trend downward in the second half of 1999, and dropped below $1,000 per mt by July 2000. From January 1998 to May 2000, while the net potential revenue exceeded $1,240 per mt, monthly imports of MPC 42 from the EU increased from 498 mt to a peak of 3,240 mt. Once the net potential revenue dropped below $1,000 per mt in June 2000, monthly imports fell to 371 mt by December 2000, reaching a low of 38 mt in April 2001. When export refunds dropped below $100 per mt in June 2001, the net potential revenue also dropped below $100 per mt. Export refunds increased, from zero in October 2001 to $834 per mt in September 2002. During this period, however, the effect of the increased export refunds and decreased world price were moderated by the reduction in U.S. support price. Nonetheless, the net potential revenue and MPC 42 imports from the EU trended upward, but to a lesser degree than in 1998-2000.

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[21] According to discussions with EU industry officials, the price of MPC 42 is largely based on the U.S. SMP price. Furthermore, the U.S. SMP support price acts as a floor on the U.S. SMP market price. Therefore, to incorporate the impact of butter/powder tilt changes into this analysis, the U.S. SMP support price was used as the proxy for the MPC 42 price. European Dairy Association, selected members of the casein industry committee, interview by USITC staff, Brussels, Belgium, Oct. 15, 2003.

[22] According to industry officials, MPC 42 exported to the United States was generally a blend of about 10 percent casein and 90 percent SMP. European Dairy Association, selected members of the casein industry committee, interviews by USITC staff, Brussels, Belgium, Oct. 15, 2003; Dr. Peter Vitaliano, National Milk Producers Federation, testimony before the USITC, Dec. 11, 2003, transcript pp. 28-29.

[23] Although this example implies that the EU processor receives the full amount of these potential revenues, the actual distribution of these potential revenues between the EU processors and U.S. importers would be based on negotiated prices and market conditions for substitute products.

[24] Data on net potential revenue in figure 5-1 is presented as the three-month moving average of monthly net potential revenue.

The analysis in figure 5-1 is supported by statistical evidence from a monthly 1997-2003 vector autoregression model (VAR) analysis of these two variables. The net potential revenue and MPC imports form a VAR model which generates strong statistical evidence that since mid-1997, changes in net potential revenue have indeed driven U.S. MPC imports from the EU. This statistically significant relationship is lagged, where an increase in net potential revenue takes up to three months before appreciable increases in MPC imports register. A more detailed presentation of this analysis can be found in appendix H.

Contribution of EU skim milk powder export refunds

During 1998-2002, a key factor in determining the trend in the net potential revenue from MPC 42 was the level of EU SMP export refunds. As part of the implementation period of the World Trade Organization (WTO) Agreement on Agriculture, the EU was allowed to carry-over unused export refund commitments from one year to the next for use without penalty. This export refund carry-over provision expired at the end of June 2000.[25] Until June 2000, the WTO limitations on export refunds did not constrain EU SMP exports, even though the maximum annual quantity fell from 335,000 mt in 1995/96 to 272,500 mt in 2000/01. In fact, unused export refund allocations were carried-over and accumulated, such that by 1999/2000, the EU had accumulated unused current and carried-over export refund commitments of 642,310 mt of SMP.

At the same time, EU purchases of SMP into intervention stocks increased and by August 1999 intervention stocks were more than 273,000 mt.[26] As a result of accumulating SMP intervention stocks, and the pending expiration of export refund carry-overs, the EU Commission significantly increased export refund rates to reduce intervention stocks.[27] As shown in table 5-6, from the first quarter of 1998 to the first quarter of 1999, the contribution of EU export refunds to net potential revenue from MPC 42 rose from $665 per mt to $873 per mt, and by June 2000 SMP intervention stocks had dropped to less than 68,000 mt. Coinciding with the decline in intervention stocks, the export refund for MPC 42 fell to $127 per mt in the fourth quarter of 2000. The drop in the value of export refunds during 2000 also coincided with a decline in U.S. imports of MPC from the EU, which declined from more than 3,000 mt in May 2000 to less than 500 mt by the end of 2000.

In addition to changes in the level of export refund, after May 2000, EU exporters of MPC to the United States were affected by a system of reduction coefficients applied to exports of milk protein products.[28] As noted in chapter 4, if export license applications in a given period exceed the quantity or value that the EU Commission planned to allocate, a coefficient (based on the ratio of total export refund applications to total export refunds provided) was applied to all applications, such that only some portion of each application was awarded. As a result, exporters did not know the actual amount of refund that would be received. According to EU industry officials, this uncertainty made applications for export

[25] The accounting year for World Trade Organization commitments is from July 1 to June 30.
[26] ZMP, *Dairy Review 2003*.
[27] EU Commission officials, Agriculture Directorate, Dairy Division, interview by USITC staff, Brussels, Belgium, Oct. 14, 2003.
[28] Commission Regulation (EC) No 238/2000, *Official Journal of the European Union,* L24/45 (Jan.28, 2000).

refunds unattractive for many EU dairy exporters since such contracts required export refunds to be competitive.[29]

Contribution of EU casein production aid

Changes in the production aid rate for casein during 1998-2002 also influenced the net potential revenue from MPC 42. Casein production aid is adjusted according to market conditions to maintain a balance between casein and SMP production.[30] The contribution of the casein production aid to the net potential revenue began in 1998 at $212 per mt of MPC 42 and increased to $234 per mt of MPC 42 during the second and third quarters of 1999 (table 5-6).[31] After this peak, the contribution of casein production aid to the net potential revenue decreased to $109 per mt in the first half of 2002, but again increased to $199 per mt by the fourth quarter of 2002.

Contribution of U.S. Dairy Price Support Program

U.S. dairy policies also contributed to the incentives for EU processors to manufacture and sell MPC 42 to the U.S. market. The U.S. SMP price, supported by the DPSP, exceeded the world price by more than $700 per mt from January 1998 to April 2000, and by more than $500 per mt from December 2001 to November 2002.[32] When the U.S. SMP support price is above the world price, its impact on the net potential revenue from MPC 42 is magnified. This is because as the world price falls, the level of EU export refunds increase (thereby increasing the net potential revenue on MPC 42), while the world price decline also directly increases the net potential revenue. Consequently, when the U.S. support price is above world prices, every unit decrease in the world price causes more than a unit increase in the net potential revenue. The January 1999 butter-powder support price adjustment, or tilt, helped drop the net potential revenue from MPC 42 below $2,000 per mt. Net potential revenue, however, quickly recovered to more than $2,000 per mt as world prices continued to decrease and the EU continued to increase export refund rates. By the time the next tilt took place in May 2001, the net potential revenue from sales of MPC 42 had already dropped to less than $300 per mt as world prices increased and export refunds decreased.

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[29] Export licenses subject to export refunds must be executed within 4 months of being awarded or the license and the deposit on the license are forfeited. This time is insufficient for companies to negotiate and execute supply contracts for many of these products.

[30] EU Commission officials, Agriculture Directorate, Dairy Division, interview by USITC staff, Brussels, Belgium, Oct. 14, 2003.

[31] The contribution to the net potential revenue on MPC 42 was calculated as 10 percent of the euro-value of the Annex II acid casein subsidy rate per mt of casein, multiplied by the exchange rate.

[32] The U.S. Market (West) and the Northern Europe low FOB, respectively, as reported by USDA.

Developments in U.S. imports of milk protein concentrate from the EU after 2001

Responses to Commission importers' questionnaires indicated that U.S. imports of MPC 40-49 from the EU fell from 17,820 mt in 2000 to 3,588 mt in 2001 (table 6-5). However, from 2001 to 2002, U.S. imports of MPC 40-49 from the EU grew from 3,588 mt to 6,683 mt. Review of U.S. MPC import data (HTS 0404.90.10) for the EU revealed that there was a change in the source of these imports by EU member states. During 1998-2002, Ireland, the Netherlands, Germany, France, and Denmark accounted for 95 percent of these imports. However, when U.S. MPC imports from the EU rose in 2002, Germany significantly increased its import share.

Further information on the nature of MPC imports from the EU by source is provided through AUV data. The AUV of U.S. MPC imports from all major EU member states trended downward from 1998 to 2000, then increased in 2001. In 2002, however, AUVs for individual member states diverged. AUVs for MPC from Ireland, the Netherlands, and Denmark increased, while AUVs of German imports decreased.[33]

Several factors suggest that German milk protein processors and traders continued to react to incentives to export MPC 42 by blending casein and SMP, in contrast to other EU processors. Based on interviews by Commission staff, primary processors from Ireland and the Netherlands indicated that they exited the market for low-protein MPC in 2001, and were focusing on exports of high-protein products that did not depend on export refunds to be competitive.[34] However, the German industry has close ties to the milk protein industries in Central and Eastern Europe, which provide German processors access to low cost supplies of casein and SMP. Additionally, with a large domestic population relative to milk supply, the German industry has more incentive to focus on research and development on domestic consumer products, rather than high-protein products for export.[35] Thus, it is likely that German processors and traders continued to focus on MPC 42.

Impact of Common Agricultural Policy reform and EU expansion

Reform of the Common Agricultural Policy (CAP) and EU expansion will likely limit the ability of EU policies to provide incentives for exports of MPC 42 to the United States in the future.[36] CAP reform phases in a reduction of 15 percent in the SMP intervention price over 3 years beginning in 2004. Because intervention prices are considered when setting export refunds and casein production aids, export subsidies and casein production aids are also expected to decrease.[37] Furthermore, the EU currently imports significant quantities of milk

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[33] U.S. Department of Commerce.

[34] European Dairy Association, selected members of casein industry committee, interview by USITC staff, Brussels, Belgium, Oct. 15, 2003; Irish Dairy Industry Association, selected members, interview by USITC staff, Dublin, Ireland, Oct. 10, 2003.

[35] Ibid.

[36] Ibid.; Irish Dairy Industry Association, selected members, interview by USITC staff, Dublin, Ireland, Oct. 10, 2003; EU Commission officials, Directorate General for Agriculture, Dairy Division, interview by USITC staff, Brussels, Belgium, Oct. 14, 2003.

[37] Ibid.; EU Commission officials, Agriculture Directorate, Dairy Division, interview by USITC staff, Brussels, Belgium, Oct. 14, 2003.

protein from Eastern and Central Europe that will become EU members in 2004.[38] The accession agreements set production quotas that should result in reduced milk production in these countries, likely reducing the quantities of protein available for export to third countries.[39]

U.S. Dairy Programs and Feasibility of Milk Protein Product Production in the United States

Under the DPSP, the Commodity Credit Corporation (CCC) is required to accept any SMP delivered to it by processors at a support price established by the USDA (see chapter 3 for more detail on the DPSP). Therefore, the program provides SMP producers with a guaranteed customer at a risk-free price. Users of milk protein products assert that the DPSP creates a disincentive for U.S. dairy producers to produce MPC, casein, and casinate.[40] Potential producers of these products would need to invest in the production facilities and then market their product without the benefit of the DPSP. Additionally, it is possible for the support price to be higher than the market price for casein or MPC, which further discourages production. Recently, the USDA conducted a review of the feasibility of casein production in the United States at the request of the National Milk Producers Federation (NMPF).[41] However, aside from this study, there are no analyses of the impact of the DPSP on the economic viability of producing casein and MPC in the United States. The following section provides analysis of the feasibility of producing MPC and casein in the United States.

Milk protein concentrate production

An analysis of the feasibility of domestic MPC production, given the existence of the DPSP, is provided below. The approach was to estimate the processing costs and returns from producing several different protein concentrations of MPC from 100 pounds of raw milk. These returns were then compared to the return from producing SMP from 100 pounds of raw milk with returns based on sales at the support price.[42]

To obtain estimates of both variable and fixed costs associated with a commercial MPC production facility, the Commission surveyed many WPC producers throughout the United States, as well as the Dairiconcepts facility in Portales, NM.[43] WPC production costs were used as proxies for MPC production because the ultrafiltration process and equipment employed in each is virtually identical.[44] These processes utilize the same filtration

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[38] ZMP, *Dairy Review 2003*.

[39] Ibid.

[40] Mr. Paul C. Rosenthal, U.S. Coalition for Nutritional Ingredients, testimony before the USITC, Dec. 11, 2003, transcript p. 230; Mr. Michael A. Reinke, Kraft Foods, testimony before the USITC, Dec. 11, 2003, transcript p. 237.

[41] USDA, Cooperative Service Program, "The Feasibility of Producing Casein in the United States," technical assistance report to NMPF (Oct. 1999).

[42] The analysis used $0.80 per pound as the support price for SMP and the Class IV skim price of $5.98 per cwt was used as the raw milk cost.

[43] As mentioned in chapter 4, this facility is the only one currently producing MPC on a large scale in the United States.

[44] U.S. and foreign industry officials, interviews by USITC staff.

equipment and similar evaporation and drying equipment. Cost estimates were obtained for the filtration process, the drying process, the disposal of the permeate, labor, and utilities.

Return on skim milk powder production

On average, processors can extract approximately 9 pounds of SMP from 100 pounds of skim milk (table 5-7). The costs associated with the drying of SMP vary between processors, but were estimated at approximately $0.14 per pound.[45] Therefore, the costs associated with producing 9 pounds of SMP from 100 pounds of skim milk are approximately $1.22. The support price for SMP in 2003 was $0.80 per pound, which equates to revenue of $7.20 for 9 pounds of SMP. Therefore, after accounting for the raw milk and other variable costs, the return on producing SMP from 100 pounds of skim milk is approximately $0.01 (table 5-7).

Return on milk protein concentrate production

The return on SMP was compared with the returns on producing MPC 42, MPC 70, and MPC 80 from 100 pounds of skim milk. The amount of MPC produced from 100 pounds of skim milk can vary based on the protein content of the milk and the efficiency of the filtration process.[46] Therefore, costs and returns were calculated for both low- and high-yield estimates of the pounds of product from 100 pounds of milk (table 5-7). Also, for each protein concentration of MPC, a low and high estimate for variable costs were analyzed, because costs vary according to the size of the operation and the geographic location of the facility (table 5-7).[47]

The price for each MPC concentration was estimated as the average unit value for U.S. imports of MPC 42, MPC 70, and MPC 80 in 2002, as reported in Commission purchasers' questionnaires. Based on these estimates, dairy processors could realize a higher return selling SMP at the 2003 support price than producing and selling MPC 42 at the average market price (table 5-7). Production of MPC 42 resulted in losses ranging from $0.29-$0.80 per 100 pounds of skim milk (table 5-7). This analysis conforms to the results from trial runs of MPC 42 production by U.S. dairy processors.[48]

For MPC 70 and MPC 80, the opportunity cost associated with producing SMP instead of MPC depends on the actual variable costs (table 5-7). Under the most advantageous conditions (i.e., high-yield and low variable costs), producers of MPC 70 could realize $0.18 more from 100 pounds of skim milk than from producing SMP, whereas for processors of MPC 80, the return would be $0.29 greater. However, under less advantageous conditions (i.e., low-yield and high variable cost), processors would be worse off producing MPC 70 or MPC 80.

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[45] U.S. industry officials, interviews by USITC staff, Jan. 2004.

[46] For example, some protein can be lost in the permeate during the filtration process, which would reduce the yield.

[47] The location of the facility impacts utility costs and the permeate and waste water disposal costs associated with the UF process.

[48] Mr. Richard Cotta, California Dairies, testimony before the USITC, Dec. 11, 2003, transcript p. 141.

Table 5-7

Milk protein products: Estimated return on the production of MPC 42, MPC 70, and MPC 80 versus the return on skim milk powder at the support price from 100 pounds of skim milk[1]

Production factors	Skim milk powder	MPC 42 High yield low cost	MPC 42 Low yield high cost	MPC 70 High yield low cost	MPC 70 Low yield high cost	MPC 80 High yield low cost	MPC 80 Low yield high cost
Raw milk quantity *(pounds)*	100	100	100	100	100	100	100
Raw milk price *(dollars per pound)*[2]	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Raw milk cost *(dollars)*	5.98	5.98	5.98	5.98	5.98	5.98	5.98
Yield *(lbs. protein product from 100 lbs. skim milk)*	9.0	7.3	7.1	4.5	4.3	4.0	3.8
Variable cost *(dollars per pound)*	0.14	0.19	0.24	0.29	0.34	0.35	0.40
Total variable cost *(dollars)*	1.22	1.39	1.70	1.31	1.46	1.40	1.52
Milk cost plus variable cost *(dollars)*	7.20	7.37	7.68	7.29	7.44	7.38	7.50
Price *(dollars per pound)*	0.80	0.97	0.97	1.66	1.66	1.92	1.92
Revenue from processing*(dollars)*	7.20	7.08	6.89	7.47	7.14	7.68	7.30
Profit from processing *(dollars)*	0.01	-0.29	-0.80	0.19	-0.30	0.30	-0.20
Opportunity cost versus SMP *(dollars)*	([3])	-0.30	-0.81	0.18	-0.31	0.29	-0.21

[1] Costs and returns presented in this table are rounded to 2 decimal places.
[2] Average 2003 class IV price skim.
[3] Not applicable.

Source: Commission estimates.

Impact of capital costs on milk protein concentrate production

The potential returns estimated above, however, do not include fixed (or capital) costs associated with the production of MPC. Capital costs vary depending upon the existing capital infrastructure of the dairy processor. Capital costs associated with the filtration equipment are estimated at between $1.5 and $2 million.[49] However, the production process also requires an appropriately sized evaporator and dryer, bagging and packaging equipment, and a building. The evaporation and drying equipment necessary for the production of MPC, particularly a high-protein MPC, differs from the equipment used in the production of SMP. A greenfield MPC facility is estimated to cost between $40 million and $108 million.[50]

Using these estimates for fixed costs, the depreciation expense on these two estimates, on a per pound basis, are $0.08 and $0.20, respectively.[51] Under the most advantageous situations (lower variable costs and higher yields), processors could still realize a better return producing MPC 80 than producing SMP. However, these capital costs would be sufficient to make the return on producing SMP higher than the return on producing MPC 70 or MPC 80 under the less advantageous conditions. These capital costs pose a significant hurdle for U.S. dairy processors. Conversion of an existing WPC facility would ameliorate some of these capital costs. However, the evaporation and drying equipment used in the production of WPC differ from the optimal mix of equipment in the production of MPC, and therefore some additional capital costs would be necessary.[52]

Moreover, conversion of an existing WPC facility to the production of MPC would be economical only under conditions where excess WPC capacity existed or when the return on producing MPC is superior to the combined return on cheese and WPC. WPC facilities are generally built in conjunction with cheese plants in order to maximize the return on the total facility.[53] However, conversion of a WPC plant to produce MPC would necessarily result in idling the cheese production facility. The WPC production process is complementary to the cheese production process, by processing the whey by-product. In contrast, the production of MPC requires both the casein and whey proteins and therefore is not complementary to the simultaneous production of cheese. A cheese facility that wanted the option of producing both cheese/WPC and MPC would likely require two separate filtration systems, one for WPC and one for MPC, because of sanitary concerns associated with switching between whey and skim milk.[54]

It is likely that U.S. dairy processors would face costs closer to the higher end of the range than the lower end of the range. The Dairiconcepts facility in Portales, NM, benefitted from a unique set of circumstances that limited additional capital costs. The involvement of Fonterra also brings experience in operating the ultrafiltration technology and in marketing MPC. Even with these advantages, purchasers of MPC from the Dairiconcepts facility still

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[49] Commission staff fieldwork, Plover, WI, Aug. 21, 2003, and the Magic Valley region, ID, Oct. 7-10, 2003.
[50] U.S. industry officials, interviews by USITC staff, Aug. 21, 2003; USITC fieldwork, Dexter, NM, Oct. 7-10, 2003; Mr. Richard Cotta, California Dairies, testimony before the USITC, Dec. 11, 2003, transcript p. 182.
[51] Calculated on a straight-line basis assuming costs of $40 million and $108 million, depreciated over 15 years at a plant producing 16,000 mt of MPC per year.
[52] U.S. industry officials, interview by USITC staff, Aug. and Oct. 2003.
[53] U.S. industry officials, interviews by USITC staff, Aug. 2003.
[54] Ibid, Oct. 2003.

pay a premium over the price of imported MPC to provide the facility with a return that is equivalent to the return on SMP.[55]

Risk premium

The DPSP offers manufacturers of SMP both a guaranteed price floor and guaranteed customer (the CCC) for their product. No such guarantees exist for MPC, and processors contemplating a switch from SMP to MPC would be forced to assume significant additional financial risk. Therefore, even if prevailing market conditions offer a superior return from producing MPC, U.S. processors could require additional revenue, or a risk premium, as compensation for the additional risk associated with marketing MPC versus SMP.

Market demand for U.S.-produced milk protein concentrate

Potential U.S. producers of MPC would have to overcome the relatively small size of the MPC market in the United States. Based on responses to Commission questionnaires, total imports of all protein concentrations of MPC in 2002 were 41,254 mt (table 6-1). As a result of very limited U.S. production until 2003, imports represented virtually the entire U.S. market for MPC in 2002. This is a relatively small market when compared with other milk protein products.[56] Any new entrant supplying MPC domestically would face significant competition from two sources. First, foreign producers that have been supplying imports to the U.S. market have a significant advantage in that they have well-established relationships with all MPC users and have been able to demonstrate the quality and consistency of their product. Second, the Dairiconcepts facility has a reported production capacity of approximately 16,000 mt, which is equivalent to about 40 percent of 2002 imports. Therefore, the U.S. market for MPC will have to grow by about 40 percent just to absorb the additional capacity of the Dairiconcencepts facility, assuming import levels remain unchanged.

Additional U.S. MPC production could cause downward price pressure that could make MPC production unprofitable at all protein levels. For example, the analysis of costs and returns demonstrates that a $0.05 decline in the average MPC 70 and MPC 80 prices reduces the return on variable costs (even under the most advantageous conditions) to a point where any significant capital costs would make MPC production unprofitable relative to SMP production (table 5-7).

A key reason why the U.S. market for MPC is currently relatively small in comparison to those for other milk protein products is the U.S. Food and Drug Administration (FDA) standards of identity. These regulations limit the use of MPC in the United States. Revisions to the FDA standards of identity to allow for the more widespread use of MPC in dairy products could create significant new demand for MPC. Without regulatory changes that would permit the increased use of MPC, and therefore increased demand, U.S. producers

[55] Certain purchasers are willing to pay a premium for MPC produced at the Dairiconcepts facility to ensure some U.S. production. Industry officials, interviews by USITC staff, Oct. 2003; Mr. John Wilson, Dairy Farmers of America, testimony before the USITC, Dec. 11, 2003, transcript p. 219.

[56] In contrast, the U.S. market for SMP was 700 million pounds, or approximately 318,800 mt in 2002.

would only be able to enter the MPC market by takings sales from imported MPC. However, it is unlikely that U.S. dairy processors, under current market conditions, could produce and market MPC at prices lower than those for imported MPC.

Feasibility of casein production

At the request of the NMPF, the USDA Rural Business-Cooperative Services Program and the Agricultural Research Service performed a technical analysis on the feasibility of producing casein versus SMP in the United States, in a report completed in October 1999.[57] The USDA estimated the production costs, including some capital costs, for acid casein at approximately $0.20 per pound.[58] Unlike the production process for MPC, casein production does not capture all the protein found in milk. In a manner similar to cheese production, casein production results in the generation of a whey protein by-product or whey stream. Therefore, a comparison of the return on producing SMP versus producing casein must also account for the value of the whey stream. Table 5-8 presents analysis of the cost and returns associated with producing SMP versus casein and whey from 100 pounds of skim milk.

Table 5-8
Milk protein products: Estimated return on the production of casein and whey versus the return on skim milk powder at the current support price from 100 pounds of skim milk

Production factors	Skim milk powder	Acid casein	Whey	Casein/ whey total
	Pounds			
Quantity	9.00	2.80	6.00	([1])
	Dollars per pound			
Price	0.80	2.27	0.20	([1])
Processing costs	0.14	0.20	0.16	([1])
	Dollars per cwt of raw milk			
Revenue from processing	7.20	6.36	1.20	7.56
Costs	1.26	0.56	0.96	1.52
Return from processing	5.94	5.80	0.24	6.04

[1] Not applicable.

Source: USDA, Rural Business Cooperative Service Program, *The Feasibility of Producing Casein in the United States*, technical assistance report (Oct. 1999), updated by the Commission.

[57] It is the general policy of the USDA cooperating agencies that technical assistance reports are confidential and not made available to the public. In this case NMPF provided a copy of this report to the Commission.

[58] The production cost estimate includes variable costs and the capital costs associated with the facility and equipment, but not the land. The plant was assumed to produce 14,784,000 pounds of casein annually and all capital costs were depreciated over 10 years.

Prices of SMP and casein and the production costs for SMP and dry whey have been updated from 1999 to 2002 levels by the Commission.[59] However, the casein production cost estimate was not updated and reflects production costs for 1999. It is likely that over the intervening period, the production cost for casein has risen, just as the production costs for SMP and dry whey have risen. Based on the available data, U.S. producers could expect to realize approximately $5.94 on the production of SMP from 100 pounds of raw milk versus approximately $6.04 from the production of casein and whey (table 5-8). Thus, producers could realize an increased return of approximately $0.10 per cwt of raw milk on the production of casein. However, as noted above, the casein production cost estimate is probably low. An increase in the casein production cost estimate from $0.20 to $0.25 would result in more revenue from the production of SMP than casein and whey. Additionally, these calculations do not include a risk premium. A risk premium could be required by dairy processors to cover the additional risk of having to market the casein without the guaranteed price and customer offered through the DPSP for SMP. Therefore, under current market conditions it appears unlikely that dairy processors could receive a superior return on producing casein versus SMP.

Government Assistance in New Zealand

Concerns regarding Fonterra's ability to use quota rents to cross-subsidize the marketing of products not subject to quotas were raised by representatives of the U.S. milk producers.[60] As noted in chapter 4, licenses held by the New Zealand Dairy Board to export to certain designated quota markets were transferred to Fonterra in 2001.[61] Fonterra's exclusive license to export to quota markets could result in the accumulation of quota rents when the price in the quota market is higher than the world price.

Calculating the value of quota rents is highly complex and cannot be accomplished without access to company-specific confidential business information. However, Fonterra reports that approximately 7 percent of its total sales by volume are to quota markets.[62] These sales consist primarily of sales of butter and cheese to Canada, the EU, and the United States. Sales of these products to these markets provide Fonterra an opportunity to realize returns from sales that are made at prices higher than the world price. However, the impact of any potential quota rents is not the total value of sales to the quota market, but rather the difference in that value and the value of the same products sold at the world price. The marginal value of these quota rents accounted for slightly less than 3 percent of Fonterra's payments to farmers in the 2001/02 marketing year.[63]

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[59] The casein and whey prices are average prices as reported in Commission questionnaires and by the U.S. Department of Agriculture's Agriculture Marketing Service, respectively.

[60] Dr. Peter Vitaliano, NMPF, testimony before the USITC, Dec. 11, 2003, transcript p. 28.

[61] Dairy Companies Association of New Zealand, posthearing submission, Dec. 23, 2003, p. 12.

[62] Dairy Companies Association of New Zealand, posthearing submission, Dec. 23, 2003, p. 28.

[63] Fonterra *Annual Report 2001/02* states that $0.15 of each $5.33 per kilogram of milk solids paid to shareholders was attributable to premiums realized from quota rents.

Production Technology

The production technology for milk protein products such as SMP, MPC, and WPC in all major producing countries is virtually identical. The production process for SMP is primarily an evaporation and drying process, the equipment and technology for which are well established. The filtration technology to produce MPC and WPC is also standardized, and several equipment producers can provide the necessary technology to any potential producer.

In contrast, the production technology for whey protein isolate (WPI), casein, caseinate, and blend or co-precipitate MPC is less established and often involves proprietary processes. Although aspects of the production technology for WPI are considered proprietary by producers, there is extensive U.S. production of WPI, to the extent that the United States is considered a world leader in the WPI market. However, the production technology for certain forms of casein, caseinate, and in particular co-precipitate MPCs, is not widely available in the United States. This is due primarily to the lack of production of these products in the United States and therefore there has been limited research and development in the United States. In particular, the production technology for co-precipitate MPC, while similar to the production technology for acid casein, is often unique and closely held proprietary information.

Exchange Rates

Exchange rates of foreign currency relative to the U.S. dollar can impact the competitiveness of foreign goods. Exchange rate movements, for the purpose of an analysis of competitiveness, are usually provided in real terms. The real exchange rate refers to rates of foreign exchange deflated by relative price changes in the countries for which currency changes are being compared.[64] For example, if the value of a country's currency weakens in real terms relative to the U.S. dollar, then the U.S. dollar has a stronger purchasing power at the new exchange rate, and the real exchange rate rises. Similarly, if the value of a country's currency increases in real terms relative to the U.S. dollar, then the U.S. dollar has less purchasing power at that exchange rate and the real exchange rate falls.

Nearly all international dairy transactions, including those for milk proteins, are denominated in U.S. dollars.[65] This means that when the foreign currency appreciates in real terms and the real exchange rate falls, the real return from exports, when translated into local currency, also falls because dollars purchase less in terms of real foreign currencies. Under a system where

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[64] The real exchange rate of a foreign country's currency ("currency-K") per U.S. dollar is equivalent to: (currency-K/U.S. dollar)*(deflUS/deflK). The asterisk is the multiplication operator; the slanted line is the division operator; and the real rate's first parenthetical term is the nominal exchange rate. The real rate's second parenthetical term is the "relative inflation factor" or the ratio of the general price indices (more specifically the gross domestic product price deflators) of the United States (deflUS) and for the foreign country (deflK). The nominal and real exchange rates would be similar if the foreign country K and the United States have similar inflation patterns, whereby the relative inflation factor would approach unity.

[65] USDA, FAS, *Dairy Production and Trade Developments,* found at *http://www.fas.usda.gov/-dlp2/circular/-2000/00-12Dairy/dairyprd.html*, retrieved Mar. 23, 2004.

exchange rates and world prices are determinants of domestic dairy prices, this will result in reduced earnings from dairy product exports, all other things held constant. Similarly, when the foreign currency depreciates in real terms and the real exchange rate increases, the real return from exports, when translated into local currency values, also increases, all other things held constant.

Table 5-9 provides quarterly real dollar exchange rates relative to the currencies of the primary milk-protein exporters: New Zealand, Australia, and the EU. Real exchange rate data were obtained for all three regions from 1999, when the euro was officially instituted, to the third quarter of 2003.[66] The real exchange rate of these currencies per U.S. dollar declined since the first quarter of 2002, meaning that each U.S. dollar purchased less foreign currency in real terms. This real exchange rate depreciation of the U.S. dollar is reflected by a 23 percent decline relative to the Australian dollar, a 27 percent decline relative to the New Zealand dollar, and a 22 percent decline relative to the euro since early 2002. Before 2002, real dollar exchange rates exhibited a rising trend.

Table 5-9
Real quarterly exchange rates in foreign currency per U.S. dollar: Australia, New Zealand, and the European Union

Quarterly date	Australia	New Zealand	European Union
1998:1	1.478	1.751	([1])
1998:2	1.567	1.897	([1])
1998:3	1.643	1.991	([1])
1998:4	1.589	1.921	([1])
1999:1	1.573	1.909	0.871
1999:2	1.529	1.889	0.924
1999:3	1.529	1.954	0.933
1999:4	1.546	2.013	0.944
2000:1	1.567	2.085	1.001
2000:2	1.672	2.154	1.059
2000:3	1.687	2.314	1.094
2000:4	1.816	2.465	1.139
2001:1	1.811	2.315	1.069
2001:2	1.875	2.410	1.132
2001:3	1.877	2.402	1.110
2001:4	1.887	2.412	1.096
2002:1	1.850	2.345	1.116
2002:2	1.741	2.190	1.066
2002:3	1.748	2.136	0.992
2002:4	1.710	2.077	0.979
2003:1	1.605	1.854	0.910
2003:2	1.482	1.776	0.858
2003:3	1.432	1.709	0.867

[1] The euro became the official currency of the EU on January 1, 1999.

Source: Compiled by the Commission with data from the International Monetary Fund, International Financial Statistics.

[66] During 1998 the average rate of exchange between the U.S. dollar and the European Currency Unit (Ecu) was $1.1224/Ecu. The euro was instituted in Jan. 1999, at an exchange rate of $1.1812/euro. The average monthly rate for Jan. 1999 was $1.1591/euro, which fell to $0.8525/euro in Oct. 2000.

Changes in real dollar exchange rates have reportedly had differential impacts on the competitiveness of milk protein suppliers. In New Zealand and Australia, since July 2000, returns to dairy farmers are largely based on export prices and U.S. dollar exchange rates. As noted in chapter 4, the depreciation of the Australian and New Zealand currencies relative to the U.S. dollar were factors that likely contributed to higher returns to dairy farmers prior to the 2002/03 seasons in those countries.

The appreciation of the New Zealand currency relative to the U.S. dollar in 2002 is reported to have adversely impacted New Zealand farmers through lower dairy prices paid by Fonterra and other New Zealand dairy supply companies (see chapter 4). In May 2003, Fonterra implemented a new foreign exchange hedging policy to protect 100 percent of projected foreign exchange earnings against spot market currency movements for a period of 15 months. This policy, in effect, will delay the impact of exchange rate changes on domestic dairy product prices on a rolling, 15-month basis.[67] For Australia, USDA reports that Australia's earnings (in Australian dollars) from dairy exports in 2002/03 were 24 percent below earnings from the previous year, owing to the effects of drought, lower international prices for some dairy products, and the effects of a surge in the value of the Australian dollar.[68]

EU exporters, on the other hand, are partially insulated from exchange rate changes because the European Commission considers exchange rates when setting export refund rates. Historically, the EU Commission has used a strengthening U.S. dollar as a reason to decrease export refunds.[69] That is, as the U.S. dollar's value increased relative to the euro, EU exporters should be able to maintain internationally competitive pricing with lower export refund rates. Conversely, as the U.S. dollar weakens against the euro, increased export refunds would be necessary for EU milk protein exporters to maintain competitive pricing.

Exchange rates, however, appear to have had only a minor impact on EU milk protein exports to the United States during 1998-2002. During 1999 and most of 2000, the U.S. dollar appreciated by as much as 31 percent relative to the euro. During this time however, the export refund rate on SMP dropped by nearly 80 percent, from €900 to €150 per mt (or from $980 to $128 per mt). The change in the export refund rate during this time appears to have been driven primarily by increases in the world price of SMP from $1,210 to $2,100 per mt. Comparatively from January 1999 to October 2000, export refunds for butter were unchanged, while export refunds for whole milk powder decreased by only 43 percent, from €120 to €68 per mt ($130 to $58 per mt).

Transportation Costs

During the 1998-2002, transportation costs from the EU and Oceania to the United States fell into the same general range. Costs from the EU during the period were relatively steady,

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[67] Ministry of Agriculture and Forestry, *Situation and Outlook for New Zealand Agriculture and Forestry* 2003, p. 21.

[68] USDA, FAS, "Australia Dairy and Products Annual 2003," GAIN Report No. AS3046 (Nov. 2003), p. 19.

[69] Eric Donald, "Strengthening Euro Hurting Food Exporters," *Irish Farmers Journal* (Jan. 10, 2004).

ranging from $120 to $130 per mt. Costs from Oceania ranged from $100 to $140 per mt during the period. Imports from both regions face similar transportation costs. Therefore, transportation costs do not appear to significantly affect the relative competitiveness of imports from the EU or Oceania.

CHAPTER 6
ANALYSIS OF U.S. IMPORTS OF MILK PROTEIN PRODUCTS

This chapter contains the results and analysis of data gathered through the U.S. International Trade Commission (Commission) importers' questionnaires. Data were gathered on imports of milk protein concentrate (MPC), casein, and caseinate for the 1998-2002 period. The Senate Committee on Finance (Committee) requested that the Commission provide information on U.S. imports of milk protein in its various forms with data broken down, to the extent possible, by protein content. This chapter provides detailed information on the nature of U.S. imports of MPC, casein, and caseinate. Specifically, data on the protein content of imports of MPC, trends in import volume and prices of MPC by protein content and country of origin, data on imports of casein and caseinate by type, and a calculation of the total volume of milk protein imported in the form of MPC, casein, and caseinate are presented.

Importers' Questionnaires

The Committee's request for detailed information on the protein content of MPC imports reflects the prevailing uncertainty with regard to this issue. The U.S. Harmonized Tariff Schedule (HTS) classifies imports of MPC into two tariff subheadings; 0404.90.10 for imports with a protein concentration from 40 to 90 percent, and 3501.10.10 for imports with a protein concentration of 90 percent or more. Considerable uncertainty existed with regard to the actual protein content of MPC imports classified in subheading 0404.90.10. Therefore, the Commission sent importers' questionnaires to companies that imported MPC from Australia, Canada, the European Union (EU), and New Zealand, classified in HTS subheadings 0404.90.10 or 3501.10.10 between 1998 and 2002. The questionnaires requested data on both the volume and value of imports by protein concentration. The data were aggregated into 10 percent concentration level ranges (e.g., imports of MPC 42 were aggregated with all imports with a protein concentration between 40 and 49 percent). Further, the Commission sent questionnaires to all firms that imported casein and caseinate from Australia, Canada, the EU, and New Zealand classified in subheadings 3501.10.50 and 3501.90.60, respectively, between 1998 and 2002. The HTS classifies all imports of casein and all imports of caseinate in the same subheading, regardless of type (e.g., no distinction is made between acid and rennet casein or between sodium and calcium caseinate). The questionnaires sent by the Commission requested data on both the quantity and value of imports based on product type. This approach permits a more detailed analysis of imports, and, as the protein content of casein and caseinate imports vary somewhat by type, a more detailed analysis of the protein content of imports.

The Commission sent questionnaires to 122 importers and received 68 responses. The volume of MPC imports reported in questionnaire responses accounted for the majority of imports based on official U.S. Department of Commerce (Commerce) data for each year in the 1998-2002 period. More specifically, MPC imports for 2002 based on questionnaire data were equivalent to 99.5 percent of the volume of imports for 2002 reported in official Commerce trade statistics. Quantities and values of imports of casein and caseinate obtained through questionnaire responses differed somewhat from official Commerce trade data. However, data on total imports of casein and caseinate obtained through the questionnaires closely matched total imports of casein and caseinate reported by official Commerce data. Therefore, it is possible that any differences in the data are the result of differences in what importers classify as casein versus caseinate.

Data compiled from Commission questionnaire responses are presented so as not to reveal the operations of individual firms furnishing the information. Certain firms supplying data authorized the Commission to publish certain data on import quantities, particularly imports of MPC by protein concentration, even though the Commission might otherwise have been obligated to withhold such data. Data on import values and average unit values were aggregated and/or presented in index form so as not to reveal the data of individual firms.

U.S. Imports of Milk Protein Concentrate

Import Volumes by Protein Content

Based on the questionnaire data, U.S. imports of MPC increased by 53 percent between 1998-2002, from 26,878 metric tons (mt) to 41,254 mt (table 6-1 and figure 6-1). Import volume peaked in 2000 at 49,816 mt, declined to 31,798 mt in 2001, before increasing again in 2002. Based on protein content, the three largest categories are MPC 40-49 (which consists almost exclusively of imports of MPC 42), MPC 70-79, and MPC 80-89 (both of which include a range of protein concentrations) (figure 6-1). There were relatively few imports in the MPC 50-59 and MPC 60-69 categories between 1998 and 2002. Therefore, the Commission distinguished between low-protein and high-protein MPC by identifying MPC with a protein content of 69 percent or less as low-protein, and MPC with a protein content of 70 percent or more as high-protein. MPC with a protein content of 70 percent or more accounted for the majority of imports in 3 of the 5 years during 1998-2002, 55 percent of total imports in 1998, 68 percent in 2001, and 69 percent in 2002. The significant increase in low-protein imports (mostly MPC 40-49) in 1999 and 2000 resulted in low-protein imports accounting for 58 percent of total imports in those years.

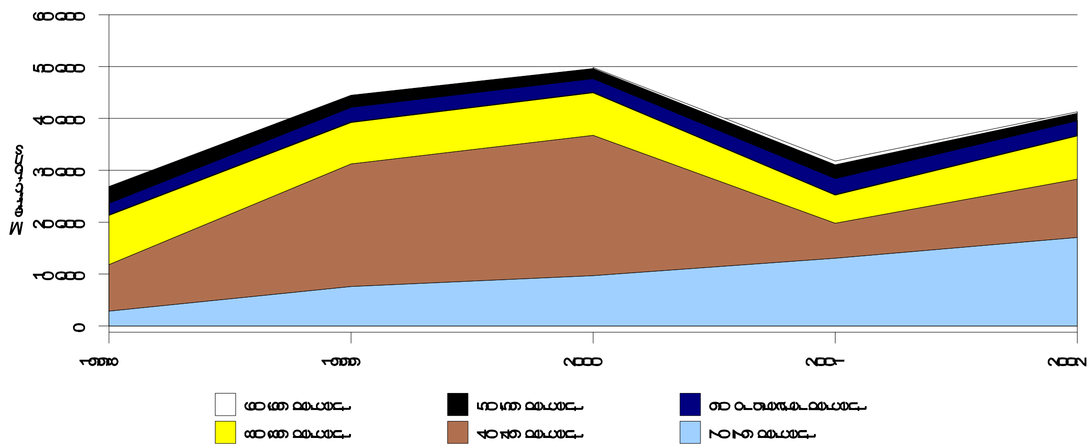
Questionnaire data indicate that the protein content of MPC imports changed during the 1998-2002 period. In 1998, MPC imports were split fairly evenly between low- and high-protein MPC (12,116 mt and 14,762 mt, respectively). However, in 1999 and 2000 there was a sharp increase in imports of MPC 40-49, from 8,961 mt in 1998 to 27,036 mt in 2000 (an increase of 200 percent). In 2001 and 2002, imports of MPC 40-49 declined significantly and accounted for much of the overall decline in import levels from the 2000 level. Imports of MPC 70-79 rose steadily from 2,846 mt in 1998 to 17,065 mt in 2002 (table 6-1 and figure 6-1). In both 2001 and 2002, MPC 70-79 accounted for about 41 percent of all MPC imports. Imports of MPC 50-59 declined relatively steadily between 1998-2002, from 12 percent of

Table 6-1
Milk protein concentrate: Quantity and share of U.S. imports by protein concentration and source, 1998-2002

Protein concentration/source	1998	1999	2000	2001	2002
	Quantity *(metric tons)*				
Low protein (percent):					
40-49	8,961	23,608	27,036	6,755	11,230
50-59	3,155	2,285	1,903	2,636	1,388
60-69	0	0	195	704	248
Subtotal	12,116	25,893	29,134	10,095	12,866
High protein (percent):					
70-79	2,846	7,608	9,709	13,040	17,065
80-89	9,536	8,030	8,237	5,480	8,380
90 or greater	2,380	2,958	2,736	3,183	2,943
Subtotal	14,762	18,596	20,682	21,703	28,388
Total	26,878	44,489	49,816	31,798	41,254
	Share *(percent)*				
Low protein (percent):					
40-49	33	53	54	21	27
50-59	12	5	4	8	3
60-69	0	0	0	2	1
Subtotal	45	58	58	32	31
High protein (percent):					
70-79	11	17	19	41	41
80-89	35	18	17	17	20
90 or greater	9	7	5	10	7
Subtotal	55	42	42	68	69
Total	100	100	100	100	100
	Quantity *(metric tons)*				
By source, all protein concentrations:					
Australia	1,354	5,058	6,713	3,418	4,003
European Union	14,219	20,243	20,943	5,451	9,861
New Zealand	9,027	15,162	18,313	21,477	23,031
All other	2,278	4,026	3,847	1,452	4,359
Total	26,878	44,489	49,816	31,798	41,254
	Share *(percent)*				
Australia	5	11	13	11	10
European Union	53	46	42	17	24
New Zealand	34	34	37	68	56
All other	8	9	8	5	11
Total	100	100	100	100	100

Source: Compiled from data submitted in response to Commission questionnaires.

Figure 6-1
U.S. imports of milk protein concentrate by protein concentration, 1998-2002



Source: Compiled from data submitted in response to Commission questionnaires.

total imports in 1998 to approximately 3 percent in 2002. Imports of MPC with a protein concentration of 80 percent or more remained relatively stable during 1998-2002.

As noted in chapter 5, the primary cause of the volatility in imports of low-protein MPC were the changes in government policies in the United States and the EU. The combined effect of these policies provided strong incentives for U.S. imports of low-protein MPC in 1999 and 2000. However, changes in these policies, as well as changes in the world price for SMP, significantly reduced these incentives in 2001 and 2002. As a result, imports of low-protein MPC declined significantly.

Data from the importers' questionnaires indicated that in 1998, the EU accounted for about one-half of the total U.S. MPC imports, and New Zealand for about one-third. In 2001, New Zealand surpassed the EU as the largest supplier of MPC to the U.S. market. By 2002, about 55 percent of U.S. MPC imports were supplied by New Zealand, 25 percent by the EU, and 10 percent each by Australia and the rest of the world (table 6-1 and figure 6-2).

Data on U.S. MPC imports by country and protein concentration are shown in tables 6-2 to 6-5. Imports from New Zealand increased steadily from 9,027 mt in 1998 to 23,031 mt in 2002, or by 155 percent (table 6-3).[1] MPC 70-79 accounted for most of this increase, rising from 2,588 mt in 1998 to 15,602 mt in 2002. By 2002, two-thirds of U.S. MPC imports supplied by New Zealand consisted of MPC 70-79. In addition, New Zealand accounted for more than 90 percent of total U.S. imports of MPC 70-79 in most years of this period. In 2001 and 2002, imports of MPC 70-79 from New Zealand accounted for close to 40 percent of total U.S. imports of MPC across all suppliers and protein ranges.

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[1] Imports from New Zealand have continued to increase steadily. Based on official U.S. Department of Commerce data, imports of MPC of all protein concentrations from New Zealand increased to 31,268 mt in 2003, accounting for 65 percent of total U.S. imports of these products.

Figure 6-2
U.S. imports of milk protein concentrate by major source, 1998-2002

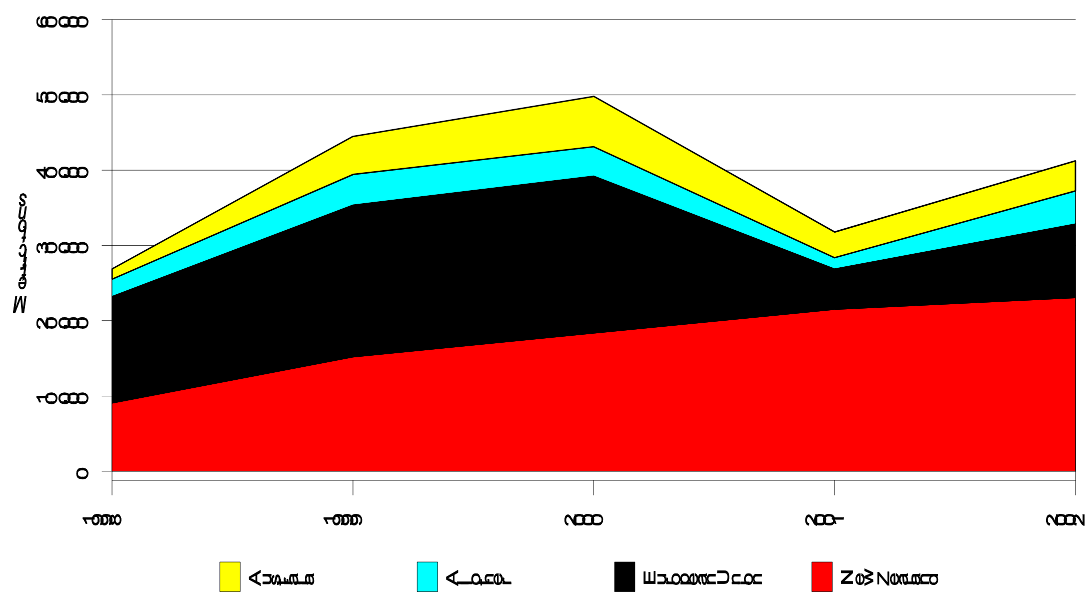

Table 6-2
Milk protein concentrate: Quantity of U.S. imports by protein concentration, 1998-2002

Protein concentration/soure	1998	1999	2000	2001	2002
	Metric tons				
Percent protein:					
40-69	12,116	25,893	29,134	10,095	12,866
70 or greater	14,762	18,596	20,682	21,703	28,388
Total	26,878	44,489	49,816	31,798	41,254
All protein concentrations:					
Australia	1,354	5,058	6,713	3,418	4,003
European Union	14,219	20,243	20,943	5,451	9,861
New Zealand	9,027	15,162	18,313	21,477	23,031
All other	2,278	4,026	3,847	1,452	4,359
Total	26,878	44,489	49,816	31,798	41,254
40-49 percent protein:					
Australia	204	3,747	3,222	479	0
European Union	6,904	14,926	17,820	3,588	6,683
New Zealand	0	1,153	2,520	1,373	318
All other	1,853	3,782	3,474	1,315	4,229
Total	8,961	23,608	27,036	6,755	11,230
50-59 percent protein:					
Australia	327	48	193	1,290	0
European Union	3	41	0	0	460
New Zealand	2,825	2,196	1,710	1,346	928
All other	0	0	0	0	0
Total	3,155	2,285	1,903	2,636	1,388
60-69 percent protein:					
Australia	0	0	195	704	248
European Union	0	0	0	0	0
New Zealand	0	0	0	0	0
All other	0	0	0	0	0
Total	0	0	195	704	248
70-79 percent protein:					
Australia	23	77	113	127	1,202
European Union	235	215	207	86	261
New Zealand	2,588	7,316	9,389	12,827	15,602
All other	0	0	0	0	0
Total	2,846	7,608	9,709	13,040	17,065
80-89 percent protein:					
Australia	800	1,186	2,990	818	2,553
European Union	7,077	5,061	2,916	1,777	2,457
New Zealand	1,234	1,539	1,958	2,748	3,240
All other	425	244	373	137	130
Total	9,536	8,030	8,237	5,480	8,380
90 percent or more protein:					
Australia	0	0	0	0	0
European Union	0	0	0	0	0
New Zealand	2,380	2,958	2,736	3,183	2,943
All other	0	0	0	0	0
Total	2,380	2,958	2,736	3,183	2,943

Source: Compiled from data submitted in response to Commission questionnaires.

Table 6-3
Milk protein concentrate: Quantity and share of U.S. imports from New Zealand by protein concentration, 1998–2002

Protein concentration	1998	1999	2000	2001	2002
	Quantity *(metric tons)*				
40-49	0	1,153	2,520	1,373	318
50-59	2,825	2,196	1,710	1,346	928
60-69	0	0	0	0	0
70-79	2,588	7,316	9,389	12,827	15,602
80-89	1,234	1,539	1,958	2,748	3,240
90 percent or more	2,380	2,958	2,736	3,183	2,943
Total	9,027	15,162	18,313	21,477	23,031
	Share *(percent)*				
40-49	0	8	14	6	1
50-59	31	14	9	6	4
60-69	0	0	0	0	0
70-79	29	48	51	60	68
80-89	14	10	11	13	14
90 percent or more	26	20	15	15	13
Total	100	100	100	100	100

Source: Compiled from data submitted in response to Commission questionnaires.

Imports of MPC from Australia increased irregularly from 1,354 mt in 1998 to 4,003 mt in 2002 (table 6-4).[2] Such imports trended toward higher-protein MPC during 1998-2002. Imports of MPC 80-89 from Australia amounted to 2,553 mt in 2002, or 64 percent of U.S. imports of MPC from Australia. There were no imports of MPC 40-49 and MPC 50-59 reported in 2002, whereas imports of MPC 70-79 increased considerably to 1,202 mt.

Table 6-4
Milk protein concentrate: Quantity and share of U.S. imports from Australia by protein concentration, 1998–2002

Protein concentration	1998	1999	2000	2001	2002
	Quantity *(metric tons)*				
40-49	204	3,747	3,222	479	0
50-59	327	48	193	1,290	0
60-69	0	0	195	704	248
70-79	23	77	113	127	1,202
80-89	800	1,186	2,990	818	2,553
90 percent or more	0	0	0	0	0
Total	1,354	5,058	6,713	3,418	4,003
	Share *(percent)*				
40-49	15	74	48	14	0
50-59	24	1	3	38	0
60-69	0	0	3	21	0
70-79	2	2	2	4	6
80-89	59	23	45	24	30
90 percent or more	0	0	0	0	64
Total	100	100	100	100	100

Source: Compiled from data submitted in response to Commission questionnaires.

[2] This pattern continued in 2003. Based on official U.S. Department of commerce data, imports of MPC of all protein concentrations from Australia increased to 5,513 mt in 2003.

U.S. MPC imports from the EU fluctuated during the 1998-2002 period, increasing from 14,219 mt in 1998 to 20,243 mt and 20,943 mt in 1999 and 2000, respectively (table 6-5). Imports dropped significantly in 2001, then rose somewhat in 2002, but remained below prior levels.[3] The volatility in MPC imports from the EU is apparent in figure 6-2, and is discussed in chapter 5. Imports of MPC from the EU were largely concentrated in the MPC 40-49 and MPC 80-89 categories during 1998-2002. U.S. imports of MPC 40-49 from the EU increased from about 6,900 mt in 1998 to 17,800 mt in 2000, and accounted for 25 percent of total U.S. imports of MPC in 1998 and about one-third in both 1999 and 2000 (table 6-5). Thus, the significant increase in U.S. imports of low-protein MPC imports in 1999 and 2000 was primarily the result of imports of MPC 40-49 from the EU. U.S. imports of MPC 40-49 from the EU dropped significantly in 2001 and 2002, although those imports remained the predominant form of MPC imported from the EU. Low-protein MPC accounted for the majority of imports in each year except 1998 when imports of high-and low-protein MPC were approximately equal. High-protein MPC from the EU actually declined in both relative and absolute terms in 1999 and 2000.

Table 6-5
Milk protein concentrate: Quantity and share of U.S. imports from the European Union by protein concentration, 1998–2002

Protein concentration	1998	1999	2000	2001	2002
	Quantity *(metric tons)*				
40-49	6,904	14,926	17,820	3,588	6,683
50-59	3	41	0	0	460
60-69	0	0	0	0	0
70-79	235	215	207	86	261
80-89	7,077	5,061	2,916	1,777	2,457
90 percent or more	0	0	0	0	0
Total	14,219	20,243	20,943	5,451	9,861
	Share *(percent)*				
40-49	49	74	85	66	68
50-59	0	0	0	0	5
60-69	0	0	0	0	0
70-79	2	1	1	2	3
80-89	50	25	14	33	25
90 percent or more	0	0	0	0	0
Total	100	100	100	100	100

Source: Compiled from data submitted in response to Commission questionnaires.

In 2002, about 11 percent of U.S. imports of MPC were supplied by countries other than Australia, the EU, and New Zealand. These imports were heavily concentrated in the 40-49 percent protein range, with a small volume of imports in the 80-89 percent protein range, primarily from Canada, India, and Poland.

[3] Imports of MPC from the EU continued to remain below peak levels. Imports of MPC of all protein concentrations from the EU declined to 8,084 mt in 2003 based on official U.S. Department of Commerce data.

Import Volumes by Production Process

The Committee also requested information on imports of milk protein in its various forms with data broken down by manufacturing process. As noted in chapter 1, three primary production processes are used to produce MPC: wet or dry blending, co-precipitation, and ultrafiltration. The production process used to produce MPC varies by country. All U.S. imports of MPC from the EU are produced using either a blending or co-precipitation method (table 6-6). There is virtually no production of MPC using the ultrafiltration process in the EU and none of it is exported.[4] In Australia and New Zealand, MPC is largely produced using the ultrafiltration process. Milk protein isolates (MPI) (MPC with a protein concentration of 90 percent or higher) is the only form of MPC not produced using the ultrafiltration process.[5] MPI is produced using the co-precipitation method (table 6-6).

Table 6-6
Milk protein concentrate: Quantity of U.S. imports by production process and major source, 1998-2002

Production process	1998	1999	2000	2001	2002
			Metric tons		
Blending or co-precipitation:					
Australia	0	0	0	0	0
European Union	14,219	20,243	20,943	5,451	9,861
New Zealand	2,380	2,958	2,736	3,183	2,943
Total	16,599	23,201	23,679	8,634	12,804
Ultrafiltration:					
Australia	1,354	5,058	6,713	3,418	4,003
European Union	0	0	0	0	0
New Zealand	6,647	12,204	15,577	18,294	20,088
Total	8,001	17,262	22,290	21,712	24,091

Source: Compiled from data submitted in response to Commission questionnaires.

Import Values

Between 1998 and 2002, the value of U.S. MPC imports increased from about $96 million to $139 million, or by 45 percent (table 6-7). The value of U.S. imports of high-protein MPC was $113 million in 2002, and accounted for about 80 percent of the value of all MPC imports. This compares with a value share of less than 60 percent in 1999 and 2000. Thus, imports of high-protein MPC became more significant in terms of quantity and value over the 1998-2002 period. Trends in import values follow closely the trends in import quantities. For example, the value of low-protein imports of MPC follows closely the trend in import quantities of MPC 40-49, increasing between 1998 and 2000, before declining significantly from 2000 to 2001. The value of high-protein MPC increased steadily throughout 1998-2002, again, reflecting the upward trend in import volumes.

To protect confidential business information, country-specific data on import values and import average unit values were converted into indices, with a base year of 1998 equal to

[4] European Dairy Association, selected members of casein industry committee, interview by USITC staff, Brussels, Belgium, Oct. 15, 2003.

[5] New Zealand produces and markets a branded milk protein isolate called Total Milk Protein (TMP).

Table 6-7
Milk protein concentrate: Value of U.S. imports by protein concentration and major source, 1998-2002

Protein concentration/source	1998	1999	2000	2001	2002
	Value *(1,000 dollars)*				
Percent protein:					
40-69	27,591	52,632	64,418	27,231	26,388
70 or greater	68,475	77,066	87,674	92,288	112,726
Total	96,066	129,698	152,092	119,519	139,114
	Value *(index)*				
All protein concentrations:					
Australia	100	233	417	219	262
European Union	100	111	112	40	64
New Zealand	100	151	179	237	242
All other	100	135	152	58	113
Total	100	135	158	124	145
40-49 percent protein:					
Australia	100	1,701	1,619	259	0
European Union	100	214	283	64	98
New Zealand	0	100	263	180	38
All other	100	196	203	79	170
Total	100	252	319	90	117
50-59 percent protein:					
Australia	100	13	57	416	0
European Union	100	1,210	0	0	14,340
New Zealand	100	74	55	48	31
All other	0	0	0	0	0
Total	100	68	56	89	43
60-69 percent protein:					
Australia	0	0	100	373	308
European Union	0	0	0	0	0
New Zealand	0	0	0	0	0
All other	0	0	0	0	0
Total	0	0	100	373	308
70-79 percent protein:					
Australia	100	258	450	553	5,138
European Union	100	86	61	47	135
New Zealand	100	256	331	481	539
All other	0	0	0	0	0
Total	100	239	305	438	537
80-89 percent protein:					
Australia	100	148	374	103	225
European Union	100	70	45	31	44
New Zealand	100	114	139	209	247
All other	100	41	71	25	23
Total	100	82	90	62	88
90 percent or more protein:					
Australia	0	0	0	0	0
European Union	0	0	0	0	0
New Zealand	100	118	112	144	119
All other	0	0	0	0	0
Total	100	118	112	144	119

Source: Compiled from data submitted in response to Commission questionnaires.

100 (table 6-7).[6] The value of U.S. MPC imports from New Zealand rose steadily in each year between 1998 and 2002, increasing by about 2.5 times over the period (table 6-7). This growth reflects the steady increase in import volumes. The value of U.S. imports of MPC 40-59 from New Zealand declined steadily during the 1998-2002 period, while the value of imports of MPC 70-89 increased substantially. The value of U.S. imports from Australia fluctuated during the 1998-2002 period, generally following the same trend as import volumes (table 6-4). The value of U.S. imports from Australia peaked in 2000, declined in 2001, and increased in 2002, but remained below 2000 levels. The value of U.S. imports of MPC 70-79 from Australia increased steadily from 1998-2001 and then increased sharply in 2002, reflecting the sharp rise in imports of MPC 70-79. The value of U.S. MPC imports from the EU generally declined, falling by 36 percent between 1998 and 2002 (table 6-7). The value of U.S. imports of MPC 40-49 from the EU fluctuated considerably during the 1998-2002 period, but returned to 1998 levels in 2002, following the same trend as import volumes. The value of U.S. imports of MPC 80-89 from the EU generally declined from 1998 to 2002.

Import Average Unit Values

The trend in the overall import average unit value (AUV) for MPC appears to be primarily driven by changes in the mix of low- versus high-protein imports. The AUVs for total U.S. imports of MPC fluctuated considerably during the 1998-2002 period (table 6-8), generally declining in years when the volume of imports increased, and increasing when the volume of imports declined. For example, AUVs were at their lowest levels, $1.32 per pound in 1999 and $1.38 per pound in 2000, when imports of low-protein MPC reached their highest levels. Import AUVs subsequently peaked in 2001 when imports of low-protein MPC declined. Import AUVs declined in 2002, reflecting the decline in AUVs of both low-and high-protein MPC. In 2002, the AUV of low-protein MPC imports matched the previous low AUV in 1999 (at 93 cents per pound), while the AUV of high-protein MPC was at its lowest level at $1.80 per pound (table 6-8).

The AUVs of U.S. imports from New Zealand fluctuated within a narrow range during the 1998-2002 period (table 6-8). The AUV of all U.S. imports of MPC from New Zealand declined slightly from 1998 to 1999, and again in 2000 to about 12 percent below the 1998 level. Import AUVs then increased to 1998 levels in 2001 before declining again in 2002. The AUV of U.S. imports of MPC 40-49 from New Zealand increased in each year when shipments occurred except 2002. The AUV of U.S. imports of MPC 70-79 from New Zealand fluctuated within a narrow range during the 1998-2002 period, reaching a peak in 1998, before declining by about 10 percent from this level in 1999, 2000, and 2002.

The AUV for total U.S. imports of MPC from Australia declined by about 38 percentage points between 1998 and 1999, but increased in each year thereafter (table 6-8). Even in 2001 and 2002, when imports from Australia declined relative to the peak level in 2000, import AUVs continued to increase. This reflects the overall shift toward higher value, high-protein MPC imports from Australia. The AUV for U.S. imports of MPC 80-89 from Australia remained constant from 1998 to 2001, before declining sharply in 2002. AUVs for all other forms of MPC imported from Australia were generally stable throughout the 1998-2002 period.

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[6] Indices show trends over time for the individual country and protein ranges, but do not allow comparison between individual time series.

Table 6-8
Milk protein concentrate: Average unit value of U.S. imports by protein concentration and major source, 1998-2002

Protein concentration/source	1998	1999	2000	2001	2002
	Average unit value *(dollars per pound)*				
Percent protein:					
40-69	1.03	0.92	1.00	1.22	0.93
70 or greater	2.10	1.88	1.92	1.93	1.80
Total	1.62	1.32	1.38	1.70	1.53
	Value *(index)*				
Total all protein concentrations:					
Australia	100	62	84	87	89
European Union	100	78	76	106	92
New Zealand	100	90	88	100	95
All other	100	76	90	90	59
Total	100	82	85	105	94
40-49 percent protein:					
Australia	100	93	102	110	0
European Union	100	99	110	124	101
New Zealand	0	100	120	151	138
All other	100	96	108	111	75
Total	100	96	106	119	93
50-59 percent protein:					
Australia	100	89	97	106	0
European Union	100	89	0	0	94
New Zealand	100	95	92	100	95
All other	0	0	0	0	0
Total	100	94	92	106	99
60-69 percent protein:					
Australia	0	0	100	103	102
European Union	0	0	0	0	0
New Zealand	0	0	0	0	0
All other	0	0	0	0	0
Total	0	0	100	103	102
70-79 percent protein:					
Australia	100	77	92	100	98
European Union	100	94	70	128	122
New Zealand	100	90	91	97	89
All other	0	0	0	0	0
Total	100	89	89	96	90
80-89 percent protein:					
Australia	100	100	100	101	71
European Union	100	98	109	122	126
New Zealand	100	92	88	94	94
All other	100	72	81	77	77
Total	100	97	105	107	100
90 percent or more protein:					
Australia	0	0	0	0	0
European Union	0	0	0	0	0
New Zealand	100	95	97	107	96
All other	0	0	0	0	0
Total	100	95	97	107	96

Source: Compiled from data submitted in response to Commission questionnaires.

The overall AUVs of U.S. imports from the EU fluctuated considerably during the 1998-2002 period, declining 22 percentage points from 1998 to 1999 and a further 2 percentage points in 2000 (table 6-8). However, the significant decline in low value, low-protein U.S. MPC imports in 2001 and 2002 resulted in a significant increase in import AUVs in those years, as U.S. imports from the EU consisted primarily of higher value, high-protein MPC. It should be noted that the sharp increase in U.S. imports of MPC 40-49 from the EU during 1998-2000 did not coincide with a decline in the AUV of these imports. The AUV of MPC 80-89 from the EU declined slightly from 1998 to 1999, and increased in each year thereafter. Thus, fluctuations in import AUVs from the EU are largely attributable to differences in the type of MPC imported, rather than changes in the AUVs of U.S. imports of MPC.

Imports of Casein and Caseinate

Imports of Casein

U.S. imports of casein fluctuated during the 1998-2002 period, reaching a peak of 86,459 mt in 2000, followed by a decline in 2001 and 2002 (table 6-9). Acid casein imports accounted for 53-69 percent of total U.S. casein imports during the 1998-2002 period (table 6-9), and the decline in overall casein imports during 2000 and 2001 can largely be attributed to a drop in imports of acid casein. Such imports fell by 36 percent from 2000 to 2001, while imports of rennet casein increased by 12 percent. In 2002, imports of acid casein recovered somewhat, while imports of rennet casein declined. The decline in total U.S. casein imports in 2000 and 2001 coincided with increases in the total AUVs (table 6-9). The AUV of imports of acid casein increased sharply in 2001 to $2.23 per pound.

Table 6-9
Casein: U.S. imports for consumption; by type, quantity, value, and average unit value, 1998-2002

Type	1998	1999	2000	2001	2002
	Quantity *(metric tons)*				
Rennet casein	19,270	23,482	28,978	32,554	26,227
Acid casein	41,332	52,622	57,481	36,513	41,173
Total	60,602	76,104	86,459	69,067	67,400
	Value *(thousand dollars)*				
Rennet casein	81,406	85,424	122,713	138,403	121,105
Acid casein	168,421	196,594	235,482	179,113	160,617
Total	249,827	282,018	358,195	347,516	281,722
	Average unit value *(dollars per pound)*				
Rennet casein	1.92	1.65	1.92	1.93	2.09
Acid casein	1.85	1.69	1.86	2.23	1.77
Total	1.87	1.68	1.88	2.09	1.90

Source: Compiled from data submitted in response to Commission questionnaires.

Unlike imports from Australia and the EU, which peaked in 2000, imports of casein from New Zealand reached their highest level in 1999 (table 6-10). Imports declined somewhat in 2000 and declined more significantly in 2001 before recovering slightly in 2002. The AUV of imports from New Zealand declined by 7 percentage points between 1998 and 1999, which coincided with the largest increase in total U.S. import volume (table 6-10). Import AUVs returned to 1998 levels in 2000, before increasing significantly in 2001 in conjunction with the largest decline in total U.S. import volumes. Import AUVs declined significantly between 2001 and 2002, to approximately the same level as in 1998 and 2000.

Table 6-10
Casein: U.S. imports for consumption; by source, quantity, value, and average unit value, 1998-2002

Source	1998	1999	2000	2001	2002
	Quantity *(metric tons)*				
Australia	1,866	4,137	5,671	4,105	5,161
European Union	27,781	37,317	42,241	37,419	31,447
New Zealand	24,494	26,012	25,385	20,684	21,569
All other	6,461	8,638	13,162	6,858	9,224
Total	60,602	76,104	86,459	69,066	67,401
	Value *(index)*				
Australia	100	211	299	277	260
European Union	100	116	152	162	121
New Zealand	100	99	103	104	87
All other	100	121	208	119	126
Total	100	113	143	139	113
	Average unit value *(index)*				
Australia	100	95	98	126	94
European Union	100	87	100	120	107
New Zealand	100	93	100	123	99
All other	100	90	102	112	89
Total	100	90	100	122	101

Source: Compiled from data submitted in response to Commission questionnaires.

U.S. imports of casein from Australia increased significantly from 1998 to 1999 and fluctuated somewhat from 1999 to 2002 (table 6-10). U.S. imports of casein from Australia accounted for a relatively small share of total U.S. casein imports. The index of AUVs of imports of casein from Australia also fluctuated considerably during the 1998-2002 period. Import AUVs declined somewhat in 1999, increased slightly in 2000, increased to a peak level in 2001, before declining significantly in 2002 to levels close to 1999 AUV.

The EU was the largest U.S. supplier of casein in each year during 1998-2002 (table 6-10). U.S. casein imports from the EU increased somewhat from 1998 to 2000, before declining to their lowest level since 1998 in 2002. The large increase in imports from the EU in 1999 coincided with the lowest AUV level, which fell by 13 percent that year.

Imports of Caseinate

U.S. imports of caseinate were more stable than imports of casein, particularly during the 1999-2002 period (table 6-11). In 1998, imports of sodium caseinate accounted for 57 percent of all caseinate imports, and remained relatively stable from 1999 to 2001. However, imports of calcium caseinate increased steadily so that imports of sodium caseinate as a share of total imports declined slightly in each year of the 1999-2001 period.

Table 6-11
Caseinate: U.S. imports for consumption; by type, quantity, value, and average unit value, 1998-2002

Type	1998	1999	2000	2001	2002
	Quantity *(metric tons)*				
Calcium caseinate	8,548	10,517	10,981	12,205	12,329
Sodium caseinate	11,148	11,989	11,568	12,572	10,675
Total	19,696	22,506	22,549	24,777	23,004
	Value *(thousand dollars)*				
Calcium caseinate	38,030	44,541	51,005	67,169	57,716
Sodium caseinate	48,489	50,043	51,397	63,644	48,832
Total	86,519	94,584	102,402	130,813	106,548
	Average unit value *(dollars per pound)*				
Calcium caseinate	2.02	1.92	2.11	2.50	2.12
Sodium caseinate	1.97	1.89	2.02	2.30	2.07
Total	1.99	1.91	2.06	2.39	2.10

Source: Compiled from data submitted in response to Commission questionnaires.

Imports of sodium caseinate declined more significantly in 2002, while imports of calcium caseinate increased slightly. As a result, imports of calcium caseinate accounted for the majority (54 percent) of U.S. caseinate imports in 2002. The AUV of caseinate imports fluctuated within a fairly wide range during the 1998-2002 period (table 6-11), reaching a peak of $2.39 in 2001, coinciding with the peak in import volumes. In every year between 1998 and 2002, the AUV of calcium caseinate was above that of sodium caseinate, although the difference was at most 20 cents per pound.

The AUV of caseinate imports from all three major suppliers peaked in 2001 (table 6-12). The import AUVs declined by 12 percentage points from 2001 to 2002, while import volume declined slightly. Imports of New Zealand caseinate fluctuated during the 1998-2002 period, reaching a peak in 2000 (table 6-12). The AUV of imports from New Zealand fluctuated throughout 1998-2002.

U.S. imports of Australian caseinate increased significantly from 2000 to 2002 (table 6-12). Imports from Australia declined somewhat in 2001 before increasing significantly in 2002. However, Australia is a relatively small U.S. supplier of caseinate. The slight decline in U.S. imports in 2001 occurred in conjunction with a sharp increase in the AUV. The import AUV increased by 24 percentage points from 1999 to 2001, then declined by 18 percentage points between 2001 and 2002, although remaining above the levels during 1998-1999. The second highest AUV for caseinate imports coincided with the largest volume of U.S. caseinate imports from Australia.

The EU was generally the second largest source of U.S. caseinate imports during 1998-2002 (table 6-12). U.S. imports of caseinate rose each year from 1998 to 2000 before declining in 2001 and 2002. The AUV of imports from the EU peaked in 2001 and occurred in conjunction with the start of the decline in import volumes. The AUV of imports declined by 12 percentage points between 2001 and 2002, when import volumes from the EU declined slightly.

Table 6-12
Caseinate: U.S. imports for consumption; by source, quantity, value, and average unit value, 1998-2002

Source	1998	1999	2000	2001	2002
	Quantity *(metric tons)*				
Australia	91	96	664	527	1,506
European Union	7,185	9,188	10,910	9,632	8,167
New Zealand	12,387	13,201	10,775	12,475	11,827
All other	33	21	200	2,143	1,504
Total	19,696	22,506	22,549	24,777	23,004
	Value *(index)*				
Australia	100	101	641	718	1,747
European Union	100	124	163	161	124
New Zealand	100	101	88	125	98
All other	100	57	483	5,823	4,107
Total	100	109	118	151	123
	Average unit value *(index)*				
Australia	100	96	88	124	106
European Union	100	97	108	120	109
New Zealand	100	95	101	124	103
All other	100	89	80	90	90
Total	100	96	103	120	105

Source: Compiled from data submitted in response to Commission questionnaires.

Imports of Milk Protein Products on a Protein Basis

To better facilitate product comparisons, U.S. imports of MPC, casein, and caseinate were converted to pounds of protein. Imports of MPC were converted based on the protein concentration reported by questionnaire respondents who were asked to provide the exact protein content of imports. Imports of casein and caseinate were converted based on average protein concentrations reported in the scientific literature for acid and rennet casein and for sodium and calcium caseinate. The trends in imports on a protein basis mirrored the trends in imports of MPC, casein, and caseinate on a volume basis (table 6-13). The import AUVs on a protein basis fluctuated in a wide range, but the volatility in AUVs was largely confined to a significant decline in the AUV in 1999 and a significant increase in the AUV in 2001. Notably, although the import AUVs on a protein basis were significantly lower in 1999 than in any other year, U.S. import volume did not peak until 2000. Despite significant differences in U.S. import volumes, import AUVs in 1998, 2000, and 2002 varied by only 3 cents per pound.

Protein Imports from Milk Protein Concentrate

U.S. imports of MPC on a protein basis increased by 55 percent between 1998 and 2002 (table 6-13). Imports rose substantially from 39 million pounds of protein in 1998 to 63 million pounds in 2000, fell to 47 million pounds in 2001, then increased to 60 million pounds in 2002. Although this trend corresponds to the trend in total U.S. imports of MPC, imports on a protein basis were notably less volatile than imports as a whole. For example, whereas from 2000 to 2001 total U.S. MPC imports declined by 36 percent on a product basis, they declined only 26 percent on a protein basis. Additionally, U.S. imports on a protein basis recovered from the decline in 2001 more significantly than total imports of MPC. On a product basis, U.S. imports of MPC in 2002 were equivalent to 83 percent of U.S. imports in 2000, the peak year for imports, while on a protein basis, U.S. imports in 2002 were equivalent to 95 percent of imports in 2000. This difference reflects the fact that the primary cause of the increase in total U.S. MPC imports in 1999 and 2000 were imports of low-protein MPC, while in 2001 and 2002 imports of MPC were primarily high-protein MPC. Thus, imports of protein recovered more quickly than total imports of MPC.

Table 6-13
Milk protein products: Imports of milk protein concentrate, casein, and caseinate, quantity, value and average unit value of U.S. imports on a protein basis, 1998-2002

Product	1998	1999	2000	2001	2002
	Quantity *(metric tons of product)*				
Milk protein concentrate	26,878	44,489	49,816	31,798	41,254
Casein	60,602	76,104	86,459	69,067	67,400
Caseinate	19,696	22,506	22,549	24,807	23,027
Total	107,176	143,099	158,824	125,672	131,681
	Quantity *(million pounds of product)*				
Milk protein concentrate	59	98	110	70	91
Casein	134	168	191	152	149
Caseinate	43	50	50	55	51
Total	236	316	350	277	290
	Quantity *(million pounds of protein)*				
Milk protein concentrate	39	57	63	47	60
Casein	118	148	168	133	131
Caseinate	40	45	45	50	46
Total	196	251	277	230	237
	Value *(thousand dollars)*				
Milk protein concentrate	96,066	129,698	152,092	119,519	139,114
Casein	249,827	282,018	358,195	347,516	281,722
Caseinate	86,519	94,584	102,402	130,813	106,548
Total	432,412	506,300	612,689	597,848	527,384
	Average unit value *(dollars per pound of protein)*				
Milk protein concentrate	2.49	2.28	2.41	2.55	2.32
Casein	2.12	1.90	2.13	2.60	2.15
Caseinate	2.19	2.09	2.26	2.63	2.31
Total	2.20	2.02	2.21	2.60	2.23

Source: Compiled from data submitted in response to Commission questionnaires.

The AUV of MPC imports on a protein basis declined from $2.49 per pound in 1998 to $2.32 per pound in 2002, a decline of 7 percent, although it fluctuated considerably over this period (table 6-13). In 2002, the AUV was the second lowest during the 1998-2002 period, and was below the AUV of $2.41 in 2000, the peak year of imports on a volume basis. This is a considerably different trend from AUVs for total U.S. imports of MPC where AUVs were lowest in 1999 and 2000 (when U.S. import volumes were at their highest levels). This trend is a result of imports increasing more rapidly on a protein basis than on a product basis. The trend to higher-protein concentration imports equates to a higher-protein per dollar value of imports. Therefore, it appears that the shift to higher protein imports did not result in a comparable increase in the value of imports, and that purchasers do not appear to be paying a significant protein premium for high- versus low-protein imports.

Protein Imports from Casein and Caseinate

U.S. casein imports on a protein basis increased substantially from 118 million pounds 1998 to 168 million pounds in 2000, before declining sharply to 131 million pounds in 2002 (table 6-13). This pattern resembles trends in U.S. casein imports on a product basis. The significant increase in U.S. casein imports on a protein basis from 1999 to 2000 was the primary cause of the overall increase in total U.S. imports on a protein basis. The increase in product imports of casein from 1999 to 2000 were larger than the increase in imports of MPC, and because casein imports in 2000 had a significantly higher protein concentration than MPC imports, the increase in imports on a protein basis was magnified. The AUV of casein imports on a protein basis fluctuated considerably during 1998-2002, ranging from $1.90 per pound in 1999 to $2.60 per pound in 2001.

U.S. caseinate imports on a protein basis were generally stable during the 1999-2002 period. Imports increased slightly from 1998-2001 and declined in 2002 (table 6-13). However, the AUV of imports on a protein basis fluctuated considerably throughout the 1998-2002 period. The AUV of caseinate imports on a protein basis ranged from a low of $2.09 per pound in 1999 to a high of $2.63 per pound in 2001. Moreover, in 1998, 2000, and 2002, when U.S. import volumes were very similar, the AUV varied by $0.12 per pound. The AUV of caseinate imports on a protein basis reached a peak of $2.63 per pound in 2001, at least $0.32 per pound more than any other year. The volume of caseinate imports on a protein basis also peaked in that year.

CHAPTER 7
USES AND SUBSTITUTABILITY OF IMPORTED MILK PROTEIN PRODUCTS

Introduction

This chapter provides information on purchases and end-uses of milk protein products in the U.S. market. The chapter identifies which end-use applications incorporate imported milk proteins, the applications where imported and domestically produced milk proteins compete, and the degree to which the various milk proteins substitute for one another. This information was compiled from responses to the Commission's purchasers' questionnaires, as well as public reports and fieldwork.

In the second part of this chapter, an assessment is made of the volume of imported milk protein that may have displaced U.S.-produced milk proteins during the 1998-2002 period. The degree to which imported and U.S.-produced milk proteins substitute for one another is an important factor determining the extent to which imports may reduce demand or prices for milk proteins in the U.S. market. The Coalition for Nutritional Ingredients (CNI) claims that these products are minimally substitutable, while the National Milk Producers Federation (NMPF) counters that the products are highly substitutable.[1] Based on use, purchase, and import data obtained from Commission questionnaires, it was estimated that imported milk protein products may have displaced approximately 318 million pounds of U.S.-produced milk protein between 1998-2002. These results are also incorporated in the qualitative analysis of the impact of imports on farm-level milk prices in chapter 9.

Uses of certain dry milk and whey products in the United States are reported each year by the American Dairy Products Institute (ADPI), based on an extensive survey of dairy processing firms and manufacturers.[2] However, the ADPI survey does not cover milk protein concentrate (MPC), casein, or caseinate, and there is very little information on the use of these products from public sources. Therefore, the Commission conducted its own survey of U.S.-based companies that purchase and use milk protein products, requesting information on the end-use applications of these products.

The Commission sent purchaser questionnaires to 450 companies, covering the full range of potential milk protein users. Included among questionnaire recipients were all members of the National Cheese Institute, as well as several manufacturers of ice cream, yogurt, and other dairy products. Questionnaires were also sent to several companies involved in the production of specialty nutrition products, including sports, geriatric, dietetic, and medical nutrition products, and infant food and formulas. Companies involved in the production of

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[1] Mr. Paul Rosenthal, CNI, testimony before the USITC, Dec. 11, 2003, transcript p. 227; and Dr. Peter Vitaliano, NMPF, testimony before the USITC, Dec. 11, 2003, transcript p. 28.

[2] For more information, see ADPI web site, found at *http://www.adpi.org/publications.asp.*

other food and animal feed products that typically incorporate milk proteins also were included in the survey. Questionnaire response rates and the markets identified as using milk protein products are summarized in table 7-1 and text box 7-1. The Commission received 280 questionnaire responses, of which 135 provided useable data on purchases of MPC, casein, caseinate, skim milk powder (SMP), or whey protein concentrate (WPC) during 1998-2002.

Table 7-1
Number of questionnaire responses by product and market category

Market category	Milk protein concentrate	Casein	Caseinate	Skim milk powder	Whey protein concentrate
	Number of responses				
Cheese products	11	4	6	28	8
Other dairy foods	2	-	1	13	4
Specialty nutrition	20	8	11	13	15
Nondairy foods	-	3	5	-	-
Bakery products	3	2	3	5	5
Confectionary applications	1	-	2	5	-
Meat applications	-	-	2	-	-
Soups, sauces, & dressing	-	-	3	4	4
Animal feed	3	-	2	8	10

Source: Compiled from responses to Commission questionnaires.

Box 7-1
Typical applications of milk protein products by market segment

Cheese products: natural and processed cheese.
Processed cheese products: processed cheese products produced outside the FDA standards of identity.
Other dairy foods: yogurt and other cultured products, ice cream and other frozen desserts.
Nondairy foods: margarine, imitation cheese, nondairy creamers, and whipped toppings.
Specialty nutrition: infant formula, meal replacer, medical nutrition, sports nutrition, and geriatric nutrition.
Other food applications: bakery, confectionary, and meat applications.
Animal feed: milk replacers and other animal and pet food.
Industrial applications: adhesives, fabric applications, paper coatings, and plastic applications.

Source: Compiled from data submitted in response to Commission questionnaires and Dairy Companies Association of New Zealand, prehearing submission, Dec. 1, 2003, pp. 28-29.

Aggregating quantities of milk protein products across respondents and end-use applications and comparing these quantities with official U.S. trade data indicated that the majority of the total U.S. market was covered by the survey. Questionnaire responses, in conjunction with the available public information, interviews, and site visits by Commission staff, were used to analyze the uses of milk protein products. Questionnaire responses indicated that all five forms of milk protein products (MPC, casein, caseinate, SMP, and WPC) were used in the production of cheese, specialty nutrition, and bakery products. All milk protein products, except casein, were used in the production of dairy foods other than cheese and in animal feed products (table 7-1). Respondents also reported that nondairy products and meat products used only casein and caseinate. MPC, caseinate, and SMP were used in the production of confectionary products, while caseinate, SMP, and WPC were used in soup and sauce products.

Uses of Milk Protein Products

Milk Protein Concentrate

Questionnaire respondents reported purchases of MPC with protein concentrations between 42 percent to more than 90 percent (table 7-2).[3] In 2002, 71 percent of MPC purchases by volume were used in the production of dairy products, of which processed cheese products accounted for 62 percent and other dairy foods, such as cultured products and frozen desserts, accounted for 9 percent. Most of the MPC was used in the production of processed cheese products outside the U.S. Food and Drug Administration (FDA) standards of identity, although some firms reported using MPC in the starter culture in natural cheese production. Specialty nutrition products represented the second-largest use of MPC, accounting for 24 percent of total purchases. No company reported purchases of MPC for use in nondairy foods. MPC was also used in bakery and confectionary applications.

Table 7-2
Milk protein concentrate: Purchases by end-use application as a share of total purchases by protein concentration, 2002

	Milk protein concentrate, protein concentration (percent)[1]					
End-use application	**40-49**	**50-59**	**70-79**	**80-89**	**90 +**	**40-90+**
	Share of total purchases					
Processed cheese products[2]	7	6	95	22	0	62
Specialty nutrition	2	38	0	77	95	24
Other dairy foods	64	45	2	1	0	9
Other foods	17	0	3	0	0	3
Bakery products	7	12	0	0	5	1
Animal feed	3	0	0	0	0	0
Total	100	100	100	100	100	100

[1] No companies reported purchases of MPC 60-69.
[2] Includes a small volume of MPC used as starter culture in natural cheese.

Note.—Data are presented as shares of total purchases so as not to reveal confidential business information.

Source: Compiled from responses to Commission questionnaires.

A breakdown of MPC use by protein concentration for the two main MPC uses—processed cheese products and specialty nutrition—is reported in table 7-3. Firms reported using MPC with protein concentrations between 42 and 80 percent in the production of processed cheese products. However, MPC 70-79 accounted for 91 percent of MPC used in processed cheese products. Given that 62 percent of all MPC was used in processed cheese production, approximately 56 percent of total MPC use in 2002 was MPC 70-79 for production of

[3] No respondents reported purchases of MPC with a protein concentration between 60 and 69 percent.

Table 7-3
Milk protein concentrate: Purchases by protein concentration for use in processed cheese and specialty nutrition products as a share of total purchases, 2002

End-use application	Milk protein concentrate, protein concentration (percent)[1] 40-49	50-59	70-79	80-89	90 +	40-90+
	Share of total purchases					
Processed cheese products[2]	1	0	91	8	0	100
Other dairy foods	8	4	60	22	6	100
Specialty nutrition	1	6	0	70	24	100

[1] No companies reported purchases of MPC 60-69.
[2] Includes a small volume of MPC used as starter culture in natural cheese.

Note.—Data are presented as shares of total purchases so as not to reveal confidential business information.

Source: Compiled from responses to Commission questionnaires.

processed cheese products. Firms reported using MPC produced via ultrafiltration and the blending method in the production of processed cheese products. However, the use of MPC produced using ultrafiltration was far more common.[4] MPC 40-49 was mainly used in production of other dairy foods, such as frozen desserts and cultured milk products, whereas very little low-protein MPC was used in processed cheese products.

Although respondents reported using the full range of MPC protein concentrations (from 42 to over 90 percent) in specialty nutrition applications, most used MPC 80 or higher (table 7-3). Specialty nutrition applications accounted for most purchases of milk protein isolate (MPI) and a significant share of all purchases of MPC 80-89. Several of the companies that used MPC in their sports nutrition or dietetic products reported that they utilize other protein products in combination with MPC. Such producers mixed MPC with WPC, soy protein, and caseinate in a manner that provides the desired functionality and protein delivery at the lowest possible cost. These mixtures can generally be altered to some degree depending on the health claims made by the producer.[5] This practice is particularly common for nutrition bar manufacturers.

Although MPC is used in a number of specialty nutrition products, use appears to be more common in bar products than in beverages. A search of products incorporating MPC brought to market between January 2001 and June 2003 identified 113 new products, or product extensions, that incorporated MPC.[6] Of these, 32 could be classified within the specialty nutrition market, including 12 ready-to-drink beverages or drink mixes, 18 bar products, and 2 were other types of products. A search for products incorporating MPI returned 54 results, 44 in the specialty nutrition market, including 34 bar products, 8 ready-to-drink beverages or drink mixes, and 2 infant formulas.[7]

The amount of MPC used in bakery products was reported to be small relative to all other uses. Companies reported using MPC 42, MPC 50, and MPC 90 in products such as cake mixes and donuts. However, MPC of protein concentrations between 40 and 59 percent

[4] Data compiled from responses to Commission purchasers' questionnaires.
[5] U.S. industry officials, interview by USITC staff, Oct. 20, 2003; FDA staff, interview by USITC staff, Dec. 8, 2003.
[6] Global New Products Database found at *www.gnpd.com,* search conducted on July 2, 2003.
[7] Ibid.

accounted for most of the MPC used in these applications. One firm reported using small quantities of MPC 42 in confectionary applications in the past, although it discontinued use of MPC during the 1998-2002 period. MPC is used in animal feed applications, although animal feed is not a major end-use. Firms reported using MPC 42, MPC 70, and MPC 85 in milk replacers.[8]

Casein

Casein is utilized in a wide variety of applications, although questionnaire respondents reported that its use is concentrated primarily in nondairy foods. In 2002, nondairy products, primarily imitation cheese and coffee creamers, accounted for 68 percent of total casein purchases (table 7-4). About 14 percent of reported casein use was for the production of specialty nutrition products and 9 percent was used to produce other dairy foods. Seven percent of casein purchases were used in processed cheese product production. While important in the past, the use of casein in industrial products has almost completely disappeared as the result of increased use of synthetic materials.[9]

Table 7-4
Casein: Purchases of acid and rennet casein as share of total purchases, 2002

Casein type/market category	*Percent*
Total casein:	
Nondairy foods	68
Specialty nutrition	14
Other dairy foods	9
Processed cheese products	7
Other food applications	([1])
Industrial applications	1
Animal feed	0
Total	100
Acid casein:	
Nondairy foods	60
Specialty nutrition	25
Other dairy foods	11
Industrial applications	2
Bakery products	1
Other food applications	([1])
Animal feed	([1])
Total	100
Rennet casein:	
Nondairy foods	79
Processed cheese products	16
Other dairy foods	5
Total	100

[1] Less than 0.5 percent

Note.—Data are presented as shares of total purchases so as not to reveal confidential business information.

Source: Compiled from responses to Commission questionnaires.

[8] Milk replacers are animal feed products used to replace the mother's milk in the feeding of newborn animals.

[9] Four companies reported purchases of acid casein for use in adhesives, leather, paint, plastic, and fabric applications.

Coffee creamer accounted for 31 percent of all casein purchases, all of which was acid casein. Companies also reported using acid casein in the production of bakery products, such as mixes and cookies. Imitation cheese accounted for 54 percent of reported purchases for the nondairy foods category. Rennet casein accounted for 96 percent of all the casein used in imitation cheese. Firms reported using rennet casein in grated cheese toppings, pizza cheese, and other processed cheese products.

Caseinate

Questionnaire responses indicated that caseinate was the only milk protein product used in the full range of products (table 7-1). Almost three-quarters of caseinate purchases were used in the production of specialty nutrition products, such as ready-to-drink beverages, drink powders, bar products, and other forms in sports, dietetic, and medical nutrition applications (table 7-5). Both sodium and calcium caseinate were utilized in manufacturing specialty nutritional products, which accounted for 59 percent of all purchases of sodium caseinate and 94 percent of all purchases of calcium caseinate.

Table 7-5
Caseinate: Purchases of sodium and calcium caseinate as share of total purchases, 2002

Caseinate type/market category	*Percent*
Total caseinate:	
Specialty nutrition	73
Other dairy foods	12
Nondairy foods	9
Processed cheese products	3
Meat products	2
Animal feed	1
Confectionary products	1
Bakery products	([1])
Other food applications	([1])
Total	100
Sodium caseinate:	
Specialty nutrition	59
Other dairy foods	16
Nondairy foods	15
Processed cheese products	5
Meat products	4
Animal feed	1
Confectionary products	1
Bakery products	1
Other food applications	([1])
Total	100
Calcium caseinate:	
Specialty nutrition	94
Other dairy foods	5
Processed cheese products	1
Bakery applications	([1])
Confectionary products	([1])
Total	100

[1] Less than 0.5 percent.

Note.—Data are presented as shares of total purchases so as not to reveal confidential business information.

Source: Compiled from responses to Commission questionnaires.

Other dairy foods, including dairy ingredients and frozen dessert products, were reported as the second-largest use of caseinate. The third-largest use of caseinate was in the production of nondairy foods, although only sodium caseinate was used in this application. Companies indicated that they used sodium caseinate in the production of coffee creamers, toppings, and other flavoring products.

Respondents reported using small amounts of caseinate in bakery, meat, confectionary, and animal feed applications. Companies also reported using calcium and sodium caseinate in the production of sugar-free products, and indicated that caseinate is an essential ingredient in the production of sugar-free or lactose-free products. Sodium and calcium caseinate were the only milk protein products that companies reported using in meat applications. Companies reported using both calcium and sodium caseinate in soup and dip products and in animal feed applications. Caseinates are commonly used in milk replacers or in other liquid applications because of their more soluble nature. Two firms reported using sodium caseinate in the production of milk replacers.

Skim Milk Powder

According to ADPI data, SMP is used in a wide array of end-use applications (table 7-6). SMP use in dairy applications accounted for the largest share, approximately 56 percent of total SMP use in 2002. The amount of SMP used in the dairy industry declined sharply during the 1998-2002 period, falling from 651 million pounds in 1998 to 416 million pounds in 2002 (table 7-6). The most significant decline was in the production of hard cheese, which declined by 83 million pounds. However, the decline in the use of SMP in cheese production was not reflected by a decline in the production of cheese. While SMP use in cheese production declined by approximately 33 percent from 1998 to 2002, total production of American-type cheese increased by approximately 12 percent, and all cheese production increased by 15 percent.[10] U.S. dairy industry representatives claim that imports of milk protein products contributed to the decline in SMP use in cheese production. The ADPI data on hard cheese primarily reflects production of American-type cheeses that are governed by FDA standards of identity. These regulations do not permit the use of MPC in the production of these products.

Responses to Commission questionnaires indicated that SMP was the only milk protein product used in the production of cheese products with FDA standards of identity. However, fieldwork by Commission staff indicated that cheese producers are increasingly using ultrafiltered (UF) milk in the production of natural cheese. A prior study identified 22 dairy plants in the United States that produce UF milk, primarily for cheese manufacturing.[11] Also, as noted in chapter 3, U.S. dairy producers in California and New Mexico are producing UF milk for use in the cheese-making process. The increased use of UF milk under the FDA's alternate make procedures (see chapter 3) may be contributing to the decline in SMP use in the cheese-making process.[12]

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[10] USDA, NASS, *Dairy Products, Annual Summary,* various issues.

[11] U.S. General Accounting Office, *Dairy Products: Imports, Domestic Production, and Regulation of Ultra-filtered Milk*, GAO-01-326 (Mar. 2001).

[12] Data are not available to demonstrate the degree of any subsitition between UF milk and SMP.

Table 7-6
Skim milk powder: Domestic sales by end-use application, 1998-2002

End-use application	1998	1999	2000	2001	2002
	Million pounds				
Dairy Industry:					
Hard cheese	252	189	112	269	169
Frozen dessert	87	110	94	93	85
Cottage & cream cheese	([1])	([1])	33	39	31
Fluid milk & drink mixes	34	43	41	13	20
Cultured products	49	68	29	21	18
Dry dairy blends	([1])	([1])	47	14	12
Sales of skim milk powder	([1])	([1])	6	1	1
All other dairy uses	229	231	164	172	82
Total	651	640	527	621	416
Nutraceuticals, pharmaceutical & special dietary use	3	24	50	52	72
Confectionary industry	53	54	51	59	67
Baking industry	37	55	67	60	59
Prepared dry mixes & dry blend manufacturers	54	60	42	47	43
Infant formula	11	19	18	19	26
Beverage manufacturers	25	11	31	25	24
All other uses	62	62	55	37	35
Total	896	925	840	920	742

[1] Not available.

Source: American Dairy Products Institute, *Dry Milk Products Utilization & Production Trends (*2000 and 2002).

Whey Protein Concentrate

According to ADPI data, WPC is used extensively in dairy, specialty nutrition, and animal feed products. In 2002, dairy products accounted for approximately 51 percent of all WPC utilization.[13] The use of WPC in dairy products increased from 62 million pounds in 1998 to 95 million pounds in 2002 (table 7-7). WPC use increased considerably from 1998 to 1999 but then declined between 1999 and 2002. Questionnaire responses indicated that WPC with protein concentrations from 35 to 55 percent were used in the production of processed cheese products, whereas WPC 34 to WPC 80 were used in the production of cultured and other frozen dessert products. WPC use in specialty nutrition applications (including infant formula, nutraceuticals, pharmaceutical, and other special dietary use) increased from 26 million pounds in 1998 to 40 million pounds in 2002 (table 7-7). Questionnaire responses indicated that companies use WPC in a variety of concentrations from WPC 34 to whey protein isolate (WPI) in the production of specialty nutrition products. Infant and pediatric nutrition products incorporate WPC 34 to WPC 80, whereas dietetic, medical, and sports nutrition products utilized WPC 34 to WPI.

[13] ADPI, *Whey Products 2002 Utilization & Production Trends* (2003).

Table 7-7
Whey protein concentrate: Domestic sales by end-use application, 1998-2002

End-use application	1998	1999	2000	2001	2002
	Million pounds				
Dairy industry	62	98	90	95	95
Dry blends & prepared dry mixes	40	51	42	24	26
Infant formula	11	19	15	19	23
Nutraceuticals, pharmaceutical & special dietary use	15	24	36	32	17
Baking industry	6	8	6	7	3
Institutional use	0	1	0	0	1
Confectionary industry	2	2	2	3	1
Meat industry	2	4	3	4	1
Soup manufacturers	1	1	0	0	0
Wet blends	14	9	10	0	0
All other uses	10	13	23	6	19
Total	161	231	228	191	186

Source: American Dairy Products Institute, *Whey Products Utilization & Production Trends (*1999, 2000, and 2002).

Substitutability of Imported Milk Protein Products

In order to conduct an analysis of the impact of imports of milk protein on the U.S. dairy industry, the Commission first determined the degree to which imports of MPC, casein, and caseinate may have been displacing U.S.-produced milk protein products, primarily SMP. The Commission utilized data gathered from purchasers' questionnaires to examine the potential displacement of U.S.-produced milk protein by imported milk protein products. Questionnaire data on purchasing patterns and choices by end-users allowed the Commission to estimate the amount of U.S.-produced milk protein that was displaced by imports during the 1998-2002 period.

Questionnaire responses and interviews with industry and academic experts indicated that the degree to which different milk protein products can substitute for one another is primarily driven by three factors: regulatory restrictions, technical substitutability, and economic substitutability. Regulatory restrictions refer primarily to FDA standard of identity regulations, which limit the use of MPC, casein, and caseinate in food applications. Technical substitutability refers to the ability of different milk proteins to provide the same functional and/or nutritional attributes required in an end-use application. As noted in chapter 1 and appendix D, the functional attributes of milk proteins depend heavily on the protein concentration and the manufacturing process. Factors influencing economic substitutability include prices, switching costs, and availability. The following discussion reviews how each of these factors affect the use and substitutability of different milk proteins in the production of dairy products; imitation or nondairy products; specialty nutrition products; animal feed; and other food products, such as bakery, confectionary, and meat applications.

Dairy Products

Milk proteins are used extensively in the production of dairy products, including hard, processed, and other forms of cheese; ice cream and other frozen desserts; and yogurt and other cultured products. Manufacturers of such products need the raw milk to be of a known and consistent protein concentration. However, the protein content of raw milk varies according to a number of natural factors, such as season, cow age, and the type of animal feed used. Therefore, milk proteins are often used to standardize the protein concentration of the milk used in the production process in order to control for the natural fluctuations in the protein concentration of raw milk.

Historically, dairy product manufacturers primarily used SMP as a protein source for milk protein standardization. However, the use of SMP for this purpose is limited by its high lactose content. Lactose is a problematic ingredient in a number of dairy products. Therefore, alternative protein sources that can deliver the desired protein without the lactose are appealing for the production of products where excess lactose is a concern. In these applications, MPC can be a good substitute for SMP, as MPC has less lactose than SMP. However, FDA standards of identity, as well as economic considerations, are also important factors in a processor's decision to use MPC instead of SMP.

Cheese

Regulatory factors

As discussed in chapter 3, current FDA regulations do not allow producers to use MPC in the production of natural cheese products with a standard of identity. MPC may be used in the production of processed cheese products (such as cheese slices, sauces, dips, and powders) for which there are no standards of identity. Additionally, cheesemakers may use MPC in the starter culture in the production of natural cheese. More detail on FDA standards of identity are provided in appendix E.

Technical factors

The presence of high levels of lactose in many dairy products is problematic for manufacturers. In interviews with Commission staff, industry and academic experts stressed the importance of controlling the amount of lactose present during the manufacturing of both natural and processed cheese.[14] Excess lactose reacts with water to form crystals, results in poor cooking and melting properties, and over time, may alter the color, flavor, and consistency of the product.[15] Industry experts noted that MPC produced using the

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[14] Dr. David Barbano, Cornell University, interview by USITC staff, July 21, 2003; Dr. Tom Flores, Pennsylvania State University, interview by USITC staff, July 22, 2003; company official, Kraft Foods, interview by USITC staff, July 23, 2003; Wisconsin Center for Dairy Research staff, presentation to USITC staff, Aug. 20, 2003.

[15] Academic experts consulted by the Commission indicated that excess lactose levels may be of more concern in natural cheeses than in processed cheese products. The reactions that cause the lactose to alter the color, flavor, and consistency of the cheese occur over time and are not instantaneous. The production process for many natural cheeses includes an aging process. It is during this aging process that the unwanted reactions can occur. Processed cheese products that are used rapidly, either as an ingredient in other products or shipped to the retail market, may be consumed before these unwanted reactions can occur. Dr. David Barbano, Cornell University, interview by USITC staff, July 21, 2003; Dr. Mark Johnson, Wisconsin Center for Dairy Research, presentation to USITC staff, Aug. 20, 2003.

ultrafiltration process is a superior ingredient to SMP in cheese manufacturing. MPC has similar solubility, color, and flavor characteristics as SMP, but has less lactose. The use of MPC allows for protein standardization without the addition of large amounts of lactose. In conjunction with this advantage, the use of MPC could increase both yield and throughput in the production of natural cheese.[16]

Natural cheese

Although the use of MPC is generally not permitted in the production of natural cheese, current FDA regulations and enforcement policy do not prohibit the use of UF milk. As a result, U.S. manufacturers of natural cheese are taking advantage of the beneficial properties of UF milk, which, like MPC, has lower levels of lactose than SMP. The use of UF milk can also increase yield and throughput in a manner similar to MPC. Some cheesemakers use UF milk purchased from third-party suppliers, while others have installed ultrafiltration equipment in their cheese plants, and the UF process is part of the entire cheese-making process.

Both industry and academic experts interviewed by Commission staff noted that MPC produced using the ultrafiltration method would function differently in the cheese-making process than MPC produced via blending or co-precipitation. In particular, experts doubted whether a blend or co-precipitate MPC would function properly in the natural cheese production process because of concern regarding the solubility and flavor; and in the case of a blend MPC produced from caseinates, because of the presence of alkalis.[17]

Processed cheese

Unlike natural cheeses, FDA regulations do not prohibit the use of MPC in processed cheese products. Processed cheese manufacturers may prefer to use MPC rather than UF milk because of important differences in the production processes between natural and processed cheese. The production process for natural cheese begins with liquid milk, so these production facilities have the infrastructure to store and process large volumes of liquid ingredients. In contrast, the production process for processed cheese begins with natural cheese (ingredient cheese or barrel cheese) as the primary ingredient. Processed cheese facilities may not have the capability to store and process large quantities of liquid ingredients. Therefore, the ability of these processed cheese facilities to use UF milk is limited without significant new capital investment.[18]

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[16] In cheese manufacturing, yield gains refer to the ability of the cheese manufacturer to produce more cheese from the same starting amount of milk, while throughput gains refer to the ability of the cheese manufacturer to produce more cheese by adding more ingredients and recovering the additional ingredients in the cheese, as opposed to the additional ingredients flowing out in the whey stream.

[17] Dr. David Barbano, Cornell University, interview by USITC staff, July 21, 2003; Dr. Tom Flores, Pennsylvania State University, interview by USITC staff, July 22, 2003; Company official, Kraft Foods, interview by USITC staff, July 23, 2003; Wisconsin Center for Dairy Research staff, presentation to USITC staff, Aug. 20, 2003.

[18] Dr. David Barbano, Cornell University, interview by USITC staff, July 21, 2003; company officials, Kraft Foods, interview by USITC staff, July 23, 2003.

Questionnaire results

The Commission sent questionnaires to every member of the National Cheese Institute, about 150 cheese manufacturers who account for approximately 80 percent of all cheese produced in the United States. These companies produce a wide range of natural and processed cheese products. Firms reported using SMP, MPC, WPC, casein, and caseinate in the production of natural or processed cheese. SMP was the only dairy protein used in the production of natural cheese. Some firms that purchased SMP stated that if the FDA standards of identity permitted the use of MPC in the production of natural cheese, they would likely switch from SMP to MPC because of its functional attributes. Firms did, however, report using MPC and SMP in the starter culture for the production of natural cheese. SMP was used in both natural and processed cheese, however, MPC was used only in processed cheese.

Firms that use MPC 42 in processed cheese products noted that potential substitute proteins were SMP and WPC, whereas firms using MPC 70 reported that potential substitute protein sources are ingredient cheese, SMP, and UF milk. Of the firms that reported using MPC 70 in processed cheese, all but one stated that their use of MPC 70 was directly substituting for ingredient cheese or SMP. One firm reported that it switched from UF milk to MPC 70.

SMP and MPC were not the only milk protein products used in the production of processed cheese products. Firms reported the use of rennet casein in grated cheese toppings, pizza cheese, and other processed cheese products. Firms also reported using sodium and calcium caseinate in cheese sauces, powders, cream cheese, and other processed cheese products. Firms reported using WPC of protein concentrations between 35 and 55 percent in a variety of processed cheese products. In many of these cases, manufacturers noted that SMP and ingredient cheese were viable substitutes.

The questionnaire responses indicate that many firms produce a wide array of products outside the FDA standards of identity. By operating outside the FDA regulations, firms have considerably more freedom to substitute other milk proteins, particularly MPC, for ingredient cheese and SMP in the production of processed cheese products. As a result, producers utilize the full array of milk proteins available in the production of these products. There appear to be few technical factors that limit the use of MPC in processed cheese. In fact, as noted above, MPC appears to provide some functional attributes that are superior to SMP. However, where the FDA regulations apply, they prevent the use of MPC. Some firms that produce private-label cheese products reported that their use of ingredients can be dictated by the need to match the ingredient labels of their major brand-name competitors. One questionnaire respondent explicitly stated that the need to match the ingredient label of the major brand-name products is increasing demand for MPC.

Economic factors

Academic and industry experts consulted by Commission staff indicated that the equipment currently used to produce processed cheese products with SMP could be used to produce processed cheese products with MPC, with little or no change in the plant equipment, employees and manufacturing process.[19] Moreover, questionnaire respondents indicated that they produce processed cheese products using either SMP or MPC on the same equipment

[19] Wisconsin Center for Dairy Research staff, presentation to USITC staff, Aug. 20, 2003; Mr. Michael Reinke, Kraft Foods, testimony before the USITC, Dec. 11, 2003, transcript p. 323.

with the same employees. This may indicate that the switching costs of producing processed cheese products with SMP versus MPC are minimal.

The analysis of the relative price of protein in SMP and MPC presented in chapter 5, indicates that imported MPC provides a lower-cost source of protein than both U.S.-produced SMP and U.S.-produced UF milk. Several questionnaire respondents reported substituting MPC and WPC for SMP and ingredient cheese in processed cheese production, based on relative prices. One firm reported switching between MPC and UF milk owing to the lower price of MPC. Firms that used SMP in the starter culture in the production of natural cheese reported switching back and forth between MPC and SMP, based on price difference. Additionally, the functional attributes of MPC provide further economic advantages over SMP in the production of processed cheese products. U.S. processed cheese manufacturers indicated that the use of MPC instead of SMP can improve the efficiency of the production process and thereby lower total production costs.[20] Processed cheese producers reported that in order to remain competitive, they must use MPC.[21]

Both SMP and MPC are widely used in the production of processed cheese products. SMP has historically been used as the primary ingredient for protein standardization in the processed cheese production process. More recently manufacturers have realized the benefits of using MPC in this process instead of SMP. The use of MPC in the production of processed cheese increased during the 1998-2002 period. Based on questionnaire responses, the use of MPC in the production of processed cheese products increased by approximately 550 percent from 1998 to 2002.

Ice cream and yogurt

Regulatory and technical factors

Ice cream and other frozen deserts, and yogurt and other cultured products, require both casein and whey protein. Ice cream requires the casein proteins for its emulsifying properties, and the whey protein for its water-binding properties. Yogurt requires the casein protein for gel formation and the whey protein for its water-binding properties. However, for both ice cream and yogurt, a complete milk protein (such as SMP or MPC) is better than using a casein protein and a whey protein separately (such as casein or caseinate and WPC). Since casein is not readily soluble, it is not widely used in the production of ice cream and yogurt. The presence of alkali in caseinates makes them a less desirable ingredient than a complete milk protein. Higher-protein WPC in ice cream production would result in too much gel formation. As a result of these technical problems, a MPC, in particular a MPC produced using the ultrafiltration method, is considered a superior ingredient to other forms of milk proteins in ice cream and yogurt production. Academic experts consulted by Commission staff indicated that such a MPC would be a superior ingredient to SMP in the production of ice cream and yogurt.[22] Since high lactose levels lower the freezing point of ice cream,

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[20] U.S. industry officials, interviews of USITC staff, July 23, 2003.

[21] Mr. John Wilson, Dairy Farmers of America, testimony before the USITC, Dec. 11, 2003, transcript p. 175.

[22] Mr. Thomas Palchack, Dr. John Flores, and Dr. Bob Roberts, Pennsylvania State University, interview by USITC staff, July 22, 2003.

complicating the production process and storage of the finished product, the low lactose levels available in MPC are attractive for the production of ice cream and yogurt.

Interviews with these experts indicated that the main reason MPC is not used in ice cream and yogurt production are regulatory restrictions that limit the use of MPC in these products. In the case of yogurt, the current FDA standards of identity allow for the use of MPC in the production process.[23] However, regulations require that any dairy ingredient used in the production of yogurt be a Grade A product as determined by the U.S. Department of Agriculture (USDA), and currently MPC does not have Grade A status.[24]

Questionnaire results

In response to the Commission's questionnaires, 14 firms indicated that they used SMP in ice cream, yogurt or other cultured products, or frozen dessert manufacturing. Four firms reported using WPC with protein concentrations between 34 and 80 percent in yogurt or ice cream products. Only two firms reported using MPC in cultured or frozen dessert products, and one of the firms reported that it discontinued its use of MPC. However, one company reported using a high-protein UF milk in the production of a cultured yogurt product. Companies noted that SMP would be a potential substitute protein for the WPC or MPC. As discussed in chapter 3, there is some confusion as to whether or not the FDA standards of identity permit the use of MPC in the production of ice cream and yogurt. Based on questionnaire responses it appears that U.S. manufacturers believe the FDA standards generally prohibit the use of MPC in the production of ice cream and yogurt.

Economic factors

Owing to FDA regulatory restrictions, there appears to be only minor use of MPC in dairy products other than cheese. As a result, the data on the economic substitutability are sparse. However, if regulations do permit the use of MPC, two economic factors could encourage the use of MPC in other dairy products: relatively low switching costs and the lower price of per pound of protein from MPC. Academic experts consulted by Commission staff indicated that switching from SMP to MPC in the ice cream production process would not require significant changes in the production process or equipment. In the case of products such as yogurt and ice cream, experts reported that producers conceivably could switch on a daily basis depending on the relative prices between SMP and MPC without significant changes to the production process. As shown in chapter 5, imported MPC offers producers a lower cost protein source than U.S.-produced SMP. The lower price of protein from MPC would provide a direct economic benefit for manufacturers.

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[23] Food Standards & Labeling, Center for Food Safety and Applied Nutrition, U.S. Food and Drug Administration staff, interview with USITC staff, Dec. 8, 2003.

[24] Industry and academic experts consulted by Commission staff indicated that a MPC produced using the ultrafiltration process would be a superior product to MPC produced via blending or co-precipitation for the production of ice cream and yogurt. The ultrafiltration process leaves the proteins in their native state, while the production process of blended or co-precipitated MPC requires chemical and/or heat treatments that can alter the proteins' chemistry thereby altering their functionality.

Specialty Nutrition Products

Specialty nutrition products include a wide variety of sports nutrition, dietetic, geriatric, medical, or other functional-food products. This sector experienced significant growth during the 1998-2002 period.[25] Often the primary function of these products is to deliver very high levels of protein in a highly concentrated form, often through beverages and bar products. Brand-name consumer products found within this sector include Slimfast shakes and bars, Ensure and Boost shakes, Atkin's shakes and bars, Balance Bars, and PowerBars, among others.

Few regulations restrict the use of milk proteins in specialty nutrition products. In particular, unlike many dairy products, there are no standards of food identity for specialty nutrition products. Therefore, the choice of protein source in the production of specialty nutrition is based primarily on technical and economic factors.[26]

Technical factors

Specialty nutrition products need to deliver very high levels of protein. As a result, they typically require a higher-protein concentration ingredient than SMP. High-protein concentrations of WPC and MPC, as well as caseinates and soy protein isolates, can all provide high levels of protein. Therefore, issues of technical substitutability tend to focus on the other functional characteristics of the protein, consumer perceptions of the efficacy of the protein, and the targeting of specific protein compositions, rather than the amount of raw protein in the protein source. The desired functional characteristics of the protein can vary depending on the production process and what other ingredients are utilized.[27] Typically, the selection of the protein used by manufacturers is significantly affected by the marketing claims of the product.

According to industry officials and academic experts consulted by Commission staff, the most significant limiting factor in the use of soy protein is its taste.[28] While milk proteins often have a clean, milk flavor, soy protein has a very distinct taste that has not proven as popular with consumers. As a result, the use of soy protein has been generally limited to products that use soy as a selling point, products with formulations that can overcome the soy flavor, and where taste is not a factor.

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[25] The U.S. market for sports nutrition products was estimated to be about $7 billion in 2001. Sales of nutritional bars reached $592 million in 2003, reflecting double digit growth in recent years. Euromonitor, *Global Strategy* (Nov. 2002), table 29; Dairy Australia, prehearing submission, Dec. 1, 2003, p. 22; "Energetic Growth," *Milling & Baking News* (July 8, 2003).

[26] Mr. John Frierott, Unilever, testimony before the USITC, Dec. 11, 2003, transcript pp. 243-244; Mr. Alan Hubble, Dean Foods, testimony before the USITC, Dec. 11, 2003, transcript pp. 258-260.

[27] For example, a weight-loss shake that uses skim milk as its base ingredient may require different functional characteristics than a weight-loss shake that uses water as its base ingredient. For beverages or shakes that use water as the base ingredient, whey protein may be preferred over caseinates because of whey's superior foaming characteristics that provide the desired thickness and mouth-feel that would otherwise have been obtained from SMP.

[28] U.S. industry officials, interviews by USITC staff, July 28 and Oct. 20, 2003; Wisconsin Center for Dairy Research staff, presentation to USITC staff, Aug. 20, 2003.

Weight-loss, meal-replacement, and sport products

In the production of weight-loss and meal-replacement products, caseinates, WPI, and soy protein isolates tend to be used more than MPC, SMP, and WPC. Most of the Slimfast brand weight-loss beverages are produced using calcium caseinate, whereas the Atkin's brand shakes are produced using WPI.[29] Bar products, both the diet and sports nutrition segment, commonly utilize a range of protein sources in each bar product. For example, Balance Bar and PowerBar products are all labeled as containing a protein blend which may include casein or caseinates, MPC, WPC, and soy protein. Several companies reported that very high-protein sources are essential ingredients for products manufactured to be lactose free or low-carbohydrate. For such products, SMP is not a viable protein source because of its high lactose content.

In certain segments of the sports/fitness nutrition market, such as body-building supplements, product manufacturers have a strong preference for whey protein. In this market, whey protein is perceived by consumers to offer superior nutritional results compared with casein or soy protein.[30] Products in this market heavily promote and advertise the presence of whey protein. Given the well established consumer perceptions of the benefits of whey protein, substitution to other protein sources is unlikely in these markets.

Medical nutrition products

Medical nutrition products are food or nutritional supplements used when an individual's physical condition prevents the consumption of necessary nutrients from food. These products are generally used in hospitals, nursing homes, or home health-care settings. These products are designed to provide specific protein profiles to meet very specific nutritional needs, and use the full range of highly concentrated protein sources, including MPC, casein, caseinates, WPC, and soy protein. Producers are targeting very specific protein compositions in these products and consequently, substitution between different protein sources is more difficult. However, U.S. manufacturers noted that, despite substitution difficulties, there are some applications where different protein sources can be substituted for one another, and in such cases, they will typically select the least-expensive protein source.[31]

Questionnaire results

In response to the Commission's questionnaires, 28 companies reported producing specialty nutrition products using either SMP, WPC, WPI, MPC, casein, or caseinate. Based on questionnaire responses, caseinate appears to be the most widely used milk protein in the specialty nutrition market. Soy protein is also used extensively in this market.

Of the 28 questionnaire respondents, 13 reported using SMP in specialty nutrition products, mostly in diet and infant food products. SMP is both the sole protein source and a base ingredient for several types of beverage products. However, products using SMP have a different nutritional profile than competing products that incorporate imported milk proteins. For example, products containing SMP cannot generally be marketed as low-carbohydrate

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[29] U.S. industry officials, interview by USITC staff, July 16, Aug. 20, and Oct. 9-10, 2003.
[30] Ibid.
[31] Ibid., July 28, 2003.

or low-sugar products. The most common potential substitute for SMP identified by questionnaire respondents was soy protein, and only one firm indicated that MPC could potentially substitute for SMP in its product formulation. Several firms reported using SMP in their products in combination with other protein sources, such as caseinate or MPC, in order to optimize flavor, functionality, and protein delivery.

Questionnaire respondents included 20 firms that reported use of MPC in specialty nutrition products. Although respondents reported using the full range of protein concentrations (42-90 percent), most used protein concentrations of 80 percent or higher. Where producers provided information on potential substitute products for MPC, soy protein was the most commonly cited, although WPC, WPI, and caseinate were also cited as potential substitutes. Only one company indicated that SMP was a potential substitute protein source for MPC. Several of the companies that utilize MPC in their sports nutrition or dietetic products use other protein products in combination with MPC. Producers mix MPC with SMP, WPC, soy protein, and caseinate to obtain the desired functionality and protein delivery. These mixtures can generally be altered to some degree, depending on the health claims made by the manufacturer.

Eleven firms reported using both sodium and calcium caseinate in a wide range of specialty nutrition products. The most commonly reported substitute protein for caseinate was soy protein, and manufacturers reported switching from caseinate to soy protein during the 1998-2002 period. Other potential substitutes for caseinate were high-protein MPC and WPC, although certain manufacturers use custom-made caseinate blends for which no viable technical substitutes are possible.

Overall, it appears that the main factors determining the technical substitutability among different protein sources are the specific nutritional claims of the products. When substitution is possible, soy protein appears to be the most common substitute. Additionally, MPC, high-protein WPC, and caseinate appear to be at least partially substitutable for one another in several products. SMP and MPC generally do not appear to be readily substitutable in specialty nutrition products, although SMP and MPC are complementary ingredients in the manufacture of certain products.

Economic factors

Caseinate is generally a cheaper source of protein than either SMP and MPC (table 5-3), and this cost difference may account for some of the preference for caseinate in the specialty nutrition market. Since many of the specialty nutrition products require milk protein products with a high-protein concentration, imported protein products with a lower price per pound have a significant advantage over domestically produced protein sources. Several specialty nutrition product manufacturers indicated that price is a very important factor when selecting a protein source.[32] However, in products where manufacturers can substitute among different protein sources in an effort to reduce costs, typically they substitute soy protein for milk proteins. Questionnaire respondents indicated extensive switching from milk proteins, including MPC and caseinate, to soy protein because of the lower price of soy protein. For those products that use a blend of several protein products, several manufacturers reported reducing their use of milk proteins in favor of soy protein to the maximum extent possible in the blend.

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[32] Mr. Alan Hubble, Dean Foods, testimony before the USITC, Dec. 11, 2003, transcript p. 279.

High-protein WPC and WPI are used extensively in the specialty nutrition market. Recently, U.S. production of WPC 70 and WPC 80 has increased substantially, as producers moved away from WPC with low-protein concentrations in response to a recent period of weak WPC 34 prices.[33] Increased U.S. production, coupled with increased imports of low-priced WPC 70 and WPC 80 (particularly from New Zealand), created an oversupply in this market, that in turn led to a dramatic decline in the price of high-protein WPC. Prices for WPC 80 reportedly declined from $1.80 per pound in 2000 to $1.20 per pound in 2002.[34] This downward price pressure also impacted prices for WPI that declined from approximately $5.00 per pound to $3.00 per pound from the late-1990s to 2002.[35] Some U.S. producers of WPC noted that price premiums previously available on high-protein WPC are no longer available and that high-protein WPC now trades at protein-adjusted prices based on the price of WPC 34. Several questionnaire respondents mentioned that their use of SMP and MPC declined because they switched to less-expensive ingredients, particularly WPC and soy protein.

An important economic consideration in the specialty nutrition market is potentially significant costs associated with changing the protein source used in the finished product (switching costs). These costs are the result of significant requirements for research and development (R&D), market testing, and in the case of certain medical products, clinical testing. Although specialty nutrition producers were unable to provide an exact dollar estimate of these switching costs, they indicated that the resource and time expenditures would be significant, likely amounting to $100,000 or more.[36] Although companies are reluctant to reformulate their products, reformulation (such as substituting less expensive WPC and soy protein, for more expensive SMP and MPC) can result in significant cost savings. Thus, U.S. producers of specialty nutrition products continually need to balance the benefit of using the least-cost ingredients with the cost of switching product formulations.

Nondairy Foods

Food products included in the nondairy processing segment include imitation cheeses, margarine, and nondairy creamers. Although these products are marketed as nondairy foods, many are manufactured using dairy proteins. There are no government regulations on product formulations of these products. Therefore, the choice of protein sources is determined by technical and economic factors.

Technical factors

Many imitation dairy products are manufactured using a combination of protein ingredients, including whey or casein. A significant amount of U.S. imports of rennet casein is used in the production of imitation cheese, whereas caseinate (both sodium and calcium caseinate) is used extensively in the production of coffee creamers and toppings. However, nondairy ingredients, such as vegetable oils, also account for a significant share of the total ingredients used in many nondairy food applications.

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[33] U.S. industry officials, interviews by USITC staff, Aug. 21, Oct. 9-10, and Nov. 13, 2003.
[34] Ibid., July 16 and Oct. 9-10, 2003.
[35] Ibid.
[36] Mr. James T. Schultz, Novartis Nutrition Corporation, testimony before the USITC, Dec. 11, 2003, transcript, pp. 290-293.

The Commission received questionnaire responses from companies using casein and caseinate in the production of coffee creamers, toppings, and flavor additives. These firms reported limited substitutability for casein and caseinate in the production of nondairy foods. Firms reported using both casein and caseinate in coffee creamers. A small number of firms reported soy protein as a potential substitute. No firms reported that SMP could substitute for casein and caseinate in their product formulations.

Economic factors

Nondairy food manufacturers have experimented with using less-expensive protein sources, such as whey protein and soy protein. However, these experiments have not resulted in final products with the desired attributes.[37] Technical limitations on the substitution of different proteins in the nondairy foods sector tend to outweigh the economic advantages of lower-cost protein sources.

Other Food Applications

Dairy proteins are used in a wide variety of other food products, including bakery products, confectionary, cereals, soups, sauces, and meat products. In these applications, the choice of the protein ingredients is generally based on functional characteristics, rather than ability to provide protein. For example, in bakery products, wheat flour provides sufficient protein to meet product protein requirements, whereas dairy proteins are used for their emulsifying, gel formation, and flavor characteristics.[38]

Questionnaire results

Twenty-one firms responding to the Commission's questionnaires indicated that they use SMP, WPC, MPC, casein, and/or caseinate in the production of bakery, confectionary, or soup and sauce products. However, only a small number of firms reported using MPC in any of these product categories, and use was limited to bakery and confectionary products. In bakery products, MPC with protein concentrations from 42 percent to over 90 percent was used. Only MPC 42 was used in confectionary products. None of the responding firms producing meat products, soups, or sauces reported purchases of MPC, although firms manufacturing soup and sauce products reported using WPC with protein concentrations of between 42 and 80 percent. The questionnaires found that WPC 34 and WPC 80 were used in bakery products, while no firm reported purchasing WPC for use in meat or confectionary products.

In confectionary products, producers indicated few potential substitutes. Many confectionary products are governed by FDA standards of identity, which limit the use of MPC. Where substitutes were identified by questionnaire respondents, it was often between whole milk powder (WMP) and a combination of SMP and milkfat. Two firms indicated that MPC and SMP would be potential substitutes and that some minor substitution of SMP for MPC did

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[37] Mr. Alan Hubble, Dean Foods, testimony before the USITC, Dec. 11, 2003, transcript p. 297.
[38] American Institute of Baking staff, interview by USITC staff, July 8, 2003.

occur. Two producers indicated that there are no viable substitutes for either sodium or calcium caseinate in low-sugar or low-carbohydrate confectionary products.

Those companies using SMP in bakery products indicated that WMP, MPC, or WPC were potential substitutes for SMP. However, companies reporting MPC as a potential substitute for SMP also indicated that considerable R&D would need to be undertaken before MPC could be incorporated into their product formulations. The firms also noted that MPC could successfully substitute for SMP in only a small portion of their respective product lines. Companies that use MPC in bakery products reported that SMP and WPC are potential substitutes at low-protein concentrations, whereas caseinate would be a potential substitute product at high-protein concentrations. Only one firm reported that MPC and SMP could substitute for caseinate in bakery products, and no firms reported potential substitutes for WPC or casein in bakery products.

Firms using SMP in soup and sauce products reported only liquid or condensed skim milk as potential substitutes. Firms using low-protein concentrations of WPC reported that SMP would be a potential substitute, whereas no substitute product information was provided for high-protein WPC. Those companies that reported substitute product information for caseinate in soup and sauce products indicated soy protein as a potential substitute. Companies that responded to the Commission's questionnaires listed both sodium and calcium casinate as the only dairy proteins used in meat applications. These companies indicated that potential substitutes are nondairy protein products, such as soy protein.

Economic factors

Producers of food products will typically use the least-expensive protein that provides the desired protein level and functional characteristics. As a result, WPC is often the first choice among alternative protein sources. In the bakery industry, producers have shifted away from SMP because of the significant volatility in SMP prices, and toward whey protein and/or whey protein/casein blends.[39] Questionnaire respondents also indicated that they switched from SMP to lower-protein MPC because of price.

Animal Feed

Twelve companies responded to Commission questionnaires indicating that they purchased SMP, MPC, WPC, or sodium caseinate for use in animal and/or pet foods. The most commonly reported dairy protein purchased was WPC with protein concentrations between 34 and 85 percent. WPC purchases were universally used in milk replacer products, while most purchases of SMP, MPC, and caseinate were also used in milk replacers.

Regulatory and technical factors

Firms using dairy proteins in animal feed indicated a high degree of technical substitutability among different protein sources. In this market, potential substitutes are not limited to other dairy proteins. Manufacturers indicated that soy protein, blood plasma, and wheat protein

[39] Ibid.

would all be potential substitute protein sources.[40] The most common substitute product reported for WPC was SMP, although companies indicated that MPC, soy protein, or blood plasma are all potential substitutes for WPC. Those firms that use SMP in their products mentioned WPC, MPC, or blood plasma as potential substitutes. Firms that use SMP reported switching between SMP and WPC based on relative prices, whereas firms that use MPC indicated that they can, and do, substitute WPC for MPC. Firms that use sodium caseinate reported high-protein WPC as a potential substitute product.

Economic factors

The relative ease with which animal feed manufacturers can meet their technical requirements using a wide array of protein sources results in most ingredient decisions being price based. WPC, generally the lowest-priced milk protein, therefore has a significant advantage and is the most frequently used milk protein in animal feed products. However, firms responding to the Commission's questionnaires indicated a high degree of economic substitutability among protein sources. Several firms indicated that they had switched between WPC, MPC, and SMP at different times during the 1998-2002 period based on relative prices.

It is generally held that the world price of SMP acts as a price ceiling for U.S. WPC 34 prices.[41] During the 1998-2002 period, the price of WPC 34 reported by the USDA averaged \$0.12 per pound less than the world price of SMP and \$0.41 per pound less than the U.S. price of SMP. With average prices of \$1.01 per pound for U.S. SMP and \$0.60 per pound for WPC 34, the \$0.41 price gap is a significant price advantage.

Two other factors that impacted WPC prices and demand in the United States are the increased supply of high-protein WPC and USDA drought assistance programs. As noted above, U.S. WPC producers reported sharp declines in the prices of high-protein WPC as a result of increased supply. An additional economic factor affecting the selection of the protein source in animal feed has been recent USDA drought assistance programs. In 2002 and 2003, the USDA provided large amounts of SMP at very low prices to the U.S. animal feed industry as part of drought assistance programs. U.S. WPC producers claim that the large quantities of SMP made available through this program depressed prices in the WPC market as feed producers switched to the low-priced SMP.[42] This allegation appears to be supported by questionnaire responses. Multiple questionnaire respondents indicated that they switched from WPC to SMP to take advantage of the USDA drought assistance program. However, the downward trend in WPC prices provides further economic advantage for the use of WPC versus other proteins in animal feed products for feed manufacturers unable to take advantage of the USDA programs.

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[40] The future use of blood plasma in animal feeds is uncertain pending changes in FDA regulations.

[41] U.S. industry officials, interviews by USITC staff, Aug. 21 and Oct. 9-10, 2003.

[42] Ibid.

Potential Displacement of U.S.-produced Milk Proteins by Imports

Based on the above information, manufacturers are using imported milk protein, such as MPC, casein, and caseinate, instead of U.S.-produced milk proteins, such as SMP, ingredient cheese, UF milk, and WPC. This substitution has occurred in several applications, including processed cheese products, other dairy foods, and bakery products. There appears to be little substitution between imported and U.S.-produced milk proteins in specialty nutrition products. It appears that the majority of this substitution occurs in the production of processed cheese products where MPC substitutes for SMP, UF milk, and ingredient cheese. To a lesser extent, manufacturers are substituting imported casein and caseinate for SMP, WPC, UF milk, and ingredient cheese in processed cheese products, other dairy foods, and bakery products. Direct analysis of the degree of substitution is difficult because the protein content of these milk protein products varies considerably. However, each can be converted to a protein basis to permit an analysis of the degree of substitution between imported and U.S.-produced milk protein products. Questionnaire responses provided data on the volume of imported milk proteins that substituted for U.S.-produced milk proteins in 2002. Data from 2002 was used to estimate the volume of substitutable milk proteins in 1998-2001. Table 7-8 presents the estimated volume of MPC, casein, and caseinate that substituted for U.S.-produced milk protein products.

Table 7-8
Milk protein products: Estimated quantity of protein from milk protein concentrate, casein, and caseinate that substitute for U.S.-produced milk protein, 1998-2002

Products	1998	1999	2000	2001	2002
	Million pounds of protein				
Milk protein concentrate	18	34	51	37	39
Casein	18	22	25	22	20
Caseinate	6	6	6	7	6
Total	41	63	82	66	66

Source: Compiled from data submitted in response to Commission questionnaires.

The volume of imports that substitute for U.S.-produced milk protein products, on a protein basis, were estimated to range from 41 million pounds in 1998 to 82 million pounds in 2000. The peak in substitutable imports in 2000 matched the peak in total imports of MPC in 2000. However, substitutable imports did not decline as significantly from 2000 to 2001 as imports of MPC declined. This is primarily the result of the increase in average protein concentration of imports from 2000 to 2001 (see chapter 6). Substitutable imports accounted for between 21 and 30 percent of total imports.

This analysis assumes that MPC, casein, and caseinate used in the production of processed cheese products, other dairy products, and bakery products are highly substitutable for U.S.-produced milk protein products. However, while manufacturers may readily switch from U.S.-produced to imported milk proteins, they are somewhat less likely to switch from imported to U.S.-produced milk proteins. Barring significant changes in relative prices, the superior functional properties of imported milk proteins discourage switching to SMP, UF milk, WPC, or ingredient cheese from MPC. It also assumes that MPC, casein, and caseinate are only marginally substitutable for U.S.-produced milk proteins in the production of other food products, specialty nutrition products, and animal feed products.[43] For nondairy foods, such as imitation cheese and coffee creamers, this analysis assumes that imported and U.S.-produced milk proteins do not substitute for one another. Further, because firms did not provide any data on the end-use applications for MPC 60-69, the Commission was unable to estimate the degree to which imports of MPC 60-69 may substitute for U.S.-produced milk proteins.

Changes in the assumptions of the degree to which imported and U.S.-produced milk proteins can substitute for each other would alter the analysis in table 7-8. Changes in the assumptions regarding substitutability in processed cheese products and specialty nutrition would have the most significant impact on this analysis. Specialty nutrition and nondairy foods accounted for approximately 24 percent of purchases of MPC and 82 percent of purchases of casein and caseinate (tables 7-2, 7-4, and 7-5). Processed cheese products accounted for 62 percent of MPC purchases, 7 percent of casein purchases, and 3 percent of caseinate purchases (tables 7-2, 7-4, and 7-5). Therefore, these three end-use applications account for more than 80 percent of all purchases of MPC, casein, and caseinate. Because other end-use applications, such as other dairy foods, confectionary, meat, and animal feed, account for a small portion of total purchases, changes in the assumptions regarding substitutability for these applications would have a limited impact on the analysis.

The volume of imports that substitute for U.S.-produced milk proteins can be converted to an SMP equivalent to allow for a direct comparison between imported and U.S.-produced milk protein products on a product basis. The product comparison is on a SMP equivalent basis because SMP has a constant protein content (approximately 36 percent). Although imported milk protein products also substitute for UF milk, ingredient cheese, and WPC, the protein content of these products varies considerably more than SMP. This variability makes conversion of pounds of protein to pounds of product less accurate. On an SMP equivalent basis, the 66 million pounds of protein used in 2002 are equivalent to approximately 183 million pounds of SMP (table 7-9). The volume of imports that substitute for U.S.-produced milk proteins on an SMP basis will be used in chapter 9 to analyze the impact of imports on U.S. farm-level prices.

The above analysis limits the estimate of the displacement of U.S.-produced milk proteins by imported milk protein products to those applications where physical substitution has actually occurred. The National Milk Producers Federation (NMPF) distinguishes between this type of analysis and what they refer to as "economic substitution."[44] The NMPF claims that "U.S. milk proteins could be and would be manufactured into any and all products currently imported, if imported milk proteins did not benefit from subsidies which reduce their prices or if U.S. milk proteins were able to receive corresponding subsidies to match

[43] Because of a lack of data, no attempt was made to estimate the potential displacement of UF milk by imported milk proteins in specialty nutrition applications. Additionally, this analysis does not estimate the degree to which U.S.-produced WPC may be displaced by imported MPC, casein, and caseinate in the specialty nutrition market. Any such displacement of U.S.-produced WPC could impact WPC prices. However, because of the manner in which FMMO prices are calculated, the impact on farm-level prices or CCC stocks would be minimal (see chapter 9). For similar reasons the analysis also does not estimate the amount of U.S.-produced WPC that may be displaced by imports of WPC.

[44] Dr. Peter Vitaliano, NMPF, testimony before the USITC, Dec. 11, 2003, transcript pp. 28-29.

Table 7-9
Milk protein products: Quantity of milk protein product imports, and estimated volume of milk protein imports that substitute for U.S.-produced milk protein, 1998-2002

Imports	1998	1999	2000	2001	2002
	Quantity *(million pounds of protein)*				
Total imports	196	251	277	230	237
Substitutable imports	41	63	82	66	66
	Quantity *(million pounds, skim milk powder equivalent)*				
Substitutable imports	114	174	229	183	183

Source: Compiled from data submitted in response to Commission questionnaires.

imported protein prices."[45] The analysis presented in chapter 5 indicates that U.S. imports of MPC from the EU were strongly affected by EU and U.S. dairy policies and that current U.S. dairy policies may limit the competitiveness of U.S.-produced MPC, casein, and caseinate. U.S. production of these products is limited, and likely to remain limited, so long as current Federal Milk Marketing Order and Dairy Price Support Program prices remain in effect. Should these conditions change, then the viability of U.S. production of MPC, casein, and caseinate could also change. Under conditions where U.S. dairy producers could be competitive in the production of these products, the degree of direct substitution between imported and U.S.-produced milk proteins could increase as imported and U.S.-produced milk proteins compete in the same form (i.e., U.S.-produced MPC versus imported MPC, as opposed to U.S.-produced SMP versus imported MPC).

[45] Ibid., transcript p. 28.

CHAPTER 8
TARIFF TREATMENT OF U.S. IMPORTS OF MILK PROTEIN PRODUCTS

The purpose of this chapter is to discuss the tariff treatment of U.S. imports of milk protein products by presenting a brief history showing how the tariff structure evolved. Tracing this history explains how current differences in tariff treatment among milk protein products arose. The chapter concludes with a review of recent rulings by the U.S. Bureau of Customs and Border Protection (Customs) concerning milk protein products.

U.S. tariff treatment of imported milk proteins varies considerably by product type. Imports of skim milk powder (SMP), whole milk powder (WMP), and fluid milk, are subject to tariff-rate quotas (TRQs) with high over-quota tariffs that, for the most part, limit trade to within quota levels.[1] In contrast, imports of many other milk protein products, such as milk protein concentrate (MPC) and whey protein concentrate (WPC), face generally low ad valorem or specific tariffs and no quantity limits, whereas imports of casein and milk albumin (whey protein isolate) enter the United States free of duty.

U.S. dairy producers, represented by the National Milk Producers Federation (NMPF), have expressed concern that importers have used this differentiation in tariff rates to "circumvent" U.S. trade regulations.[2] Specifically, the NMPF asserts that importers are exploiting a "loophole"[3] in the U.S. tariff schedule in which dairy products with very similar characteristics and composition to SMP are being imported as MPC at a low rate of duty, whereas SMP is subject to much higher TRQ rates. The NMPF has responded to its members' concerns in two ways. First, it has supported proposed legislation that would introduce two new TRQs—one for MPC and another for casein and caseinate—that would significantly reduce imports from recent levels.[4] Second, the NMPF has petitioned Customs to reclassify MPC manufactured through a blending process in a tariff provision that would subject imports to the existing TRQ on SMP.

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[1] During 2000-2002, imports of dried skim milk (HTS Chapter 4, note 7) and dried whole milk (HTS Chapter 4, note 8) in excess of their quota levels accounted for less than 1 percent and 2 percent, respectively, of total imports of these products.

[2] Mr. Jerry Kozak, NMPF, in letter to USITC, concerning Bill Report H.R. 1786 and S. 847, Aug. 13, 2001.

[3] Mr. Jerry Kozak, NMPF, in testimony before the Subcommittee on Department Operations, Oversight, Nutrition, and Forestry, Committee on Agriculture House of Representatives, May 20, 2003, transcript p. 161.

[4] The Milk Import Tariff Equity Act of 2003 was introduced into the House (H.R. 1160) and Senate (S. 560) on March 6, 2003. Under these identical bills, annual imports of MPC (HTS subheading 0404.90.10) would be limited to 15,818 mt, beyond which imports would face an over-quota tariff of $1,560 per mt. Also, imports of casein and caseinate (3501.10.10, 3501.10.50, and 3501.90.60) would be limited to 54,051 mt annually, beyond which imports would face an over-quota tariff of $2,160 per mt. The proposed quota levels are roughly 50 percent of actual average imports over 1997-1999, and the over-quota tariff rates would reflect the protein content of these imports in relation to the over-quota tariff and protein content in SMP.

History of U.S. Tariff Classification and Tariff Treatment

Section 22 of the Agricultural Adjustment Act

Current tariff treatment of milk protein products is the result in part of actions taken by the President under section 22 of the Agricultural Adjustment Act (AAA) of 1933[5] prior to 1995, when the World Trade Organization (WTO) Agreement on Agriculture[6] entered into force.[7] Section 22 authorized the President to impose quotas or fees on imported agricultural products when such imports were found to "render or tend to render, or materially interfere with, any program or operation undertaken by the U.S. Department of Agriculture (USDA), or to reduce substantially the amount of any product processed in the United States from any agricultural commodity or product thereof covered by a USDA program."[8] Between mid-1953 and the implementation of the WTO Agreement on Agriculture, 55 separate section 22 investigations were conducted, most of them covering dairy products. Quotas were imposed on virtually all imports of articles derived from cow's milk except casein, caseinates, lactalbumin, and soft-ripened cow's-milk cheese. Dairy and products containing dairy ingredients accounted for nearly 45 percent of the total value of U.S. import restrictions under section 22. As a result of the WTO Agreement on Agriculture, section 22 quotas and fees were converted into tariffs in the form of TRQs (see below). As part of its commitments under the WTO Agreement on Agriculture, the United States agreed not to use section 22 in the future against imports from other WTO members, and virtually all section 22 quotas were converted to TRQs in 1995.[9]

[5] 7 U.S.C. sec. 624 as amended.

[6] The WTO Agreement on Agriculture is also referred to as the Uruguay Round Agreement on Agriculture.

[7] When the United States became a member of the GATT in 1947, it became subject to GATT Article XI banning quantitative restrictions on trade which posed a legal obstacle to the use of section 22 against U.S. imports of agricultural products. However, in 1955, the United States was granted a waiver to GATT Article XI, thereby permitting continued use of section 22.

[8] Before quotas could be introduced, the Secretary of Agriculture had to advise the President that there was a reason to believe imports were impacting programs administered by the USDA. Then, the President would request that the U.S. International Trade Commission (USITC) conduct an investigation to provide findings and recommendations. Following the USITC report, the President was permitted to impose an import fee of up to 50 percent ad valorem or a quantitative restriction. Quotas on dairy products generally limited imports to a quantity of about 2 percent of the equivalent of U.S. production of milk. U.S. International Trade Commission, "Section 22: Uruguay Round Agreement Changes U.S. Operation of Agricultural Program," *Industry, Trade, and Technology Review* (May 1995).

[9] *Uruguay Round Agreement Act, Statement of Administrative Action*, published in H. Doc. 103-316, 103d Cong., 2d Sess., p. 728.

Tariff History Before the World Trade Organization Agreement on Agriculture

Skim milk powder (HTS 0402.10.05, 0402.10.10, and 0402.10.50)

During the 1980s, until the 1989 implementation of the Harmonized Tariff Schedule of the United States (HTS), imports of SMP were classifiable for tariff purposes under item 115.50[10] of the former Tariff Schedules of the United States (TSUS) at the rate of 1.5 cents per pound (equivalent to the current 3.3 cents per kilogram). Imports were also subject to an absolute quantitative limitation pursuant to a Presidential Proclamation[11] issued under the authority of section 22 of the AAA.[12] The annual quantity permitted under that proclamation was 1,807,000 pounds.

In 1989, the United States adopted the international Harmonized Commodity Description and Coding System (HS) as the framework for its combined tariff-statistical nomenclature. The Omnibus Trade and Competitiveness Act of 1988[13] authorized the President to proclaim the new HS-based publication, the HTS. Under the new system, SMP was provided for in HTS subheading 0402.10.00.[14] The existing section 22 quota quantity was converted to 819,641 kilograms (HTS subheading 9904.10.09). Imports under HTS 0402.21.20[15] were also counted toward that quota.

On December 23, 1994, the President proclaimed modifications to the HTS, for the purpose of implementing the trade agreements resulting from the Uruguay Round of Multilateral Trade Negotiations.[16] Among the modifications proclaimed were the replacement of existing absolute quantitative limitations with TRQs. HTS subheading 0402.10.00 was replaced with three new subheadings: (1) 0402.10.05, covering imports under HTS general note 15 (U.S. Government imports, personal imports, samples or display articles, and certain other exclusions), dutiable at the existing rate of 3.3 cents per kilogram and not subject to or counted against the TRQ; (2) 0402.10.10, covering SMP shipments, dutiable at the existing 3.3 cents per kilogram rate, up to the TRQ limit, described in additional U.S. note 7 to Chapter 4;[17] and, (3) 0402.10.50, covering quantities beyond the TRQ limit. The tariff rate on imports beyond the quota was initially set at 99.2 cents per kilogram in 1995 and decreased over a 6-year period to the bound rate of 86.5 cents per kilogram in 2000. At the same time, original subheading 0402.21.20 was superseded by three new subheadings, 0402.21.02, 0402.21.05, and 0402.21.25; imports under these subheadings were counted

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[10] "Dried milk and cream: Other: Containing not over 3 percent of butterfat."

[11] Proc. 3019 of June 8, 1953, 18 F.R. 3361.

[12] 7 U.S.C. sec. 624 as amended.

[13] P.L. 100-418.

[14] "Milk and cream, concentrated or containing added sugar or other sweetening matter: In powder, granules or other solid forms, of a fat content, by weight, not exceeding 1.5 percent."

[15] "Milk and cream, concentrated or containing added sugar or other sweetening matter: In powder, granules or other solid forms, of a fat content, by weight, exceeding 1.5 percent: Not containing added sugar or other sweetening matter: Of a fat content, by weight, not exceeding 3 percent."

[16] Proc. 6763 of December 23, 1994, 60 F.R. 1007.

[17] The quantity permitted under that note 7 during 1995 was 1,261 mt and was increased over the subsequent 5 years to the bound quantity of 5,261 mt. See "Tariffication and market-access commitments," below.

toward the same TRQ as subheadings 0402.10.05, 0402.10.10, and 0402.10.50, and were subject to the same tariff rates. Tariff rates applicable to SMP from 1985 to 2004 are reported in table 8-1.

Milk protein concentrate (HTS 0404.90.10 and 3501.10.10)

Before the implementation of the HTS in 1989, U.S. imports of milk protein concentrates were classified for tariff purposes under one of three rate items of the TSUS. In the TSUS, milk protein products not considered to be natural milk products (e.g., fluid milk, concentrated or dried milk, butter, and cheese) or fermented milk products (e.g., yogurt and buttermilk) were classified by Customs in one of the following provisions, depending on the proportions of constituent materials: (1) TSUS item 183.05, a residual category for edible preparations (the column-1, or most-favored-nation (MFN) rate—now known as the normal trade relations (NTR) rate—was 10 percent ad valorem); (2) TSUS item 190.05, a residual category for albumin (the NTR rate was free); or, (3) TSUS item 493.17, a residual category for casein and mixtures in chief value of casein (the NTR rate was 0.2 cents per pound). None of these rate lines was subject to fees or quantitative restrictions that had been imposed on many other imported dairy products pursuant to section 22.

The Trade and Tariff Act of 1984[18] created a new TSUS rate line for MPC. Specifically, section 123 of that Act established TSUS item 118.45, covering MPC, with a duty rate of 0.2 cents per pound (the same rate then in effect for casein under TSUS 493.17) and not subject to fees or quantitative restrictions under section 22.[19] Section 123 also created a TSUS legal note defining the scope of the new MPC rate line. The note stated, that "for purposes of item 118.45, the term 'milk protein concentrate' means any complete milk protein (casein plus albumin) concentrate that is 40 percent or more protein by weight." In 1986, Congress modified the definition by changing "albumin" to "lactalbumin."[20]

When the HTS was implemented in 1989, TSUS item 118.45 was split into two subheadings, with MPC provided for under subheadings 0404.90.10 and 3501.10.10. HTS heading 0404 covers, "Whey, whether or not concentrated or containing added sugar or other sweetening matter; products consisting of natural milk constituents, whether or not containing added sugar or other sweetening matter, not elsewhere specified or included." Subheading 0404.10 (a subordinate or subset HS category) covers "Whey and modified whey, whether or not concentrated or containing added sugar or other sweetening matter." HS 0404.90 is a residual subheading covering other products of heading 0404, and subheading 0404.90.10 covers "milk protein concentrates." Heading 0404 covers products containing several or all components found in milk (with or without added sweetening), but which contain such components in proportions not found in fresh milk (heading 0401), concentrated or sweetened milk (heading 0402), or buttermilk and acidified or fermented milk (heading 0403). Subheading 0404.90.10 carried the 0.44 cents per kilogram (0.2 cents per pound)

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[18] P.L. 98-573; 98 Stat. 2948.

[19] The Omnibus Tariff and Trade Act also created two other rate lines: TSUS 118.35, for "whey protein concentrates," at the TSUS 183.05 rate of 10 percent; and TSUS 118.40, for "lactalbumin," at the TSUS 190.05 rate of free.

[20] Tax Reform Act of 1986 (P.L. 99-514), sec. 1885(a)(3)(A), enacted October 22, 1986. The change was effective 15 days after enactment.

Table 8-1
Column 1-General Normal Trade Relations (NTR) rates for skim milk powder, milk protein concentrate, casein, and caseinates, 1985 to 2004[1]

Year(s)	Skim milk powder[2]			Milk protein concentrate		Casein	Caseinates
	Cents per kilogram						
	(TSUS 115.50)			*(TSUS 118.45)*		*(TSUS 493.12)*	*(TSUS 493.17)*
1985-88	3.3			0.44		Free	0.44
	(HTS 0402.10.00)			*(HTS 0404.90.10)*	*(HTS 3501.10.10)*	*(HTS 3501.10.50)*	*(HTS 3501.90.50)*
1989-94	3.3			0.44	0.44	Free	0.44
	(HTS 0402.10.05)[3]	*(HTS 0402.10.10)*[4]	*(HTS 0402.10.50)*[5]	*(HTS 0404.90.10)*	*(HTS 3501.10.10)*	*(HTS 3501.10.50)*	*(HTS 3501.90.60)*
1995	3.3	3.3	99.2	0.43	0.43	Free	0.43
1996	3.3	3.3	96.7	0.42	0.42	Free	0.42
1997	3.3	3.3	94.2	0.41	0.41	Free	0.41
1998	3.3	3.3	91.6	0.39	0.39	Free	0.39
1999	3.3	3.3	89.0	0.38	0.38	Free	0.38
2000-04	3.3	3.3	86.5	0.37	0.37	Free	0.37

[1] See appendix G for an explanation of tariff items and codes used in this table.
[2] Section 22 Quotas (before 1995) and tariff rate quotas (after 1995) apply to imports of dried skim milk under the indicated tariff lines and other tariff lines.
[3] Imports under General Note 15 to the HTS. See explanation in "Tariff History pre-Uruguay Round: "Skim Milk Powder."
[4] Imports under the tariff-rate-quota quantity. See explanation in "Tariff History pre-Uruguay Round: "Skim Milk Powder."
[5] Imports above the tariff-rate-quota quantity. See explanation in "Tariff History pre-Uruguay Round: "Skim Milk Powder."

Source: U.S. International Trade Commission, *Tariff Schedules of the United States*; *Harmonized Tariff Schedule of the United States.*

NTR rate of duty corresponding to that of former TSUS item 118.45. The TSUS legal note describing the scope of that item was restated as HTS Chapter 4, additional U.S. note 13.[21]

HTS heading 3501 provides for "Casein, caseinates and other casein derivatives; casein glues" and subheading 3501.10 describes "Casein." The first subheading under 3501.10 is 3501.10.10 which describes "Milk protein concentrates." Subheading 3501.10.10 continued the 0.44 cents per kilogram (0.2 cents per pound) NTR rate of duty corresponding to that of former TSUS item 118.45. The TSUS legal note describing the scope of that item was restated as HTS Chapter 35 additional U.S. note 1,[22] except the phrase, "that is 40 percent or more protein by weight" was omitted.[23] The rates of duty applicable to milk protein concentrates, on January 1 of each year from 1985-2004 are shown in table 8-1.

Casein and caseinate (HTS 3501.10.50 and 3501.90.60)

During the 1980s, until the 1989 implementation of the HTS, imports of casein entered free of duty under item 493.12[24] of the TSUS. Imports of caseinates were classifiable in item 493.17[25] at the rate of 0.2 cents per pound. In 1989, casein was provided for in HTS subheading 3501.10.50 at a Free rate,[26] and caseinates were provided for in HTS subheading 3501.90.50[27] at a rate of 0.44 cents per kilogram. Subheading 3501.90.50 was later renumbered as 3501.90.60 in the Presidential proclamation[28] modifying the HTS to implement the trade agreements resulting from the Uruguay Round of Multilateral Trade Negotiations. That proclamation also provided for reductions in the duty rate for such caseinates over a 6-year period from 0.44 cents per kilogram to the bound rate of 0.37 cents per kilogram. Casein (subheading 3501.10.50) continues to enter free of duty. Tariff rates applicable to casein and caseinates from 1985 to 2004 are shown in table 8-1.

U.S. International Trade Commission investigations

Since the late-1970s, the U.S. International Trade Commission (Commission) has conducted three investigations concerning imports of milk protein products—a section 332 investigation in 1979 and section 22 investigations in 1982 and in 1993. As with this investigation, these earlier investigations were requested largely in response to concerns about imports of milk protein products and their impact on Commodity Credit Corporation (CCC) purchases under the dairy price support program. No previous Commission statutory investigation has specifically focused on MPC.

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[21] Chapter 4, additional U.S. note 13 states, "for purposes of subheading 0404.90.10, the term "Milk Protein Concentrate" means any complete milk protein (casein plus lactalbumin) concentrate that is 40 percent or more protein by weight."

[22] Chapter 35, additional U.S. note 1 states, "for purposes of subheading 3501.10.10, "Milk Protein Concentrate" means any complete milk protein (casein plus lactalbumin) concentrate."

[23] It is the understanding of the Commission that preparations containing a high proportion of protein by weight are in HS 3501. Customs has classified in subheading 3501.10 products with more than 90 percent protein. Therefore, the 40 percent criteria would not seem to be necessary in additional U.S. note 1 of Chapter 35.

[24] "Casein and mixtures in chief value thereof: Casein."

[25] "Casein and mixtures in chief value thereof: Other: Other"

[26] "Casein, caseinates and other casein derivatives: Casein."

[27] "Casein, caseinates and other casein derivatives: Other: Other."

[28] Proc. 6763 of Dec. 23, 1994, 60 F.R. 1007.

1979 study

In 1979, the Committee on Ways and Means of the U.S. House of Representatives requested that the Commission examine trade trends with respect to casein and the impact of casein on the domestic dairy industry. On June 21, 1979, the Commission instituted an investigation pursuant to section 332(g) of the Tariff Act of 1930 (19 U.S.C. 1332(g)). Investigation No. 332-105 focused on casein and mixtures in chief value of casein, and involved a study of sources of casein used in the United States, food and industrial uses of casein in the United States, patterns of import trade in casein, estimates of future trade patterns, and the relationship between imported casein and domestic utilization of other protein-containing milk products. In December 1979, the Commission reported[29] that imports of casein had fluctuated in recent years, and that casein was generally used in applications for which other sources of milk proteins were not used. It was also noted that the market segmentation appeared to be the result of two factors: (1) the lack of import quotas on casein, permitting casein to be available in the United States at or near the relatively low world price of casein; and, (2) the relatively high price of other sources of milk proteins—notably SMP—resulting from restrictive section 22 quotas on imports of such products and from the price support program. The Commission investigation found, "virtually no relationship between imports of casein and mixtures of casein and purchases of nonfat dry milk under the price support program in recent years."

1981 investigation

In 1981, the President requested that the Commission conduct an investigation under section 22(a) of the AAA (7 U.S.C. 624(a)) to determine whether imports of casein, casein mixtures ("caseinates"), or lactalbumin materially interfered with the price support program for milk products or reduced the level of domestic production of such products. On January 29, 1982, the Commission reported[30] to the President that imports were not being or likely to be imported in such quantities as to materially interfere with the price support program.[31] In this report, the Commission stated that imports of the subject products did increase the cost of the program, but not enough to consider the imports to "materially interfere with" the price support program, as required by statute for an affirmative finding. The Commission and the USDA (which administers the dairy price support program) agreed that the impact of lactalbumin imports was *de minimis* and they therefore focused their attention on casein and caseinates. With regard to the impact of subject products on domestic milk-derived products, the Commission reached essentially the same conclusion it had made in the 1979 report, and for the same reasons. The Commission again reported that the most significant influence on the high costs of the dairy price support program was the high prices established by statute for CCC purchases of products that were the subject of the price support program.

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[29] U.S. International Trade Commission, "Casein and its Impact on the Domestic Dairy Industry," *Report to the Committee on Ways and Means of the United States House of Representatives on Investigation No.332-105 Under Section 332 of the Tariff Act of 1930, as Amended*, USITC publication No. 1025 (Dec. 1979).

[30] U.S. International Trade Commission, "Casein, Mixtures in Chief Value of Casein, and Lactalbumin," *Report to the President on Investigation No. 22-44 Under Section 22 of the Agricultural Adjustment Act*, USITC publication No. 1217 (Jan. 1982).

[31] Commissioner Eugene J. Frank, dissented, opining that there was sufficient evidence that imports of casein and caseinates were materially interfering with the USDA price support program for milk. Ibid, p. 17.

1993 investigation

In 1993, the Commission conducted a section 22 investigation to determine whether conditions of trade in several specific dairy products had changed sufficiently to permit modifications of the section 22 restrictions. In its report,[32] the Commission stated that it had determined that circumstances had changed to the extent that the proposed modifications would not reduce the effectiveness or otherwise materially interfere with a program or operation of the USDA. The proposed actions[33] were eventually proclaimed by the President, but there is no indication that any form of milk protein concentrate was involved in this action.

Tariff History After the World Trade Organization Agreement on Agriculture

The WTO Agreement on Agriculture was the first agreement to bring agriculture under disciplines of the General Agreement on Tariffs and Trade (GATT).[34] The Agreement set out principles in three major areas—export subsidies, domestic support, and market access.[35] Under the market-access provisions, significant changes were introduced with respect to tariff treatment of dairy products, especially through conversion of nontariff barriers to tariffs, commitments to maintain current access or provide minimum-access opportunities, tariff bindings and reductions, and special safeguards. The United States was obligated to implement its commitments over a 6-year period beginning in 1995.

Tariffication and market-access commitments

As indicated above, under WTO Agreement on Agriculture, the United States agreed to convert its section 22 quotas to tariffs, a process referred to as "tariffication." For the U.S. dairy industry, this meant converting existing section 22 absolute import quotas to TRQs. In all, 16 dairy TRQs were established, in groupings generally consistent with the products subject to section 22 quotas, 7 of which covered milk protein products (table 8-2). Those products that were within the scope of existing GATT bindings related to section 22 quotas or fees were accorded TRQ treatment under the WTO Agreement on Agriculture. Because MPC and casein were not subject to section 22 restrictions prior to 1995, they were not made subject to TRQs under the new regime.

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[32] U.S. International Trade Commission, "Certain Dairy Products," Investigation No. 22-53, USITC publication No. 2659 (July 1993).

[33] The actions were: (1) removing from quotas any imported cajeta not made from cows' milk and inedible dried milk powders used for calibrating milk analyzers; (2) changing the relevant quota category for margarine cheese from Sweden; (3) taking dried cream and malted milk and articles of milk or cream off of the import licensing program while leaving it subject to quotas; and, (4) permitting any country not specifically excluded from any quota to take advantage of unused country quotas for a particular quota category.

[34] In earlier rounds, agriculture had been granted special exemptions from GATT rules (under GATT 1947) and had not been subject to the disciplines applied to industrial and manufactured goods. USDA, ERS, "Uruguay Round Agreement on Agriculture: The Record to Date," *Agricultural Outlook* (Dec. 1998).

[35] Text on the Uruguay Round Agreement on Agriculture can be found at *http://www.wto.org/-english/docs_e/-legal_e/legal_e.htm*.

Table 8-2
Certain milk protein products: Harmonized Tariff Schedule of the United States (HTS) chapter and note, applicable section 22 quota, and World Trade Organization (WTO) Agreement on Agriculture base and bound tariff-rate quota market access commitments

Milk protein product	HTS chapter & note	Section 22	WTO Agreement on Agriculture commitment: Base (1995)	WTO Agreement on Agriculture commitment: Bound (2000)
		Metric tons		
Milk & cream, fluid,or frozen, fresh or sour[1, 2]	4, 5	5,678	5,727	6,695
Dried skim milk	4, 7	820	1,261	5,261
Dried whole milk	4, 8	3	371	3,321
Dried milk & cream	4, 9	0	100	100
Articles with 5.5 percent-45 percent butterfat	4, 10	1,170	1,905	4,105
Milk and cream, condensed or evaporated.	4, 11	2,445	2,857	6,857
Dried buttermilk/whey	4, 12	225	296	296

[1] 1,000 liters.
[2] Section 22 quotas only applied to fluid milk with a butterfat content greater than 5.5 percent.

Note.—Excludes quantities allocated to Mexico under the North American Free Trade Agreement.

Source: World Trade Organization Agreement on Agriculture.

Under WTO Agreement on Agriculture rules, countries were required to set minimum initial (1995) TRQ quantities equivalent to 3 percent of domestic consumption during a 1986-88 base period, increasing to 5 percent by the end of the implementation period.[36] If imports during 1986-88 were greater than 5 percent of domestic consumption, then countries were required to maintain at least this level of access during the implementation period. Countries were required to set in-quota tariffs low enough to enable commercial trade to take place (many countries used the same rates they applied to products under the quota system). For over-quota tariffs, countries were required to set any over-quota tariff rates at levels no greater than the level of protection afforded by the nontariff barriers, based on the 1986-88 base period.[37] For example, if the quota had resulted in a U.S. domestic price of SMP of 80 cents per pound during 1986-88, while the world price was 35 cents per pound, under tariffication, an over-quota tariff limited to 45 cents per pound would have been applied.

Tariff bindings and reductions

In addition to "tariffication," the WTO Agreement on Agriculture required that tariffs on articles subject to TRQs (both those resulting from tariffication of nontariff barriers and any preexisting tariffs) be reduced in equal increments over 6 years by a minimum of 15 percent and on average by 36 percent (using a simple, unweighted average). The United States mostly committed to reduce over-quota tariff rates on dairy products by the minimum 15 percent (table 8-3). U.S. tariffs on SMP were reduced from 46 cents per pound to 39 cents per pound, and in-quota rates were held constant throughout the Agreement's implementation period at 1.5 cent per pound.

[36] *Uruguay Round Agreement Act, Statement of Administrative Action*, published in H. Doc. 103-316, 103d Cong., 2d Sess., p. 712.
[37] Ibid., p. 711.

Table 8-3
Certain milk protein products: Harmonized Tariff Schedule of the United States (HTS) chapter and note, in-quota, and base (1995) and bound (2000) over-quota tariffs under the World Trade Organization Agreement on Agriculture

Milk protein product	HTS chapter and note	In-quota tariff[1]	Base over-quota tariff	Bound over-quota tariff
Milk & cream, fluid or frozen, fresh or sour *(cents per litter)*	4, 5	3.2	90.8	77.2
Dried skim milk *(cents per kilogram)*	4, 7	3.3	101.8	86.5
Dried whole milk *(cents per kilogram)*	4, 8	6.8	128.5	109.2
Dried milk & cream *(cents per kilogram)*	4, 9	13.7	183.1	155.6
Articles with 5.5%-45% butterfat	4, 10	([2])	([2])	([2])
Milk & cream, condensed or evaporated.	4, 11	([2])	([2])	([2])
Dried buttermilk/whey *(cent per kilogram)*	4, 12	3.3	103.0	87.6

[1] In-quota tariff was set during 1995-2000 at levels shown.
[2] Numerous tariffs

Source: Harmonized Tariff Schedule of the United States, 1995 and 2000.

Products not subject to section 22 quotas or tariffication, such as MPC and casein, were also subject to tariff reductions under the WTO Agreement on Agriculture. As noted above, prior to the Uruguay Round, tariffs on these products were generally low. For example, the tariff on MPC was reduced by the minimum 15 percent from 0.44 cents per kilogram in 1995 to 0.37 cents per kilogram in 2000, and the reduction for WPC was from 10 percent ad valorem to 8.5 percent.

Special safeguards

Under Article 5 of the WTO Agreement on Agriculture, countries may apply special safeguards (SSG) to products whose prior nontariff measures have been converted into tariffs, when goods were designated for SSG treatment in their schedules of GATT obligations.[38] Thus, U.S. imports of milk protein products subject to TRQ are also covered by SSG. Special safeguards take the form of temporary additional duties and are typically applied to products that are particularly "sensitive to trade." Under rules in the WTO Agreement on Agriculture, SSGs are permissible to prevent low prices or import surges from injuring a domestic industry (although no determination of injury is required). There are two types of SSGs: price-based and volume-based. In either case, SSGs are applied on a tariff-line basis and may be applied only to over-quota tariff lines. Only one type of SSG may be applied at any one time, so if criteria are met for both, a country must choose whether to impose price- or volume-based safeguards. Because SSG on milk protein products exist only for products subject to TRQs, they do not apply to imports of MPC, casein, and caseinates.

[38] *Uruguay Round Agreement Act, Statement of Administrative Action*, published in H. Doc. 103-316, 103d Cong., 2d Sess., p. 714.

Tariff Treatment for Imports of Milk Protein Products in 2004

Customs classifications for milk protein products under the HTS are shown in table 8-4. Most imported milk protein products fall under Chapter 4 (dairy produce; birds' eggs; natural honey; and edible products of animal origin, not elsewhere specified or included) of the HTS. Such goods include MPC, WPC, SMP, WMP, and fluid milk. Casein and caseinates enter under Chapter 35 (albuminoidal substances, modified starches, and glue enzymes), whereas a few milk protein products are classified in Chapter 21 (miscellaneous edible preparation). Appendix G contains HTS product definitions and rates of duty of milk protein products.

Many products entered under Chapter 4 and Chapter 21 are subject to TRQs. Typically, a product subject to a TRQ will have three separate 8-digit HTS subheadings—one for products subject to general note 15,[39] an in-quota tariff line, and an over-quota tariff line. The quota quantities are provided in the "additional U.S. notes" to the chapter and each TRQ has such a note. The additional U.S. notes also list the HTS subheadings covering goods that are counted toward a specific TRQ quantity. For example, additional note 7 to Chapter 4 states that total imports entering under HTS 0402.10.10 and 0402.21.05 can not exceed 5,261 mt, otherwise the over-quota tariff applies. As required by the WTO Agreement on Agriculture, in-quota tariffs are low, generally 5 percent ad valorem equivalent (AVE) or less (with the exception of duty rates on modified whey and certain types of dried whole milk). Over-quota tariffs are higher, with most in the 30-50 percent AVE range. Products not subject to TRQs include MPC, WPC, casein, caseinate, fluid skim milk, and fluid whey. Tariffs on these products are negligible (with the exception of WPC—8.5 percent ad valorem). In addition to the NTR tariffs listed in table 8-4, the United States participates in several regional and bilateral free trade agreements,[40] in which special tariff concessions are afforded to U.S. imports of dairy products from partner countries. A detailed description of U.S. tariff treatment for dairy products is provided in appendix G.

Recent Rulings by the U.S. Bureau of Customs and Border Protection Concerning Milk Protein Concentrates

On June 21, 2001, the NMPF requested that Customs reconsider two earlier rulings (NY 800374 of July 27, 1994, and NY D83787 of November 13, 1998) in which Customs had classified certain milk protein products in HTS subheading 0404.90.10, a non-TRQ category. On September 18, 2002, Customs published a notice in the *Federal Register* (67 FR 58837) announcing "Receipt of Domestic Interested Party Petition Concerning Tariff Classification of Dairy Protein Blends" and that pursuant to section 516 of the Tariff Act of 1930, as amended (19 U.S.C. 1516), it was conducting a review of the two rulings. Customs received over 960 comments during the public comment period.

[39] General note 15 products are those that do not enter U.S. commerce, such as products imported for research purposes and samples.

[40] For example, North American Free Trade Agreement and the U.S.-Chile Free Trade Agreement.

Table 8-4
Milk protein products: Product descriptions, Harmonized Tariff Schedule of the United States (HTS) subheadings, tariff treatment, chapter 4 note, and tariff in 2004

Product	Description	HTS subheading	TRQ treatment[1]	TRQ note[2]	Tariff 2004	AVE[3]
						Percent
Fluid skim milk	<1% fat	0401.10.00	NA	NA	0.34 ¢/liter	([2])
Fluid whole milk	1%-6% fat	0401.20.20	IQ	NA	0.43 ¢/liter	1
		0401.20.40	OQ	NA	1.50 ¢/liter	3
Dried skim milk	< 1.5% fat	0402.10.05	GN 15	NA	3.3 ¢/kg	2
		0402.10.10	IQ	4-7	3.3 ¢/kg	2
		0402.10.50	OQ	4-7	86.5 ¢/kg	51
	1.5% - 3% fat	0402.21.02	GN 15	NA	3.3 ¢/kg	2
		0402.21.05	IQ	4-7	3.3 ¢/kg	2
		0402.21.25	OQ	4-7	86.5 ¢/kg	55
Dried whole milk	3%-35% fat	0402.21.27	GN 15	NA	6.8 ¢/kg	4
	unsweetened	0402.21.30	IQ	4-8	6.8 ¢/kg	4
		0402.21.50	OQ	4-8	109.2 ¢/kg	59
	>35% fat	0402.21.73	GN 15	NA	13.7 ¢/kg	18
	unsweetened	0402.21.75	IQ	4-9	13.7 ¢/kg	18
		0402.21.90	OQ	4-9	155.6 ¢/kg	202
	>1.5% fat	0402.29.05	GN 15	NA	17.5%	
	sweetened	0402.29.10	IQ	4-10	17.5%	
		0402.29.50	OQ	4-10	110.4 ¢/kg + 14.9%	83
Concentrated milk	Not dried	0402.91.03	GN 15	NA	2.2 ¢/kg	3
	unsweetened	0402.91.06	GN 15	NA	3.3 ¢/kg	4
		0402.91.10	IQ	4-11	2.2 ¢/kg	3
		0402.91.30	IQ	4-11	3.3 ¢/kg	4
		0402.91.70	OQ	4-11	31.3 ¢/kg	38
		0402.91.90	OQ	4-11	31.3 ¢/kg	38
Whey protein concentrate		0404.10.05	NA	NA	8.5%	
Modified whey		0404.10.08	GN 15	NA	13%	
		0404.10.11	IQ	4-10	13%	
		0404.10.15	OQ	4-10	103.5 ¢/kg + 8.5%	36
Fluid whey		0404.10.20	NA	NA	0.34 ¢/liter	3
Dried whey		0404.10.48	GN 15	NA	3.3 ¢/kg	6
		0404.10.50	IQ	4-12	3.3 ¢/kg	6
		0404.10.90	OQ	4-12	87.6 ¢/kg	160
Milk protein concentrate		0404.90.10	NA	NA	0.37 ¢/kg	([4])
Products consisting of		0404.90.28	GN 15	NA	14.5%	
natural milk constituents		0404.90.30	IQ	4-10	14.5%	
		0404.90.50	OQ	4-10	118.9 ¢/kg + 8.5%	57
		0404.90.70	NA	NA	8.5%	
Food preps derived from		2106.90.03	GN 15	NA	2.9 ¢/kg	1
dried milk, buttermilk or		2106.90.06	IQ	4-10	2.9 ¢/kg	1
whey of Chapter 4		2106.90.09	OQ	4-10	86.2 ¢/kg	30
Casein, MPC		3501.10.10	NA	NA	0.37 ¢/kg	([4])
Casein		3501.10.50	NA	NA	Free	
Caseinate		3501.90.60	NA	NA	0.37 ¢/kg	([4])
Milk albumin		3502.20.00	NA	NA	Free	
Other albumin		3502.90.00	NA	NA	Free	

[1] NA: Not applicable; IQ: in-quota tariff rate; OQ: over-quota tariff rate; GN15: general note 15.
[2] Chapter 4 note of the HTS.
[3] Ad valorem equivalents (AVE) of the specific tariffs were calculated as the import unit value for the in-quota imports averaged over 2000-2002.
[4] Less than 0.5 percent

Source: Harmonized Tariff Schedule of the United States, 2004.

On April 1, 2003, Customs issued a ruling (HQ 965592) affirming its earlier classification. Customs stated that subheading 0404.90.10 includes both (1) the traditional MPC produced by ultrafiltration, containing the same proportions of casein and albumin as are present in milk, and (2) a blend of milk constituents and concentrated milk proteins, containing over 40 percent by weight of proteins (casein plus lactalbumin).

The percentage composition by weight of the products in the two earlier rulings is provided below:

	NY 800374	NY D83787
Lactose	42	N/A[41]
Protein	41	41
Ash	8	7
Moisture	4	6
Fat	2	29

The NMPF's position was that the product consisting of a blend of milk constituents and milk proteins was an intentional blend rather than milk that had been subjected to a concentration operation. In their view, it was classifiable as sweetened or concentrated milk of heading 0402 (and thus subject to a TRQ as specified in Chapter 4, note 7). In rejecting the petition, Customs stated that there was neither statutory language nor legislative history to justify that distinction.[42]

The NMPF had argued that the expression, "complete milk protein" in Chapter 4 additional U.S. note 13 refers only to "unified protein complexes in which both the casein and lactalbumin are present in the same proportion, relative to each other, as they are found in natural milk." To reinforce its claims, the NMPF cited language from the Senate Finance Committee Report on the Tariff and Trade Act of 1984 (S. Prt. 98-219) in which the Committee described "total milk proteinate" as "a soluble milk proteinate in which casein and undenatured whey products were isolated as a single protein complex." In its reply, Customs noted that neither the expression "total milk proteinate," nor any of the other specifications for similar products was adopted as statutory language in the HTS, although in creating a new legal note Congress could have chosen to do so. Customs noted that U.S. Food and Drug Administration regulations used the expression "concentrated" in the context of "concentrated milk," referring to the product resulting only from the removal of water from milk. In Customs' view, the "concentrates" in question were not "concentrated" milk of HTS heading 0402 because, although they contained only milk constituents, the constituents were not in the same proportion as found in natural milk. The text of HTS heading 0404 ("..., products consisting of natural milk constituents, whether or not containing added sugar or other sweetening matter, not elsewhere specified or included") clearly provides for these products.

Similarly, Customs rejected NMPF's argument that the proportion of milk constituents in the subject articles was too different from "traditional" MPC to be considered the same

[41] Not provided in NY D83787; case files were lost in the destruction of the New York Customs House at the World Trade Center on September 11, 2001. Assumed to be approximately 15 percent.

[42] Absent explicit language in the HTS, Customs classifies goods based on their conditions as imported. Customs cannot directly verify how a good was made upstream or easily follow it downstream into U.S. commerce.

product. Customs opined that the intent of the framers of the HS was to create in heading 0404 a single location for various combinations of natural milk products with widely varying proportions of ingredients. Customs noted the broad trade usage of the expression "milk protein concentrate" and ruled that there is no evidence, in either the statutory language, legislative history, or common meaning of the expression "milk protein concentrate," that the HTS subheading should be construed so narrowly as to encompass only a particular type of MPC.[43]

Customs regulations provide that when Customs rejects a section 516 "domestic interested party" petition, the domestic interested party petitioner may contest the decision within 30 days (19 C.F.R. 175.23). On April 29, 2003, the NMPF filed a notice with Customs contesting that decision. On July 15, 2003, Customs published notice of receipt of the NMPF appeal. As of mid-May 2004, Customs was examining records to determine actual ports at which the subject products had entered, in order to assist the interested domestic party in selecting a specific entry or entries whose classification would be contested. Challenges to Customs' rulings on these petitions are within the jurisdiction of the U.S. Court of International Trade.

[43] In 2001, in response to an informal request by the NMPF, Customs had considered revoking several existing rulings on milk protein concentrate, including the above mentioned NY D83787. In its notice of proposed revocation, Customs noted that, "the common dictionary meaning of the words 'milk protein concentrate' would be a protein product derived from milk in which the milk protein content has been intensified or purified by the removal of 'foreign or inessential' milk constituents, such as water, minerals and lactose" Customs further suggested that milk protein concentrate of HTS subheading would have milk protein as its "sole substantive constituent." *Customs Bulletin and Decision*, vol. 35, No. 40 (Oct. 3, 2001). Such a ruling would have excluded from the scope of the HTS 0404.90.10 those shipments that contained more than a small amount of lactose and/or fats. However, after analyzing the responses to their notice of possible revocation, Customs decided to withdraw the proposed revocation of the rulings. *Customs Bulletin and Decisions*, vol. 36, No. 14 (Apr. 3, 2002)

CHAPTER 9
ASSESSMENT OF THE IMPACT OF IMPORTED MILK PROTEIN PRODUCTS ON U.S. FARM-LEVEL MILK PRICES

Introduction

This chapter provides both qualitative and quantitative assessments of how imported milk protein products affect farm-level milk prices in the United States. This issue has been widely debated and still remains highly controversial among industry groups. U.S. dairy producer representatives allege that the recent growth in U.S. imports of milk protein products was a major factor contributing to the low milk prices in 2000 and 2002.[1] In contrast, representatives of dairy processors who purchase imported milk protein products counter that low milk prices reflect trends in domestic production and consumption, and are not attributable to imports.[2]

Standard economic theory suggests that an increase in the level of imports, which raises overall domestic supplies, should lead to a fall in the domestic price. However, the extent to which this theoretical relationship holds in the case of imports of milk protein products and farm-level milk prices depends on several factors. These factors include the substitutability of imported and domestically produced milk protein products, and the effects of government intervention on dairy prices through the Dairy Price Support Program (DPSP) and Federal Milk Marketing Orders (FMMOs).

An overview of how U.S. imports of milk protein products affect farm-level prices is shown in figure 9-1. As discussed in chapter 7, domestically produced and imported milk protein products compete primarily in the production of dairy products, particularly processed cheese products. A significant amount of this competition is with skim milk powder (SMP). Therefore the impact of imports on farm-level prices will be felt primarily through their effects on the demand for domestically produced SMP.

Information on U.S. government dairy programs, including the DPSP, was provided in chapter 3. As discussed in that chapter, the DPSP maintains a floor price for SMP through Commodity Credit Corporation (CCC) purchases of domestic product when the market price reaches the predetermined support price level. The impact of imported milk proteins on farm-level prices depends on where the market price of SMP is in relation to its support price. If market prices are above the support price, then growth in milk protein imports

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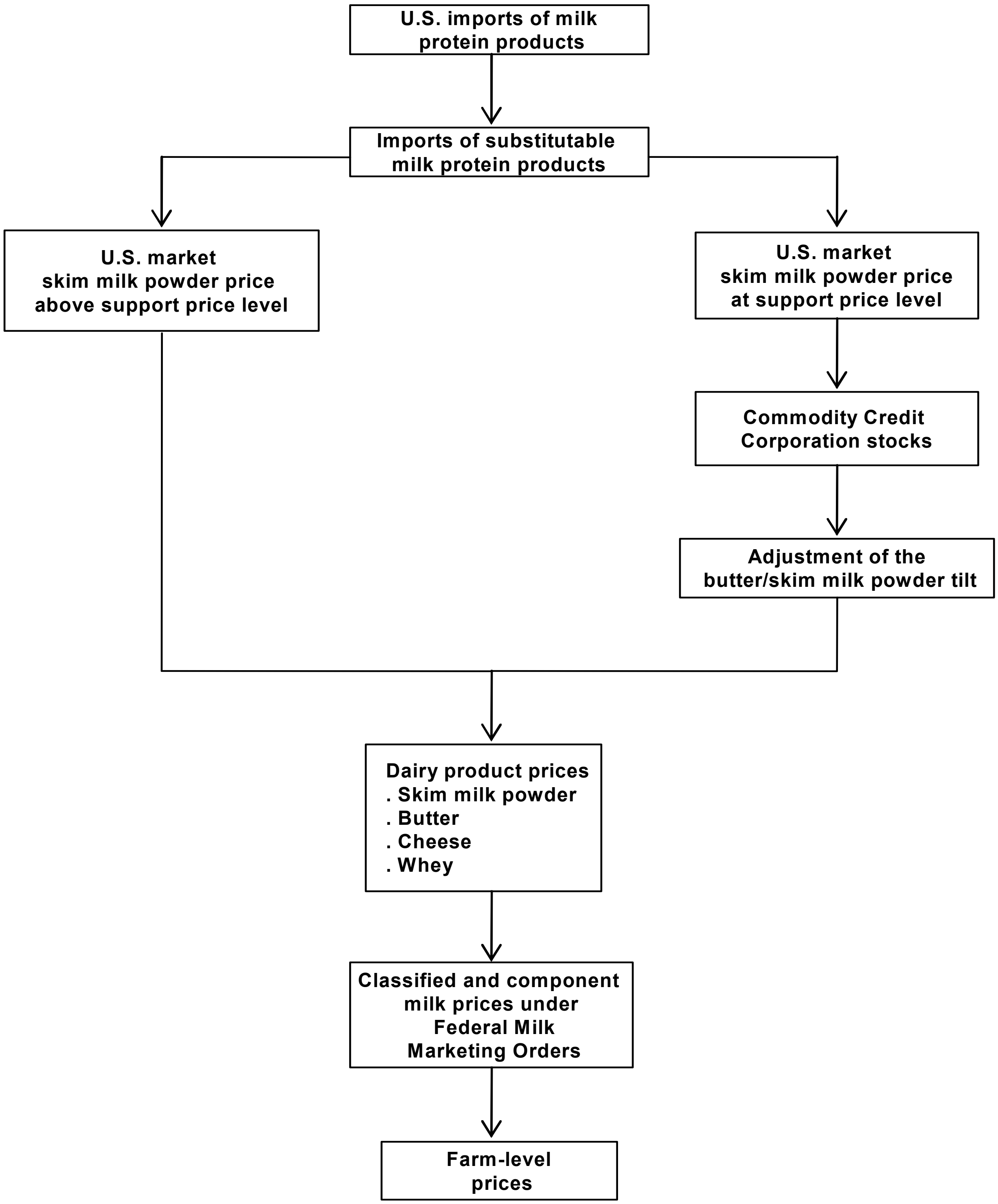
[1] Dr. Peter Vitaliano, National Milk Producers Federation (NMPF), testimony before the USITC, Dec. 11, 2003, transcript pp. 30-31.

[2] Mr. Paul Rosenthal, Coalition for Nutritional Ingredients (CNI), testimony before the USITC, Dec. 11, 2003, transcript pp. 239-40.

Figure 9-1
Overview of impact of U.S. imports of milk protein products on farm-level prices



Source: Compiled by the Commission.

will tend to force market prices lower; if market prices are at the support level, then the impact of imports is reflected in additional government purchases and growth of CCC stocks. In this scenario, the impact of imports could be to cause CCC stocks to rise to a level at which the U.S. Department of Agriculture (USDA) lowers the SMP support price (referred to as an adjustment in the butter/SMP tilt).[3]

The effect of lower SMP prices (either from additional imports reducing market prices, or from a tilt adjustment) on farm-level prices is largely determined by the pricing mechanism under the FMMOs, as discussed in chapter 3. Under FMMOs, SMP prices feed into formulas for milk component prices (protein, butterfat, nonfat solids, and other solids), that in turn feed into the milk class prices that make up the farm-level price (figure 9-1).

The qualitative analysis of the impact of milk protein imports on farm-level prices presented in this chapter is as follows. First, a brief discussion of recent trends in milk protein imports and farm-level prices is presented. This is followed by a number of sections that explain how imports of substitutable milk protein products impact the domestic SMP price and CCC stocks, and how farm-level prices are linked to dairy product prices through FMMO component and class pricing. Given that U.S. SMP prices were at, or near, the support level for most of the 1998-2002 period, the next sections discuss how milk protein imports may have affected growth in CCC stocks and, consequently, adjustments in the butter/SMP tilt. Using Commission questionnaire data on substitutable milk protein imports, it is estimated that such imports contributed about 35 percent to the growth in CCC stocks during 1996-2002. However, it is not clear the extent to which these imports affected the USDA decisions to adjust the butter/SMP tilt. The final section of this analysis examines how adjustments in the butter/SMP tilt affect component and class prices under the FMMOs.

The quantitative assessment of the effect of milk protein imports and farm-level prices involves a review of studies undertaken by various academic researchers who have used detailed economic models that capture relationships between milk protein imports, government support prices, CCC stocks, and farm-level prices. These analyses generally found that most of the impact of milk protein product imports is on CCC stocks, not on farm-level prices.

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[3] Changing butter and SMP prices is referred to as a tilt because if the support price of one product is lowered, then the price of the other must be increased in order for the legislated support price of $9.90 per hundredweight (/cwt) to be maintained. The prices at which the CCC purchases butter, SMP, and cheese are determined by formulas that take into account the cost of manufacturing products and assumptions about the yield of product per hundredweight of fluid milk. In the case of the joint products butter and SMP, support prices are determined so that the revenues from sales of butter and SMP obtained from a hundredweight of milk over and above the make allowance are sufficient to meet the support price of milk of $9.90/cwt. As long as the joint net revenue from butter and SMP is equal to this support price, then the USDA can adjust the relative support prices of butter and SMP in response to market conditions. Edward V. Jesse and Robert Cropp, "The Butter-Powder Tilt," Marketing and Policy Brief Paper No. 72, Department of Agricultural and Applied Economics (University of Wisconsin-Madison, June 2001), found at *http://www.aae.wisc.edu/www/pub/mpbpapers/mpb72.pdf,* retrieved May 6, 2003.

Recent Trends in U.S. Farm-Level Milk Prices and Imported Milk Protein Products

Trends in farm-level milk prices, as measured by the USDA's all-milk price,[4] between 1996 and 2003 are shown in figure 9-2. The average annual all-milk price reached a historical peak in 1998 at $15.46 per hundredweight (/cwt) for the calendar year.[5] However, prices declined over the next 2 years, reaching $12.40/cwt in 2000. Prices rebounded in 2001 to $15.05/cwt, before falling to $12.19/cwt in 2002, the lowest-recorded annual price since 1979. In 2003, the price rose moderately to $12.51/cwt.[6] Within this overall trend, monthly average milk prices have become increasingly volatile in recent years. In September 2001, the all-milk price was $17.20/cwt. Ten months later, the price had declined to $11.20/cwt, a drop of about 35 percent.

U.S. Department of Commerce data on U.S. imports of milk protein concentrate (MPC), casein, and caseinate are also plotted in figure 9-2. The data do not show a clear and direct relationship between imports of milk protein products and the all-milk price in all years. There appears to be an inverse relationship between the two series during 1999 and 2002, that is, a decline in the all-milk price occurred in years when imports of milk protein products increased. However, this relationship was not evident in 1998, the year the all-milk price was at a historical high of $15.46/cwt, and when imports of milk protein products rose relative to the previous 2 years.[7]

Relationships between Milk Protein Imports and U.S. Dairy Product Markets

This section deals with the first part of the chain shown in figure 9-1—the direct link between substitutable imported milk protein products and the U.S. price of SMP. However, owing to the interrelationships among dairy products, changes in milk protein imports can indirectly affect the markets for cheese, butter, and whey. These indirect market relationships are also discussed in this section.

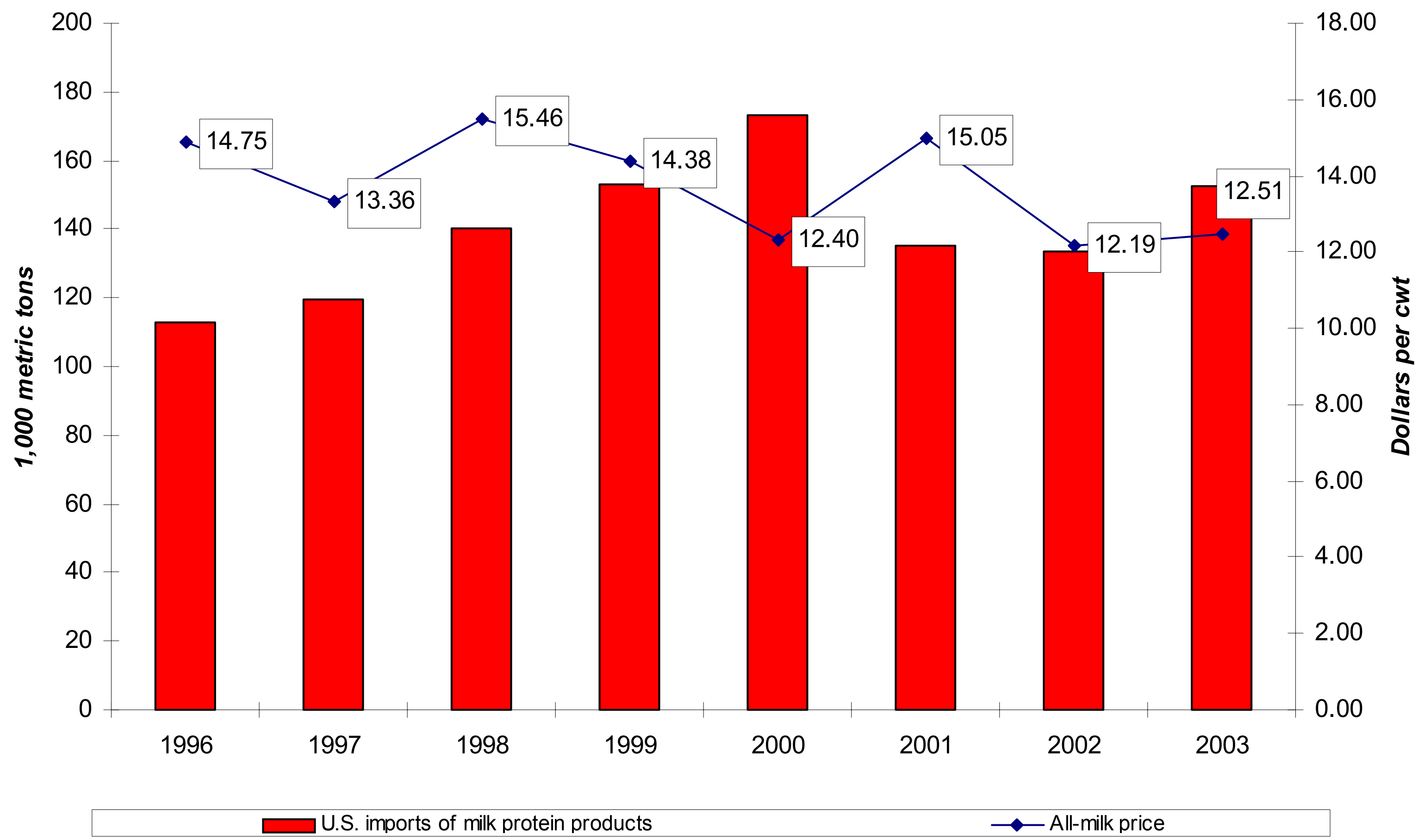
[4] For the purposes of this investigation, the USDA's National Agricultural Statistical Service (NASS) all-milk price was considered the best indicator of the farm-level price that a producer receives for milk. It is a weighted average of the prices dairy processors pay producers for grade A milk (milk for consumption) and grade B milk (manufacturing grade milk). The all-milk price is collected for most states and a national average is calculated. The all-milk price is reported prior to making deductions for hauling and does not include government deficiency payments. However, the price does include quality, quantity, and other premiums, such as over-order premiums.

[5] The all-milk price is reported in USDA, NASS, *Agricultural Prices*, found at *http://usda.-mannlib.cornell.edu/-reports/nassr/price/zap-bb/*.

[6] The all-milk price increased rapidly in early-2004, reaching $18.00/cwt in April.

[7] This analysis of import and price trends does not take into account other factors that may have been influencing changes in milk prices over time, such as feed costs and government programs.

Figure 9-2
U.S. imports of milk protein products[1] and the all-milk price, 1996-2003



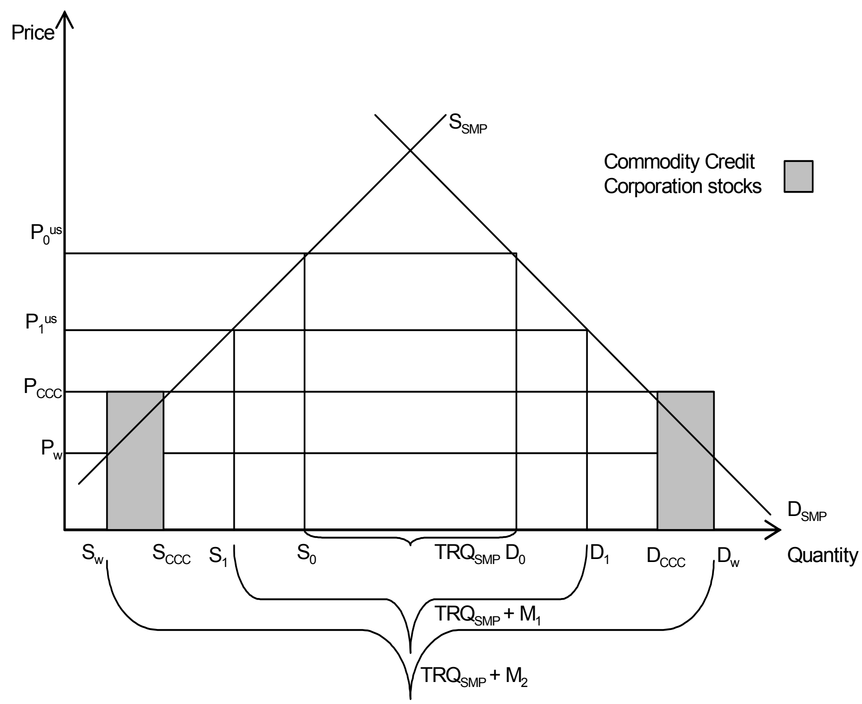
[1] Milk protein products include milk protein concentrate in HTS Chapters 4 and 35, casein, and caseinate.

Source: U.S. Department of Agriculture, National Agricultural Statistical Service; U.S. Department of Commerce.

Effect of Milk Protein Imports on the Skim Milk Powder Market

An analytical framework to demonstrate how substitutable imported milk proteins affect the U.S. SMP market is presented in figure 9-3. The U.S. supply and demand for SMP are represented by S_{SMP} and D_{SMP}, respectively, in figure 9-3. Initially, assume a U.S. price of SMP (P_0^{us}) above the world price (P_w), with domestic supply and demand at S_0 and D_0, respectively. U.S. prices are maintained above world prices through a tariff-rate quota (TRQ) on SMP that limits imports to the amount TRQ_{SMP}.[8] Since the over-quota tariff is assumed to be prohibitive, no SMP imports enter the U.S. market beyond the quota level. Thus, the TRQ has the effect of raising the U.S. domestic price of SMP from P_w to P_0^{us}, which in this scenario is also above the U.S. support price (P_{ccc}) at which the CCC purchases SMP from the domestic market. Now consider the impact of imports of milk protein products that substitute for SMP in the U.S. market. First, assume that SMP-substitutable imports of milk protein products increase by the amount M_1, so that total imports entering the market are represented by $TRQ_{SMP} + M_1$ (figure 9-3). This has the effect of increasing the wedge between domestic supply and demand (domestic quantity supplied falls from S_0 to S_1 and domestic quantity demanded rises from D_0 to D_1), forcing the domestic price of SMP to fall from P_0^{us} to P_1^{us}, but remains above the price support level, P_{ccc}.

Figure 9-3
Impact of substitutable milk protein imports on the U.S. skim milk powder market



Source: Complied by the Commission.

[8] More information on the economics of TRQs is found in Devry S. Boughner, Harry de Gorter, and Ian Sheldon, “The Economics of Two-Tier Tariff-Rate Import Quotas in Agriculture," *Agricultural and Resource Economics Review*, No. 20 (Apr. 2000), pp. 58-69.

Next consider the impact of additional imports of milk protein products that are substitutable for SMP of amount, M_2. Now overall imports (SMP, plus SMP-substitutable imported milk protein products) are represented by $TRQ_{SMP} + M_2$ in figure 9-3. In the absence of the DPSP, imports at this level force the domestic price of SMP to the world price level, P_w, and domestic quantity supplied and demanded to S_w and D_w, respectively. However, before reaching the world price level, the domestic price falls to the government support price, P_{ccc}, at which point greater returns are derived from selling product to the CCC than from selling to the domestic market. Thus, an amount of SMP is purchased by the CCC (equivalent to $(S_{ccc} - S_w) + (D_w - D_{ccc})$ in figure 9-3), with CCC expenditure represented by the shaded rectangles in figure 9-3. These CCC purchases would prevent the domestic price from falling below the support level. At the support level, domestic quantity supplied and demanded would be S_{ccc} and D_{ccc}, respectively (figure 9-3).

Under these conditions, once the domestic price has reached the support price level, additional imports have no impact on domestic SMP prices or production. Any additional imports beyond the level at which the market price is equal to the support prices would result in SMP sales to the CCC. Thus, the impact of such imports is felt not in the marketplace, but as a rise in government expenditures on SMP purchases and maintaining stocks. When the domestic price is at the support level, the manner in which imported milk proteins affect the SMP price is if the support price (P_{ccc}) is lowered by the USDA. In this case, the market price for SMP (P^{us}), would fall, which, as explained later in this chapter, would lead to lower FMMO and farm-level prices.

Effect of Milk Protein Imports on the Butter, Cheese, and Whey Markets

The Commission questionnaires provided evidence that imported milk protein products may substitute for ingredient cheese in the production of processed cheese (see chapter 7). The analysis presented in figure 9-3 on the impact of milk protein products imports on the U.S. SMP market would therefore also be applicable to analyzing the cheese market. Thus, imports of MPC that substitute for both SMP and cheese will likely affect FMMO and farm-level prices. In addition, some analysts have noted a potential impact of imported milk protein products on U.S. cheese production.[9] This is because use of low-cost protein imports in cheese making may reduce production costs and boost efficiency, leading to increased cheese production and lower cheese prices. Again, the effect would be a lowering of FMMO and farm-level prices.

Owing to the dynamics of the dairy market in the United States, secondary, or counter effects, may positively affect the farm-level price as a result of imported milk protein products placing downward pressure on the price of SMP. Secondary market-driven effects arise as a result of a drop in the production of milk in response to a lower milk price. If overall milk production declines as a result of imports of milk protein products, a drop in the U.S. supply of all milk components occurs, such as a decline in the production of butterfat,

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[9] Kenneth W. Bailey, "Impact of MPC Imports on 2002 U.S. Cheese Production," Staff Paper No. 362 (Pennsylvania State University, Mar. 2003), found at *http://dairyoutlook.aers.psu.edu/-reports/Pub2003/staffpaper362.pdf*.

leading to an increase in the price of components, which causes increases in FMMO prices.[10] These counter effects may mitigate the decline in the all-milk price that initially may have occurred because of increased imports of milk proteins.

Milk Pricing in the U.S. Market

The link between imported milk proteins and the all-milk price is shown in figure 9-4. Imports of milk protein products affect U.S. farm-level milk prices through their effect on the prices of dairy products (SMP, butter, cheese, and whey). Dairy product prices are used in the FMMO-class price formulas to construct milk component prices (butterfat, protein, other solids, and nonfat solids), that in turn feed into the formulas for Class I-IV prices.[11] The FMMO formulas that determine class prices are shown in box 9-1. The class prices are then used in a blend price, which is a weighted average of the class prices, with weights determined by the milk utilization in each class. Finally, the blend price is the major determinant of the farm-level all-milk price.

Pricing Under Federal Milk Marketing Orders

Since January 1, 2000, the USDA's National Agricultural Statistics Service (NASS) has compiled weekly product price data (i.e., block and barrel cheddar cheese, Grade AA butter, SMP, and whey) from a weekly nationwide survey of dairy buyers and sellers. These product prices are used in the FMMO price formulas to determine values of four milk components (protein, butterfat, nonfat solids, and other solids). Protein values are determined from cheese and butter prices; butterfat values are determined from butter prices; nonfat solid values are determined from SMP prices; and other solids value is determined from the dry whey price. Component price formulas are based on a simple product break-even analysis and consist of NASS survey prices, make allowances, and yield factors. The make allowance is the manufacturing cost (including labor, energy, and capital costs, as well as marketing and administrative expenses) of processing raw milk into finished products.[12] Yield factors are used in the component value formulas and indicate the amount of a particular component needed to produce one pound of finished product. Because a certain amount of components is inevitably lost between the farm and processing facility (referred to as "shrinkage"), yield

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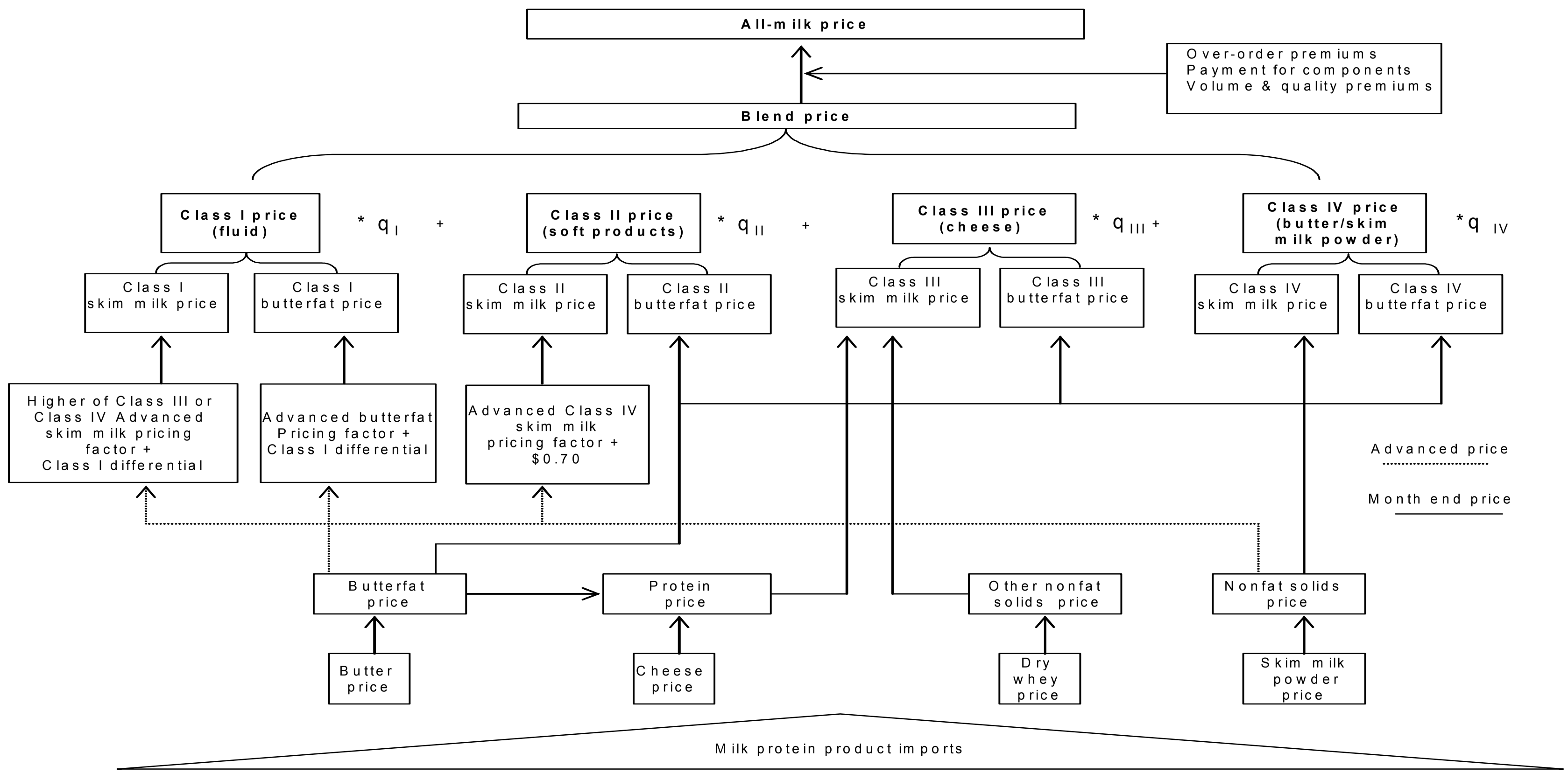
[10] Analysis by Nicholson and Bishop showed empirically the importance of capturing counter effects in estimating the impact of milk protein imports on U.S. farm-level prices. Charles F. Nicholson and Phillip M. Bishop, *U.S. Dairy Product Trade: Modeling Approaches and the Impact of New Product Formulations*, Final Report for NRI Grant No. 2001-35400-10249, Cornell Program on Dairy Markets and Policy, Department of Applied Economics and Management, Cornell University (Mar. 2004).

[11] Class I milk is used for fluid (beverage) consumption. Class II milk is used to produce soft dairy products, such as ice cream and yogurt. Class III milk is used in cheese production. Class IV milk is used to produce butter and SMP.

[12] The make allowance of 14 cents in the nonfat solids price formula is based on the assumption that it takes 14 cents to manufacture one pound of SMP. Currently, the make allowances for other products are as follows: butter, 11.5 cents per pound; cheese 16.5 cents per pound; and dry whey, 15.9 cents per pound.

Figure 9-4
U.S. milk pricing under Federal Milk Marketing Orders: Links between milk protein imports and the all-milk price



Note.—q_I, q_{II}, q_{III}, q_{IV} are Class I-IV shares of total milk allocated to each class.

Source: U.S. Department of Agriculture, Agricultural Marketing Service.

Box 9-1
Milk class and component price formulas under Federal Milk Marketing Orders

Class I

Class I price= (Class I skim milk price x 0.965) + (Class I butterfat price x 3.5)

Class I skim milk price = Higher of the advanced[1] Class III skim milk pricing factor and advanced[1] Class IV skim milk pricing factor + Class I differential adjusted for location

Class I butterfat price = Advanced butterfat pricing factor[1] + (applicable Class I differential divided by 100)

Class II

Class II price = (Class II skim milk price x 0.965) + (Class II butterfat price x 3.5)

Class II skim milk price = Advanced Class IV skim milk price + $0.70

Class II butterfat price = Butterfat price + $0.007

Class II nonfat solids price = (Class II skim milk price) / 9.0

Class III

Class III price = (Class III skim milk price x 0.965) + (Class III butterfat price x 3.5)

Class III skim milk price = (Class III protein price x 3.1) + (Class III other nonfat solids price x 5.9)

Class III protein price = ((NASS[2] weighted average cheese price - $0.165) x 1.383) + ((((NASS weighted average cheese price - $0.165) x 1.572) - butterfat price x 0.90) x 1.17)

Class III other nonfat solids price = (NASS dry whey price - 0.159) x 1.03

Class III butterfat price = (NASS AA butter price - $0.115) x 1.20

Class IV

Class IV price (per cwt) = (Class IV skim milk price x 0.965) + (Class IV butterfat price x 3.5)

Class IV skim milk price = Class IV nonfat solids price x 9.0

Class IV nonfat solids price = (NASS skim milk powder price - 0.14) x 0.99

Class IV butterfat price = (NASS AA butter price - $0.115) x 1.20

Somatic cell adjustment = Cheese price x 0.0005. Rate is per 1,000 somatic cell count from 350,000

[1] The advanced pricing factors are based on a weighted average of the two most recent NASS U.S. average weekly survey prices announced before the 24th day of the month. All other prices use NASS survey prices for the entire month.
[2] U.S. Department of Agriculture, National Agricultural Statistical Service.

Source: U.S. Department of Agriculture, Agricultural Marketing Service,*Federal Milk Order Price Information. Price Formulas 2003*, *http://www.ams.usda.gov/dyfmos/mib/price_form_2003.htm,* retrieved June 25, 2003.

factors are adjusted downward.[13] The formulas are based on the economic value of one pound of milk component to a dairy processor.[14] In general, the component value formulas are structured as product price, less the make allowance, multiplied by the yield factor.

The next step is to convert component prices into class prices. There are four classes and for each class, two prices are derived, one for skim milk and another for butterfat. For all classes, the price (at 3.5 percent butterfat) is equal to the class skim-milk price (measured in dollars per hundredweight) multiplied by 0.965 plus the class butterfat price (measured in dollars per pound) multiplied by 3.5 (box 9-1).[15] The formulas that link the component values with the class skim-milk and butterfat prices are also shown in box 9-1.

While Class II, III, and IV prices are the same each month across all FMMOs, prices for Class I skim milk and butterfat prices differ between FMMOs because of the "Class I differential." Every county in the nation is assigned a Class I differential which is added to the Class III or IV price (in the Class I skim milk price formula) and to the butterfat price (in the Class I butterfat price formula).[16] The map of Class I differentials was adjusted with Congressional approval under the recent FMMO reform, and differentials account for the distance milk is produced from consumption centers,[17] reflecting the costs of transportation.

Finally, the blend price is a weighted-average price received by producers for all sales of milk to processors. The blend price P_b is defined as:

$$P_b = (P_I \text{ x } q_I) + (P_{II} \text{ x } q_{II}) + (P_{III} \text{ x } q_{III}) + (P_{IV} \text{ x } q_{IV})$$

where: P_I, P_{II}, P_{III}, and P_{IV} are Class I -IV prices of milk, and q_I, q_{II}, q_{III}, and q_{IV} are Class I-IV shares (utilization) of total milk allocated to each class (e.g., q_I is the percentage of total milk used in Class I (fluid) processing).

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[13] Butter (finished product) is about 82 percent butterfat (component), so that one pound of butter requires 0.82 pounds of butterfat. Thus, one pound of butterfat yields about 1.22 (i.e., 1/0.82) of butter. To account for shrinkage, the butterfat value formula includes a yield factor of 1.2. Similarly, SMP is 96 percent nonfat solids, so that one pound of nonfat solids produces about 1.04 pounds of SMP. To account for shrinkage and the fact that in plants producing butter some nonfat solids are contained in buttermilk, a yield factor of 0.99 is used. The value of protein is derived from cheese prices. In this case, the USDA formula uses the Van Slyke cheese yield formula that takes into account the effects of both protein and butterfat on cheese yields. The value of other nonfat solids is based on the price of dry whey.

[14] Consider how much a manufacturer of SMP (product) would be willing to pay for one pound of nonfat solids (component). Because nonfat solids are an input in the production of SMP, processors are willing to pay for nonfat solids to the point at which they break-even. On a per pound SMP basis, the break-even point is where the price of SMP (revenue) = make allowance + price of nonfat solids x amount of nonfat solids required to produce one pound of SMP (cost). Rearranging this expression gives: price of nonfat solids = (price of SMP - make allowance) /amount of nonfat solids to produce one pound of SMP. Alternatively, price of nonfat solids per pound = (price of SMP - make allowance) x amount of SMP produced from one pound of nonfat solids. International Dairy Foods Association, Milk Procurement Workshop, Dallas, TX (Mar. 26, 2003).

[15] Based on whole-milk components of 96.5 percent skim milk and 3.5 percent butterfat.

[16] A listing of base zone Class I differentials for all Federal orders is provided in table 33 of USDA, AMS, *Federal Milk Order Market Statistics, 2002 Annual Summary*, Statistical Bulletin No. 1001 (June 2003), found at *http://www.ams.usda.gov/dyfmos/mib/annsum2002.pdf*.

[17] Class I differentials tend to be higher in the east and south.

The All-Milk Price

The final step is linking the blend price to the all-milk price. Although the link between the two is not determined by a formula, the blend price is the principal determinant of the all-milk price. The main difference involves various premium payments to farmers, of which there are four major types:[18] components premiums,[19] over-order premiums,[20] quality premiums,[21] and volume premiums.[22] Neither the blend price nor the all-milk price include deductions, such as fees paid to cooperatives, charges for milk hauling, and assessments for milk promotion and advertising.[23] The all-milk price also does not include producer direct payments under the Milk Income Loss Contract (MILC) Payments Program.

Effect of Milk Protein Product Imports on Commodity Credit Corporation Stocks

Since mid-1997, U.S. market prices for SMP have been at, or close to, support levels. With the U.S. SMP price at the support level, increased imports likely had little direct bearing on the all-milk price, but rather on CCC purchase levels. Between 1998 and 2002, annual CCC purchases of SMP increased from 114 million pounds to 680 million pounds, while CCC stocks rose from 95 million pounds to over 1 billion pounds. According to USDA officials, tilt adjustments were made in response to growth in CCC stocks and the mounting purchase and storage costs to the Federal budget.[24] Given the importance of the tilt adjustments in 2001 and 2002, an important issue for the analysis of milk protein imports and farm-level prices is the extent to which growth in milk protein imports contributed to the CCC stocks. Alternatively, would CCC stocks have reached the levels that gave rise to tilt changes, absent the growth in imports?

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[18] Kenneth W. Bailey, "Understanding Your Milk Check," Department of Agricultural and Rural Sociology, Pennsylvania State University (2000), found at *http://pubs.cas.psu.edu/-FreePubs/pdfs/ua341.pdf,* retrieved July 10, 2003; Kenneth W. Bailey, Pennsylvania State University, interview by USITC staff, July 8, 2003.

[19] Farmers are paid premiums over the announced uniform prices because the uniform prices are in terms of standard component levels (i.e., 3.5 percent butterfat, 2.99 percent protein, and 5.69 percent other solids). Most farmers produce milk with component levels higher than these standard levels and thus receive a premium for their milk. For orders using multiple component pricing, farmers are paid in terms of the pounds of butterfat, protein, and other solids they actually supply (individual farmer's milk is tested for component levels).

[20] Farmers may receive payments over and above the minimum prices required under FMMOs. These premiums generally reflect the need for plants to maintain high levels of capacity utilization, and thus must provide financial incentives to suppliers of the plant, especially during periods when supplies are short.

[21] Premiums are also paid for milk quality (e.g., lower levels of bacteria) because higher-quality milk is more valuable in terms of the yields and quality of finished products.

[22] Producers receive premiums based on the volume of milk they ship to any particular plant, reflecting the economies of scale and cost savings in transporting the milk from farm to plant.

[23] For more information on the components of the mailbox price, see *http://www.fmma30.com/-Homepage/-FO30-MailboxPrices.htm*.

[24] USDA official, interview by USITC staff, Dec. 17, 2003.

The National Milk Producers Federation (NMPF) claims that the two tilt adjustments were solely the result of imports. To support this view, NMPF compared the growth in milk protein imports of MPC, casein, and caseinate (converted into SMP equivalent based on protein content) since 1993 with annual levels of SMP purchases by the CCC. A close correlation was asserted between these two series, and it was alleged that for 2000 and 2001, more than 80 percent of CCC purchases of SMP since 1993 were accounted for by imports. For this reason the NMPF claimed, "that the growing volume of skim solids finding their way into the government price support program was strongly related to growing milk protein imports," and that imports "were responsible for the large purchases and growing inventories that were the justification for the tilt in 2001."[25]

According to the Coalition for Nutrition Ingredients (CNI), imports were not a major factor contributing to the tilt adjustments.[26] The CNI contended that the high support price of SMP has led to an overproduction of milk proteins, which in turn resulted in large purchases by the U.S. Government. CNI has argued that a domestic structural surplus of milk protein caused the recent expansion of CCC stocks, rather than the growth in imports. According to the CNI, " the condition of oversupply and the consequent reduction in prices and farmer revenues were the direct result of the market signals generated by the U.S. price support program." CNI does not hold imports responsible for the recent tilt changes and the consequent reduction in farm-level prices.

Estimates of the Contribution of Imported Milk Proteins to Commodity Credit Corporation Stocks Using Commission Questionnaire Data

The Commission estimated the contribution to CCC stocks of imported milk protein products based on a supply/use balance for SMP during the 1996-2002 period using its questionnaire response data. The Commission compared the growth in CCC SMP stocks with imports of milk protein products that are directly substitutable for SMP. The year 1996 was chosen as a starting point for this analysis for two reasons. First, in 1996 there appears to have been little or no surplus of milk proteins in the U.S. market. Domestic SMP production was almost the same as commercial disappearance (consumption) (table 9-1), and the commercial ending stocks-to-use ratio was at very low levels. The U.S. market price of SMP in 1996 was $1.22 per pound (/lb), about 14-percent higher than the government support level of $1.07/lb, and as a result, there were no price-support purchases that year and government stocks of SMP were nonexistent.[27] Second, 1996 was chosen as a starting point for the analysis because it was about that year when imports of MPC started to increase rapidly.

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[25] NMPF, posthearing submission, Jan. 15, 2004, pp. 5 and 7.

[26] CNI, prehearing submission Dec. 1, 2003, pp. 11-12.

[27] In the 3 years prior to 1996, the U.S. SMP market also appeared to have been in balance, as indicated by government stocks averaging about 2 percent of commercial disappearance between 1993 and 1995.

Table 9-1
U.S. skim milk powder market: Supply/use balance, government stocks, and prices, 1996-2002

Variable	1996	1997	1998	1999	2000	2001	2002	Annual growth 1996-2002
	Million pounds							*Percent*
Production	1,062	1,218	1,135	1,360	1,452	1,414	1,569	7.1
Beginning commercial stocks	71	71	103	56	140	119	121	22.7
Imports	5	7	11	13	9	9	15	23.8
Total supply	1,138	1,295	1,250	1,428	1,601	1,541	1,705	7.3
Ending commercial stocks	71	103	56	140	119	121	101	19.8
Price support purchases	0	40	114	237	558	355	680	([1])
DEIP removals[2]	63	258	228	304	134	141	162	48.9
Unrestricted sales[3]	6	0	16	0	0	0	18	([1])
Net removals[4]	57	298	326	541	693	496	824	93.6
Commercial disappearance[5]	1,009	894	867	748	789	924	780	-3.5
Government stocks	0	22	95	134	516	776	1,047	([1])
	Dollars per pound							
Market price	1.22	1.1	1.07	1.03	1.02	1.01	0.93	
Government support price	1.07	1.05	1.04	1.01	1.01	0.94	0.88	

[1] Not applicable.
[2] Skim milk powder used in the Dairy Export Incentive Program.
[3] Sales of skim milk powder from government stocks.
[4] Equal to price support purchases plus DEIP removals minus unrestricted sales.
[5] Equal to total supply minus ending commercial stocks minus net government removals.

Sources: U.S. Department of Agriculture (USDA), Economic Research Service, *Livestock, Poultry, and Dairy, Situation and Outlook*, various issues; USDA, Agriculture Marketing Service, *Dairy Market News*, various issues; Official trade statistics, U.S. Department of Commerce; Commission importers' questionnaires.

Responses to the Commission questionnaires indicated that in 1996 about 39 million pounds of imported milk protein displaced domestically produced SMP, which was equivalent to 109 million pounds of SMP (based on a conversion factor of 35.9 percent) (tables 9-2 and 9-3).[28] Thus, in a year when the U.S. protein market appeared to be in balance and when the SMP market price was 14 percent above the support price of $1.07/lb, the market absorbed 109 million pounds (SMP equivalent) of imported milk protein products without the need for CCC purchases. Between 1996 and 2000, annual imports of milk protein products that were substitutable for SMP grew to 229 million pounds (SMP equivalent), before declining to 183 million pounds (SMP equivalent) in 2001 and 2002 (table 9-2).

Table 9-2
Milk protein products: Quantity of milk protein product imports that substitute for U.S.-produced milk protein, 1996-2002

Product	1996	1997	1998	1999	2000	2001	2002
	Quantity *(million pounds of protein)*						
Milk protein concentrate	12	19	18	34	51	37	39
Casein	20	19	18	22	25	22	20
Caseinate	7	8	6	6	6	7	6
Total	39	45	41	63	82	66	66
	Quantity *(million pounds, skim milk powder equivalent[1])*						
Total	109	125	114	174	229	183	183

[1] Converted from pounds of protein to skim milk powder equivalent using a conversion factor of 35.9 percent.

Source: Compiled from data submitted in response to Commission questionnaires.

Growth of imports since 1996 was captured by the accumulated difference between annual imports and 1996 imports. In other words, in each year from 1997-2002, the difference between the actual import level in that year and 109 million pounds (the 1996 import level) was calculated (table 9-3), and then summed across all the years, 1997-2002. By accumulating additional imports over time, import growth was captured in terms of a stock variable that is appropriate for a comparison with growth of CCC stocks of product.[29] Finally, the ratio of accumulated imports to accumulated stocks was calculated to measure the contribution of SMP-substitutable imports to CCC stocks.

Using this approach, it was shown that accumulated imports that may substitute for SMP increased from 16 million pounds (SMP equivalent) in 1997 to 353 million pounds (SMP equivalent) (table 9-3). Over this period, accumulated CCC stocks of SMP grew from 22 million pounds to 1,047 million pounds. As a result, the ratio of accumulated imports to accumulated CCC stocks over the 1996-2002 period was 34 percent. To determine whether this result was sensitive to the base year, an identical comparison was made using base years of 1997 and 1998. As shown in table 9-3, changing the base year to 1997 resulted in the ratio of accumulated imports to accumulated CCC stocks of 25 percent by 2002, and 33 percent

[28] Protein content and the degree of substitutability of imported milk proteins in 1996 and 1997 were estimated based on 1998 data.

[29] The approach by NMPF was to compare, annually, changes in milk protein imports from a base year of 1993, with the actual level of CCC purchases. NMPF, prehearing submission, Dec. 11, 2003, p. 10.

Table 9-3
U.S. skim milk powder (SMP) market: Analysis of Commodity Credit Corporation (CCC) stocks and SMP substitutable imports, 1996-2002

Variable	1996	1997	1998	1999	2000	2001	2002
	Million pounds						
Government stocks	0	22	95	134	516	776	1,047
SMP substitutable milk protein imports[1]	109	125	114	174	229	183	183
	Million pounds						
Change since 1996:							
Accumulated change in CCC stocks	0	22	95	134	516	776	1,047
Change in SMP substitutable milk protein imports	0	16	5	65	120	74	74
Accumulated change in SMP substitutable imports	0	16	21	86	205	279	353
	Percent						
Ratio of accumulated imports to accumulated stocks	0	73	22	64	40	36	34
	Million pounds						
Change since 1997:							
Accumulated change in CCC stocks		0	74	112	494	754	1,025
Change in SMP substitutable milk protein imports		0	-11	49	104	58	58
Accumulated change in SMP substitutable imports		0	-11	38	143	201	259
	Percent						
Ratio of accumulated imports to accumulated stocks			-15	34	29	27	25
	Million pounds						
Change since 1998:							
Accumulated change in CCC stocks			0	38	421	680	952
Change in SMP substitutable milk protein imports			0	60	115	69	69
Accumulated change in SMP substitutable imports			0	60	175	244	313
	Percent						
Ratio of accumulated imports to accumulated stocks				156	42	36	33

[1] Converted from pounds of protein to SMP equivalent using a conversion factor of 35.9 percent.

Sources: U.S. Department of Agriculture, Economic Research Service, *Livestock, Poultry, and Dairy, Situation and Outlook*, various issues; Commission importers' questionnaires.

by 2002 using a 1998 base-year. Thus, there was only a small change in magnitude of these ratios for different base years. These calculations indicate that about 65-75 percent of CCC stocks in 2002 were likely the consequence of factors other than imports.

A key factor contributing to CCC purchases and stock growth is domestic SMP production growth during 1996-2002 (table 9-1). SMP production increased from about 1 billion pounds in 1996 to 1.6 billion in 2002, and production grew as much as 11 percent between 2001 and 2002. Most of the growth in SMP production reflects growth in milk production over this period, especially production from the large dairy operations in the Western United States. For example, between 1999 and 2002, the period when CCC purchases grew significantly, U.S. milk production increased at almost 2 percent annually. Much of this milk production growth was in response to strong demand for many dairy products during 1999-2001.[30] Thus, although milk did not appear to be in surplus over this time frame, there did appear to be an oversupply of milk protein.[31] At the same time, SMP production remained profitable because of the high support price for SMP.

The precise methodology used by the USDA to determine whether, and by how much, tilt changes are made is not transparent.[32] Given that the USDA relies primarily on the level of CCC stocks for determining when tilt adjustments are necessary, it is possible that the accumulation of CCC stocks resulting from imports could have raised stocks to a level that prompted a tilt adjustment. However, owing to the nontransparency of the USDA's decisions on tilts, it is not possible to make definitive statements as to whether or not a reduction of CCC stocks by about 25-35 percent would have prevented a change in the tilt. In summary, the analysis presented above suggests that imports of milk protein products may have contributed to the buildup of CCC stocks during 1996-2002. At the same time, domestic production and consumption trends during the time period also appear to have been important factors behind the recent CCC accumulation of SMP.

Other Estimates of the Effect of Milk Protein Imports on Commodity Credit Corporation Stocks

Analysis of this issue was also provided by Bailey, based on certain assumptions about the protein content and uses of imported milk protein products.[33] Bailey calculated that during 1997-2002, imports of MPC rose by 8,938 metric tons (mt), whereas government support purchases increased by 103,963 mt. Net removals[34] are shown to increase about 90,000 mt between 1997 and 2002. Protein import growth represented about one-tenth of the growth in net purchases over this time period. Bailey concluded that even if one assumes that imported protein displaces domestically produced SMP on a one-for-one basis, only about 9,000 mt of imports went into CCC stocks and that 96,700 mt had nothing to do with

[30] USDA, ERS, *Livestock, Dairy, and Poultry, Situation and Outlook*, LDP-M-105 (Mar. 2003), pp. 2-7, found at *http://www.ers.usda.gov/publications/ldp/Mar03/LDPM105Dairy.-pdf.*

[31] Dr. Peter Vitaliano, NMPF, testimony before the USITC, Dec. 11, 2003, transcript p. 91.

[32] USDA official, interview by USITC staff, Dec. 17, 2003.

[33] Kenneth W. Bailey, prehearing submission, Dec. 11, p. 11-12.

[34] Net removals are defined by the USDA as price support purchases plus removals under the Dairy Export Incentive Program, less unrestricted sales.

imports.[35] For this reason and the observation that the supply/use balance indicated that imports represent only about 5-6 percent of milk protein supplies to the U.S. market, Bailey concluded that imports alone had limited impact on farm-level milk prices.

Jesse also explored the issue of imports and recent tilt decisions by estimating the amount of domestically produced SMP that may have been displaced by imported milk proteins[36] between 1997 and 2002, and then comparing this displacement with CCC purchases.[37] The imputed SMP displacement by milk protein imports was estimated to have increased from 79 million pounds in 1997 to 427 million pounds in 2002, whereas actual CCC net removals of SMP increased from almost 300 million pounds to over 800 million pounds in this time frame. Thus, the difference between government purchases and estimated displacement increased from 200 million pounds in 1997 to almost 400 million pounds in 2002.[38]

Impact of Tilt Changes on Federal Milk Marketing Order Prices and Farm-Level Prices

The Secretary of Agriculture has the authority to change the tilt twice annually;[39] and since 2001, the USDA twice reduced the support price of SMP and increased the support price of butter in an attempt to reduce production of SMP and control forfeitures to the CCC. The first tilt adjustment occurred on May 31, 2001, when the SMP support price was reduced from $1.0032/lb to $0.90/lb (the butter support price increased from $0.65/lb to $0.85/lb), followed by a second tilt on November 15, 2002, when the SMP support price was reduced to $0.80/lb (the butter support price increased to $1.05/lb). Although the butter support price was raised, the prevailing market price for butter continued to exceed the support level, so no forfeitures of butter resulted. After the first adjustment in the tilt, production of SMP continued to rise, increasing by 11 percent between 2001 and 2002. After the second tilt, production declined, falling by about 5 percent between 2002 and 2003.

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[35] NMPF argues that the period of 1997-2002 used by Bailey, "is completely unrepresentative of the relationship between increased milk protein imports and CCC purchases during the entire period from 1993 through the present." NMPF, posthearing submission, Jan. 15, 2004, p. 6.

[36] Displacement of domestically produced SMP by imports was calculated as the difference between actual domestic commercial-use of SMP during 1997-2002 and a trend in commercial use derived by extrapolating SMP commercial use growth experienced during 1982-1996 into the period 1997-2002.

[37] Edward V. Jesse, "U.S. Imports of Concentrated Milk Proteins: What We Know and Don't Know," Marketing and Policy Briefing Paper No. 80, Department of Agricultural and Applied Economics (University of Wisconsin-Madison, Feb. 2003).

[38] Jesse raised the question of whether the tilts would have occurred if milk protein imports had been curtailed. He concluded that, "the Secretary (of Agriculture) would have been obligated to reduce the SMP purchase price even if imports had remained at their 1996 levels." He also noted however, that political pressure may have been sufficient for the USDA to resist making a tilt adjustment if the level of SMP purchases and stocks had not been so high. Edward V. Jesse, "U.S. Imports of Concentrated Milk Proteins: What We Know and Don't Know," Marketing and Policy Briefing Paper No. 80, Department of Agricultural and Applied Economics (University of Wisconsin-Madison, Feb. 2003), p. 17.

[39] Congressional Research Service, *Dairy Policy Issues*, CRS Issue Brief No. IB97011 (Apr. 18, 2003).

Impact of Tilt Changes on Federal Milk Marketing Order Prices

Tilts are significant policy changes because, under pricing formulas established under FMMOs, lowering the support price for SMP results in reductions in the Class IV price, as well as Class I and Class II prices.[40] Thus, through the complex system of formula pricing, tilt changes ultimately mean lower farm-level prices.[41] Lowering the support price of SMP reduces the market price and the NASS survey price. This lower SMP price then feeds into the formula for nonfat solids and the Class IV price via the Class IV skim milk price. In addition, the Class I skim milk price is determined by the higher of the Class III skim milk pricing factor and Class IV skim milk pricing factor. Since the Class IV skim milk price was above the Class III skim milk price for the period in which the tilts took place,[42] lowering the Class IV skim milk price had the effect of lowering the Class I skim milk price, and thus the overall Class I price. Finally, the Class II skim milk price is determined by the advanced Class IV skim milk price (plus a 70-cent differential), so, again, a decline in the Class IV skim price would give rise to a decline in the Class II skim price and thus the overall Class II price.

For illustrative purposes, the impacts on class and component prices following the two recent tilt changes (in which the per-pound SMP support price was lowered from $1.00 to $0.90, and then further from $0.90 to $0.80) are shown in table 9-4. The example shows how tilt changes might impact FMMO prices, assuming milk class utilization rates and the Class I price differential for the Northeast Order in 2002, and annual average product prices for 2001 and 2002. The table shows how class, component and blend prices are affected when the SMP support price is lowered. These impacts assume no change in the market price of butter, even though the support price of butter increases with the tilts, because market prices for butter were above the support level during 2001 and 2002. The analysis also assumes no changes in milk class utilization rates following the tilt adjustments.

As a result of the first tilt adjustment, the Class IV nonfat solids price falls from $0.85/lb to $0.75/lb, which leads to drops in both the Class IV and II skim milk prices by $0.92/cwt and the overall Class IV and II prices by $0.89/cwt (the tilt is assumed not to impact the butterfat price). The Class I skim milk price also falls by $0.49/cwt. This is because the Class I mover (that is, the higher of the Class III and IV skim milk prices) falls from $7.69/cwt (the Class IV skim price) to $7.20/cwt (the Class III skim price). Combining the Class I mover, the Class I differential, and butterfat price, results in a reduction of the overall Class I price of $0.47/cwt ($17.12/cwt to $16.64/cwt). Combining the class price changes with assumed utilization rates (Class I, 42 percent; Class II, 17 percent; Class III, 31 percent; and Class IV, 10 percent), the blend price falls $0.44/cwt ($15.20/cwt to $14.77/cwt). For the 2002 tilt, a

[40] Dr. Peter Vitaliano, NMPF, interview by USITC staff, June 17, 2003.

[41] Edward V. Jesse and Robert Cropp, "The Butter-Powder Tilt," Marketing and Policy Brief Paper No. 72, Department of Agricultural and Applied Economics (University of Wisconsin-Madison, June 2001), found at *http://www.aae.wisc.edu/www/pub/mpbpapers/mpb72.pdf,* retrieved May 6, 2003.

[42] It is important to note that the impact of the tilt on the Class I occurs when the Class IV skim milk price is higher than the Class III skim milk price. During most of the period since Jan. 2000 when the new formulas were adopted, the Class IV skim milk price has been above the Class III skim milk price, and as a result, fluid milk prices were totally independent from the cheese market. Thus, for this period, the government support price for SMP has been key in determining fluid milk prices, and this largely has made the tilts controversial.

Table 9-4
Analysis of the impact of butter-powder tilts on Federal Milk Marketing Order prices, an example of the Northeast Order, 2002

Prices	2001 price support level			2002 price support level		
	1 dollar	90 cents	Change	90 cents	80 cents	Change
Product prices:						
Block cheese *(dollars per pound)*	1.42	1.42	0.00	1.19	1.19	0.00
Grade AA butter *(dollars per pound)*	1.65	1.65	0.00	1.10	1.10	0.00
Skim milk powder *(dollars per pound)*	1.00	0.90	-0.10	0.90	0.80	-0.10
Dry whey *(dollars per pound)*	0.27	0.27	0.00	0.20	0.20	0.00
Class IV:						
Butterfat price *(dollars per pound)*	1.84	1.84	0.00	1.18	1.18	0.00
Nonfat solids price *(dollars per pound)*	0.85	0.75	-0.10	0.75	0.65	-0.10
Class IV price skim *(dollars per cwt)*	7.69	6.77	-0.92	6.77	5.88	-0.89
Class IV price *(dollars per cwt)*	13.87	12.98	-0.89	10.67	9.81	-0.86
Class III:						
Butterfat price *(dollars per pound)*	1.84	1.84	0.00	1.18	1.18	0.00
Protein price *(dollars per pound)*	2.10	2.10	0.00	2.06	2.06	0.00
Other nonfat solid *(dollars per pound)*	0.11	0.11	0.00	0.04	0.04	0.00
Class III skim price(dollars per cwt)	7.20	7.20	0.00	6.63	6.63	0.00
Class III price *(dollars per cwt)*	13.39	13.39	0.00	10.53	10.53	0.00
Class II:						
Nonfat solids price *(dollars per pound)*	0.93	0.83	-0.10	0.83	0.73	-0.10
Butterfat price *(dollars per pound)*	1.85	1.85	0.00	1.19	1.19	0.00
Class II skim price *(dollars per cwt)*	8.39	7.47	-0.92	7.47	6.58	-0.89
Class II price *(dollars per cwt)*	14.57	13.68	-0.89	11.37	10.51	-0.86
Class I:[1]						
Butterfat price *(dollars per pound)*	1.87	1.87	0.00	1.21	1.21	0.00
Class I skim price *(dollars per cwt)*	10.94	10.45	-0.49	10.02	9.88	-0.14
Class I price *(dollars per cwt)*	17.12	16.64	-0.47	13.92	13.78	-0.14
Blend price *(dollars per cwt)*[2]	15.20	14.77	-0.44	12.11	11.82	-0.29

[1] Class I differential for Northeast Order is 3.25.
[2] Assumes class utilization rates of 42 percent (Class I), 17 percent (Class II), 31 percent (Class III), 10 percent (Class IV).

Source: Commission estimates based on information from U.S. Department of Agriculture, Agricultural Marketing Service, *Federal Milk Order Market Statistics, Annual Summary*, 2001 and 2002, found at *http://www/ams.usda.gov/-dyfmos/mib/fmoms.htm*.

similar analysis shows that reducing the tilt from $0.90/lb to $0.80/lb gave rise to a drop in the blend price of $0.29 ($12.11/cwt to $11.82/cwt).[43]

Impact of Tilt Changes on Farm-Level Prices

The illustration above shows how tilt changes might impact class and component prices under FMMOs. However, the overall impact of tilt changes on farm-level prices and incomes depends on other factors in addition to FMMO prices. Such factors include the effects of the tilt changes on milk-class utilization, market prices for other dairy products, (such as butter), and deficiency payments under the MILC program (see chapter 3 for more details). This section discusses analysis by the USDA and others on how the two recent tilt changes

[43] This decline would be offset by an increase in the MILC payment. Based on the assumptions above, the MILC payment (equal to $16.94 less the Class I price) multiplied by 0.45, would increase from $1.36 /cwt to $1.42 /cwt, a rise, of $0.06/cwt. Payments per farm are limited to the first 2.4 million pounds of production each fiscal year.

affected farm-level prices and producer incomes. Studies indicate that tilt changes did reduce farm-level prices, although there are significant differences over the magnitude of those reductions.

The USDA estimated that the November 2002 tilt reduced the fiscal year (FY) 2003 all-milk price from $12.10/cwt to $11.90/cwt (a drop of $0.20/cwt).[44] This decline resulted from a drop in the Class IV price of about $0.30/cwt, with the lower SMP price offset by higher butter prices. Butter prices were estimated to increase following the tilt because lower milk prices translated into lower milk production, such that less milk was available for use in Class IV product (SMP and butter), resulting in lower butter production and higher butter prices. The USDA determined that butter prices also rose because the price of Class III milk declined less than the price of Class IV milk ($0.10/cwt as opposed to $0.35/cwt), so that milk was diverted toward cheese production and away from butter/SMP production, again resulting in higher butter prices. The analysis also showed a reduction in both the Class I and II price of $0.35/cwt. USDA also estimated that the $0.20/cwt drop in the all-milk price would be offset by an average increase in the MILC payment of about $0.10/cwt, although the magnitude would depend on geographical location, with the offsetting MILC payment being lower in regions where operations are very large. Finally, USDA estimated that the November 2002 tilt led to a loss in farm income (cash income plus MILC payments) of about $192 million in FY2003.

The NMPF estimated that the tilts had a significantly larger impact on farm prices and farm incomes than the USDA. Specifically, NMPF estimates that the two tilts in 2001 and 2002 (i.e., reducing the SMP support price from $1.0032/lb to $0.90/lb to $0.80/lb) had the effect of lowering producer prices by $0.19/cwt in 2001, $0.48/cwt in 2002, and $0.76/cwt in 2003. These price declines translated into reductions in producer income of $156 million in 2001, $816 million in 2002, and $1,283 million in 2003.[45] In addition to the $0.20/lb drop in the SMP support price, the NMPF analysis assumed that the tilt changes had no effect on butterfat prices or the Class III price of milk. It was also assumed that tilt changes would have no impact on U.S. milk production or utilization of milk in each class. The NMPF also assumed no effects of MILC payments in its calculation of impacts of tilt changes on producer revenues.

A simulation model of the U.S. dairy sector (the Interregional Competition Model) was used by Cox to analyze the November 2002 tilt.[46] Based on market conditions in 2000, the model results indicated that the change in the SMP/butter support price from $0.90/lb to $0.80/lb would give rise to a $0.16/cwt drop in the all-milk price, a 814-million-pound drop in milk production, and a $371 million decline in farm-level revenue. However, simulations on the effect of the tilt and MILC in 2000 (a low-price year) indicated that the milk price received by producers would actually increase by $0.47/cwt (in other words, the lower price resulting from the tilt is more than offset by the MILC payment). Using 2001 as the base year for the analysis, the effects of the tilt change were estimated to be larger. In this scenario, the milk price fell by $0.43/cwt, and farm production and income declined by 1.8 billion pounds and $959 million, respectively. Similarly, in 2001 (a high-price year) the MILC payment offset the lower milk price from the tilt change, such that the net reduction in milk price was

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[44] USDA official, interview by USITC staff, Feb. 2004.

[45] NMPF, prehearing submission, Dec. 11, 2003, p. 14.

[46] Thomas L. Cox, "Interregional Impacts of 2002 U.S. Dairy Policies: The 2002 Dairy MILC, 80/105 SMP-Butter Tilt, and New Class III/IV Prices," presented at the Minnesota-Wisconsin Dairy Policy Conference, St. Paul, MN (Apr. 4, 2003).

$0.24/cwt. These results suggested that farmers did not face the full brunt of the tilt, and that a substantial part of the cost was borne by the taxpayers through the MILC payment program.

Quantitative Analysis of the Impact of Milk Protein Imports on Farm-Level Prices

A quantitative analysis of the impact of milk proteins on farm-level prices requires the application of an economic model that captures the complexity of the U.S. dairy industry as outlined throughout this report. In particular, any model for such analysis must: (1) be specified in terms of dairy components; (2) account for the system of component and class pricing under the FMMO; and, (3) capture the dairy price support program, including intervention pricing and CCC stocks. The Commission frequently uses three models in factfinding investigations—the Commercial Policy Analysis System (COMPAS) model, which is a partial equilibrium trade model developed by the USITC; the USITC computable general equilibrium (CGE) model (U.S. model); and, the Global Trade Analysis Project (GTAP) model, also a CGE model. Although the Commission has used these models for analysis of trade policy changes on the U.S. dairy sector,[47] the models are based on aggregated product groupings (e.g., fluid milk and cheese), and parameters and input-output data are not available at the dairy component level necessary to estimate how imported milk proteins affect farm-level milk prices in the United States.[48] Therefore, the quantitative assessment of the impact of milk protein imports on farm-level prices presented below is based on a review of recent studies that have attempted to model the effects of imports on milk prices, as opposed to developing a U.S. dairy model at the Commission especially for this investigation.

Four directly relevant modeling analyses of effects of milk protein product imports on farm-level prices by Burke and Cox,[49] Bishop and Nicholson,[50] Sumner and

[47] For an example, refer to U.S. International Trade Commission, *The Economic Effects of Significant U.S. Import Restraints, Third Update 2002,* (Investigation No. 332-325) USITC publication No. 3519 (June 2002).

[48] The COMPAS model has been adapted to account for linkages between upstream and downstream goods (e.g., wheat and flour, flat rolled steel products). However the parameters necessary to adapt the COMPAS model to reflect the linkages in the dairy market are not available at the dairy component level. Likewise, while the USITC CGE framework models linkages in the dairy market, the necessary parameters and data are not available at the dairy component level.

[49] Joseph Burke and Thomas Cox, "University of Wisconsin-Madison/ITC Proposal: Assessing the impacts of Off-Shore Dairy-Based Ingredients on the U.S. Dairy Sector," unpublished and undated paper, Department of Agricultural Economics, University of Wisconsin, Madison, WI, received by USITC staff on Sept. 30, 2003.

[50] Charles F. Nicholson and Phillip M. Bishop, "U.S. Dairy Product Trade: Modeling Approaches and the Impact of New Product Formulations," Final Report for NRI Grant No. 2001-35400-10249, Cornell Program on Dairy Markets and Policy, Department of Applied Economics and Management, Cornell University (Mar. 2004).

Balagtas,[51]and Bailey[52] are summarized in table 9-5.[53] Even though these studies differed in terms of modeling approaches, commodity coverage, and base year, they generally found that imports of milk protein products have had little impact on farm-level prices in the U.S. market. In the models developed by Burke and Cox and Nicholson and Bishop, which fully incorporated government intervention in the dairy sector through the FMMO system and the DPSP, the price impacts of milk protein imports were small because government SMP purchases prevented the SMP price from falling below the support level. Thus, policy changes that might influence U.S. imports of milk protein (such as an import ban or quota, or liberalization of U.S. Food and Drug Administration (FDA) standards of identity to allow for MPC use in standardized cheese) affected CCC stocks and not farm-level prices. In the case of the Sumner/Balagtas analysis, the finding that milk protein imports have a minimal impact on farm-level price was driven by the assumption that imported milk proteins account for less than 5 percent of total protein availability in the U.S. market. Bailey did not directly estimate the impact of imports on farm-level prices, but rather simulated the effects of milk protein price changes on imports and CCC purchases. More detailed discussion of these analyses is presented below.

Burke and Cox (2004, Ongoing)[54]

Burke and Cox developed a mathematical optimization (programming) model capable of estimating the effects of milk protein product imports on U.S. dairy production and use, government support purchases, and farm-level milk prices. The model has a single aggregate U.S. dairy market and up to 23 dairy and milk protein products. All products are defined by a production function consisting of five milk components (whey and casein proteins, fat, lactose, and other solids). The baseline for the model is 2002. The framework captures the imperfect substitutability among domestically produced and imported milk protein products in the cheese-making process. The impacts of changes in the milk-protein import level are traceable through to domestic use and prices of all 23 products, and government purchases under the dairy price support program, by means of an accounting balance of the 5 milk components. By simultaneously balancing all five components, offsetting effects of imports on different milk-component prices can be captured. For example, lower milk prices following increased milk protein imports might lead to a reduction in overall milk supply, which, in turn, would reduce production of butterfat and cause the price of butter to increase.

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[51] Daniel A. Sumner and Joseph Balagtas, "Effects of Imported Milk Protein Concentrate on the U.S. Dairy Situation," unpublished paper commissioned by Dairy Companies Association of New Zealand and Dairy Australia for submission to the USITC hearing, Dec. 11, 2003; posthearing submission to the USITC on behalf of the Dairy Companies Association of New Zealand, Dec. 23, 2003; Daniel Sumner, email message sent to USITC staff, received Jan. 13, 2004.

[52] Kenneth W. Bailey, "Implications of Dairy Imports: The Case of Milk Protein Concentrates," *Agricultural and Resource Economics Review*, vol. 31, No. 2 (2002), pp. 248-59.

[53] Detailed summaries of these studies are provided in appendix H.

[54] Joseph Burke, and Thomas Cox, "University of Wisconsin-Madison/ITC Proposal: Assessing the impacts of Off-Shore Dairy-Based Ingredients on the U.S. Dairy Sector," unpublished and undated paper, Department of Agricultural Economics, University of Wisconsin, Madison, WI, received by USITC staff on Sept. 30, 2003; USITC staff's field notes of meetings with University of Wisconsin dairy economists, Aug. 19, 2001; telephone conversation with Dr. Thomas Cox, University of Wisconsin dairy economist, Sept. 22 and Oct. 1, 2003.

Table 9-5

Summary of models and results on effects of milk protein concentrate imports on the U.S. dairy industry

Author(s)	General framework and general dimensions.	Experiments simulated	Results
Burke and Cox (2004) Goal: model milk protein import-induced impacts on U.S. dairy sector.	Mathematical programming optimization following Samuelson/Takayama/Judge. Products: 5 components or inputs, and 23 intermediate or final products, including Chapter 4 and 35 MPC. Regions: Aggregate U.S. region and undetermined number of foreign regions. 2002 baseline.	Five simulations against baseline focus on three policy issues: (1) elimination of MPC imports under varying degrees of substitutability among cheese and noncheese proteins; (2) unlimited MPC imports with relaxed standards of identity; and (3) implementation of mild and pronounced tilts ($0.80/lb, $0.70/lb).	(1) MPC import elimination effects on U.S. dairy markets generally mild: little/no effect on farm milk price, farm revenue, and milk supply, although Commodity Credit Corporation (CCC) purchases decline 22-70 percent. (2) Relaxation of standards identity has generally mild U.S. market impacts: little/no change in farm milk price, supply, revenue, and prices/use of most dairy products, although CCC purchases noticeably rise 219 percent and MPC imports escalate ten-fold. (3) Implementation of tilts generates following ranges of noticeable impacts: decline in milk prices (2-4 percent), farm revenue (3-6 percent), and milk supply (1-2 percent); 31-70 percent declines in CCC purchases; and large changes in selected product prices and use levels. Pronounced tilt to a $0.70/lb, skim milk powder (SMP) support price equals world 2002 level and effectively dismantles dairy price support program.
Nicholson and Bishop (2004) Goal: model milk protein import-induced impacts on U.S. dairy sector.	Mathematical programming optimization following Samuelson/Takayama/Judge with extended, nonlinear framework. Products: 3 components and 15 final products including 12 separate Chapter 4 and 35 imports. Regions: bi-regional United States (California and rest of United States) and aggregate rest of world. 2001 baseline. Includes 888 equations.	One simulation against baseline: elimination of Chapter 4 MPC imports (Chapter 35 MPC35 imports unchanged) under two assumptions: (1) dairy users consider MPC and SMP perfect substitutes, and (2) nondairy users have no alternative substitute for MPC such that domestic MPC production is activated.	MPC import elimination induces domestic MPC production, and in turn, the demand for milk, and generating following U.S. effects: increases in farm milk price (0.4 percent), milk production (0.1 percent), and cheese prices (1 percent). As MPC production side effect, butter production rises 21 million pounds and price falls 4 percent. SMP production falls 4 percent and SMP prices unchanged, as CCC purchases increase 13 percent.
Sumner and Balagtas (2003) Goal: model milk protein import-induced impacts on U.S. dairy sector.	COMPAS-like partial equilibrium model of US/rest of world trade in milk protein. Log-linear, percent change model. 2 components: protein and nonprotein solids. 1999-2002 baseline. Includes 12 equations.	25 percent drop in milk protein imports.	1.5 percent rise in milk protein price and 1 percent decline in price of nonprotein solids; 0.3 percent rise in farm milk price; 0.1 percent rise U.S. milk production; less than 0.5 percent rise in U.S. dairy revenues.

Table 9-5—*Continued*

Summary of models and results on effects of milk protein concentrate imports on the U.S. dairy industry

Author(s)	General framework and general dimensions.	Experiments simulated	Results
Bailey (2002) Goal: econometrically estimate U.S. demand for SMP and imported milk proteins. Simulate effects of milk protein price changes on U.S. dairy sector.	Econometrically estimated, quarterly two-sector model of the U.S. SMP subsector and U.S. milk imports. Summarized by 3 Seemingly unrelated regression (SUR)-estimated demand equations: equations for U.S. SMP, imported MPC4, and imported MPC35. Equations estimated 1990.1-2000.4; 1996.1-2000.4 baseline. Simulated over all or part of baseline period.	Simulation 1: rise in world milk protein price to $0.99/lb. Simulation 2: decrease CCC purchase SMP price to $0.80/lb.	Ranges of quarterly results: Simulation 1: rise in SMP use, 10-42 percent; imports fall 14-51 percent; CCC SMP outlays fall $800 million. Simulation 2: SMP prices falls 14-35 percent; SMP use up 7-21 percent; substantial fall in imports; and Federal outlays fall $572 million.

Sources: Joseph Burke and Thomas Cox, "University of Wisconsin-Madison/ITC Proposal: Assessing the impacts of Off-Shore Dairy-Based Ingredients on the U.S. Dairy Sector," unpublished and undated paper, Department of Agricultural Economics, University of Wisconsin, Madison, WI, received by USITC staff on Sept. 30, 2003; Charles F. Nicholson and Phillip M. Bishop, "U.S. Dairy Product Trade: Modeling Approaches and the Impact of New Product Formulations," Final Report for NRI Grant No. 2001-35400-10249, Cornell Program on Dairy Markets and Policy, Department of Applied Economics and Management, Cornell University (Mar. 2004); Daniel A. Sumner and Joseph Balagtas, "Effects of Imported Milk Protein Concentrate on the U.S. Dairy Situation," unpublished paper commissioned by Dairy Companies Association of New Zealand and Dairy Australia for submission to the USITC hearing, Dec. 11, 2003; Kenneth W. Bailey, "Implications of Dairy Imports: The Case of Milk Protein Concentrates," *Agricultural and Resource Economics Review*, vol. 31, No. 2 (2002), pp. 248-59.

Burke and Cox[55] simulated their model to estimate the impacts of certain changes in trade and domestic policies on the U.S. dairy industry. In all, five policy scenarios were analyzed: elimination of MPC imports (scenarios 1 and 2); allowing unlimited imports of MPC with relaxation of standards of identity for cheese making (scenario 4); and, adjustment of the government support prices of SMP and butter (tilt changes) (scenarios 3 and 5). The effects of these policy changes on key U.S. dairy industry variables were analyzed, including farm milk price, milk supply and farm revenue, CCC purchases of SMP, as well as market prices and commercial disappearance for a number of processed dairy products (whole milk, skim milk, butter, cheese, SMP, condensed skim milk, buttermilk, soft products, and frozen products).

In scenarios 1 and 2, Burke and Cox simulate the effects of setting MPC imports to zero. Simulations are run under two extreme assumptions about the substitutability between cheese proteins and noncheese proteins, where cheese proteins are those from SMP and MPC (primarily casein) for use in cheese making (these exclude whey stream products), whereas noncheese proteins are those which are not used in cheese making, and include whey stream products. Import elimination under both scenarios has negligible effects on farm-level milk prices, dairy product prices, and domestic production. Domestic production of MPC increases in response to the demands of manufacturers of nonstandardized cheese and nondairy products (e.g., nutritional beverages and sports drinks). However, the main impact of eliminating MPC imports under both scenarios is on the level of CCC purchases, which fall by between 180 million pounds (scenario 1) and 581 million pounds (scenario 2) compared with the 2002 base.

Under the assumption of unlimited MPC imports and full liberalization of FDA domestic-cheese standards to permit MPC use in all production (scenario 4), imports of MPC increase dramatically (from 107 million pounds in the baseline to 1.2 billion pounds, a ten-fold increase). Again, there are no significant changes in farm milk prices, milk supply, or farm revenues. Further, there is little impact on dairy product prices (3 percent or lower) and commercial disappearance levels (1 percent or less), because the CCC absorbs the additional imports, such that CCC purchases of SMP escalate from 828 million pounds to 2.6 billion pounds, an increase of 219 percent.

Given that most of the effects of alternative MPC import scenarios are through the CCC purchases and stock levels, Burke and Cox explore how tilt changes might impact farm-level prices. They simulate implementation of two tilts—adjusting the support price of SMP down from \$0.90/lb to \$0.80/lb (i.e., the November 2002 tilt) (scenario 3) and a hypothetical tilt where the SMP support price is lowered from \$0.90/lb to \$0.70/lb (scenario 5). Model simulations of these policy changes indicate that the effects of the 90/80 tilt would likely reduce the farm-level price by about 2 percent (or \$0.26/cwt).[56] However, the milk price decline is shown to be largely offset by the 2002 MILC payments, so that overall farm revenue is unchanged. However, the 90/70 tilt is equivalent to eliminating the dairy price support program, because the 70-cent SMP support price is equivalent to the world price in 2002. In this scenario, the market effects are significant. First, the lower support price leads

[55] Simulation scenarios and resulted based on: Joseph Burke and Thomas Cox, "Impact of MPC Imports on Farm-Gate Milk Prices and CCC Purchases of Dry Milk, Executive Summary," unpublished paper, Department of Agricultural and Applied Economics, University of Wisconsin, Madison (undated, but received by USITC staff, Feb. 27, 2004), pp. 1-6.

[56] This impact differs from the results of the Cox analysis of the 90/80 tilt change reported earlier. This is mainly because of a difference in the base period.

to a reduction in the milk price by about $0.52/cwt (or 4 percent), and milk supply falls by about 2 percent and farm revenues by almost 6 percent. Again, the effects of lower milk prices and revenues are offset (though not entirely in this scenario) by additional deficiency payments under the MILC. The 90/70 tilt would also have significant effects of dairy product prices, ranging from a 24 percent increase in the price of butter to a 23 percent drop in the price of SMP. Another key finding of the 90/70 tilt analysis is that a 70-cent SMP support price would completely eliminate imports of MPC because cheaper milk proteins would be available from the domestic market.

The Burke and Cox analysis confirms that the mechanism by which imported milk proteins can affect farm-level prices is through a change in the tilt. They indicate that changes could lower farm-level milk prices by 2 to 4 percent depending on the magnitude of the tilt change, although the overall impact on farm revenues depends on the degree to which additional MILC payments offset the decline in the milk price. The key question of whether USDA would have adjusted the tilt during 2000-2002, absent growth in milk protein imports, is not answered by the quantitative analysis. However, Burke and Cox show that elimination of milk protein imports would decrease CCC purchases of SMP by 180 to 581 million pounds, depending on the assumption about protein substitutability,[57] and in their view, displacement of 581 million pounds of SMP would be sufficient to have induced a tilt.

Bishop and Nicholson (2004, Ongoing)[58]

Bishop and Nicholson developed a mathematical programming model that estimates the effects of milk protein imports on the U.S. dairy industry, including effects on U.S. production, consumption, prices, and Federal outlays on the dairy price support program. Products in the model are specified in terms of milk components (fat, protein, and other solids), and the model solves for component and product prices by balancing components not only among regions, but also among competing plants within regions. The model calibrates to a 2001 baseline and includes 888 equations and variables. Included in the model are 15 final products, 7 interplant dairy products traded/shipped among processors, a two-region U.S. entity (California and the rest of the country), and an endogenous 12-product import model. Bishop and Nicholson's model balances components at both the regional and processor (plant) levels with nonlinear and endogenous yield equations rather than fixed Leontief proportions.

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[57] This range is consistent with the Commission estimate of 353 million pounds of CCC SMP stocks that were attributable to imports of milk protein products. It is also consistent with the estimate by Edward V. Jesse that displacement of SMP by imported proteins increased from 200 million pounds in 1997 to 400 million pounds in 2002.

[58] Phillip Bishop and Charles Nicholson, "Market Impacts of Milk Trade Policy: Brief Model Description," unpublished paper, Department of Applied Economics and Management, Cornell University, Sept. 25, 2003; Phillip Bishop, and Charles Nicholson, "Assessing the Market Impacts of Dairy Protein Trade Policy: Comments on Current Status," unpublished summary of project status, Department of Applied Economics and Management, Cornell University, July 21, 2003; USITC staff field notes of meetings with Cornell University dairy economists, July, 2003; Charles Nicholson, telephone interview by USITC staff, Sept. 2003.

Nicholson and Bishop[59] provide preliminary results for the effects of restricting U.S. imports of MPC (HTS 0404.90.10 only) on the U.S. dairy sector. They look at elimination of U.S. MPC imports under two different assumptions about the substitutability of imported and domestically produced protein. Under the first assumption, dairy users consider MPC and domestic dairy proteins (particularly SMP) as perfect substitutes; and under the second assumption, other nondairy users of milk protein have no available substitute protein for imported MPC, such that import restrictions result in domestic MPC production.

Similar to Burke and Cox, model results indicate that the market impacts of eliminating U.S. MPC imports on farm-level milk prices are mild. The Nicholson and Bishop results show that by banning MPC imports, incentives are created for domestic MPC production which, in turn, increases demand for milk and leads to a 0.4-percent rise ($0.06/cwt) in the U.S. all-milk price. Higher milk prices translate into increased U.S. milk production, which rises by about 0.1 percent or 200 million pounds. The model captures the counter effects of an increase in milk production on other milk-component prices. For example, increased domestic production of MPC raises demand for raw milk and generates by-product production of fat and whey products, leading to a 21-million-pound rise in butter production and a 4-percent decline in the price of butter. U.S. cheese prices rise by about 1 percent, and the prices of certain evaporated and condensed milk products increase by about 2 percent. U.S. production levels for most final dairy products change by less than 0.5 percent, although production of butter increases by 1.6 percent, whereas the production of SMP falls by 34 million pounds or 4 percent. As SMP production drops, CCC purchases also decline by a similar amount or by nearly 13 percent, resulting in a $36-million Federal outlay savings.

Sumner and Balagtas (2003)[60]

In a study commissioned by the New Zealand and Australian dairy industries, Sumner and Balagtas provide an analysis of the influence of milk protein product imports on the U.S. dairy sector, with focus on effects on the U.S. farm milk price. The framework employed is a partial equilibrium, comparative static, log-linear (percent-change) model that captures relationships along the vertical chain from the farm-gate to consumers. The model includes two regions—the United States and the rest of the world—and is based on an accounting system in which all domestic dairy products and imported milk proteins are denominated in terms of two milk components—protein and nonprotein solids. It is also assumed that all U.S.-produced milk proteins form, or translate into, a domestic aggregate or "composite;" and that all imported milk proteins form an imported milk protein composite. Imported and domestic milk protein composites are considered as imperfect substitutes. Domestic and imported protein composites then form a single total U.S.-market milk protein supply, which

[59] Charles F. Nicholson and Phillip M. Bishop, *U.S. Dairy Product Trade: Modeling Approaches and the Impact of New Product Formulations*, Final Report for NRI Grant No. 2001-35400-10249, Cornell Program on Dairy Markets and Policy, Department of Applied Economics and Management, Cornell University (Mar. 2004). Charles Nicholson and Phillip Bishop, telephone interview by USITC staff, Mar. 2, 2004.

[60] Daniel A. Sumner and Joseph Balagtas, "Effects of Imported Milk Protein Concentrate on the U.S. Dairy Situation," unpublished paper commissioned by Dairy Companies Association of New Zealand and Dairy Australia for submission to the USITC hearing, Dec. 11, 2003; posthearing submission to the USITC on behalf of the Dairy Companies Association of New Zealand, Dec. 23, 2003; Daniel Sumner, email message sent to USITC staff, received Jan. 13, 2004.

is combined with the supplies of nonprotein solids as inputs, or "building blocks," in the production of a single aggregate U.S. dairy output. The model parameters assume limited technical substitutability between the protein and nonprotein milk components in the production of the U.S. dairy aggregate output.[61]

Simulation results are reported for reductions in milk protein imports by 12.5 percent, 25 percent, and 50 percent under a range of assumptions about substitutability and other key parameters. The results indicate that any restrictions on imported milk protein products would have little effect on U.S. farm milk price, milk use, and milk revenues. More specifically, a 25-percent reduction[62] in milk protein imports from the 1999-2002 baseline levels would generate minor U.S. protein price increases of 1.5 percent or less; price declines for U.S. nonprotein solids of about 1 percent; increases in U.S. farm milk price of 0.3 percent or less; small rises in U.S. milk quantity of 0.14 percent or less; and increases in U.S. milk revenues of less than 0.5 percent. These results are driven by the degree of substitutability among the imported and domestic protein composites (assumed as imperfect or moderate substitutes) and the imported protein composite's share of the total milk protein market (calculated at 4.7 percent).

Bailey (2002)[63]

Bailey econometrically estimates and simulates a quarterly model to test two hypotheses. First, did the combination of lowering U.S. import barriers, low world milk protein prices, and high U.S. levels of dairy sector support lead to escalating U.S. imports of milk protein products? And, second, did increased milk protein product imports displace U.S. SMP, and raise U.S. Federal outlays on the dairy program through increased Federal SMP purchases? Owing to limited data resources, Bailey econometrically estimated a two-subsector U.S. milk protein model (domestic SMP market and imported milk proteins) with three U.S. demand equations as a seemingly unrelated regression (SUR) system. Three U.S. demand equations were specified for SMP, milk protein imports entering under HTS Chapter 4 (MPC 4), and protein imports entering under HTS Chapter 35 (MPC 35).

The model was estimated over 1991-2000, and simulated over 1996-2000 under two experiments: (1) a rise in the world SMP price to $0.99/lb, and (2) a fall in the CCC SMP purchase price to $0.80/lb. As formulated, the simulation results are a series of period-specific quarterly values for all, or part, of the 1996-2000 period, which are summarized in ranges. Increasing the world protein price to $0.99/lb generated the following ranges of results over the 1997-2002 period: U.S. quarterly SMP use would rise by between 10 and 42 percent, and quarterly protein product imports would fall by between 14 and

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[61] At the hearing and in posthearing requests, substantive questions arose regarding some of these assumptions, particularly on aggregating all imported and all domestic milk proteins into a two separate composites, and over the assumed imperfect substitutability of the domestic and imported protein composites. Daniel Sumner, Department of Agricultural and Resource Economics, University of California, Davis, testimony before the USITC, Dec. 11, 2003, pp. 395-98.

[62] Since the model is linear, results of different simulations are proportional to the differences in size of the simulated shocks, and only the results of the 25-percent milk protein product import decline are provided here.

[63] Kenneth W. Bailey, "Implications of Dairy Imports: The Case of Milk Protein Concentrates," *Agricultural and Resource Economics Review*, vol. 31, No. 2 (2002), pp. 248-59.

51 percent. Over the entire 1996-2000 period, U.S. Federal dairy program outlays would fall by more than $800 million. Results from dropping the CCC purchase price of SMP to $0.80/lb generated the following ranges of results over the 1996-2002 period: U.S. quarterly SMP use would rise by between 7 and 21 percent; the U.S. SMP market price would fall by between 14 and 35 percent. U.S. protein product imports would fall noticeably (by up to 91 percent for MPC 4 and by up to 30 percent for MPC 35). And over the entire 1996-2000 simulation period, model results suggest that U.S. dairy program outlays would decline by $572 million.

APPENDIX A
REQUEST LETTER FROM THE SENATE FINANCE COMMITTEE

chair rec'd 5/14/03
1. Secretary
2. OPS.
3. ER

United States Senate
COMMITTEE ON FINANCE
WASHINGTON, DC 20510-6200

May 13, 2003

ER — MAY 13 RECD — 043

DOCKET NUMBER 2305
Office of the Secretary Int'l Trade Commission

'03 MAY 14 AM 0:49

The Honorable Deanna Tanner Okun
Chairman
U.S. International Trade Commission
500 E Street, S.W.
Washington, DC 20436

Dear Chairman Okun:

I am writing to request that the U.S. International Trade Commission (ITC) conduct an investigation under section 332(g) of the Tariff Act of 1930 (19 U.S.C. 1332(g)) regarding U.S. market conditions for milk proteins.

The investigation should examine the competitiveness of a variety of milk proteins in the U.S. market, focusing on milk protein concentrate, casein, and caseinate and the market for those products compared with other milk proteins, including whole milk, skim milk, dried whole milk, dried skim milk, whey, dried whey, and whey protein concentrates. The report should focus on the period 1998-2002.

To the extent possible, the report should include the following:

- an overview of the global market for milk proteins in their various forms, including such factors as consumption, production, and trade during the period 1998-2002;

- profiles of the milk protein industries of the United States and major dairy exporting countries, and in particular, the industries of Australia, New Zealand, and the European Union;

- information on the overall level of government support and other government intervention affecting producers of milk proteins in the United States and in each of the above-referenced trading partners together with a discussion of competitive factors, including government policies, that impact U.S. production, use, and trade in milk protein products in their various forms;

- information on U.S. imports and exports of milk protein in its various forms with data broken down, to the extent possible, by protein content, end use, and manufacturing processes;

The Honorable Deanna Tanner Okun
May 13, 2003
Page Two

- a history of U.S. tariff classification of milk proteins and tariff treatment of these products, including any fees or quotas imposed under section 22 of the Agricultural Adjustment Act, tariff rate quotas established pursuant to the Uruguay Round Agreements, and U.S. Customs Service classification decisions;

- a qualitative and, to the extent possible, quantitative assessment of how imported milk proteins affect farm level milk prices in the United States; and,

- other information relating to competitive factors affecting: (1) the U.S. industry that imports and consumes milk proteins; (2) the U.S. industry that supplies competitive products, and (3) the competitive factors, including government policies, that impact potential U.S. production of milk proteins in their various forms.

The Commission should provide its completed report no later than twelve months from the receipt of this request. As we intend to make the report available to the public, we request that it not contain confidential business information.

Sincerely,

Chuck Grassley

Charles E. Grassley
Chairman

APPENDIX B
FEDERAL REGISTER NOTICES

Addison, IL, Magruder Color Company, Inc., Elizabeth, NJ, and Sun Chemical Corporation, Fort Lee, NJ.

Participation in the Investigations and Public Service List

Persons (other than petitioners) wishing to participate in these investigations as parties must file an entry of appearance with the Secretary to the Commission, as provided in sections 201.11 and 207.10 of the Commission's rules, not later than seven days after publication of this notice in the **Federal Register**. Industrial users and (if the merchandise under investigation is sold at the retail level) representative consumer organizations have the right to appear as parties in Commission countervailing duty and antidumping investigations. The Secretary will prepare a public service list containing the names and addresses of all persons, or their representatives, who are parties to these investigations upon the expiration of the period for filing entries of appearance.

Limited Disclosure of Business Proprietary Information (BPI) Under an Administrative Protective Order (APO) and BPI Service List

Pursuant to section 207.7(a) of the Commission's rules, the Secretary will make BPI gathered in these investigations available to authorized applicants representing interested parties (as defined in 19 U.S.C. 1677(9)) who are parties to these investigations under the APO issued in these investigations, provided that the application is made not later than seven days after the publication of this notice in the **Federal Register**. A separate service list will be maintained by the Secretary for those parties authorized to receive BPI under the APO.

Conference

The Commission's Director of Operations has scheduled a conference in connection with these investigations for 9:30 a.m. on June 27, 2003, at the U.S. International Trade Commission Building, 500 E Street SW., Washington, DC. Parties wishing to participate in the conference should contact Fred Ruggles (202–205–3187 or *fruggles@usitc.gov*) not later than June 25, 2003, to arrange for their appearance. Parties in support of the imposition of countervailing duties and antidumping duties in these investigations and parties in opposition to the imposition of such duties will each be collectively allocated one hour within which to make an oral presentation at the conference. A nonparty who has testimony that may aid the Commission's deliberations may request permission to present a short statement at the conference.

Written Submissions

As provided in sections 201.8 and 207.15 of the Commission's rules, any person may submit to the Commission on or before July 2, 2003, a written brief containing information and arguments pertinent to the subject matter of these investigations. Parties may file written testimony in connection with their presentation at the conference no later than three days before the conference. If briefs or written testimony contain BPI, they must conform with the requirements of sections 201.6, 207.3, and 207.7 of the Commission's rules. The Commission's rules do not authorize filing of submissions with the Secretary by facsimile or electronic means, except to the extent permitted by section 201.8 of the Commission's rules, as amended, 67 FR 68036 (November 8, 2002).

In accordance with sections 201.16(c) and 207.3 of the rules, each document filed by a party to these investigations must be served on all other parties to these investigations (as identified by either the public or BPI service list), and a certificate of service must be timely filed. The Secretary will not accept a document for filing without a certificate of service.

Authority: These investigations are being conducted under authority of title VII of the Tariff Act of 1930; this notice is published pursuant to section 207.12 of the Commission's rules.

Issued: June 6, 2003.

By order of the Commission.

Marilyn R. Abbott,

Secretary to the Commission.

[FR Doc. 03–14793 Filed 6–10–03; 8:45 am]

BILLING CODE 7020–02–P

INTERNATIONAL TRADE COMMISSION

[Investigation No. 332–453]

Conditions of Competition for Milk Protein Products in the U.S. Market

AGENCY: United States International Trade Commission.

ACTION: Institution of investigation and scheduling of public hearing.

EFFECTIVE DATE: June 5, 2003.

SUMMARY: Following receipt of the request on May 14, 2003, from the Senate Committee on Finance, the Commission instituted investigation No. 332–453 *Conditions of Competition for Milk Protein Products in the U.S. Market,* under section 332(g) of the Tariff Act of 1930 (19 U.S.C. 1332(g)).

As requested by the Committee, the Commission will conduct an investigation and provide a report on competitive conditions for milk protein products in the U.S. market. In its report the Commission will provide, to the extent possible, the following:

- An overview of the global market for milk proteins in their various forms, including such factors as consumption, production, and trade during the period 1998–2002;
- Profiles of the milk protein industries of the United States and major dairy exporting countries, and in particular, the industries of Australia, New Zealand, and the European Union;
- Information on the overall level of government support and other government intervention affecting producers of milk proteins in the United States and in each of the above-referenced trading partners together with a discussion of competitive factors, including government policies, that impact U.S. production, use, and trade in milk protein products in their various forms;
- Information on U.S. imports and exports of milk protein in its various forms with data broken down, to the extent possible, by protein content, end use, and manufacturing processes;
- A history of U.S. tariff classification of milk proteins and tariff treatment of these products, including any fees or quotas imposed under section 22 of the Agricultural Adjustment Act, tariff rate quotas established pursuant to the Uruguay Round Agreements, and U.S. Customs Service classification decisions;
- A qualitative and, to the extent possible, quantitative assessment of how imported milk proteins affect farm level milk prices in the United States; and,
- Other information relating to competitive factors affecting: (1) The U.S. industry that imports and consumes milk proteins; (2) the U.S. industry that supplies competitive products, and (3) the competitive factors, including government policies, that impact potential U.S. production of milk proteins in their various forms.

As requested by the Committee, the Commission's report will provide information on the competitiveness of a variety of milk proteins in the U.S. market, focusing on milk protein concentrate, casein, and caseinate and the market for those products compared with other milk proteins, including whole milk, skim milk, dried whole milk, dried skim milk, whey, dried whey, and whey protein concentrates, covering the period 1998–2002. As requested, the Commission will transmit its report to the Committee by May 14, 2004. The Committee indicated that it intends to make the report public.

FOR FURTHER INFORMATION CONTACT: Industry-specific information may be obtained from Jonathan Coleman, Project Leader (202–205–3465 or *jcoleman@usitc.gov*) or Warren Payne, Deputy Project Leader (202–205–3317 or *wpayne@usitc.gov*), Office of Industries, U.S. International Trade Commission, Washington, DC 20436. For information on legal aspects of this investigation, contact William Gearhart of the Office of General Counsel (202–205–3091 or *wgearhart@usitc.gov*). Hearing impaired individuals are advised that information on this matter can be obtained by contacting the TDD terminal on (202–205–1810).

Public Hearing

A public hearing in connection with the investigation will be held at the U.S. International Trade Commission Building, 500 E Street SW, Washington, DC beginning at 9:30 a.m. on December 4, 2003. All persons shall have the right to appear, by counsel or in person, to present information and to be heard. Requests to appear at the public hearing should be filed with the Secretary, United States International Trade Commission, 500 E Street SW, Washington, DC 20436, no later than 5:15 p.m., November 20, 2003. Any prehearing briefs (original and 14 copies) should be filed not later than 5:15 p.m., November 24, 2003, the deadline for filing post-hearing briefs or statements is 5:15 p.m., December 18, 2003. In the event that, as of the close of business on November 20, 2003, no witnesses are scheduled to appear at the hearing, the hearing will be canceled. Any person interested in attending the hearing as an observer or non-participant may call the Secretary (202–205–1806) after November 20, 2003, to determine whether the hearing will be held.

Written Submissions

In lieu of or in addition to participating in the hearing, interested parties are invited to submit written statements concerning the investigation. Commercial or financial information that a submitter desires the Commission to treat as confidential must be submitted on separate sheets of paper, each clearly marked "Confidential Business Information" at the top. All submissions requesting confidential treatment must conform with the requirements of section 201.6 of the *Commission's Rules of Practice and Procedure* (19 CFR 201.6). All written submissions, except for confidential business information, will be made available for inspection by interested parties. The Senate Committee on Finance has requested that the Commission prepare a public report (containing no confidential business information). Accordingly, any confidential business information received by the Commission in this investigation and used in preparing the report will not be published in a manner that would reveal the operations of the firm supplying the information. To be assured of consideration by the Commission, written statements relating to the Commission's report should be submitted to the Commission at the earliest practical date and should be received no later than the close of business on December 18, 2003. All submissions should be addressed to the Secretary, United States International Trade Commission, 500 E Street SW, Washington, DC 20436. The Commission's rules do not authorize filing submissions with the Secretary by facsimile or electronic means, except to the extent permitted by section 201.8 of the Commission's Rules, as amended, 67 FR 8036 (Nov. 8, 2002). The public record for this investigation may be viewed on the Commission's electronic docket (EDIS) at *http://edis.usitc.gov.* Hearing-impaired individuals are advised that information on this matter can be obtained by contacting our TDD terminal on (202) 205–1810. Persons with mobility impairments who will need special assistance in gaining access to the Commission should contact the Office of the Secretary at 202–205–2000.

List of Subjects

Milk proteins, government intervention, tariffs, and imports.

Issued: June 5, 2003.

By order of the Commission.

Marilyn R. Abbott,

Secretary.

[FR Doc. 03–14792 Filed 6–10–03; 8:45 am]

BILLING CODE 7020–02–P

DEPARTMENT OF JUSTICE

Bureau of Alcohol, Tobacco, Firearms, and Explosives

Agency Information Collection Activities: Proposed Collection Commnets Requested

ACTION: 30-day notice of information collection under review: extension of a currently approved collection; Application and Permit for Temporary Importation of Firearms and Ammunition by Nonimmigrant Aliens.

The Department of Justice (DOJ), Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) has submitted the following information collection request to the Office of Management and Budget (OMB) for review and approval in accordance with the Paperwork Reduction Act of 1995. The proposed information collection is published to obtain comments from the public and affected agencies. This proposed information collection was previously published in the **Federal Register** Volume 68, Number 51, and page 12716 on March 17, 2002, allowing for a 60-day comment period.

The purpose of this notice is to allow for an additional 30 days for public comment until July 11, 2003. This process is conducted in accordance with 5 CFR 1320.10.

Written comments and/or suggestions regarding the items contained in this notice, especially the estimated public burden and associated response time, should be directed to The Office of Management and Budget, Office of Information and Regulatory Affairs, Attention Department of Justice Desk Officer, Washington, DC 20503. Additionally, comments may be submitted to OMB via facsimile to (202) 395–7285.

Written comments and suggestions from the public and affected agencies concerning the proposed collection of information are encouraged. Your comments should address one or more of the following four points:

(1) Evaluate whether the proposed collection of information is necessary for the proper performance of the functions of the agency, including whether the information will have practical utility;

(2) Evaluate the accuracy of the agencies estimate of the burden of the proposed collection of information, including the validity of the methodology and assumptions used;

(3) Enhance the quality, utility, and clarity of the information to be collected; and

(4) Minimize the burden of the collection of information on those who are to respond, including through the use of appropriate automated, electronic, mechanical, or other technological collection techniques or other forms of information technology, *e.g.*, permitting electronic submission of responses.

also be obtained by contacting the park Superintendent. This information will also be published on the General Management Plan Web site *(http://www.nps.gov/abli)* for Abraham Lincoln Birthplace.

ADDRESSES: Scoping suggestions should be submitted to the following address to ensure adequate consideration by the National Park Service: Superintendent, Abraham Lincoln Birthplace National Historic Site, 2995 Lincoln Farm Road, Hodgenville, Kentucky 42748, Telephone: 270–358–3137, e-mail: *Abli_Superintendent@nps.gov.*

FOR FURTHER INFORMATION CONTACT: Superintendent, Abraham Lincoln Birthplace National Historic Site, 2995 Lincoln Farm Road, Hodgenville, Kentucky 42748, Telephone: 270–358–3137, e-mail: *Abli_Superintendent@nps.gov.*

SUPPLEMENTARY INFORMATION: Abraham Lincoln Birthplace National Historic Site is located about 3 miles south of Hodgenville, Kentucky, on U.S. Highway 31E and Kentucky Highway 61. The park was authorized on June 11, 1940, and now consists of more than 340 acres. The park was established in 1933 when it was transferred from the War Department to the National Park Service. The site contains a cabin, symbolic of the one in which Lincoln was born, preserved in a memorial building at the site of his birth. The Master Plan was completed in 1964 and in the ensuing years much has changed. A boundary change occurred in 1998, which added a Boyhood Home Unit to the park. This area contains the site of the Lincoln farm along with the field and surrounding woodland area belonging to that farm. Also the site contains a historic tavern and replica cabin. A General Management Plan and Environmental Impact Statement would provide the park with better guidance and direction in regard to management of natural and cultural resources and providing a quality visitor experience.

The plan will provide direction to correct existing management deficiencies through the establishment of management prescriptions, carrying capacities and appropriate types and levels of development and recreational use for all areas of the park. Resource protection, visitor experiences and community relationships will be improved through completion and implementation of the General Management Plan.

Public documents associated with the planning effort, including all newsletters, will be posted on the Internet through the Park's Web site at *http://www.nps.gov/abli.*

The Draft and Final General Management Plan and Environmental Impact Statement will be made available to all known interested parties and appropriate agencies. Full public participation by federal, state, and local agencies as well as other concerned organizations and private citizens is invited throughout the preparation process of this document.

The responsible official for this Environmental Impact Statement is Patricia A. Hooks, Acting Regional Director, Southeast Region, National Park Service, 100 Alabama Street SW., 1924 Building, Atlanta, Georgia 30303.

Dated: September 23, 2003.

Patricia A. Hooks,

Acting Regional Director, Southeast Region.

[FR Doc. 03–28388 Filed 11–12–03; 8:45 am]

BILLING CODE 4310–L6–P

INTERNATIONAL TRADE COMMISSION

[Investigation 332–453]

Conditions of Competition for Milk Protein Products in the U.S. Market

AGENCY: United States International Trade Commission.

ACTION: Rescheduling of public hearing.

EFFECTIVE DATE: November 5, 2003.

SUMMARY: The public hearing on this matter, scheduled for December 4, 2003, has been rescheduled to December 11, 2003. The public hearing will be held at the U.S. International Trade Commission building, 500 E Street SW., Washington, DC, beginning at 9:30 a.m. on December 11, 2003. All interested persons will have the right to appear, by counsel or in person, to present information and to be heard. Requests to appear at the public hearing should be filed with the Secretary, United States International Trade Commission, 500 E Street SE., Washington, DC 20436, no later than 5:15 p.m., November 26, 2003. Any prehearing briefs (original and 14 copies) should be filed not later than 5:15 p.m., December 1, 2003; the deadline for filing post-hearing briefs or statements is 5:15 p.m., December 24, 2003.

FOR FURTHER INFORMATION CONTACT: Industry-specific information may be obtained from Mr. Jonathan Coleman, project leader (202–205–3465) or Mr. Warren Payne, deputy project leader (202–205–3317) of the Office of Industries, U.S. International Trade Commission, Washington, DC 20436. For information on the legal aspects of this investigation contact Mr. William Gearhart of the Office of the General Counsel (202–205–3091). Hearing impaired individuals are advised that information on this matter can be obtained by contacting the TDD Terminal on (202–205–1107).

SUPPLEMENTARY INFORMATION: This investigation is being conducted at the request of the Senate Committee on Finance in its letter of May 14, 2003. The Commission plans to submit its report by May 14, 2004. Notices of institution of the investigation and an earlier scheduled hearing date were published in the **Federal Register** of June 11, 2003 (68 FR 35004).

The Commission is particularly interested in receiving testimony with respect to the following:

(1) the end use applications of various milk protein products;

(2) the ability of different milk and non-milk proteins to substitute for each other in end use applications, considering both the functional and nutritional aspects that impact the substitutability of different proteins;

(3) the different production processes associated with various forms of milk protein and the impact of the production process on their nutritional and functional characteristics;

(4) the impact of U.S. government intervention on the profitability of commercial milk protein concentrate and casein production in the United States;

(5) the impact of imports of milk proteins on U.S. farm-level milk prices;

(6) the impact of foreign government intervention on the ability of imported milk proteins to compete in the U.S. market; and

(7) the global market for milk protein products, especially trade involving high-value or customized dairy products.

Written Submissions: As provided for in the Commission's prior notices, in lieu of or in addition to participating in the hearing, interested parties are invited to submit written statements (original and 14 copies) concerning the matters to be addressed by the Commission in its report on this investigation. Commercial or financial information that a person desires the Commission to treat as confidential must be submitted on separate sheets of paper, each clearly marked "Confidential Business Information" at the top. The Commission's Rules do not authorize filing of submissions with the Secretary by facsimile or electronic means. All submissions requesting confidential treatment must conform with the requirements of section 201.6 of the Commission's Rules of Practice and Procedure (19 CFR 201.6). All written submissions must conform with the provisions of section 201.8 of the Commission's Rules. The Commission's rules do not authorize filing submissions with the Secretary by facsimile or electronic means, except to the extent permitted by section 201.8 of the Commission's Rules (19 CFR 201.18) (*see* Handbook for Electronic Filing Procedures, *ftp://FTP.usitc.gov/pub/reports/electronic_filing_handbook.pdf*). All written submissions, except for confidential business information, will be made available in the Office of the Secretary of the Commission for inspection by interested parties. To be assured of consideration by the Commission, written statements relating to the Commission's report should be submitted to the Commission at the earliest practical date and should be received no later than the close of business on December 24, 2003. All submissions should be addressed to the Secretary, United States International Trade Commission, 500 E Street SW., Washington, DC 20436.

Persons with mobility impairments who will need special assistance in gaining access to the Commission should contact the Office of the Secretary at (202–205–2000). General information concerning the Commission may also be obtained by accessing its Internet server (*http://www.usitc.gov*).

List of Subjects

Milk proteins, government intervention, tariffs, and imports.

Issued: November 6, 2003.

By order of the Commission.

Marilyn R. Abbott,

Secretary.

[FR Doc. 03–28426 Filed 11–12–03; 8:45 am]

BILLING CODE 7020–02–P

INTERNATIONAL TRADE COMMISSION

[Investigation No. 731–TA–1022 (Final)]

Refined Brown Aluminum Oxide from China

Determination

On the basis of the record [1] developed in the subject investigation, the United States International Trade Commission (Commission) determines,[2] pursuant to section 735(b) of the Tariff Act of 1930 (19 U.S.C. 1673d(b)) (the Act), that an industry in the United States is materially injured by reason of imports from China of refined brown aluminum oxide, provided for in subheading 2818.10.20 of the Harmonized Tariff Schedule of the United States, that have been found by the Department of Commerce (Commerce) to be sold in the United States at less than fair value (LTFV). Concurrently, the Commission finds that critical circumstances do not exist with respect to imports of the subject product from China.

Background

The Commission instituted this investigation effective November 20, 2002, following receipt of a petition filed with the Commission and Commerce by Washington Mills Company, Inc., North Grafton, MA.[3] The final phase of the investigation was scheduled by the Commission following notification of a preliminary determination by Commerce that imports of refined brown aluminum oxide from China were being sold at LTFV within the meaning of section 733(b) of the Act (19 U.S.C.1673b(b)). Notice of the scheduling of the final phase of the Commission's investigation and of a public hearing to be held in connection therewith was given by posting copies of the notice in the Office of the Secretary, U.S. International Trade Commission, Washington, DC, and by publishing the notice in the **Federal Register** of May 23, 2003 (68 FR 28255). The hearing was held in Washington, DC, on September 23, 2003, and all persons who requested the opportunity were permitted to appear in person or by counsel.

The Commission transmitted its determination in this investigation to the Secretary of Commerce on November 10, 2003. The views of the Commission are contained in USITC Publication 3643 (November 2003), entitled *Refined Brown Aluminum Oxide from China: Investigation No. 731–TA–1022 (Final).*

Issued: November 7, 2003.

By order of the Commission.

Marilyn R. Abbott,

Secretary.

[FR Doc. 03–28427 Filed 11–12–03; 8:45 am]

BILLING CODE 7020–02–P

[1] The record is defined in sec. 207.2(f) of the Commission's Rules of Practice and Procedure (19 CFR 207.2(f)).

[2] Commissioner Daniel R. Pearson not participating.

[3] On November 27, 2002, the petition was amended to include two additional petitioners, C–E Minerals, King of Prussia, PA, and Treibacher Schleifmittel Corporation, Niagara Falls, NY.

DEPARTMENT OF LABOR

Employment and Training Administration

Federal-State Unemployment Compensation Program: Certifications for 2003 Under the Federal Unemployment Tax Act

On October 31, 2003, the Secretary of Labor signed the annual certifications under the Federal Unemployment Tax Act, 26 U.S.C. 3301 *et seq.*, thereby enabling employers who make contributions to state unemployment funds to obtain certain credits against their liability for the federal unemployment tax. By letter of the same date the certifications were transmitted to the Secretary of the Treasury. The letter and certifications are printed below.

Dated: November 3, 2003.

Emily Stover DeRocco,

Assistant Secretary.

Secretary of Labor, Washington

October 31, 2003.

The Honorable John W. Snow,

Secretary of the Treasury, Washington, DC 20220

Dear Secretary Snow: Transmitted herewith are an original and one copy of the certifications of the states and their unemployment compensation laws for the 12-month period ending on October 31, 2003. One is required with respect to the normal federal unemployment tax credit by Section 3304 of the Internal Revenue Code of 1986 (IRC), and the other is required with respect to the additional tax credit by Section 3303 of the IRC. Both certifications list all 53 jurisdictions.

Sincerely,

Elaine L. Chao.

Enclosures.

Certification of States to the Secretary of the Treasury Pursuant to Section 3304(c) of the Internal Revenue Code of 1986

In accordance with the provisions of Section 3304(c) of the Internal Revenue Code of 1986 (26 U.S.C. 3304(c)), I hereby certify the following named states to the Secretary of the Treasury for the 12-month period ending on October 31, 2003, in regard to the unemployment compensation laws of those states which heretofore have been approved under the Federal Unemployment Tax Act:

Alabama
Alaska
Arizona
Arkansas
California
Colorado
Connecticut

APPENDIX C
HEARING CALENDAR AND POSITIONS OF INTERESTED PARTIES

CALENDAR OF PUBLIC HEARING

Those listed below were scheduled to appear as witnesses at the United States International Trade Commission's hearing:

Subject: Conditions of Competition for Milk Protein Products in the U.S. Market

Inv. No.: 332-453

Date and Time: December 11, 2003 - 9:30 a.m.

Sessions were held in connection with this investigation in the Main Hearing Room (room 101), 500 E Street, S.W., Washington, D.C.

EMBASSY APPEARANCES:

Embassy of Australia
Washington, D.C.

His Excellency Michael Thawley, Ambassador Extraordinary & Plenipotentiary, Embassy of Australia

Embassy of New Zealand
Washington, D.C.

His Excellency John Wood, Ambassador Extraordinary & Plenipotentiary, Embassy of New Zealand

ORGANIZATION AND WITNESS:

PANEL 1

National Milk Producers Federation

Peter Vitaliano, Vice President, Economics, National Milk Producers Federation

Jaime Castaneda, Vice President, Trade Policy, National Milk Producers Federation

Robert Byrne, Vice President, Regulatory Affairs, National Milk Producers Federation

Idaho Dairymen's Association, Incorporated

Bob Naerebout, Executive Director, Idaho Dairymen's Association, Incorporated

<u>ORGANIZATION AND WITNESS</u>:

California Polytechnic State University, San Luis Obispo

Philip S. Tong, Ph.D., Professor, Dairy Products Technology Center, California Polytechnic State University, San Luis Obispo

American Dairymen's Federation

Stuart Huber, Member, American Dairymen's Federation

California Dairy Campaign

Xavier J. Avila, President, California Dairy Campaign

National Farmers Union

Joaquin Contente, President, California Farmers Union

<u>PANEL 2</u>

Select Milk Producers, Incorporated

Michael McClosky, Chief Executive Officer, Select Milk Producers, Incorporated

California Dairies, Incorporated

Richard Cotta, Senior Vice President, Government and Producer Relations, California Dairies, Incorporated

Land O'Lakes, Incorporated

Peter Kappelman, Dairy Producer and Member, Board of Directors, Land O'Lakes, Incorporated

Upstate Farms Cooperative, Incorporated

Timothy R. Harner, General Counsel, Upstate Farms Cooperative, Incorporated

Dairy America

Richard Lewis, Chief Executive Officer, Dairy America

Associated Milk Producers, Incorporated

Mark Furth, General Manager, Associated Milk Producers, Incorporated

Dairy Farmers of America, Incorporated

<u>ORGANIZATION AND WITNESS</u>:

John Wilson, Vice President, Corporate Marketing and Economic Analysis, Dairy Farmers of America, Incorporated

<u>PANEL 3</u>

Collier Shannon Scott
Washington, D.C.
<u>on behalf of</u>

U.S. Coalition for Nutritional Ingredients

Clayton L. Hough, Senior Vice President and General Counsel, International Dairy Foods Association

Gregory M. Frazier, Consultant, International Dairy Foods Association

Paul C. Rosenthal)
) – OF COUNSEL
Michael R. Kershow)

Dean Specialty Foods Group

Alan M. Hubble, Director, Commodities and Food Ingredients, Dean Specialty Foods Group

Erie Foods International, Incorporated

James M. Klein, Vice President, Technical Services/Sales, Erie Foods International, Incorporated

Unilever United States, Incorporated

John Frierott, Vice President, Beverage Manufacturing, Slim Fast Foods Company

Novartis Nutrition Corporation

James T. Schultz, Vice President, Research & Development/Quality Assurance, Novartis Nutrition Corporation

Kraft Foods North America, Incorporated

Michael A. Reinke, Associate Director, Dairy Procurement, Kraft Foods North America, Incorporated

Penn State University

Kenneth W. Bailey, Associate Professor, Penn State University

ORGANIZATION AND WITNESS:

PANEL 4

DMV International

Toine Hendrickx, Technical Marketing Manager, Proteins, DMV International

Irish Dairy Industries Association

Patrick Ivory, Director, Irish Dairy Industries Association

Glanbia

Michael Patten, Group Managing Director, Corporate Affairs, Glanbia plc

Fraser Tooley, Director of Marketing and Research, Glanbia Ingredients

Murray Goulburn Co-Operative Company, Limited

Paul Kerr, Chief Operating Officer, Murray-Goulburn Co-Operative Company, Limited

Robert Pettit, Manager, Americas and Caribbean, International Trade Development Group, Dairy Australia

Blank Rome LLP
Washington, D.C.
on behalf of

Dairy Companies Association of New Zealand

Terry Childs, Director, Business Development, Fonterra (USA)

Daniel Sumner, Frank H. Buck, Jr., Professor, Department of Agricultural and Resource Economics, University of California, Davis; and Director, University of California, Agricultural Issues Center

Edward J. Farrell)
) – OF COUNSEL
Roberta Kienast Daghir)

-END-

Senators Arlen Specter and Larry Craig; and Representatives James Walsh, Tim Holden, Tammy Baldwin, Don Sherwood, and Dennis Cardoza [64]

These Members of Congress state that imported milk protein products have placed downward pressure on domestic milk prices to such an extent that milk prices recently reached a 25-year low. According to these Members, this is caused by an oversight during the Uruguay Round of global trade negotiations that allowed imports of milk protein concentrate (MPC) into the United States to face a very low tariff and no quantitative restrictions. These Members state that imported casein for edible use interferes with domestic sales of milk proteins for use in human food and animal feed. They also state that most nations that export these proteins to the United States heavily subsidize their production. They state that the lack of restrictions on MPC, casein, and caseinate imports has cost the U.S. Government $890 million since 1994. These Members urge the U.S. International Trade Commission (Commission) to recognize that the importation of casein and MPC has negatively impacted U.S. dairy producers.

Senator Russell D. Feingold[65]

Senator Feingold states that the growing level of imports of milk protein products such as MPC and casein has been a concern of Wisconsin dairy farmers for years. According to Senator Feingold, the net economic effect of these imports has been to depress U.S. farm prices by more than $1 billion between 1994-2001. Senator Feingold also states that blended dairy proteins are being imported for the sole purpose of avoiding the U.S. TRQ on nonfat dry milk (NFDM). According to Senator Feingold, imported milk proteins are displacing U.S.-produced milk for use in cheese, dairy foods, and nutritional supplement products. Senator Feingold states that he is cosponsoring legislation that would impose TRQs on MPC, casein, and caseinate imports.

Senator Hillary Rodham Clinton[66]

Senator Clinton states that milk price declines in the State of New York, caused in large part by increased MPC imports, have cost dairy farmers more than $114 million in 2003. According to Senator Clinton, imported dairy proteins are able to displace domestically produced nonfat dry milk, much of which is subsequently bought by the U.S. Government under the dairy price support program, because they are subject to a very low tariff. Senator Clinton states that by imposing a tariff-rate quota (TRQ) on MPC, casein, and caseinates U.S. dairy farmers would be able to compete fairly with producers in other countries.

[64] Written statements to the Commission, received Dec. 8, Nov. 25, Dec. 10, Nov. 21, Dec. 4, Dec. 9, and Dec. 1, 2003, respectively.

[65] Ibid., Dec. 23, 2003.

[66] Ibid., Dec. 11, 2003.

Senator Mark Dayton[67]

Senator Dayton states that a flood of excess milk protein is undermining U.S. milk prices. According to Senator Dayton, when the United States negotiated during the Uruguay Round and converted its dairy quotas to TRQs, imports of MPC were not included owing to an oversight. This created a loophole through which imports of milk protein products are imported without restriction. Senator Dayton states that he is a cosponsor of legislation that would impose a TRQ on MPC and casein.

Representative David Obey[68]

Representative Obey states that dairy farmers in northern and central Wisconsin are concerned about the growing impact of MPC and other imported milk proteins on the U.S. industry. Representative Obey notes that in 2001 the U.S. General Accounting Office reviewed the situation and reported that although there are significant TRQs on similar dairy products, there is a negligible tariff on MPC. Representative Obey states that he has proposed legislation that would place a TRQ on MPC and casein that would maintain the current level of imports while establishing a cap on future growth. According to Representative Obey, imported milk proteins displace domestically produced milk proteins in manufactured dairy products, and U.S. MPC imports originate either from countries that generously subsidize dairy production, or from New Zealand, which operates a monopoly.

Representative Kenny Hulshof[69]

Representative Hulshof strongly supports the Commission's investigation into the U.S. market for milk protein products. Representative Hulshof hopes that the Commission's study will explain why the United States imports large quantities of milk protein products when there are large amounts of domestically produced milk protein in the form of nonfat dry milk (NFDM) in storage with the Commodity Credit Corporation (CCC). According to Representative Hulshof, milk prices remain volatile and it is important for the Commission to describe in its study how imported milk proteins affect farm-level milk prices.

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[67] Ibid.
[68] Ibid.
[69] Ibid., Oct. 1, 2003.

American Dairymen's Federation[70]

The American Dairymen's Federation (ADF) is a federation of dairy producer organizations that promotes the development of strategies to address issues that affect the U.S. dairy industry. ADF claims that the failure of U.S. trade negotiators during the Uruguay Round to impose TRQs on milk protein products has allowed low-priced imports to displace substantial amounts of domestically produced NFDM and producer milk. ADF maintains that the butter-powder tilts that occurred in 2000 and 2001 were a direct result of the increased cost of CCC purchases of NFDM and contributed to substantial decreases in dairy farmers' incomes.

Associated Milk Producers Inc.[71]

Associated Milk Producers Inc. (AMPI) is a dairy farmer cooperative that represents 6,000 Midwest dairy farmers. AMPI states that there is currently an adequate supply of domestically produced milk protein for use by U.S. food processors, yet imports of milk protein products are entering the U.S. market in increasing volumes because they are being sold at artificially depressed prices. These imports are hurting U.S. dairy producers by lowering the U.S. milk pricing structure, AMPI states. In addition, the cooperative maintains that milk protein imports are surging because of their low price relative to other dairy inputs, not because of any superior qualities they may possess.

California Dairies, Inc.[72]

California Dairies' 674 member-owners handle over 40 percent of the milk produced in California and own five milk processing plants throughout the state. California Dairies is the largest dairy cooperative in the state and the second-largest dairy cooperative in the United States. California Dairies states that imported milk proteins hurt U.S. dairy producers by displacing domestically produced milk proteins, thereby increasing CCC purchases of NFDM. California Dairies maintains that increased costs incurred by the CCC have resulted in butter-powder tilts that lower the price farmers receive for their milk. If U.S. milk proteins were able to receive subsidies to match imported protein prices (similar to those received by foreign producers), California Dairies maintains that U.S. milk proteins would be manufactured into all forms for which domestic uses exist.

[70] Stuart Huber, President of the Board, Primary Dairies, USA, and Member, American Dairymen's Federation, statement before the Commission, Dec. 11, 2003, transcript pp. 44-48.

[71] Mark Furth, General Manager, Associated Milk Producers, statement before the Commission, Dec. 11, 2003, transcript pp. 164-69.

[72] Richard Cotta, Senior Vice-President, Government & Producer Relations, California Dairies, Inc., statement before the Commission, Dec. 11, 2003, transcript pp. 145-52.

California Dairy Campaign[73]

The California Dairy Campaign (CDC) represents more than 350 dairy producers throughout the state of California. The CDC asserts that rising imports of casein and MPC have been the direct cause of growing stocks of NFDM held by the CCC. The CDC states that the lack of tariffs or quotas on imports of MPC and casein is a serious flaw in U.S. trade laws that must be fixed if U.S. dairy producers are to remain competitive in the future. U.S. producers do not produce MPC today because it is not profitable, according to the CDC, owing to the level of subsidization of casein and MPC that is occurring in the European Union (EU).

California Farmers Union[74]

The California Farmers Union (CFU) is the 24th state chapter of the National Farmers Union, a general farm organization representing nearly 300,000 family farmers and ranchers nationwide. CFU states that the high level of EU subsidies on casein production and the U.S. government's failure to establish TRQs on casein and casein derivatives have a large impact on the U.S. market for dairy proteins and provide an unfair competitive advantage for EU producers in the global dairy market. The CFU asserts that unrestricted imports of milk protein directly compete with U.S.-produced NFDM. The CFU contends that American dairy producers are very efficient, and can be competitive if they are provided a fair and level playing field. However, according to the CFU, the current flaws in our trade agreements have given our foreign competitors an unfair advantage at the expense of U.S. producers.

California Polytechnic State University[75]

Dr. Phillip S. Tong is a professor at the Dairy Products Technology Center of the California Polytechnic State University. Dr. Tong states that MPCs are produced by a process of ultrafiltration of skim milk and subsequently spray dried to produce a powder. He states that the dry blending of isolated milk components is not considered to be true MPC. According to Dr. Tong, it is highly unlikely that dry blending of milk components could result in a product with the same nutritional and functional properties as traditional MPC. Dr. Tong asserts that when large quantities of blend products are used instead of true MPC, an economic factor or other market forces are probably involved.

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[73] Xavier Avila, President, California Dairy Campaign, statement before the Commission, Dec. 11, 2003, transcript pp. 48-54.

[74] Joaquin Contente, President, California Farmers Union, statement before the Commission, Dec. 11, 2003, transcript pp. 57-62.

[75] Phillip S. Tong, Ph.D., Professor, Dairy Products Technology Center, California Polytechnic State University, San Luis Obispo, statement before the Commission, Dec. 11, 2003, transcript pp. 36-43.

Dairy Australia[76]

Dairy Australia is the trade organization that represents the members of the Australian dairy industry. Murray Goulburn is Australia's largest milk processor and is the only regular Australian supplier of MPC, caseinates, and casein to the United States. Dairy Australia states that Australian exports are not subsidized, the Australian market for dairy products is open, and U.S. demand for Australian MPC is strong despite the fact that its protein-equivalent prices are above U.S. domestic prices for NFDM. According to Dairy Australia, U.S. food processors import large volumes of milk protein products because the food ingredients market is a highly sophisticated one. Dairy Australia claims that restricting access for milk protein products will increase the commercial incentives for nondairy substitutes, such as soy, a development that would be detrimental to the United States as well as the global dairy industry. Dairy Australia maintains that economic analysis has shown that imported MPC, casein, and caseinate comprise such a small share of the milk protein consumed in the United States, that even very large reductions from the current level of imports would most likely raise the all-milk price in the United States by less than 0.3 percent.

Dairy Companies Association of New Zealand[77]

Dairy Companies Association of New Zealand (DCANZ) is composed of three New Zealand dairy cooperatives–Fonterra, Tatua, and Westland–which collectively account for almost all New Zealand-produced milk. DCANZ states that Fonterra engages in extensive research and development, which plays a significant role in its growth and profitability. DCANZ believes that the increased trade in milk protein products has been market driven and reflects an increasing sophistication in the application of technology to milk proteins. According to DCANZ, because MPCs are customized for use in specific end products, they sell at higher prices than the equivalent amount of domestic milk protein in NFDM. DCANZ maintains that economic analysis has shown that imports of MPC, casein, and caseinate are small relative to the total milk protein consumed in the United States, and that the restriction of imports of these products into the United States would raise the price of milk in the United States by less than 1 percent.

[76] Paul Kerr, Chief Operating Officer, Murray-Goulburn Cooperative Co. Ltd., statement before the Commission, Dec. 11, 2003, transcript pp. 353-58.

[77] Edward J. Farrell, Esquire, Blank Rome LLP, Counsel to Dairy Companies Association of New Zealand; Terry Childs, Director, Business Development, Fonterra (USA); Daniel Sumner, Professor, Department of Agricultural and Resource Economics, University of California, Davis, statements before the Commission, Dec. 11, 2003, transcript pp. 359-77.

Dairy Farmers of America[78]

Dairy Farmers of America (DFA) is a dairy farmer-owned cooperative of 14,329 farms in 47 states that markets approximately 30 percent of the U.S. domestic milk supply. DFA states that increased imports of milk proteins have adversely affected prices paid to U.S. dairy farmers. According to DFA, the co-op led an initiative in 2003 to better align domestic milk production with demand. However, DFA contends that U.S. dairy farmers need assistance from the Federal Government in limiting imports that negate steps already taken by U.S. milk producers. DFA states that the use of MPC in processed cheese production displaces the use of natural cheese, and, as a result, more U.S. milk ends up in NFDM production. DFA states that although compelled to purchase and use imported MPC in its processed cheese operations to remain price competitive, it supports the imposition of tariffs on MPC and casein, as well as the strengthening of the standards of identity to prohibit its use in cheese making. In addition, DFA states that it has been proactive in response to continued high levels of imported milk proteins by forming a joint-venture with Fonterra (USA) to produce MPC in the United States.

Dairy America[79]

Dairy America is a marketing organization for its dairy cooperative members, which represent 75 percent of the NFDM produced and marketed in the United States. DairyAmerica states that imported proteins displace U.S.-produced NFDM and increase CCC purchases, thereby putting downward pressure on already low producer milk prices. According to DairyAmerica, imports of MPC and casein are subsidized by foreign governments and will continue to enter the U.S. market unless a TRQ is imposed on all imported dairy products.

Dean Specialty Foods Group[80]

Dean Foods Co. is a processor and distributor of milk and other dairy products with 120 manufacturing facilities in 37 states. Dean Foods uses casein, sodium and calcium caseinates, and high-protein MPC in the production of its dry and liquid nondairy creamers, dry whipped toppings, nutritional beverages, meal-replacement beverages, nondairy aerosol toppings, and weight-loss drinks. Dean Foods states that the flavor, functionality, and low level of allergen concerns of these milk protein products makes them superior to any other alternatives in its finished products. Dean Foods has found that U.S.-produced NFDM converted to casein results in an undesirable elevated lactose content, as some lactose

[78] John Wilson, Vice President, Corporate Marketing and Economic Analysis, Dairy Farmers of America, statement before the Commission, Dec. 11, 2003, transcript pp. 170-76.

[79] Rich Lewis, Chief Operating Officer, DairyAmerica, statement before the Commission, Dec. 11, 2003, transcript pp. 158-64.

[80] Alan M. Hubble, Director, Commodities and Food Ingredients, Dean Specialty Foods Group, statement before the Commission, Dec. 11, 2003, transcript pp. 253-60.

remains chemically bound to the casein. In addition, Dean Foods states that multiple drying/heating cycles negatively affect the flavor of the resulting casein. Dean Foods states that actions that would increase the cost of imported milk protein products would have a significantly negative impact on the U.S. elderly, diabetic, lactose-intolerant, and weight-conscious customer bases that rely on its products.

DMV International[81]

DMV International, a division of the Dutch dairy cooperative Campina, produces caseinates and pharmaceutical-grade lactose in Europe; and protein hydrolozates, bioactive proteins, and bioactive peptides in the United States. DMV states that the processes used to produce these specialized protein products require investments of up to hundreds of millions of dollars. DMV states that casein, caseinates, and MPC 80 differ in many aspects from NFDM because they can be specially formulated to meet customers' specific needs. According to DMV, in terms of functionality, NFDM is poor in most of the qualities that U.S. food manufacturers are seeking in their products.

Embassy of Australia[82]

The Australian Government states that Australia's exports of milk protein products to the United States have provided a key input that has facilitated the rapid growth of new food products such as sports, protein, and health-food supplements. According to the Australian Government, imports of milk protein products do not reduce the market for NFDM produced in the United States. This is because Australian high-protein, ultrafiltered milk protein product cannot be replaced by the lower-protein, higher-lactose NFDM produced in the United States. In addition, the Government contends that Australia's exports of milk protein products are relatively small and therefore have a negligible impact on the U.S. market for milk and milk products.

Embassy of New Zealand[83]

The New Zealand Government states that imports of milk protein products serve an important and useful function within the U.S. food-processing industry. According to the New Zealand Government, U.S. food processors are constantly employing new technology to develop innovative products that have generated new demand for specialized milk protein ingredients, many of which are not produced in the United States. For this reason, the New

[81] Toine Hendrickx, Technical Marketing Manager, DMV International, statement before the Commission, Dec. 11, 2003, transcript pp. 336-41.

[82] His Excellency Michael Thawley, Ambassador, Embassy of Australia, statement before the Commission, Dec. 11, 2003, transcript pp. 10-14.

[83] His Excellency John Wood, Ambassador, Embassy of New Zealand, statement before the Commission, Dec. 11, 2003, transcript pp. 14-23.

Zealand Government contends that limiting imports of MPC and caseins would not have a significant impact on the prices U.S. dairy producers receive for their product. New Zealand is an unsubsidized exporter that does not seek special treatment, but simply an opportunity to trade freely in response to market demand.

Erie Foods International[84]

Erie Foods International is a privately held company supplying milk protein ingredients and custom processing services to the food and nutritional industries. Erie Foods states that it imports high-protein MPCs from Australia for use in health and nutritional applications. Erie Foods attributes its growth in recent years to its focus on providing new, specialized milk protein products to the functional foods and nutritional application markets. Erie states that NFDM cannot meet the requirements that Erie Foods' customers demand for their products.

European Dairy Association[85]

The European Dairy Association (EDA) is a federation of the national dairy associations in the EU. EDA states that the EU casein production aid program was introduced in the 1960s to compliment another policy program to encourage the use of NFDM in animal feed and not to encourage large exports of casein and caseinates to third-country markets. The EDA also notes that the reform of the EU Common Agriculture Policy (CAP) will reduce the current amount of aid on casein production by 50 percent by 2006 and will probably eliminate it thereafter. EDA states that the EU is not the dominant global price setter for milk protein products, but that Oceania is currently the leading exporter to the world of such products. The EDA states that its strategic focus is currently on high-protein, value-added products that offer functional and technical value to customers.

Family Dairies USA[86]

Family Dairies USA is a U.S. Department of Agriculture (USDA)–qualified cooperative representing 4,200 dairy farm members operating in seven Upper Midwestern states. The cooperative states that the implementation of the World Trade Organization (WTO) in 1996 established TRQs on the import of most manufactured dairy products entering the U.S. market with the exception of MPCs, casein, and caseinates.

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[84] James M. Klein, Vice President of Technical Services and Sales, Erie Foods International, statement before the Commission, Dec. 11, 2003, transcript pp. 246-53.

[85] Jon E. Huenemann, Senior Vice President, Fleishman-Hillard Government Relations, for the European Dairy Association, written statement to the Commission, Dec. 19, 2003.

[86] Stewart G. Huber, President of the Board, Family Dairies USA, written statement to the Commission, Nov. 19, 2003.

Glanbia[87]

Glanbia is an international dairy company specializing in consumer foods and nutritional products with processing operations in Ireland, the United States, and the United Kingdom. Glanbia maintains that of the 2.5 million tons of milk protein production in the United States, casein and caseinate imports (which have remained relatively stable) equal only 3.5 percent of the total, and MPC imports equal only about 0.8 percent of the total. Glanbia states that at least 10 percent of the dairy proteins imported into the United States are subsequently reexported as value-added products such as baby food, or peptides and hydrolysates.

Idaho Dairymen's Association/Oregon Dairy Farmers Association/Washington State Dairy Federation[88]

The Idaho Dairymen's Association (IDA), the Oregon Dairy Farmers Association (ODFA), and the Washington State Dairy Federation (WSDF) represent all the dairy farmers in their respective state. These three states combined produce approximately 10 percent of the annual U.S. milk supply. The IDA/ODFA/WSDF state that the dairy industries in rural communities in the Pacific Northwest have felt a significant economic impact due to MPC and casein imports. IDA/ODFA/WSDF contend that a significant portion of domestically produced skim milk is being displaced by imported MPCs and caseins, particularly for use in cheese making which is important in Idaho. The IDA/ODFA/WSDF hold the view that given the proper market signals, a domestic supply of specialized milk protein products would rapidly develop.

Irish Dairy Industries Association[89]

The Irish Dairy Industries Association (IDIA) represents the interests of Irish dairy manufacturing and processing companies and cooperatives, as well as the infant formula industry in that country. The IDIA maintains that owing to the reform of the CAP, restrictions on milk output will continue until 2015, intervention prices will be reduced for butter and NFDM over a 3-4 year period, and significant limits will be placed on dairy intervention support. The IDIA states that these changes should result in a more efficient, market-driven dairy industry, focused increasingly on research and development of higher-value-added dairy products in place of the traditional commoditized dairy products.

[87] Fraser Tooley, Director of Marketing and Research, Glanbia Ingredients, statement before the Commission, Dec. 11, 2003, transcript pp. 342-47.

[88] Bob Naerebout, Executive Director, Idaho Dairymen's Association, statement before the Commission, Dec. 11, 2003, transcript pp. 32-36.

[89] Patrick Ivory, Director, Irish Dairy Industries Association, statement before the Commission, Dec. 11, 2003, transcript pp. 347-53.

Kraft[90]

Kraft Foods North America is the largest branded food company in North America and a major processor, marketer, and purchaser of dairy products. Kraft states that while casein, caseinates, MPC, and NFDM are all derived from whole milk, each is a unique product with distinguishing characteristics, functionalities, applications, price structures, and markets, and they are not interchangeable within product formulations. Kraft maintains that available production technology and large supplies of fluid milk have not sparked U.S. production of milk protein products because the U.S. dairy price support program ensures that the U.S. Government buys certain processed dairy products at prescribed prices, leaving dairy producers little incentive to invest in new manufacturing equipment or technological expertise to take advantage of developing market opportunities. Kraft maintains that excess milk production in the face of lagging demand, rather than imports of milk protein products, has caused the recent slump in producer milk prices.

Land O'Lakes[91]

Land O'Lakes (LOL) is a farmer-owned cooperative made up of approximately 5,000 dairy producers across the United States. LOL states that other dairy producing countries use subsidies and other internal policies to give their dairy products an advantage in the global marketplace, which allows them to sell milk proteins to food producers in the United States at prices lower than most U.S. dairy farmers can produce them. This results in a surplus of U.S. NFDM, which increases dairy producers' costs and the cost to the U.S. taxpayer. LOL states that if it became profitable to produce MPC domestically to fill the demand for it, U.S. users would import less, thereby reducing the CCC stocks of NFDM.

National Family Farm Coalition[92]

The National Family Farm Coalition (NFFC) represents 33 grassroots farms, resource conservation, and rural advocacy groups from 33 states, regarding family farm issues. NFFC states that food processors began using MPC as an ingredient in clear violation of the Code of Federal Regulation regarding food safety. NFFC maintains that Kraft Foods is exploiting a nondomestic supply of ingredients in many of its food products instead of using regional American milk supplies. According to NFFC, Customs rulings have shown that MPC is not a unique product manufactured by utilizing the latest filtration technology, but actually a blend of NFDM and other ingredients. NFFC also states that it is food processors that use milk protein products and their retailers that retain all the cost savings of a cheaper ingredient, and that the cost borne by the farmer cannot be sustained.

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[90] Michael A. Reinke, Associate Director, Dairy Procurement, Kraft Foods North America, Inc., statement before the Commission, De. 11, 2003, transcript pp. 233-40.

[91] Peter Kappelman, Dairy Producer and Member, Board of Directors, Land O'Lakes, statement before the Commission, Dec. 11, 2003, transcript pp. 145-52.

[92] Written statement to the Commission, Dec. 23, 2003.

National Milk Producers Federation[93]

The National Milk Producers Federation (NMPF) is the national farm commodity organization that represents dairy farmers and the dairy cooperative marketing associations that they own and operate throughout the United States. NMPF supports legislation to impose tariffs on the importation of milk protein products. According to NMPF, the price advantage that imported milk protein products enjoy over domestically produced products is due to the fact that production and marketing of these products by other countries is largely subsidized. NMPF contends that U.S. milk proteins could and would be manufactured into any and all forms for which domestic uses exist, including all products currently imported, if U.S. milk proteins were able to receive corresponding subsidies to match imported protein prices. NMPF foresees that imported milk proteins will continue to grow as a percentage of U.S. domestic milk protein production, and the increased CCC purchase of displaced domestic milk protein in the form of NFDM will render the price support program increasingly unmanageable.

Novartis Nutrition[22]

Novartis Nutrition is dedicated to researching, producing, and marketing medical nutrition products for patients and residents in hospitals, nursing homes, and clinics. Novartis states that it uses milk protein products in its medical formulas to meet protein nutritional requirements, as well as for their lactose-free qualities, flavor, cost, clarity, pH level, mineral contribution, emulsification, heat-processing stability, solubility, viscosity, and color. According to Novartis, for many of their applications there are no suitable protein replacement options. Novartis states that if a high tariff is placed on caseinates and MPC, great economic hardship will be placed on the medical nutrition industry because not only will millions of dollars in reformulation cost have to be at least partially passed onto customers, but also resources will be taken away from developing new innovative nutrition therapies. Novartis also states that any reformulation would almost certainly substitute soy proteins and/or whey protein isolate, rather than NFDM, for currently used milk protein products.

Pennsylvania State University[23]

Dr. Kenneth Bailey is an Associate Professor at Pennsylvania State University (PSU). As part of his work through a research grant from the USDA and PSU, Dr. Bailey has conducted an assessment of the protein content of U.S. trade in dairy products and their potential impact

[93] Peter Vitaliano, Vice President, Economic Policy and Market Research, National Milk Producers Federation, statement before the Commission, Dec. 11, 2003, transcript pp. 24-32.

[22] James Schultz, Vice President of Research and Development and Quality Assurance, Novartis Nutrition, statement before the Commission, Dec. 11, 2003, transcript pp. 240-46.

[23] Dr. Kenneth Bailey, Associate Professor, Pennsylvania State University, statement before the Commission, Dec. 11, 2003, transcript pp. 268-74.

on farm-gate milk prices. Dr. Bailey concludes that MPC imports are not related to the volatility in U.S. milk prices, particularly during 1997-2002. He also states that MPC imports had little to do with the growing CCC purchases of NFDM, which are more likely a result of the imbalance between the growing U.S. milk supply and insufficient demand.

Select Milk Producers, Inc.[24]

Select Milk Producers is a cooperative of dairy producers in eastern New Mexico and western Texas that produces and markets fluid milk, with the balance sold to cheese plants as milk or processed into liquid MPC in the co-op's own ultrafiltration/reverse-osmosis facilities. According to Select Milk Producers, they have created an on-farm ultrafiltration system to process their regional surplus of fluid milk and improve its access into the U.S. marketplace. Select Milk Producers states that the largest hurdle to U.S. competitiveness in the market for milk protein products is the existence of subsidies for these products in the EU, which allows EU producers of dry MPC to price their product in the U.S. market at a lower level than can U.S. producers.

Unilever (Slim Fast Foods Co.)[25]

The Slim Fast Foods Co. produces weight-loss, meal-replacement products, including ready-to-drink beverages, bars, powders, soups, and pastas. The company employs 600 people and has two production facilities in Covington, TN, and Tucson, AZ. According to Slim Fast, the company uses predominantly NFDM and calcium caseinate in its products. Slim Fast states that since consumers increasingly demand high-protein products with low calorie content, the company supplements the protein in the NFDM with calcium caseinate, which adds protein with fewer additional calories than would be the case in using additional NFDM. Slim Fast imports calcium caseinate from the EU or New Zealand because those sources produce it from fresh milk as opposed to domestic supplies made from imported casein. According to Slim Fast, the calcium caseinate available from U.S. producers results in a finished product with unsatisfactory sensory qualities.

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[24] Michael McCloskey, Chief Executive Officer, Select Milk Producers, Inc., statement before the Commission, Dec. 11, 2003, transcript pp. 132-38.

[25] John Frierott, vice president of Beverage Operations, Slim Fast Foods Company, statement before the Commission, Dec. 11, 2003, transcript pp. 261-68.

Upstate Farms Cooperative (O-At-Ka Milk Products Cooperative, Inc.)[26]

O-At-Ka Milk Products operates a milk-processing facility in Batavia, NY, which produces a wide variety of processed dairy products, including ultrafiltered MPC, infant formula, meal replacers, and protein drinks. O-At-Ka states that it has encountered many quality issues from imported proteins owing to the lack of stringent regulatory programs in certain countries of origin. According to O-At-Ka, the United States has the technology and expertise to produce high-quality MPC. However, foreign cost advantages from poor quality and/or subsidies prevent further development of U.S. production.

U.S. Coalition for Nutritional Ingredients[27]

The U.S. Coalition for Nutritional Ingredients is an ad hoc association of approximately 50 organizations that support policies aimed at ensuring continued affordable and unrestricted access to imported milk protein products. The Coalition states that U.S. dairy and other food processors purchase specialized milk protein products even though they can be more expensive than NFDM on a protein-content basis. This is because their precise formulations and functional attributes make them superior to NFDM in a wide range of applications. The Coalition maintains that imports of milk protein products have responded to the growth in market demand and do not displace U.S. production of NFDM. The Coalition claims that there would be no meaningful effect on the accumulated CCC stocks of NFDM if imports of milk protein products were eliminated. The Coalition contends that the U.S. dairy price support program diverts milk protein from growing high-value markets to government stockpiles of a low-value commodity.

Western United Dairymen[28]

Western United Dairymen (WUD) asserts that evidence suggests that imported milk protein products have contributed to large surplus stocks of domestic protein products, primarily NFDM, perhaps lowering prices paid for those goods and for the raw milk used to make them. The WUD urges the Commission to analyze in depth the possibility of restructuring the current price-support system to contain a program to foster domestic production of milk proteins such as casein and MPC. According to the WUD, subsidies provided by foreign governments may prohibit domestic milk proteins from competing with imported milk proteins. WUD urges the Commission to address and examine the blending of imported milk

[26] Timothy Harner, General Counsel, Upstate Farms Cooperative, statement before the Commission, Dec. 11, 2003, transcript pp. 152-58.

[27] Paul C. Rosenthal, Esquire, Collier Shannon Scott, Counsel to the U.S. Coalition for Nutritional Ingredients, statement before the Commission, Dec. 11, 2003, transcript pp. 226-33.

[28] Michael L. H. Marsh, chief executive officer, Western United Dairymen, written statement to the Commission, Dec. 5, 2003.

protein products, such as NFDM and casein, as attempts to circumvent tariffs on these individual products.

Oleta Harton, Doris and Lean Bogley, and Jerry Holmes[29]

These individuals state that U.S. dairy farmers are facing increased costs of production and are receiving less per hundredweight of milk today than they received in 1982. They state that at the same time, imports of MPCs are displacing large amounts of NFDM. They urge the Commission to support the setting of reasonable limits on imports of MPC and casein.

[29] Written statements to the Commission, received Dec. 12, 2003.

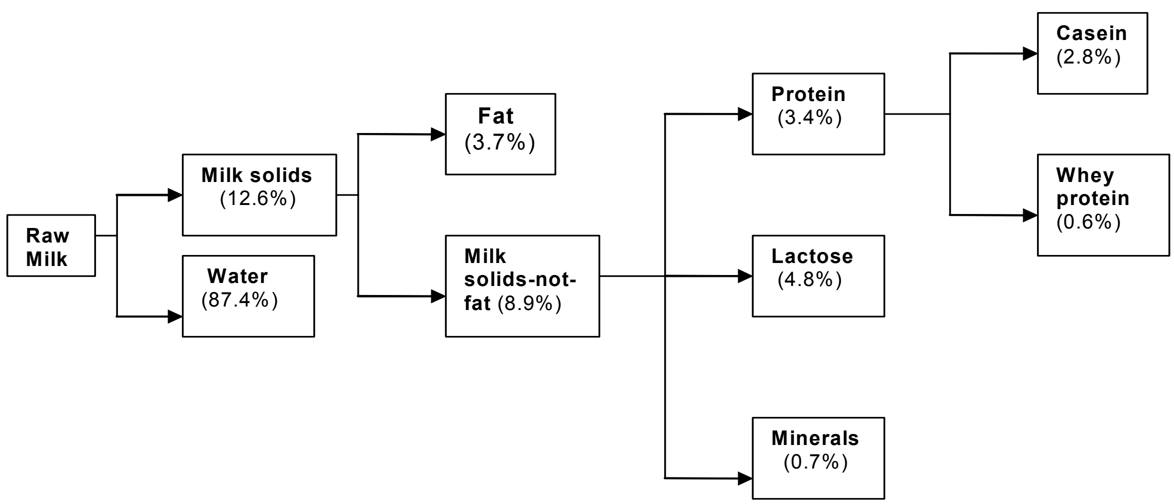
APPENDIX D
INTRODUCTION TO MILK PROTEINS

Milk Protein Manufacturing Processes

Overview

The milk processing industry worldwide is constantly evolving. Through scientific discovery and development of new technology and techniques, new products and applications for existing products are continually being developed. Processors are increasingly using milk as a raw material from which individual components, such as fat, lactose, minerals, and particularly proteins, can be extracted. Processors are refining raw milk and isolating its individual components in a manner analogous to the refinement of crude petroleum into its various refined component products.[1] The gross composition of raw milk is presented in figure D-1.

Figure D-1
Raw milk: Composition by major constituent and share (by weight) of total



Source: Chardan Ramesh, *Dairy-Based ingredients* American Association of Cereal Chemists (Eagan Press Handbook, 1997).

Cows' milk is made up of about 87 percent water and 13 percent milk components (milk solids). The milk solids consist of a fat portion, accounting for 3.7 percent of milk, and a solids-not-fat (SNF is sometimes referred to as skim solids or skim serum solids) portion, accounting for 8.9 percent of milk. SNF consists of three broad categories: lactose, minerals, and proteins. Lactose is the sugar component in milk, while minerals ("ash") include elements, such as calcium and potassium, and vitamins, such as A, B_1, B_2, C, and D. There

[1] The Northeast Dairy Foods Research Center at Cornell University and the Center for Dairy Research at the University of Wisconsin have developed the initial economic and technological research promoting the "milk refinery" approach to dairy processing.

are broadly two types of milk protein: casein and whey. Casein accounts for 80 percent of milk proteins, with whey proteins making up the remaining 20 percent. Increasingly, more highly formulated food products are developed by processors that incorporate very specific types of proteins with very specialized chemical and functional attributes. For example, there are five specific types of casein protein: α_{s1}-casein, α_{s2}-casein, β-casein, κ-casein, and γ-casein.[2] Whey protein primarily consists of two types of protein, β-lactoglobulin and α-lactalbumin, but includes five other important proteins as well, serum albumin, immunoglobulins, glycomacropeptide, lactoferrin, and peptide fragments.[3] Food processors, particularly those involved in the speciality nutrition sector, may use specific casein or whey protein for highly formulated products.[4]

The major types and forms of milk protein products produced from raw milk are shown in figure D-2. The shaded boxes indicate the major milk protein products relevant to this study, particularly skim milk powder (SMP), whey protein concentrate (WPC), milk protein concentrate (MPC), casein, and caseinate. These products have overlapping ranges of protein concentration and end-use applications.

The component composition for several milk protein products is shown in table D-1, and provides a useful snapshot of the wide range of protein concentrations found in different products. As the percentage concentration of protein in these products increases, the percentage concentration of other components must necessarily decrease. Lactose accounts for the largest share of solids in whole and skim milk. Therefore, as the protein concentration in products increase, the amount of lactose decreases, because most of the increased share of protein comes at the expense of the share of lactose.

Milk protein products do more than just increase the protein content of the foods in which they are present. In many processed foods, milk proteins are used because they also deliver functionality. Functionality refers to "any property of a substance, besides its nutritional ones, that affects its utilization."[5] Many of the functional properties of milk products are derived from the protein content of the product, in combination with the protein's interaction with other milk components, such as fat, lactose, and salts. Several milk protein products have similar functional properties and applications when used in food processing.

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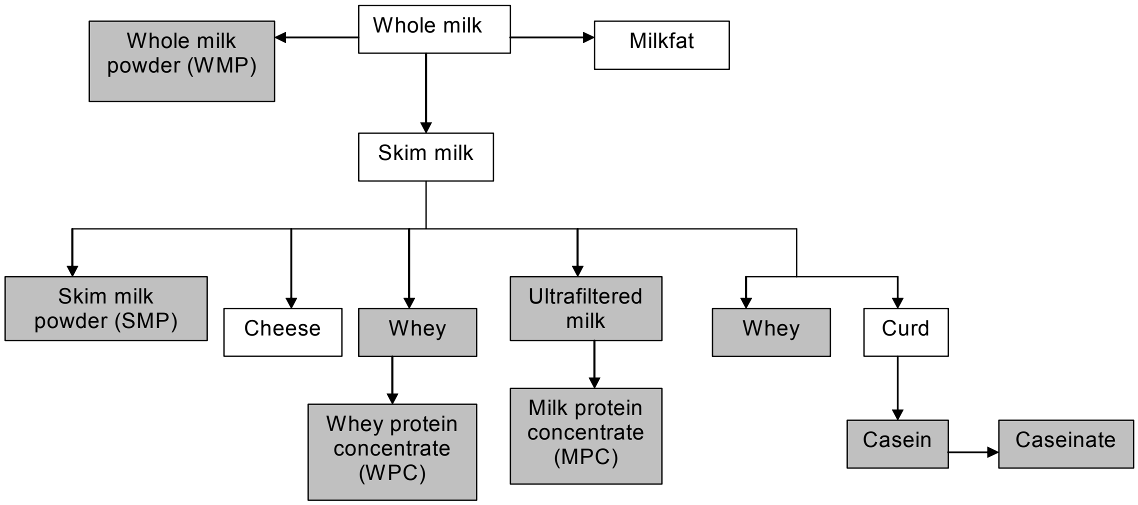
[2] Pieter Walstra, et. al., "Dairy Technology: Principles of Milk Properties and Processes," *Food Science and Technology*, vol. 90 (May 1999).

[3] Srinivasan Damodaran, et. al., *Food Proteins and Their Applications* (Marcel Dekker, 1997).

[4] An example is lactoferrin, an iron-binding and transport protein found in whey. Lactoferrin has antibacterial and antioxidant attributes which provide resistance against nonspecific diseases. Recently, technology has been developed to isolate lactoferrin and it is now produced on a commercial basis (requiring 10,000 units of milk for every one unit of lactoferrin). Owing to its specific properties, the product is used in infant formulas, sports foods, personal care products, and in veterinary medicines. Lactoferrin is also used as an antipathegen cleaning agent in the meat sector. International Dairy Federation, *World Dairy Situation 2003*, Bulletin 384/2003 (Aug. 2003).

[5] A. Pour-El, *World Soybean Research* (Interstate Publishing, 1976).

Figure D-2
Milk and milk derivative products



Source: Wisconsin Center for Dairy Research.

Table D-1
Composition of milk protein products

Product	Water	Fat	Protein	Lactose	Minerals
	Percent				
Skim milk powder	3.5	0.8	35.9	52.3	8.0
Milk protein concentrate-42	3.5	1.0	40.5	46.0	7.9
Milk protein concentrate-80	3.8	2.5	77.2	5.5	8.5
Acid casein	9.0	1.0	90.0	0.1	2.2
Rennet casein	11.0	1.0	85.0	0.1	4.0
Calcium caseinate	3.5	1.0	90.9	0.1	4.5
Sodium caseinate	3.5	1.0	91.4	0.1	4.0
Whey protein concentrate-34	4.0	3.0	32.6	51.0	6.0
Whey protein concentrate-50	4.0	4.0	48.0	35.0	7.0
Whey protein concentrate-80	4.0	5.0	76.8	4.0	4.0
Whey protein isolate-91	3.5	0.5	93.0	1.0	2.0

Notes.—Compositions are approximate and may vary.

Sources: Ramesh Chardan, *Dairy-Based Ingredients*, American Association of Cereal Chemists (Eagan Press Handbook, 1997); Brian W. Gould and Hector J. Villarreal, “A Descriptive Analysis of Recent Trends in the International Market for Dry Milk Products,” Babcock Institute Discussion Paper No. 2002-2 (University of Wisconsin, 2002).

Whole Milk and Whole Milk Powders

In the United States, whole milk (also referred to as raw milk, or commercial raw milk) is defined as cow's milk under the U.S. Food and Drug Administration's (FDA) Standards of Identity.[6] Prior to processing, whole milk is heat pasteurized to render it safe for human consumption.[7] The production process for whole milk powder (WMP) generally consists of two stages: condensation/evaporation and drying (text box D-1).[8] In the first stage, milk is condensed to 45-50 percent solids under vacuum in a multieffect evaporator.[9] In the second stage, the milk is dried using either spray or roller dryers, which removes all but 4-5 percent of the water content.[10] The resulting powder is WMP. The protein content of WMP can vary, but is generally about 26 percent (table D-1). WMP has a considerably higher fat content (27 percent) than other milk products; and this reduces its shelf life (to 6-9 months) compared with other dry milk products. WMP does not dissolve well in water unless further processed by the addition of an emulsifier (such as lecithin, a soybean extract).

Skim Milk and Skim Milk Powder

Liquid skim milk results when most of the fat is removed from whole milk. When milk is left undisturbed the fat globules, which are lighter (less dense), rise to the surface and separate from other milk components. This natural process is accelerated using centrifuges to separate the fat from the water containing other milk solids. In this process, the fat concentration in the milk is reduced from approximately 3.5 percent in whole milk to 0.1 percent in skim milk, while the water content and protein concentration is increased (owing to the fat removal). The milk fat (cream) is used in the production of butter, some full-fat cheeses, and ice cream.

SMP is produced by removing water from pasteurized skim milk, resulting in a product containing proteins, lactose, and minerals (figure D-3).[11] The production process for SMP is the same as WMP. SMP has a higher protein content than WMP (approximately 36 percent versus approximately 26 percent), and a much lower fat content (about 1 percent), (table D-1). SMP has a high lactose content, up to 52 percent (table D-1). Several of the

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[6] Chapter 3 and appendix E of this report further explains the FDA standards of identity.

[7] Ramesh Chandan, *Dairy-Based Ingredients*, American Association of Cereal Chemists (Eagan Press Handbook, 1997).

[8] The definition and composition of WMP is governed by the FDA standards of identity found in 21 CFR 131.147.

[9] Ramesh Chandan, *Dairy-Based Ingredients*, American Association of Cereal Chemists (Eagan Press Handbook, 1997).

[10] Spray drying is more common because roller drying may result in more scorched particles and results in poorer product solubility. Ramesh Chandan, *Dairy-Based Ingredients*, American Association of Cereal Chemists (Eagan Press Handbook, 1997).

[11] The definition of SMP is governed by the FDA standards of identity found at 21 CFR 131.125. SMP is also commonly referred to as nonfat dry milk (NFDM or NDM).

Box D-1
Production processes and technology used in the milk protein industry

Milk Protein Products

Casein: Casein is the primary protein found in milk, accounting for approximately 80 percent of the total protein content. It is also a milk protein product produced by separating the casein protein in milk from all other milk components. Casein is typically produced using one of two processes. Rennet casein is produced using enzymes which cause the casein to coagulate and congeal into a solid mass. Acid casein is produced from the application of acid which causes the casein protein to precipitate from the milk at a pH of 4.6.

Caseinate: Caseinate is a derivative of casein produced by neutralizing acid with alkali and drying the final product. The alkali treatments result in caseinates being more soluble in water than casein. The two most common neutralizing agents are sodium hydroxide (which results in sodium caseinate) and calcium hydroxide (which results in calcium caseinate).

Milk protein concentrate (MPC): A concentrated milk protein product that contains both casein and whey protein. MPC is often referred to in conjunction with its protein content. For example, MPC with a protein concentration of 42 percent is commonly referred to as MPC 42.

Nonfat dry milk (NFDM or NDM): A synonym for skim milk powder commonly used in the United States.

Skim milk powder (SMP): SMP is produced by removing water from pasteurized skim milk, resulting in a product containing proteins, lactose, and minerals. The production process consists of evaporation and drying, usually via a spray dryer, to remove all but 4-5 percent of the water content. SMP is also commonly referred to as nonfat dry milk (NFDM or NDM).

Whey: Whey is one of the two proteins found in milk and accounts for approximately 20 percent of the total protein content. Whey is typically a by-product formed after the fat and casein have been removed from the milk in cheese and casein production. There are several whey products, including dry sweet whey, dry acid whey, reduced lactose whey, reduced mineral whey, whey protein concentrate (WPC), and whey protein isolate (WPI).

Whey protein concentrate (WPC): WPC is typically produced using an ultrafiltration process. After the ultrafiltration process, the concentrated liquid whey passes through an evaporator and a spray dryer to remove all but 4-5 percent of the water. WPC is often referred to in conjunction with its protein concentration. For example, WPC with a protein concentration of 34 percent is commonly referred to as WPC 34.

Whey protein isolate (WPI): WPI denotes WPC with very high protein concentrations, 90 percent or more. The production of WPI requires additional processing steps compared with WPC. Two different processes can be used to produce WPI: ion exchange or microfiltration. The ion exchange process separates the components based on their electrical charge. The microfiltration process is analogous to the ultrafiltration process except that it utilizes ceramic filters instead of polymeric filters.

Production Processes and Other Terms

Co-precipitation: A production process in which skim milk undergoes a moderate to severe heat treatment followed by precipitation with acid or calcium salts.

Denaturation: The process that proteins undergo when subjected to certain physical or chemical treatments (e.g., heating) that cause disruption of bonds that maintain the protein's structure. Denaturation causes profound changes in functional properties.

Diafiltration: A process used in conjunction with ultrafiltration and microfiltration whereby water is added to the retentate before it passes through the ultrafiltration membrane as a means of decreasing viscosity and increasing the rate of permeate flow through the filter.

Dry blending: A process in which dried, powdered milk fractions are blended together to form a composite milk component product, such as mixing casein and WPC to produce MPC.

Evaporation: Process of drying liquid milk or milk fractions by heating the liquid (generally under a vacuum) to remove some of the water of the liquid.

Electrodialysis: A process that uses electric charge to separate substances in solution, such as removing minerals from whey or milk fractions.

Homogenization: The process of subdividing the fat globules in liquid dairy products to a smaller, more uniform size by forcing them under pressure through a membrane.

Box D-1—*Continued*
Production processes and technology used in the milk protein industry

Production Processes and Other Terms—*Continued*

Ion exchange: A form of chromatography where ions held on absorbent beads are exchanged for the ions in the solution. Different milk components have different charges allowing the ion exchange to separate components with different charges.

Microfiltration: See definition of ultrafiltration. Pores in a microfiltration membrane are larger than ultrafiltration pores, which allows the passage of larger molecules into the permeate.

Pasteurization: The process of heating liquid milk or milk fractions to a given temperature for a specified period of time such that any pathogenic microorganisms present are destroyed.

Permeate: The by-product of the ultrafiltration process consisting of the milk fractions that are allowed to pass through the filter and be separated out from the retentate.

Precipitation: An acid and heat treatment process through which casein proteins are separated from other milk fractions.

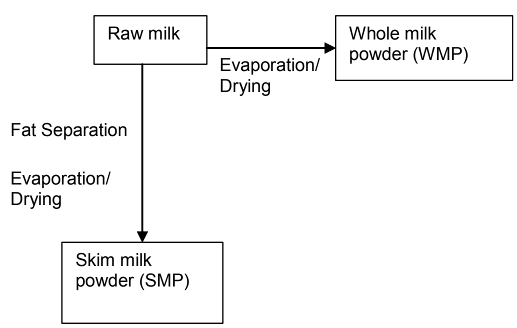
Retentate: The milk fractions captured, or retained, during the ultrafiltration process.

Roller drying (or drum drying): A process where fluid dairy products are dried by conveying them over the surface of two heated, revolving drums.

Spray drying: A process in which milk or milk fractions are atomized into a chamber where extremely hot air is used to dry the milk or milk fractions. The powder is then collected from the drying chamber.

Ultrafiltration: A process that uses a semipermeable membrane to separate milk fractions based on molecular size.

Figure D-3
Production process of whole milk powder and skim milk powder



Source: Wisconsin Center for Dairy Research.

functional characteristics of SMP vary depending on the temperature during the drying process. Both high- and low-heat SMP are readily soluble in cold water. High-heat SMP has good water-binding characteristics that add structure and firmness, and is typically used in bakery, meat, and confectionary applications.[12] Low-heat SMP is typically used in dairy and beverage applications because of its good flavor profile.[13]

Whey[14]

Whey is a greenish-yellow watery liquid formed after the fat and casein have been removed from the milk in cheese and casein production. There are several whey products, including dry sweet whey, dry acid whey, reduced lactose whey, reduced minerals whey, WPC, and whey protein isolate (WPI).

Fluid whey can be pasteurized and dried to produce dry whey.[15] There are typically two types of dry whey: sweet whey and acid whey. Sweet whey is the water and milk solids remaining after either the manufacture of cheddar, Swiss, and mozzarella cheeses, or after the production of rennet casein. Acid whey results from the production of cottage and ricotta cheeses, or the production of acid casein.[16] The protein content of both dry sweet and acid whey is 12-13 percent. The production process for dry whey is similar to the production process for WMP and SMP. The primary difference in the manufacturing processes is that whey also passes through a crystallizer as well as an evaporator and dryer.

Whey Protein Concentrate

A further derivative product of whey is WPC, typically produced using an ultrafiltration and diafiltration process (figure D-4).[17] Diafiltration involves adding water to the filtration process to reduce product viscosity, allowing more of the lactose and minerals to pass through the membrane, and resulting in higher protein concentrations. After the filtration process, which removes lactose, the concentrated liquid whey passes through an evaporator and a spray dryer to remove all but 4-5 percent of the water. WPC with a protein concentration of 34 percent (WPC 34) is a standard product. WPC 34 has similar properties

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[12] Ramesh Chandan, *Dairy-Based Ingredients*, American Association of Cereal Chemists (Eagan Press Handbook, 1997).

[13] Ibid.

[14] Members of the U.S. industry are currently developing new processing techniques that result in the separation of the casein protein from the whey protein via a filtration process. The whey protein that results from this process is generally referred to as serum protein to distinguish it from whey protein obtained via the cheesemaking process. This processing technology is being developed because it is believed that serum protein is more consistent and has better functionality as a result of not having been exposed to heat and chemical reactions in the cheesemaking process. Removing some of the whey before cheese production would also improve the efficiency of the cheese production process. This product is still in the development stage and not yet produced or traded commercially in the United States.

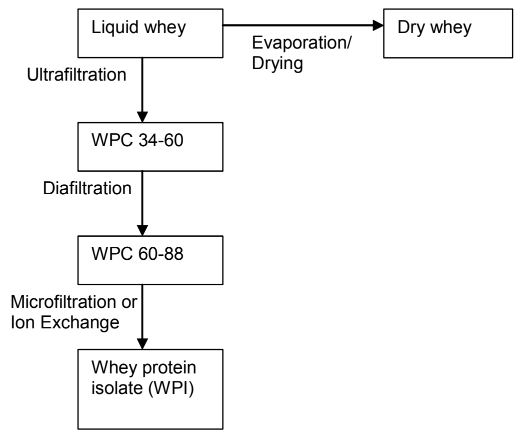
[15] The definition of dry whey is governed by the FDA standards of identity that specify the exact composition of the product and can be found at 21 CFR 184.1979.

[16] Ramesh Chandan, *Dairy-Based Ingredients*, American Association of Cereal Chemists (Eagan Press Handbook, 1997).

[17] Dominic W.S. Wong, et. al., "Structures and Functionalities of Milk Proteins," *Critical Reviews in Food Science and Nutrition*, vol. 36, issue 8, (1996).

to SMP and can be used in many of the same applications.[18] WPC with lower-protein concentrations (34-50 percent) have high lactose contents (35-51 percent). Independent of its protein content, WPC has a slightly higher fat content than SMP, typically between 3-5 percent (table D-1).

Figure D-4
Production process for dry whey, whey protein concentrate, and whey protein isolate



Source: Wisconsin Center for Dairy Research.

Whey Protein Isolate

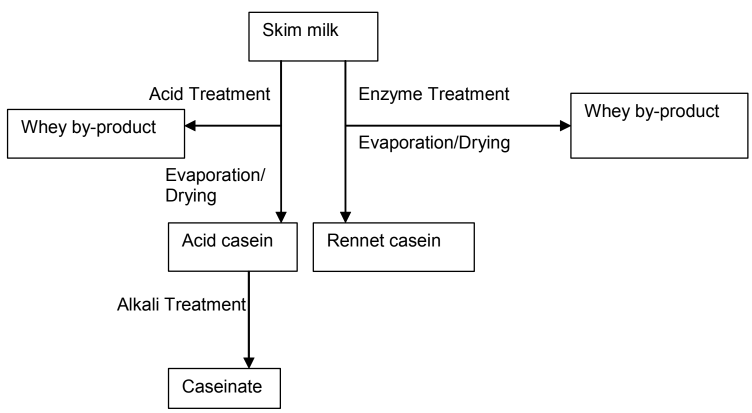
The term WPI is used to denote WPC with very high-protein concentrations, 90 percent or more. The production of WPI requires additional processing steps compared with WPC. Two different processes can be used to produce WPI: ion exchange or microfiltration (MF).[19] The ion exchange process separates the proteins by changing their charge which alters the functional and nutritional profile of the proteins.[20] WPI can also be produced using MF, a filtration process utilizing ceramic or polymeric filters. This process results in WPI with the same protein composition as the original whey. The major difference between these two processes is that WPI produced using the ion exchange method does not contain glycomacropeptide (GMP). GMP is a specific type of whey protein that has specific nutritional characteristics not found in other types of whey protein.[21]

[18] Wisconsin Center for Dairy Research staff and U.S. industry officials, interviews by USITC staff, Aug. 20 and 21, 2003.
[19] Dominic W.S. Wong, et. al., "Structures and Functionalities of Milk Proteins," *Critical Reviews in Food Science and Nutrition*, vol. 36, issue 8 (1996); U.S. industry officials, interviews by USITC staff.
[20] Wisconsin Center for Dairy Research staff, interview by USITC staff, Aug. 20, 2003.
[21] Wisconsin Center for Dairy Research staff, interview by USITC staff, Aug. 20, 2003; U.S. industry officials, interview by USTIC staff, Oct. 16 and 17, 2003.

Casein and Caseinates[22,23]

Casein is the primary protein found in milk, accounting for approximately 80 percent of the total protein content.[24] Commercial casein production was originally used in industrial applications (e.g., glue, paper coatings, plastics, and synthetic fiber production). As manufacturing technologies improved the ability to isolate casein protein and reduce its bacteria content, casein increasingly became a food ingredient while synthetics replaced casein in industrial products.[25] There are two types of casein: rennet casein and acid casein. Rennet casein is produced when the enzyme chymosin causes casein to coagulate and congeal into a solid mass.[26] Acid casein is produced when the addition of acid causes the casein protein to precipitate from milk at a pH of 4.6 (figure D-5).[27]

Figure D-5
Production process for casein and caseniate



Source: Wisconsin Center for Dairy Research.

To start the process, rennet or acid (hydrochloric or sulfuric) is injected into the skim milk stream. At this point, the rennet process slightly diverges from the acid process; because the reaction is slower, the milk-rennet mixture is circulated in a holding tank for several minutes before entering the coagulator. In contrast, the acid-milk mixture enters the coagulator

[22] The terms casein and caseinate are sometimes used interchangeably, with the underlying chemical differences assumed. For the purposes of this report, casein will describe only those milk proteins produced from milk and not having been exposed to alkali treatment. The term caseinate will refer only to casein that has been exposed to an alkali treatment.

[23] The production of serum protein via ultrafiltration results in the production of casein protein as well. As noted above this production process is, however, not currently in commercial use.

[24] Dominic W.S. Wong, et. al., "Structures and Functionalities of Milk Proteins," *Critical Reviews in Food Science and Nutrition*, vol. 36, issue 8 (1996).

[25] TEAGASC Dairy Products Research Center staff, interview by USITC staff, Oct. 7, 2003.

[26] Historically rennet was taken from the fourth stomach of a cow. Today, chymosin (a synthetic version) is more commonly used in commercial production applications.

[27] TEAGASC Dairy Products Research Center staff, interview by USITC staff, Oct. 7, 2003.

directly after acid injection. In both processes, the coagulator applies indirect heat and mixes the clotted milk to maximize casein precipitation. After leaving the coagulator, the casein curd is separated from the whey stream by centrifuge. The curd is then washed with fresh water to remove residual whey, lactose, and minerals.[28] The casein curd is again centrifuged to reduce moisture to about 50 percent. At this point, the casein may be dried to be sold as acid or rennet casein, or it can be combined with alkalis to produce caseinates. Casein and caseinates are typically dried using vibrating-bed, roller, or attrition dryers,[29] after which the product is milled to the appropriate mesh size.[30] Attrition drying combines the drying and milling processes.

Codex standards require rennet casein to have a protein concentration of not less than 84 percent, and acid casein to have a protein concentration of not less the 90 percent. Casein proteins must account for at least 95 percent of the total protein content.[31] Both rennet and acid casein are insoluble in water. Rennet casein is generally used without further modification, often in the production of imitation cheese.[32] Acid casein is, however, generally further modified by the addition of an alkali which makes the product soluble, and is thereafter considered caseinate.

Caseinate is a derivative of casein produced by neutralizing acid with alkali and drying the final product.[33] The alkali treatments result in caseinates being more soluble in water than casein.[34] A range of alkalis can act as neutralizing agents. The two most common neutralizing agents are sodium hydroxide (resulting in sodium caseinate) and calcium hydroxide (resulting in calcium caseinate). Other potential alkali agents include potassium and magnesium. The specific alkali used can affect the functionality of the resulting caseinate. For example, sodium caseinate has somewhat different solubility, viscosity, and emulsification properties than calcium caseinate.[35] Caseinates have a protein concentration of at least 88 percent and the casein protein must account for at least 95 percent of the total protein content.[36]

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[28] Acid casein production creates a whey stream with a higher mineral concentration then rennet casein production because acid strips calcium and phosphorous from the casein molecules, hence the higher mineral or ash level and correspondingly lower level of protein in rennet casein as compared with acid casein. TEAGASC Dairy Products Research Center staff, interview by USITC staff, Oct. 7, 2003.

[29] TEAGASC Dairy Products Research Center staff, interview by USITC staff, Oct. 7, 2003.

[30] The standard mesh sizes used for casein and caseinate production are 30-60-and 90-mesh. European industry officials, interviews by USITC staff, Oct. 7-18, 2004

[31] There is no FDA standard of identity for casein, however, the composition of casein is set forth in the Codex Alimentarius at Codex Stan A-18-1995, Rev. 1-2001.

[32] Wisconsin Center for Dairy Research staff, interview by USITC staff, Aug. 20, 2003; the European industry refers to imitation cheese as “analog cheese,” European industry officials, interviews by USITC staff, Oct. 7-18, 2003.

[33] Ramesh Chandan, *Dairy-Based Ingredients*, American Association of Cereal Chemists (Eagan Press Handbook, 1997).

[34] Guy Linden and Denis Lorient, *New Ingredients in Food Processing: Biochemistry and Agriculture* (CRC Press, 1999).

[35] DMV International staff, interviews by USITC staff, Veghel, the Netherlands, Oct. 13, 2003.

[36] There is no FDA standard of identity for caseinate, however, the composition of caseinate is set forth in the Codex Alimentarius at Codex Stan A-18-1995, Rev. 1-2001.

Milk Protein Concentrate

The definition of MPC in the Harmonized Tariff Schedule of the United States (HTS), Additional U.S. Note 13, is “any complete milk protein (casein plus lactalbumin) that is 40 percent or more protein by weight,” The term “lactalbumin” in this definition is a synonym for whey protein.[37] Thus, this definition requires that MPC contain both casein protein and whey protein. Unlike many dairy proteins, there is no FDA standard of identity for MPC, nor is there an accepted industry standard for the composition or production process for MPC, other than that set forth in the HTS. There is also no internationally recognized definition of MPC in the Codex Alimentarius. MPC may be produced using three very different methods: ultrafiltration, blending, and co-precipitation.[38] The ultrafiltration method is most commonly used in Australia and New Zealand. A limited amount of production using the ultrafiltration method takes place in the United States and EU. The blending method is most commonly utilized in Europe. The co-precipitate method is not common but is utilized in Australia, Europe, and New Zealand.

In the ultrafiltration process, MPC is produced from skim milk using a filter (a polymeric membrane with minute pores) that separates larger molecules from smaller molecules (figure D-6). When skim milk is passed over the membrane, the lactose and minerals particles that are able to pass through the pores in the membrane are separated from the larger protein molecules.[39] The remaining milk therefore has a higher concentration of protein than the original skim milk. The lactose and minerals separated out during the filtration process are called “the permeate,” while the concentrated milk protein retained is called “retentate.” The retentate is then spray dried in a manner similar to the WMP and SMP production process. To achieve protein concentrations of 65 percent or higher, diafiltration is required.[40] The proteins in MPC produced by ultrafiltration are often referred to as native-state proteins because the original structure of the casein and whey proteins remains the same both before and after the filtering processes.[41]

MPC may be produced by blending various dairy proteins, such as SMP, casein, or WPC, in specific proportions to produce powders with specific protein concentrations or functional properties (figure D-7). Low-protein MPC (e.g., 42 percent protein) is typically produced by combining SMP with casein, whereas high-protein MPC (e.g., 80 percent protein) is typically produced by combining casein and WPC.[42] Blended MPC may be produced using dry blending or wet blending techniques. The specific dairy ingredients and blending techniques used affect the functionality of the final product.[43] Therefore, it not possible to predict the functional properties of a blended MPC based solely on its protein content.

[37] The term lactalbumin is rarely used by food scientists in the dairy sector to denote whey protein.

[38] The U.S. HTS definition of MPC does not specify or limit the manufacturing process used to manufacture it.

[39] Wisconsin Center for Dairy Research staff, interview by USITC staff, Aug. 20, 2003.

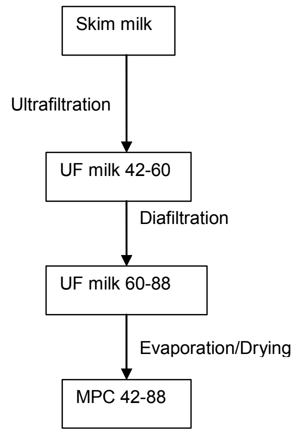
[40] Ibid.

[41] Dr. David Barbano, Cornell University, interview by USTIC staff, July 21, 2003.

[42] European industry officials, interviews by USITC staff, Oct. 7-18, 2003.

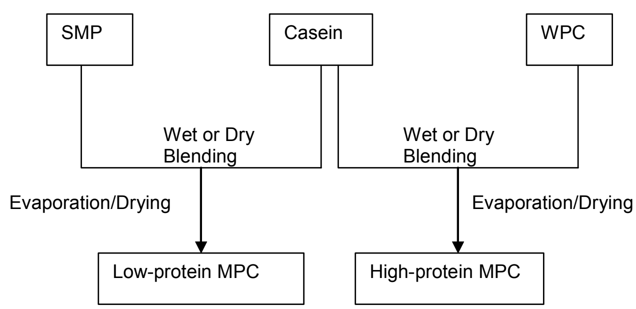
[43] Dr. Brendan T. O’Kennedy and Dr. Philip M. Kelly, TEAGASC Dairy Products Research Center, interview by USITC staff, Oct. 7, 2003.

Figure D-6
Production process of ultrafiltered milk protein concentrate



Source: Wisconsin Center for Dairy Research.

Figure D-7
Production process for blend milk protein concentrate

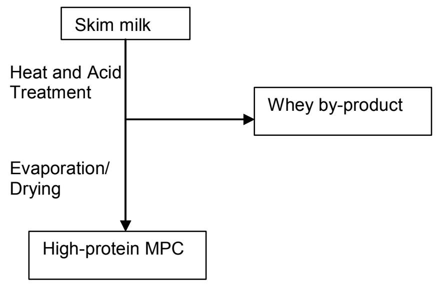


Source: Wisconsin Center for Dairy Research.

The process of co-precipitation is essentially a modification of the acid casein process (figure D-8). In the co-precipitating process, skim milk is first heated to cause the whey protein to denature. In their denatured state, the whey proteins bind to the casein proteins.[44] When an acid treatment is applied, the whey protein precipitates out with the casein protein

[44] Guy Linden and Denis Lorient, *New Ingredients in Food Processing: Biochemistry and Agriculture* (CRC Press, 1999).

Figure D-8
Production process for co-precipitate milk protein concentrate



Source: Wisconsin Center for Dairy Research.

because the two proteins are bound together.[45] This process recovers approximately 96 percent of the proteins in the milk and results in a product with a protein concentration of at least 80 percent.[46] Co-precipitate MPC has different functional characteristics than either ultrafiltered MPC or blended MPC, although it is potentially more similar to a blend MPC than MPC produced using ultrafiltration.[47]

Functional Properties of Milk Proteins

In addition to delivering protein, food processors use milk protein products because they provide functionality to the products in which they are used. A number of milk proteins have similar functional properties and applications. Some of the more commonly referenced functional characteristics include solubility, viscosity, water-binding, emulsifying, whipping and foaming, heat stability, and gelation/coagulation. Additionally, individual functional characteristics are strongly interrelated (for example, a protein's solubility affects foaming, gelation, and emulsifying characteristics) and processes undertaken to enhance one particular characteristic can impact other functional characteristics. These major functional characteristics are examined in more detail below; table D-2 presents a broad summary of the functional characteristics of casein and whey proteins.

[45] Ibid.
[46] Ibid.
[47] One producer of co-precipitate MPC reports the functionality of the product is similar to caseinate. Industry official, interview by USITC staff, Sept. 24, 2003.

Table D-2
Main functional characteristics of milk protein

Product	Casein	Whey
Solubility	Insoluble at pH 4.6	Very soluble at all pH levels, but insoluble at pH 5 if denatured
Viscosity	Solutions very viscous at neutral and alkaline pH	Solutions not very viscous unless denatured
Water-binding (hydration)	High water retention with formation of glue at high concentrations	Water retention increases with denaturation
Emulsifying	Excellent emulsifying characteristics especially at neutral or alkaline pH	Good emulsifying characteristics except at pH4-5 after denaturation
Whipping/foaming	Good swelling but poor foam stability	Good swelling and excellent foam stability
Heat stability	Good heat stability	Protein subject to denaturing when exposed to heat
Gelling	No thermal gelling except in the presence of calcium	Thermal gelling from 70 degrees Celsius, influenced by pH

Source: Guy Linden and Denis Lorient, *New Ingredients in Food Processing: Biochemistry and Agriculture* (CRC Press, 1999).

Solubility

Solubility refers to the ability of the protein to dissolve or disperse evenly in a solution. Insoluble proteins will clump together and form a strata within, or drop out of, a solution.[48] Solubility is particularly important in beverage applications, such as meal replacement or nutritional supplement beverages (such as Slim Fast shakes). A number of factors during milk protein production can impact the level of solubility. For example, evaporation and drying temperatures, pH level of the solution, and the charge of the protein molecule are all important in determining the solubility of the final product.

The solubility of SMP depends on the production process used in the evaporation and drying of the skim milk. High-heat SMP has low solubility, but low-heat SMP is very soluble.[49] Casein produced both by acid precipitation and rennent coagulation is insoluble in water.[50] Solubility of caseinate depends upon the final pH and the alkali used. Sodium and potassium caseinate are almost completely soluble, while calcium caseinate is less soluble.[51] The production process influences the solubility of MPC. MPC is soluble in solutions with a pH of 7.0 or higher. However, MPC produced using ultrafiltration with a protein content of 80 percent or more is less soluble than lower-protein concentration MPC. The solubility of MPC produced via a blending process is dependent on the solubility of its constituent parts and the production process. Co-precipitate MPC, after certain pH adjustments, is highly

[48] John F. Kinsella, "Milk Proteins: Physicochemical and Functional Properties," *CRC Critical Reviews in Food Science and Nutrition*, vol. 21, issue 3, 1981.

[49] Guy Linden and Denis, Lorient, *New Ingredients in Food Processing: Biochemistry and Agriculture* (CRC Press, 1999).

[50] P.F. Fox, *Advanced Dairy Chemistry*, vol. 1, part B (Kluwer Academic/Plendum Publishers, 2003).

[51] Srinivasan Damodaran, et. al., *Food Proteins and Their Applications* (Marcel Dekker, 1997).

soluble.[52] WPC is generally soluble over the full pH range, however, exposure to heat treatments may cause some loss in its solubility.[53]

Viscosity

Viscosity is a measure of a fluid's resistance to flow. For example, a fluid with a high viscosity resists motion because its molecular composition generates significant friction. Dairy products, such as yogurt and ice cream, require proteins with high viscosity in order to maintain their form and structure. The viscosity of the protein is determined by the size, shape, composition, and charge of the protein.[54]

Casein and caseinates tend to produce solutions with higher levels of viscosity than other milk proteins.[55] Casein is more viscous at higher pH levels. The viscosity of caseinates (generally considered to be highly viscous) depends on both the temperature and pH of the solution.[56] Whey proteins are not particularly viscous, even at high-protein concentrations.[57] The viscosity of whey proteins is also dependent upon the pH and temperature of the solution.

Water-binding (Hydration)[58]

Water-binding, or hydration, refers to the ability of the protein to absorb and/or bind water molecules to the protein.[59] Water-binding properties are important functional characteristics in both the meat and bakery industries. In these applications, the water-binding characteristics are important to the texture and structure of the final product. Highly soluble proteins are less effective at water-binding than less soluble proteins.[60] Therefore, milk protein products that are highly soluble, such as WPC, are less effective as water-binders. However, WPC is a more effective water-binder when exposed to heat.[61] Casein and caseinates have effective water-binding characteristics.[62] The water-binding ability of MPC produced from a blending process is dependent on the solubility of its constituent parts and the production process. MPC produced via the ultrafiltration process has good water-binding

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[52] Guy Linden and Denis Lorient, *New Ingredients in Food Processing: Biochemistry and Agriculture* (CRC Press, 1999).

[53] Joseph F. Zayas, Functionality of Proteins in Food (Berlin/Heidelberg: Springer-Verlag, 1997).

[54] Wisconsin Center for Dairy Research staff, interview by USITC staff, Aug. 20, 2003.

[55] Ibid.

[56] Ibid.

[57] Srinivasan Damodaran, et. al., *Food Proteins and Their Applications* (Marcel Dekker, 1997).

[58] The interaction of proteins with water can be expressed interchangeably by using the terms water hydration, water holding, water retention, water binding, water imbibing, water absorption, and others. There is no standardized definition of protein functionality. Joseph F. Zayas, *Functionality of Proteins in Food* (Berlin/Heidelberg: Springer-Verlag, 1997).

[59] Wisconsin Center for Dairy Research staff, interview by USITC staff, Aug. 20, 2003.

[60] Joseph F. Zayas, *Functionality of Proteins in Food* (Berlin/Heidelberg: Springer-Verlag, 1997).

[61] Guy Linden and Denis Lorient, *New Ingredients in Food Processing: Biochemistry and Agriculture* (CRC Press, 1999).

[62] Joseph F. Zayas, *Functionality of Proteins in Food* (Berlin/Heidelberg: Springer-Verlag, 1997).

properties. SMP has moderate water-binding capacity compared to other milk proteins.[63] Medium-heat SMP has the best water-binding properties of all forms of SMP because of its reduced solubility.[64]

Emulsification

An emulsion is a suspension of oil and water. An emulsifying agent is soluble in both oil and water and holds together oil and water, which otherwise would not mix.[65] The emulsion prevents the separation of the oil and water into two separate compounds. Emulsifying properties are important in virtually all applications that use milk proteins. In processed imitation cheese and meat applications, the emulsifying characteristics of milk protein are critical to maintaining the structure and texture of the product.

Milk proteins are capable of capturing the oil and fat molecules on one side of their molecular structure, while capturing water molecules on the other side, thus serving as the binding agent between these two substances.[66] Caseinates have excellent emulsifying properties.[67] Casein has good emulsifying properties, but not as good as caseinate. Whey proteins also have good emulsifying characteristics, but this varies greatly by the pH and temperature of the whey protein.[68] Caseinate, casein, and WPC have better emulsifying properties than SMP, although low-heat SMP has better emulsifying properties than high-heat SMP.[69] MPC produced using ultrafiltration has good emulsifying capacity but is not considered superior to caseinate, particularly sodium caseinate.[70] Co-precipitate MPC with a high calcium content has better emulsifying properties than other forms of co-precipitates.[71] The emulsifying properties of MPC produced via a blending process are dependent on the solubility of its constituent parts and the production process.

Whipping and Foaming Properties

Generally, the higher the protein concentration of a milk protein the better its foaming characteristics. There is a limit however, and very high protein concentrations have poorer foaming characteristics because of their decreased solubility.[72] The amount of heat applied to the protein and the pH can affect the amount and stability of the foam. WPC and WPI are

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[63] Ibid.
[64] Guy Linden and Denis Lorient, *New Ingredients in Food Processing: Biochemistry and Agriculture* (CRC Press, 1999).
[65] Ramesh Chandan, *Dairy-Based Ingredients*, American Association of Cereal Chemists (Eagan Press Handbook, 1997).
[66] Wisconsin Center for Dairy Research staff, interview by USITC staff, Aug. 20, 2003.
[67] Srinivasan Damodaran, et. al., *Food Proteins and Their Applications* (Marcel Dekker, 1997).
[68] Ibid.
[69] Joseph F. Zayas, *Functionality of Proteins in Food* (Berlin/Heidelberg: Springer-Verlag, 1997).
[70] Company officials, DMV International, interviews by USITC staff, Veghel, the Netherlands, Oct. 13, 2003.
[71] Guy Linden and Denis Lorient, *New Ingredients in Food Processing: Biochemistry and Agriculture* (CRC Press, 1999).
[72] Joseph F. Zayas, *Functionality of Proteins in Food* (Berlin/Heidelberg: Springer-Verlag, 1997).

particularly effective at forming a stable foam because they are soluble, and stabilize foam by increased viscosity.[73] The foaming characteristic of WPC increases as its solubility increases.[74] Caseinate has good whipping and foaming properties.[75] Casein generally produce a less stable foam than WPC, WPI, or caseinate, because of its less soluble nature.[76] MPC, especially MPC with high-protein concentrations, has good foaming characteristics. Co-precipitate MPC generally has foaming characteristics somewhat better than sodium caseinate.[77] Co-precipitate MPC with high-calcium concentrations has better whipping and foaming characteristics than acid co-precipitate MPC.[78]

Heat Stability

Heat stability represents the protein's ability to maintain its structure when exposed to heat treatments.[79] Heat stability is particularly important in aseptically packaged products. The aseptic process requires a high heat treatment. Thus, for products that are packaged in aseptic cans, such as meal-replacement beverages, the ability of the protein to resist heat is particularly important.

Caseins and sodium caseinates are heat stable, but most calcium caseinates are not. Whey proteins are not generally heat stable because they tend to denature when exposed to high temperature, although the degree of the instability is also affected by the pH, and protein, and lactose concentration.[80] The heat stability of MPC produced via a blending process is dependent on the solubility of its constituent parts and the production process. Co-precipitate MPC has good heat stability characteristics.[81] SMP has better heat stability than WPC because of the presence of casein proteins that will not denature.[82]

Gelation and Coagulation

A gel occurs when a small proportion of solid is dispersed in a relatively large proportion of liquid but maintains many of the properties (such as stability) of a solid. Many of the same products that require good emulsifying characteristics also require good gel formation characteristics. Applications of milk proteins with good gelation and coagulation properties in products, such as imitation cheese, processed cheese, and certain meat products, helps

[73] Ibid.
[74] Ibid.
[75] Dominic W.S. Wong, et. al., *Structures and Functionalities of Milk Proteins* (*Critical Reviews in Food Science and Nutrition*, vol. 36, issue 8, 1996).
[76] Joseph F. Zayas, *Functionality of Proteins in Food* (Berlin/Heidelberg: Springer-Verlag, 1997).
[77] Guy Linden and Denis Lorient, *New Ingredients in Food Processing: Biochemistry and Agriculture* (CRC Press, 1999).
[78] John F. Kinsella, "Milk Proteins: Physicochemical and Functional Properties," *CRC Critical Reviews in Food Science and Nutrition*, vol. 21, issue 3, 1981.
[79] Wisconsin Center for Dairy Research staff, interview by USITC staff, Aug. 20, 2003.
[80] Ibid.
[81] Guy Linden and Denis Lorient, *New Ingredients in Food Processing: Biochemistry and Agriculture* (CRC Press, 1999).
[82] John F. Kinsella, "Milk Proteins: Physicochemical and Functional Properties," *CRC Critical Reviews in Food Science and Nutrition*, vol. 21, issue 3, 1981.

maintain the product's structure. The gelation of milk proteins is directly responsible for the structure of cheese and semisolid dairy products and influences the texture of other dairy products such as yogurt.[83] Casein generally does not have good gel-forming characteristics.[84] Sodium caseinate has better gel-forming characteristics than other forms of caseinate.[85] WPC and WPI have very good gel-forming characteristics, although the pH level and temperature can affect the gel characteristics.[86] WPC require higher temperatures before gel formation begins, therefore the temperature of the process incorporating WPC can determine its effectiveness.[87] Very high temperatures, however, will denature the whey protein and weaken its gel-forming properties.[88] MPC produced using ultrafiltration also has good gel-forming characteristics.[89] The gel-forming properties of MPC produced via a blending process is dependent on the solubility of its constituent parts and the production process. Co-precipiate MPC has gel-forming characteristics similar to caseinate. Low-heat SMP has good gel forming characteristics.[90]

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[83] Joseph F. Zayas, *Functionality of Proteins in Food* (Berlin/Heidelberg: Springer-Verlag, 1997).

[84] Wisconsin Center for Dairy Research staff, interview by USITC staff, Aug. 20, 2003.

[85] Ibid.

[86] Ibid.

[87] Joseph F. Zayas, *Functionality of Proteins in Food* (Berlin/Heidelberg: Springer-Verlag, 1997).

[88] Ibid.

[89] Wisconsin Center of Dairy Research staff, interview by USITC staff, Sept. 26, 2003.

[90] Guy Linden and Denis Lorient, *New Ingredients in Food Processing: Biochemistry and Agriculture* (CRC Press, 1999).

APPENDIX E
U.S. FOOD AND DRUG ADMINISTRATION STANDARDS OF IDENTITY FOR MILK PROTEIN PRODUCTS

U.S. Food and Drug Administration Standards of Identity

The 1938 Food, Drug & Cosmetic Act established standards of identity for foods. These standards govern what ingredients may be used and the manufacturing process by which a food must be produced in order to be labeled with the food name indicated by the standard. In order to comply with Federal regulations, food manufacturers are responsible for following the standard exactly as written in order to use the name listed in the standard. As food technology evolved in the 1960s and 1970s, efforts were made to transform and modernize the food standards process. In 1990, the Nutrition Labeling and Education Act embodied the notion that food standards should not inhibit innovation in the marketplace and that new products should be safe and informatively labeled.

Today, there are 98 standards for dairy foods, 72 of which apply to individual cheeses and cheese products (table E-1).[1] Many of these standards have not evolved with food manufacturing technology and are in much the same state as they were when they were originally issued in the late-1970s and early-1980s. It is not clear that efforts to amend and clarify existing dairy food standards have met with much success since the 1990s.[2] Petitions to amend dairy standards for ice cream and frozen desserts, and to define filtered skim milk have been pending since the late-1990s. Portions of the yogurt standard have been stayed, pending a hearing, since the early-1980s.[3]

Dairy food manufacturers are limited in their manufacturing choices by the food standards. Although the U.S. Food and Drug Administration (FDA) does not currently explicitly provide for the use of fluid ultrafiltered (UF) milk as an ingredient in standardized cheese, filtration technology is used in U.S. cheese making under the "alternate make" procedures authorized in certain cheese standards.[4] FDA has indicated that milk that has been ultrafiltered "as an integral part of the cheesemaking process" is acceptable in the production of standardized cheeses. FDA has exercised enforcement discretion with respect to cheese plants that use ultrafiltered milk produced outside their own cheese making plants.[5] In

[1] The standards of identity for food products are found in Title 21 of the Code of Federal Regulations, Parts 130-169. Parts 131-135 apply to dairy foods.

[2] The standard-setting process for all foods was a formal one prior to 1990. That is, interested parties were permitted to object to any portion of a final standard (or "rule") after publication of that standard by the FDA in the Federal Register. Any objection led to that portion of the standard being stayed, or suspended, pending a further hearing on the matter. The formal process often resulted in significant delays in the final rule making. The 1961, a public hearing to debate the standard for peanut butter lasted 20 weeks and generated 8,000 pages of transcript. Junod Suzanne White "The Rise and Fall of Food Standards in the U.S.," U.S. Food and Drug Administration, paper presented to the Society for the Social History of Medicine, Aberdeen, Scotland (Spring 1999). While the standard-setting process for other food standards has since been converted to an expedited informal one, in which the standard is set once the FDA issues the final rule, rule making for dairy foods continues to operate under the lengthier formal process.

[3] Petition submitted to the Food and Drug Administration to amend standard of identity for yogurt, Leslie G. Sarasin, President, National Yogurt Association (Feb. 18, 2000).

[4] "Alternate make" provisions allow for deviation from the prescribed method of manufacture, as long as the procedure results in a cheese with the same physical and chemical properties.

[5] U.S. General Accounting Office, *Dairy Products: Imports, Domestic Production, and Regulation of Ultra-filtered Milk*, GAO-01-326 (Mar. 2001), p. 12.

Table E-1
Dairy foods covered by U.S. Food and Drug Administration standard of identity regulations

Section	Product
§131.25	Whipped cream products containing flavoring or sweetening.
§131.110	Milk.
§131.111	Acidified milk.
§131.112	Cultured milk.
§131.115	Concentrated milk.
§131.120	Sweetened condensed milk.
§131.125	Nonfat dry milk.
§131.127	Nonfat dry milk fortified with vitamins A and D.
§131.130	Evaporated milk.
§131.147	Dry whole milk.
§131.149	Dry cream.
§131.150	Heavy cream.
§131.155	Light cream.
§131.157	Light whipping cream.
§131.160	Sour cream.
§131.162	Acidified sour cream.
§131.170	Eggnog.
§131.180	Half-and-half.
§131.200	Yogurt.
§131.203	Lowfat yogurt.
§131.206	Nonfat yogurt.
§133.102	Asiago fresh and asiago soft cheese.
§133.103	Asiago medium cheese.
§133.104	Asiago old cheese.
§133.106	Blue cheese.
§133.108	Brick cheese.
§133.109	Brick cheese for manufacturing.
§133.111	Caciocavallo siciliano cheese.
§133.113	Cheddar cheese.
§133.114	Cheddar cheese for manufacturing.
§133.116	Low sodium cheddar cheese.
§133.118	Colby cheese.
§133.119	Colby cheese for manufacturing.
§133.121	Low sodium colby cheese.
§133.123	Cold-pack and club cheese.
§133.124	Cold-pack cheese food.
§133.125	Cold-pack cheese food with fruits, vegetables, or meats.
§133.127	Cook cheese, koch kaese.
§133.128	Cottage cheese.
§133.129	Dry curd cottage cheese.
§133.133	Cream cheese.
§133.134	Cream cheese with other foods.
§133.136	Washed curd and soaked curd cheese.
§133.137	Washed curd cheese for manufacturing.
§133.138	Edam cheese.
§133.140	Gammelost cheese.
§133.141	Gorgonzola cheese.
§133.142	Gouda cheese.
§133.144	Granular and stirred curd cheese.
§133.145	Granular cheese for manufacturing.
§133.146	Grated cheese.
§133.147	Grated American cheese food.
§133.148	Hard grating cheeses.
§133.149	Gruyere cheese.
§133.150	Hard cheeses.
§133.152	Limburger cheese.
§133.153	Monterey cheese and monterey jack cheese.

Table E-1—*Continued*
Dairy foods covered by U.S. Food and Drug Administration standard of identity regulations

Section	Product
§133.154	High-moisture jack cheese.
§133.155	Mozzarella cheese and scamorza cheese.
§133.156	Low-moisture mozzarella and scamorza cheese.
§133.157	Part-skim mozzarella and scamorza cheese.
§133.158	Low-moisture part-skim mozzarella and scamorza cheese.
§133.160	Muenster and munster cheese.
§133.161	Muenster and munster cheese for manufacturing.
§133.162	Neufchatel cheese.
§133.164	Nuworld cheese.
§133.165	Parmesan and reggiano cheese.
§133.167	Pasteurized blended cheese.
§133.168	Pasteurized blended cheese with fruits, vegetables, or meats.
§133.169	Pasteurized process cheese.
§133.170	Pasteurized process cheese with fruits, vegetables, or meats.
§133.171	Pasteurized process pimento cheese.
§133.173	Pasteurized process cheese food.
§133.174	Pasteurized process cheese food with fruits, vegetables, or meats.
§133.175	Pasteurized cheese spread.
§133.176	Pasteurized cheese spread with fruits, vegetables, or meats.
§133.178	Pasteurized neufchatel cheese spread with other foods.
§133.179	Pasteurized process cheese spread.
§133.180	Pasteurized process cheese spread with fruits, vegetables, or meats.
§133.181	Provolone cheese.
§133.182	Soft ripened cheeses.
§133.183	Romano cheese.
§133.184	Roquefort cheese, sheep's milk blue-mold, and blue-mold cheese from sheep's milk.
§133.185	Samsoe cheese.
§133.186	Sap sago cheese.
§133.187	Semisoft cheeses.
§133.188	Semisoft part-skim cheeses.
§133.189	Skim milk cheese for manufacturing.
§133.190	Spiced cheeses.
§133.191	Part-skim spiced cheeses.
§133.193	Spiced, flavored standardized cheeses.
§133.195	Swiss and emmentaler cheese.
§133.196	Swiss cheese for manufacturing.
§135.110	Ice cream and frozen custard.
§135.115	Goat`s milk ice cream.
§135.130	Mellorine.
§135.140	Sherbet.
§135.160	Water ices.

Source: Code of Federal Regulations, Parts 131-135.

2001, the U.S. General Accounting Office (GAO) reported that the majority of the ultrafiltered milk transported from ultrafiltration facilities was destined for use in the cheese making operations of related companies.[6]

Three separate, but similar, petitions from the National Milk Producers Federation, the National Cheese Institute, and the American Dairy Products Institute requesting that the definition of milk in cheese standards include ultrafiltered milk are currently pending at

[6] Ibid., p. 11.

FDA.[7] Among the FDA FY2003 "A-list" work priorities was the development of a proposed rule to amend the definition for "milk" in cheese standards to clearly allow for the use of fluid UF milk.[8] Some cheese manufacturers have been waiting to invest in filtration technology until the issue of standardization can be settled.[9]

Should a food manufacturer desire to produce a food whose ingredients deviate from the standard of identity for that product, options are limited. One is to rename the product. Foods that do not meet a defined standard must be named by a common or usual name of the food other than the name in the standard, or in the absence of a common or usual name, an appropriately descriptive term.[10] In one such instance, Kraft Foods renamed their single cheese slices "process cheese product" in order to use the ingredient milk protein concentrate, which is unapproved for use in cheeses that have a standard of identity. Alternatively, a manufacturer could choose to add the word "substitute" or "imitation" to its product, although those terms may have pejorative connotations to consumers.[11]

Another option is to apply for a temporary marketing permit by which permission is granted by FDA to manufacture the product outside the standard but label it with the standard name.[12] Such permits are granted for a period of 15 months, after which the requester must file a petition requesting a change in the standard of identity to allow for the product to be manufactured with a new ingredient. The requester can continue to manufacture the product outside the standard until FDA acts on the petition. Once a temporary marketing permit is granted to the requester, the same option is available to any other firm that desires to produce a product outside the standard. However, that company must notify FDA that it desires to manufacture under the provisions of the temporary marketing permit.

Milk protein concentrate (MPC) is not permitted in the production of most standardized dairy foods since it is not listed as a primary ingredient nor as an optional ingredient in the

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[7] Letters from Jerry Kozak, Chief Executive Officer, National Milk Producers Federation to Christine J. Lewis, Director, Office of Nutritional Products, Labeling, and Dietary Supplements, U.S. Food and Drug Administration, dated Sept. 6, 2001 and Oct. 19, 2001, and letter from C. Gordon Brown, Senior Vice President, Regulatory & Scientific Affairs, International Dairy Foods Association, to Dr. Christine J. Lewis, Director, Office of Nutritional Products, Labeling, and Dietary Supplements, U.S. Food and Drug Administration, dated Sept. 20, 2001.

[8] FDA's intention was to complete at least 90 percent of the "A-list" items by the end of FY 2003. CFSAN 2003 Program Priorities, U.S. Food and Drug Administration, Center for Food Safety and Applied Nutrition, Mar. 10, 2003, found at *http://www.cfsan.fda.gov/~dms/cfsan303.-html*, retrieved Oct. 1, 2003.

[9] Letter from C. Gordon Brown, Senior Vice President, Regulatory & Scientific Affairs, International Dairy Foods Association, to Dr. Christine J. Lewis, Director, Office of Nutritional Products, Labeling, and Dietary Supplements, Food and Drug Administration, dated Sept. 20, 2001.

[10] Letter from John B. Foret, Director, Division of Compliance and Enforcement, Office of Nutritional Products, Labeling and Dietary Supplements, Center for Food Safety and Applied Nutrition, U.S. Food and Drug Administration to James E. Harsdorf, Secretary, Wisconsin Department of Agriculture, Trade and Consumer Protection, dated May 7, 2002.

[11] Use of the words "like," "similar to," or "imitation" in the product name or labeling of a food product is regulated by the FDA. It has been determined by FDA that the word "like" is not sufficient to differentiate a product that has not been manufactured to the specifications of the standard. The use of the words "imitation" and "substitute" is permitted and governed by CFR, Title 21, Part 101.3.

[12] The procedure for securing a temporary marketing permit to produce a food outside the standard of identity is outlined in 21 CFR Part 130.17.

standards of identity. MPC may not be used as an ingredient in any of the cheeses or cheese products covered by standards of identity.[13] The standards appear to permit the usage of MPC in the manufacture of ice cream[14] and yogurt.[15] They also permit the use of UF milk in the manufacture of certain standardized cheeses for which FDA has practiced enforcement discretion (cheddar and mozzarella).[16]

[13] Letter from John B. Foret, Director, Division of Compliance and Enforcement, Office of Nutritional Products, Labeling and Dietary Supplements, Center for Food Safety and Applied Nutrition, U.S. Food and Drug Administration to James E. Harsdorf, Secretary, Wisconsin Department of Agriculture, Trade and Consumer Protection, dated May 7, 2002.

[14] The standard of identity for ice cream, under 135.110 (b) Optional dairy ingredients, allows for the use of "skim milk, that may be concentrated, and from which part or all of the lactose has been removed by a safe and suitable procedure." Since milk protein concentrate is not defined, this standard allows for the use of both liquid ultrafiltered milk and dry milk protein concentrate in the manufacture of ice cream.

[15] The standard of identity for yogurt lists specific permissible milk-derived ingredients under 131.200 (d) 1, 131.203 (d)(1), and 131.206 (d)(1). Objections by interested parties to the listing of specific ingredients versus language that provided for any safe and suitable milk-derived ingredient were acknowledged by the FDA in the late 1970s. Those portions of the standard were subsequently stayed, pending a hearing on the matter. As a result, yogurt manufacturers are permitted, under the standard, to use any safe and suitable milk-derived ingredient in yogurt, including MPC. Food Standards & Labeling staff, Center for Food Safety and Applied Nutrition, Food and Drug Administration, interview with USITC staff, Dec. 8, 2003.

[16] Food Standards & Labeling staff, Center for Food Safety and Applied Nutrition, Food and Drug Administration, interview by USITC staff, Dec. 8, 2003.

APPENDIX F
CENSUS TRADE TABLES

Table F-1
Milk protein products: U.S. imports by product type,[1] 1996-2002

Product	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
Casein	342,558	280,952	295,579	238,774	302,806	294,779	230,320
Caseinate	135,767	117,165	131,392	135,508	153,674	196,614	156,605
Milk protein concentrate	56,855	65,826	99,133	122,253	152,847	101,060	114,619
Milk albumin	27,814	36,868	43,967	37,967	64,801	75,805	64,565
Casein/Milk protein concentrate	14,366	38,824	38,037	28,943	43,806	33,485	31,290
Skim milk powder	4,967	5,660	8,119	8,077	6,815	7,658	10,451
Whey protein concentrate	2,616	6,240	6,570	9,104	12,981	11,355	8,545
Whole milk powder	3,091	6,278	6,782	8,527	7,926	9,431	7,650
Whey	745	957	1,801	1,738	2,759	3,876	4,223
Fluid whole milk	2,030	3,760	4,042	4,879	2,522	2,206	2,555
Concentrated unsweetened milk	1,236	1,489	499	967	1,533	2,794	1,455
Dried whey	3	62	116	9	54	130	149
Fluid skim milk	3	0	18	97	197	251	120
Food preparations	41	122	72	42	92	25	95
Total	592,093	564,203	636,127	596,887	752,813	739,467	632,642
	Metric tons						
Casein	69,166	65,025	70,394	65,960	74,230	61,577	57,559
Caseinate	25,481	25,961	29,929	32,460	34,200	38,234	34,709
Milk protein concentrate	14,256	16,998	28,929	44,877	52,677	28,468	33,626
Milk albumin	6,960	10,429	10,916	9,535	12,579	10,834	15,594
Casein/Milk protein concentrate	3,867	11,394	10,919	9,849	11,921	6,934	7,815
Skim milk powder	2,469	3,057	4,957	5,731	4,207	3,889	6,828
Whey protein concentrate	1,140	3,409	4,642	6,818	7,610	6,990	9,236
Whole milk powder	1,461	3,023	3,265	4,826	4,270	4,204	4,586
Whey	2,304	3,068	5,832	4,376	8,171	13,362	13,444
Fluid whole milk	3,660	5,688	5,967	7,392	3,550	3,283	7,337
Concentrated unsweetened milk	1,117	1,284	421	895	1,748	3,226	1,963
Dried whey	0	32	152	9	93	375	520
Fluid skim milk	0	0	42	136	239	346	137
Food preparations	20	61	37	41	52	9	44
Total	131,903	149,429	176,412	192,905	215,549	181,731	193,399

[1] Casein 3501.10.50; caseinate 3501.90.60; milk protein concentrate 0404.90.10; milk albumin 3502.20.00, 3502.90.00; casein/Milk protein concentrate 3501.10.10; skim milk powder 0402.10.05, 0402.10.10, 0402.10.50, 0402.21.02, 0402.21.05, 0402.21.25; whey protein concentrate 0404.10.05; whole milk powder 0402.21.27, 0402.21.30, 0402.21.50, 0402.21.73, 0402.21.75, 0402.21.90, 0402.29.05, 0402.29.10, 0402.29.50; whey 0404.10.08, 0404.10.11, 0404.10.15, 0404.10.20, 0404.90.28, 0404.90.30, 0404.90.50, 0404.90.70; fluid whole milk 0401.20.20, 0401.20.40; concentrated unsweetened milk 0402.91.03, 0402.91.06, 0402.91.10, 0402.91.30, 0402.91.70, 0402.91.90; dried whey 0404.10.48, 0404.10.50, 0404.10.90; fluid skim milk 0401.10.00; and preparations (derived from dried milk, buttermilk or whey of chapter 4) 2106.90.03, 2106.90.06, 2106.90.09.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-2
Milk protein products:[1] U.S. imports by principal suppliers, 1996-2002

Supplier	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
European Union	303,043	259,927	265,479	259,114	321,503	269,949	253,781
New Zealand	190,490	212,495	259,123	219,598	272,690	316,866	240,058
Australia	19,895	26,804	34,438	47,006	58,753	43,690	48,863
India	6,988	5,688	13,737	15,662	21,415	20,408	26,153
Canada	13,923	16,514	19,999	23,883	24,055	25,233	22,409
Poland	17,263	7,838	8,630	4,720	4,454	17,351	12,588
Ukraine	5,190	4,678	3,780	5,960	8,813	8,423	6,979
Russia	19,576	19,105	18,377	11,513	17,670	6,633	6,900
Hungary	2,801	4,865	4,269	3,536	7,811	5,385	3,668
Mexico	6,660	1,019	1,301	1,359	2,796	2,593	2,066
Israel	17	228	1,065	964	0	1,061	1,825
Norway	3,083	2,272	1,654	431	578	2,325	1,766
Lithuania	294	1,390	1,534	422	388	43	1,026
Estonia	0	143	381	1,047	2,259	1,419	817
China	5	20	180	115	1,508	1,672	719
Other	2,864	1,216	2,180	1,558	8,121	16,417	3,024
Total	592,093	564,203	636,127	596,887	752,813	739,467	632,642
	Metric tons						
European Union	58,245	58,248	62,381	74,377	87,400	56,267	65,637
New Zealand	41,381	55,090	67,629	64,611	69,292	70,699	65,021
Australia	5,409	7,905	9,988	16,399	17,414	9,588	14,130
India	1,417	1,385	3,861	4,621	5,369	4,445	6,774
Canada	10,610	14,114	18,267	21,576	20,938	26,289	28,196
Poland	4,992	3,106	4,257	2,580	1,282	4,393	3,560
Ukraine	1,366	1,339	1,038	1,887	2,632	2,230	2,169
Russia	5,189	5,588	5,176	3,788	4,804	1,845	2,368
Hungary	495	796	730	845	1,934	1,627	949
Mexico	1,152	248	317	396	870	897	622
Israel	6	75	600	514	0	600	1,154
Norway	857	625	468	118	183	791	438
Lithuania	106	476	423	109	185	20	380
Estonia	0	60	180	540	580	401	406
China	12	2	54	37	430	392	200
Other	667	372	1,042	508	2,236	1,245	1,393
Total	131,903	149,429	176,412	192,905	215,549	181,731	193,399

[1] Casein 3501.10.50; caseinate 3501.90.60; milk protein concentrate 0404.90.10; milk albumin 3502.20.00, 3502.90.00; casein/Milk protein concentrate 3501.10.10; skim milk powder 0402.10.05, 0402.10.10, 0402.10.50, 0402.21.02, 0402.21.05, 0402.21.25; whey protein concentrate 0404.10.05; whole milk powder 0402.21.27, 0402.21.30, 0402.21.50, 0402.21.73, 0402.21.75, 0402.21.90, 0402.29.05, 0402.29.10, 0402.29.50; whey 0404.10.08, 0404.10.11, 0404.10.15, 0404.10.20, 0404.90.28, 0404.90.30, 0404.90.50, 0404.90.70; fluid whole milk 0401.20.20, 0401.20.40; concentrated unsweetened milk 0402.91.03, 0402.91.06, 0402.91.10, 0402.91.30, 0402.91.70, 0402.91.90; dried whey 0404.10.48, 0404.10.50, 0404.10.90; fluid skim milk 0401.10.00; and food preparations (derived from dried milk, buttermilk or whey of chapter 4) 2106.90.03, 2106.90.06, 2106.90.09.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-3
Casein:[1] U.S. imports by principal suppliers, 1996-2002

Supplier	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
European Union	189,261	136,754	126,479	104,695	128,638	121,810	96,571
New Zealand	90,130	92,978	113,480	78,153	99,951	108,037	65,602
Australia	12,518	15,069	15,370	21,334	21,789	25,385	25,633
India	6,988	5,590	12,815	15,393	21,231	19,698	24,879
Ukraine	5,122	4,678	3,780	5,716	8,374	7,289	6,909
Russia	18,909	19,037	18,211	11,117	17,388	6,185	6,825
Lithuania	158	1,100	1,372	216	0	0	1,026
Latvia	260	136	700	473	183	463	719
Other	19,213	5,611	3,372	1,677	5,253	5,913	2,158
Total	342,558	280,952	295,579	238,774	302,806	294,779	230,320
	Metric tons						
European Union	35,393	28,985	28,003	28,210	31,085	25,382	22,006
New Zealand	18,567	22,393	27,799	21,704	23,969	21,829	16,984
Australia	2,506	3,548	3,698	5,697	5,248	4,898	6,415
India	1,417	1,301	3,221	4,178	5,312	4,250	6,470
Ukraine	1,343	1,339	1,038	1,827	2,518	1,896	2,129
Russia	5,041	5,568	5,128	3,663	4,716	1,729	2,341
Lithuania	40	303	389	60	0	0	380
Latvia	60	40	200	140	40	100	160
Other	4,799	1,548	920	482	1,342	1,491	673
Total	69,166	65,025	70,394	65,960	74,230	61,577	57,559
	Dollars per ton						
European Union	5,347	4,718	4,517	3,711	4,138	4,799	4,388
New Zealand	4,854	4,152	4,082	3,601	4,170	4,949	3,863
Australia	4,995	4,247	4,157	3,745	4,152	5,182	3,996
India	4,933	4,296	3,979	3,685	3,997	4,635	3,845
Ukraine	3,813	3,494	3,641	3,128	3,325	3,843	3,245
Russia	3,751	3,419	3,551	3,035	3,687	3,577	2,915
Lithuania	3,938	3,627	3,528	3,601	0	0	2,699
Latvia	4,311	3,397	3,498	3,375	4,587	4,631	4,491
Other	4,004	3,623	3,667	3,478	3,914	3,965	3,206
Total	4,953	4,321	4,199	3,620	4,079	4,787	4,001

[1] HTS 3501.10.50.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-4
Caseinate:[1] U.S. imports by principal suppliers, 1996-2002

Supplier	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
European Union	69,155	58,404	69,288	77,356	90,468	102,619	93,989
New Zealand	60,350	57,235	60,634	54,463	60,336	79,938	52,480
Poland	799	166	157	419	1,875	13,111	9,769
China	0	0	0	0	3	11	291
Russia	500	0	0	0	0	0	71
Ukraine	16	0	0	243	168	887	0
Australia	431	1249	383	2,261	617	0	0
Other	4517	111	930	767	207	49	4
Total	135,767	117,165	131,392	135,508	153,674	196,614	156,605
	Metric tons						
European Union	12,929	12,579	15,563	17,985	20,546	20,303	20,093
New Zealand	11,471	13,016	14,034	13,501	12,995	14,811	11,971
Poland	149	38	40	133	434	2,896	2,510
China	0	0	0	0	0	4	114
Russia	108	0	0	0	0	0	20
Ukraine	3	0	0	60	40	199	0
Australia	83	313	127	607	139	0	0
Other	738	15	165	174	45	21	0
Total	25,481	25,961	29,929	32,460	34,200	38,234	34,709
	Dollars per ton						
European Union	5,349	4,643	4,452	4,301	4,403	5,054	4,678
New Zealand	5,261	4,397	4,321	4,034	4,643	5,397	4,384
Poland	5,353	4,402	3,925	3,154	4,322	4,527	3,892
China	0	0	0	0	11,000	2,410	2,547
Russia	4,625	0	0	0	0	0	3,550
Ukraine	5,410	0	0	4,055	4,205	4,468	0
Australia	5,197	3,992	3,026	3,727	4,435	0	0
Other	6,124	7,359	5,633	4,409	4,567	2,374	0
Total	5,328	4,513	4,390	4,175	4,493	5,142	4,512

[1] HTS 3501.90.60.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-5
Milk protein concentrate:[1] U.S. imports by principal supplier, 1992-2002

Supplier	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars										
New Zealand	461	1	4,780	9,904	17,217	26,974	38,935	44,998	66,387	76,149	75,172
European Union	7,300	11,384	18,688	9,377	30,418	30,371	38,318	51,518	51,152	10,550	23,483
Australia	211	940	1,245	717	2,575	3,121	8,053	13,854	22,122	7,956	9,507
Hungary	0	2	955	854	812	1,099	2,668	1,714	4,642	3,562	2,617
Poland	41	1,099	676	656	1,728	1,143	5,168	1,544	175	1,406	1,739
India	0	0	0	0	0	0	0	0	0	158	1,154
Estonia	0	0	0	0	0	143	381	577	161	508	566
Canada	0	82	1,941	670	3,325	2,630	4,917	7,753	5,063	0	349
All other	1	0	0	1,084	780	344	692	295	3,143	770	32
Total	8,014	13,508	28,285	23,261	56,855	65,826	99,133	122,253	152,847	101,060	114,619
	Metric tons										
New Zealand	158	0	1,477	3,000	4,905	7,831	11,243	14,601	19,352	21,192	20,610
European Union	3,301	4,943	8,586	3,187	6,014	6,126	9,832	20,197	21,300	2,720	8,392
Australia	85	342	455	152	1,036	1,141	2,246	4,967	6,936	2,154	2,564
Hungary	369	0	170	153	114	168	395	416	1,267	1,280	730
Poland	20	470	331	237	700	519	2,720	875	59	624	660
India	0	0	0	0	0	0	0	0	0	34	255
Estonia	0	0	0	0	0	60	180	300	80	201	237
Canada	0	65	990	340	1,303	1,016	1,957	3,420	2,234	0	169
All other	0	0	0	218	183	137	356	101	1,451	263	10
Total	3,933	5,820	12,009	7,287	14,256	16,998	28,929	44,877	52,679	28,468	33,627
	Dollars per ton										
New Zealand	2,927	5,112	3,236	3,301	3,510	3,444	3,463	3,082	3,431	3,593	3,647
European Union	2,211	2,303	2,177	2,942	5,058	4,958	3,897	2,551	2,402	3,879	2,798
Australia	2,482	2,751	2,735	4,720	2,485	2,736	3,586	2,789	3,190	3,694	3,707
Hungary	0	5,146	5,618	5,580	7,122	6,522	6,753	4,120	3,663	2,783	3,586
Poland	2,051	2,339	2,044	2,768	2,467	2,205	1,900	1,764	2,962	2,253	2,637
India	0	0	0	0	0	0	0	0	0	4,640	4,526
Estonia	0	0	0	0	0	2,382	2,119	1,924	2,016	2,529	2,382
Canada	0	1,262	1,961	1,972	2,552	2,588	2,512	2,267	2,267	0	2,066
All other	0	0	0	4,972	4,262	2,520	1,947	2,934	2,167	2,930	3,309
Total	2,038	2,321	2,355	3,192	3,988	3,873	3,427	2,724	2,902	3,550	3,409

[1] HTS 0404.90.10.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-6
Milk albumin:[1] U.S. imports by principal suppliers, 1996-2002

Supplier	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
European Union	4,230	6,312	7,405	9,362	21,053	20,252	21,111
New Zealand	18,527	22,236	25,526	21,508	26,147	26,815	29,382
Australia	2,950	5,879	8,193	5,299	10,112	9,442	7,205
Canada	1,821	2,298	2,622	1,593	4,004	3,949	5,080
Norway	0	0	0	118	439	900	1,766
Korea	0	0	0	0	0	0	14
India	0	0	0	0	0	5	8
Other	286	143	221	87	3,046	14,442	0
Total	27,814	36,868	43,967	37,967	64,801	75,805	64,565
	Metric tons						
European Union	757	859	925	1,411	3,308	2,316	3,827
New Zealand	5,086	7,355	7,193	6,219	6,052	5,663	8,523
Australia	1,044	2,099	2,768	1,714	2,849	2,268	2,671
Canada	71	115	26	152	37	40	132
Norway	0	0	0	38	144	219	438
Korea	0	0	0	0	0	0	2
India	0	0	0	0	0	1	2
Other	279	313	380	371	775	947	487
Total	6,958	10,428	10,916	9,532	12,580	10,833	15,594
	Dollars per ton						
European Union	5,588	7,348	8,005	6,635	6,364	8,744	5,516
New Zealand	3,643	3,023	3,549	3,458	4,320	4,735	3,447
Australia	2,826	2,801	2,960	3,092	3,549	4,163	2,697
Canada	25,648	19,983	100,851	10,480	108,228	98,725	38,485
Norway	0	0	0	3,105	3,049	4,110	4,032
Korea	0	0	0	0	0	0	6750
India	0	0	0	0	0	5000	4,000
Other	1025	457	582	235	3,930	15,250	0
Total	3,997	3,535	4,028	3,983	5,151	6,998	4,140

[1] HTS 3502.20.00 and 3502.90.00.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-7
Casein/milk protein concentrate:[1] U.S. imports by principal suppliers, 1996-2002

Supplier	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
European Union	7,910	23,242	21,033	13,685	24,231	9,952	12,702
New Zealand	2,740	8,225	13,360	11,725	13,851	19,502	11,795
Australia	0	0	1,000	372	98	514	4,915
Hungary	1,025	3,045	627	1,174	2,119	1,496	962
Poland	1,432	4,194	1,743	928	607	586	348
Belarus	97	0	0	0	73	0	332
India	0	0	30	0	72	377	75
China	5	0	0	3	0	51	66
Other	311	68	244	1,056	2,755	1,007	30
Total	13,520	38,874	38,037	28,943	43,806	33,485	31,290
	Metric tons						
European Union	2,086	7,186	6,476	5,409	7,270	1,960	3,235
New Zealand	601	1,916	3,135	2,971	3,263	4,081	2,681
Australia	0	0	244	320	20	117	1,453
Hungary	150	452	145	289	407	280	199
Poland	600	1,800	840	454	231	167	100
Belarus	20	0	0	0	20	0	100
India	0	0	17	0	24	101	20
China	12	0	0	1	0	5	6
Other	399	40	63	405	687	224	21
Total	3,867	11,394	10,919	9,849	11,921	6,934	7,815
	Dollars per ton						
European Union	3,792	3,234	3,248	2,530	3,333	5,078	3,926
New Zealand	4,560	4,293	4,261	3,946	4,246	4,779	4,400
Australia	0	0	4,101	1,163	4,893	4,400	3,384
Hungary	6,836	6,736	4,336	4,068	5,208	5,352	4,823
Poland	2,388	2,330	2,075	2,043	2,631	3,511	3,483
Belarus	4,845	0	0	0	3,629	0	3,311
India	0	0	1,771	0	3,008	3,725	3,730
China	431	0	0	3,495	0	10,172	11,006
Other	2,898	2,942	3,873	2,608	4,010	4,492	1,428
Total	3,715	3,407	3,483	2,939	3,675	4,829	4,004

[1] HTS 3501.10.10.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-8
Skim milk powder:[1] U.S. imports by principal suppliers, 1996-2002

Supplier	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
Canada	2,259	629	508	575	943	3,522	4,287
New Zealand	468	2,881	3,928	2,662	1,381	1,702	2,133
Israel	17	217	1,065	900	0	1,052	1,823
Australia	1,282	1,364	1,306	2,364	2,452	0	1,469
European Union	45	114	334	295	571	124	358
Estonia	0	0	0	0	0	0	246
Ukraine	0	0	0	0	0	247	70
Poland	620	301	584	1,209	383	35	21
Other	276	153	394	73	1,085	976	45
Total	4,967	5,660	8,119	8,077	6,815	7,658	10,451
	Metric tons						
Canada	1,124	360	282	367	576	1,678	2,946
New Zealand	205	1,564	2,398	2,091	1,117	908	1,375
Israel	6	75	600	500	0	600	1,153
Australia	669	746	780	1,716	1,498	0	954
European Union	11	56	179	80	268	71	161
Estonia	0	0	0	0	0	0	168
Ukraine	0	0	0	0	0	135	40
Poland	327	175	398	933	189	20	17
Other	127	81	320	44	530	477	14
Total	2,469	3,057	4,957	5,731	4,178	3,889	6,828
	Dollars per ton						
Canada	2,010	1,749	1,802	1,565	1,638	2,099	1,455
New Zealand	2,283	1,843	1,638	1,273	1,236	1,874	1,551
Israel	2,833	2,898	1,775	1,800	0	1,754	1,581
Australia	1,917	1,828	1,674	1,378	1,637	0	1,540
European Union	4,091	2,036	1,861	3,688	2,130	1,745	2,224
Estonia	0	0	0	0	0	0	1,463
Ukraine	0	0	0	0	0	1,832	1,750
Poland	1,895	1,720	1,468	1,296	2,026	1,750	1,235
Other	2,176	1,883	1,230	1,659	1,938	2,047	3,214
Total	2,012	1,852	1,638	1,409	1,620	1,969	1,531

[1] HTS 0402.10.05, 0402.10.10, 0402.10.50, 0402.21.02, 0402.21.05, 0402.21.25

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-9
Whey protein concentrate:[1] U.S. imports by principal suppliers, 1996-2002

Supplier	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
European Union	1,579	4,115	1,694	1,536	4,163	3,605	4,225
Canada	647	1,768	4,077	3,938	6,419	7,208	3,782
New Zealand	86	248	229	2,508	1,722	262	316
Argentina	0	0	0	0	0	0	140
Australia	2	6	28	847	540	110	51
India	0	98	542	265	112	170	21
Switzerland	0	0	0	0	0	0	7
Other	302	5	0	10	25	0	3
Total	2,616	6,240	6,570	9,104	12,981	11,355	8,545
	Metric tons						
European Union	593	2,066	726	591	2,502	2,778	6,027
Canada	443	1,157	3,210	3,598	3,968	4,029	2,911
New Zealand	45	101	144	1,222	965	103	219
Argentina	0	0	0	0	0	0	40
Australia	0	1	20	960	136	21	16
India	0	84	543	442	33	59	20
Switzerland	0	0	0	0	0	0	2
Other	59	0	0	5	6	0	1
Total	1,140	3,409	4,642	6,818	7,610	6,990	9,236
	Dollars per ton						
European Union	2,662	1,992	2,333	2,597	1,664	1,298	701
Canada	1,458	1,529	1,270	1,094	1,618	1,789	1,299
New Zealand	1,911	2,459	1,595	2,053	1,786	2,544	1,444
Argentina	0	0	0	0	0	0	3,500
Australia	2,000	6,000	1,380	883	3,971	5,238	3,188
India	0	1,168	999	600	3,394	2,884	1,050
Switzerland	0	0	0	0	0	0	3,500
Other	5,119	0	0	2,000	4,167	0	3,000
Total	2,295	1,831	1,415	1,335	1,706	1,624	925

[1] HTS 0404.10.05.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-10
Whole milk powder:[1] U.S. imports by principal suppliers, 1996-2002

Supplier	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
New Zealand	970	1,700	2,986	3,582	2,882	4,460	3,032
Mexico	434	933	1,294	1,300	2,087	1,781	2,066
Canada	1,410	3,328	2,466	2,877	1,402	2,749	2,061
European Union	50	128	36	78	479	82	137
Colombia	0	0	0	0	2	0	88
Australia	136	114	0	675	1,023	283	84
Philippines	0	0	0	0	19	0	59
Dominican Republic	0	0	0	0	0	0	58
Other	91	75	0	15	32	76	64
Total	3,091	6,278	6,782	8,527	7,926	9,431	7,650
	Metric tons						
New Zealand	501	911	1,663	2,301	1,551	2,111	2,143
Mexico	123	237	317	356	564	539	622
Canada	614	1,729	1,276	1,721	970	1,214	1,221
European Union	115	50	10	26	565	106	300
Colombia	0	0	0	0	1	0	31
Australia	70	57	0	420	587	130	57
Philippines	0	0	0	0	13	0	51
Dominican Republic	0	0	0	0	0	0	137
Other	38	39	0	2	104	64	24
Total	1,461	3,023	3,266	4,826	4,355	4,164	4,586
	Dollars per ton						
New Zealand	1,936	1,866	1,795	1,557	1,859	2,113	1,415
Mexico	3,526	3,942	4,088	3,655	3,703	3,307	3,321
Canada	2,295	1,925	1,933	1,672	1,445	2,264	1,688
European Union	436	2,560	3,600	3,000	847	771	456
Colombia	0	0	0	0	2,539	0	2,838
Australia	1,949	2,003	0	1,609	1,741	2,173	1,470
Philippines	0	0	0	0	1,507	0	1,164
Dominican Republic	0	0	0	0	0	0	427
Other	2,395	1,923	0	7,500	308	1,188	2,667
Total	2,115	2,077	2,077	1,767	1,820	2,265	1,668

[1] HTS 0402.21.27, 0402.21.30, 0402.21.50, 0402.21.73, 0402.21.75, 0402.21.90, 0402.29.05, 0402.29.10, 0402.29.50.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-11
Whey:[1] U.S. imports by principal suppliers, 1996-2002

Supplier	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
Canada	704	837	1,183	1,637	2,478	3,458	4,069
European Union	29	112	498	72	268	404	150
Ecuador	5	8	15	3	9	0	3
Korea	0	0	3	25	0	0	0
Other	7	0	101	0	3	14	0
Total	745	957	1,801	1,738	2,759	3,876	4,223
	Metric tons						
Canada	2,279	3,046	5,394	4,289	8,092	13,297	13,423
European Union	22	21	331	14	74	62	21
Ecuador	3	1	2	0	1	0	0
Korea	0	0	4	71	0	0	0
Other	0	0	101	0	5	3	0
Total	2,304	3,068	5,832	4,376	8,171	13,362	13,444
	Dollars per ton						
Canada	309	275	219	382	306	260	303
European Union	1,315	5,343	1,505	4,990	3,643	6,496	7,106
Ecuador	1,841	5,974	6,299	6,027	6,806	0	7,169
Korea	0	0	885	356	0	0	0
Other	0	0	1,003	0	672	4,450	0
Total	3,465	11,592	9,911	11,755	11,427	11,206	14,578

[1] HTS 0404.10.08, 0404.10.11, 0404.10.15, 0404.10.20, 0404.90.28, 0404.90.30, 0404.90.50, and 0404.90.70.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-12
Fluid whole milk:[1] U.S. imports by principal suppliers, 1996-2002

Supplier	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
Canada	2,007	3,720	4,036	4,876	2,518	2,197	2,406
European Union	19	8	0	0	0	0	104
Costa Rica	0	0	0	0	0	0	38
Russia	0	0	0	0	0	3	4
Chile	0	4	0	3	0	0	2
Other	4	28	6	0	4	6	1
Total	2,030	3,760	4,042	4,879	2,522	2,206	2,555
	1,000 liters						
Canada	3,658	5,666	5,975	7,392	3,548	3,268	7,088
European Union	1	4	0	0	0	0	180
Costa Rica	0	0	0	0	0	0	60
Russia	0	0	0	0	0	10	7
Chile	0	2	0	0	0	0	1
Other	1	16	2	0	2	5	1
Total	3,660	5,688	5,977	7,392	3,550	3,283	7,337
	Dollars per liter						
Canada	1	1	1	1	1	1	0
European Union	19	2	0	0	0	0	1
Costa Rica	0	0	0	0	0	0	1
Russia	0	0	0	0	0	0	1
Chile	0	3	0	3	0	0	3
Other	4	2	3	0	2	1	0
Total	1	1	1	1	1	1	0

[1] Fluid whole milk 0401.20.20, and 0401.20.40.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-13
Concentrated unsweetened milk:[1] U.S. imports by principal suppliers, 1996-2002

Supplier	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
European Union	340	365	389	518	443	546	952
Panama	0	0	0	0	0	57	149
Philippines	0	0	0	5	91	148	123
Nicaragua	0	0	0	0	0	188	104
Canada	896	1,108	101	439	989	1,792	92
Honduras	0	0	0	0	0	26	21
Other	0	16	9	5	10	37	14
Total	1,236	1,489	499	967	1,533	2,794	1,455
	Metric tons						
European Union	321	316	334	454	411	569	1,394
Panama	0	0	0	0	0	55	147
Philippines	0	0	0	4	78	95	71
Nicaragua	0	0	0	0	0	123	138
Canada	796	966	79	433	1,236	2,312	108
Honduras	0	0	0	0	0	34	95
Other	0	2	8	4	23	38	10
Total	1,117	1,284	421	895	1,748	3,226	1,963
	Dollars per ton						
European Union	1,057	1,155	1,164	1,141	1,078	960	683
Panama	0	0	0	0	0	1,038	1,011
Philippines	0	0	0	1,360	1,175	1,560	1,731
Nicaragua	0	0	0	0	0	1,528	754
Canada	1,126	1,148	1,270	1,013	800	775	851
Honduras	0	0	0	0	0	763	217
Other	0	1,155	1,165	1,141	1,078	960	1,464
Total	1,106	1,159	1,186	1,081	877	866	741

[1] HTS 0402.91.03, 0402.91.06, 0402.91.10, 0402.91.30, 0402.91.70, and 0402.91.90.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-14
Dried whey:[1] U.S. imports by principal suppliers, 1996-2002

Supplier	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
New Zealand	0	0	0	0	22	0	145
Canada	1	0	6	9	0	50	2
Honduras	0	0	0	0	0	0	2
European Union	0	0	0	0	30	0	0
Nicaragua	0	2	0	0	3	0	0
Switzerland	0	60	110	0	0	0	0
Norway	0	0	0	0	0	80	0
Other	2	0	0	0	0	0	0
Total	3	62	116	9	55	130	149
	Metric tons						
New Zealand	0	0	0	0	22	0	516
Canada	0	0	13	9	0	84	4
Honduras	0	0	0	0	0	0	0
European Union	0	0	0	0	69	0	0
Nicaragua	0	1	0	0	2	0	0
Switzerland	0	31	139	0	0	0	0
Norway	0	0	0	0	0	291	0
Other	0	0	0	0	0	0	0
Total	0	32	152	9	93	375	520
	Dollars per ton						
New Zealand	0	0	0	0	972	0	281
Canada	5,136	0	503	967	0	599	635
Honduras	0	0	0	0	0	0	15,441
European Union	0	0	0	0	439	0	0
Nicaragua	0	1,835	0	0	1,466	0	0
Switzerland	0	1,944	790	0	0	0	0
Norway	0	0	0	0	0	276	0
Other	0	0	0	0	0	0	0
Total	6,336	1,940	766	967	585	348	287

[1] HTS 0404.10.48, 0404.10.50, and 0404.10.90.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-15
Fluid skim milk:[1] U.S. imports by principal suppliers, 1996-2002

Supplier	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
Canada	0	0	18	97	171	251	120
European Union	0	0	0	0	0	0	0
Lebanon	3	0	0	0	0	0	0
Mexico	0	0	0	0	24	0	0
Peru	0	0	0	0	2	0	0
Other	0	0	0	0	0	0	0
Total	3	0	18	97	197	251	120
	1,000 liters						
Canada	0	0	42	136	236	346	137
European Union	0	0	0	0	0	0	0
Lebanon	0	0	0	0	0	0	0
Mexico	0	0	0	0	3	0	0
Peru	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Total	0	0	42	136	239	346	137
	Dollars per ton						
Canada	0	0	1	1	1	1	1
European Union	0	0	0	0	0	0	0
Lebanon	80	0	0	0	0	0	0
Mexico	0	0	0	0	8	0	0
Peru	0	0	0	0	35	0	0
Other	0	0	0	0	0	0	0
Total	80	0	1	1	1	1	1

[1] HTS Fluid skim milk 0401.10.00.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-16
Food preparations:[1] U.S. imports by principal suppliers, 1996-2002

Supplier	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
Canada	7	54	12	42	69	6	83
Korea	0	0	0	0	0	8	9
Switzerland	0	0	0	0	0	0	2
Brazil	0	0	0	0	0	6	0
New Zealand	3	17	45	0	11	0	0
Colombia	0	7	5	0	0	0	0
Australia	0	2	3	0	0	0	0
Dominican Republic	10	31	0	0	0	0	0
Other	21	11	9	0	12	5	0
Total	41	122	72	42	92	25	95
	Metric tons						
Canada	2	28	6	41	43	1	43
Korea	0	0	0	0	0	7	1
Switzerland	0	0	0	0	0	0	1
Brazil	0	0	0	0	0	1	0
New Zealand	1	3	21	0	8	0	0
Colombia	0	2	2	0	0	0	0
Australia	0	1	0	0	0	0	0
Dominican Republic	12	25	0	0	0	0	0
Other	5	2	8	0	1	0	0
Total	20	61	37	41	52	9	44
	Dollars per ton						
Canada	3,822	1,927	1,901	1,015	1,622	6,331	1,925
Korea	0	0	0	0	0	1,100	17,481
Switzerland	0	0	0	0	0	0	3,351
Brazil	0	0	0	0	0	4,640	0
New Zealand	6,250	6,183	2,193	0	1,433	0	0
Colombia	0	2,767	2,894	0	0	0	0
Australia	0	1,883	0	0	0	0	0
Dominican Republic	878	1,267	0	0	0	0	0
Other	3,435	5,199	938	0	6,123	57,419	0
Total	2,062	1,986	1,971	1,015	1,759	2,677	2,133

[1] HTS 2106.90.03, 2106.90.06, and 2106.90.09.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-17
U.S. imports from World,[1] 1996-2002

Product	1996	1997	1998	1999	2000	2001	2002
	Value *(1,000 dollars)*						
Milk protein concentrate	56,855	65,826	99,133	122,253	152,847	101,059	114,619
Casein/Milk protein concentrate	14,366	38,824	38,037	28,943	43,806	33,485	31,290
Casein	342,558	280,952	295,579	238,774	302,806	294,779	230,320
Caseinate	135,767	117,165	131,392	135,508	153,674	196,614	156,605
Total	549,546	502,766	564,141	525,479	653,133	625,936	532,834
	Quantity *(metric tons)*						
Milk protein concentrate	14,256	16,998	28,929	44,877	52,677	28,469	33,626
Casein/Milk protein concentrate	3,867	11,394	10,919	9,849	11,921	6,934	7,815
Casein	69,166	65,025	70,394	65,960	74,230	61,577	57,559
Caseinate	25,481	25,961	29,929	32,460	34,200	38,234	34,709
Total	112,771	119,378	140,171	153,146	173,029	135,214	133,709
	Unit value *(dollars per metric ton)*						
Milk protein concentrate	3,988	3,873	3,427	2,724	2,902	3,550	3,409
Casein/Milk protein concentrate	3,715	3,407	3,483	2,939	3,675	4,829	4,004
Casein	4,953	4,321	4,199	3,620	4,079	4,787	4,001
Caseinate	5,328	4,513	4,390	4,175	4,493	5,142	4,512
Total	4,873	4,212	4,025	3,431	3,775	4,629	3,985

[1] HTS 0404.90.10, 3501.10.10, 3501.10.50 and 3501.90.60.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-18
U.S. imports from New Zealand, [1] 1996-2002

Product	1996	1997	1998	1999	2000	2001	2002
	Value *(1,000 dollars)*						
Milk protein concentrate	17,217	26,974	38,935	44,998	66,387	76,149	75,172
Casein/Milk protein concentrate	2,740	8,225	13,360	11,725	13,851	19,502	11,795
Casein	90,130	92,978	113,480	78,153	99,951	108,037	65,602
Caseinate	60,350	57,235	60,634	54,463	60,336	79,938	52,480
Total	170,436	185,413	226,408	189,339	240,525	283,627	205,049
	Quantity *(metric tons)*						
Milk protein concentrate	4,905	7,831	11,243	14,601	19,352	21,192	20,610
Casein/Milk protein concentrate	601	1,916	3,135	2,971	3,263	4,081	2,681
Casein	18,567	22,393	27,799	21,704	23,969	21,829	16,984
Caseinate	11,471	13,016	14,034	13,501	12,995	14,811	11,971
Total	35,543	45,156	56,211	52,778	59,578	61,913	52,246
	Unit value *(dollars per metric ton)*						
Milk protein concentrate	3,510	3,444	3,463	3,082	3,431	3,593	3,647
Casein/Milk protein concentrate	4,560	4,293	4,261	3,946	4,246	4,779	4,400
Casein	4,854	4,152	4,082	3,601	4,170	4,949	3,863
Caseinate	5,261	4,397	4,321	4,034	4,643	5,397	4,384
Total	4,795	4,106	4,028	3,587	4,037	4,581	3,925

[1] HTS 0404.90.10, 3501.10.10, 3501.10.50 and 3501.90.60.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-19
U.S. imports from Australia,[1] 1996-2002

Product	1996	1997	1998	1999	2000	2001	2002
	Value *(1,000 dollars)*						
Milk protein concentrate	2,575	3,121	8,053	13,854	22,122	7,956	9,507
Casein/Milk protein concentrate	0	0	1,000	372	98	514	4,915
Casein	12,518	15,069	15,370	21,334	21,789	25,385	25,633
Caseinate	431	1,249	383	2,261	617	0	0
Total	15,524	19,439	24,807	37,820	44,625	33,855	40,055
	Quantity *(metric tons)*						
Milk protein concentrate	1,036	1,141	2,246	4,967	6,936	2,154	2,564
Casein/Milk protein concentrate	0	0	244	320	20	117	1,453
Casein	2,506	3,548	3,698	5,697	5,248	4,898	6,415
Caseinate	83	313	127	607	139	0	0
Total	3,625	5,002	6,314	11,590	12,343	7,169	10,432
	Unit value *(dollars per metric ton)*						
Milk protein concentrate	2,485	2,736	3,586	2,789	3,190	3,693	3,707
Casein/Milk protein concentrate	0	0	4,101	1,163	4,892	4,400	3,384
Casein	4,995	4,247	4,157	3,745	4,152	5,182	3,996
Caseinate	5,197	3,992	3,026	3,727	4,435	0	0
Total	4,282	3,886	3,929	3,263	3,616	4,722	3,840

[1] HTS 0404.90.10, 3501.10.10, 3501.10.50 and 3501.90.60.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-20
U.S. imports from the European Union,[1] 1996-2002

Product	1996	1997	1998	1999	2000	2001	2002
	Value *(1,000 dollars)*						
Milk protein concentrate	30418	30,371	38,318	51,518	51,152	10,550	23,483
Casein/Milk protein concentrate	7,910	23,242	21,033	13,685	24,231	9,952	12,702
Casein	189,261	136,754	126,479	104,695	128,638	121,810	96,571
Caseinate	69,155	58404	69,288	77,356	90,468	102,619	93,989
Total	296,744	248,770	255,120	247,254	294,489	244,931	226,745
	Quantity *(metric tons)*						
Milk protein concentrate	6,014	6,126	9,832	20,197	21,300	2,720	8,392
Casein/Milk protein concentrate	2,086	7,186	6,476	5,409	7,270	1,960	3,235
Casein	35,393	28,985	28,003	28,210	31,085	25,382	22,006
Caseinate	12,929	12,579	15,563	17,985	20,546	20,303	20,093
Total	56,423	54,876	59,874	71,801	80,202	50,365	53,726
	Unit value *(dollars per metric ton)*						
Milk protein concentrate	5058	4,958	3,897	2,551	2,402	3,879	2,798
Casein/Milk protein concentrate	3,792	3,234	3,248	2,530	3,333	5,078	3,926
Casein	5,347	4,718	4,517	3,711	4,138	4,799	4388
Caseinate	5,349	4,643	4,452	4,301	4,403	5,054	4678
Total	5,259	4,533	4,261	3,444	3,672	4,863	4220

[1] HTS 0404.90.10, 3501.10.10, 3501.10.50 and 3501.90.60.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-21
U.S. imports from India,[1] 1996-2002

Product	1996	1997	1998	1999	2000	2001	2002
	Value *(1,000 dollars)*						
Milk protein concentrate	0	0	0	0	0	158	1,154
Casein/Milk protein concentrate	0	0	30	0	72	377	75
Casein	6,988	5,590	12,815	15,393	21,231	19,698	24,879
Caseinate	0	0	350	4	0	0	0
Total	6,988	5,590	13,195	15,397	21,303	20,232	26,108
	Quantity *(metric tons)*						
Milk protein concentrate	0	0	0	0	0	34	255
Casein/Milk protein concentrate	0	0	17	0	24	101	20
Casein	1,417	1,301	3,221	4,178	5,312	4,250	6,470
Caseinate	0	0	81	1	0	0	0
Total	1,417	1,301	3,319	4,179	5,336	4,385	6,745
	Unit value *(dollars per metric ton)*						
Milk protein concentrate	0	0	0	0	0	4,640	4,526
Casein/Milk protein concentrate	0	0	1,771	0	3,008	3,725	3,730
Casein	4,933	4,296	3,979	3,685	3,997	4,635	3,845
Caseinate	0	0	4,337	4,216	0	0	0
Total	4,933	4,296	3,976	3,685	3,992	4,614	3,871

[1] HTS 0404.90.10, 3501.10.10, 3501.10.50 and 3501.90.60.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-22
U.S. imports from Poland,[1] 1996-2002

Product	1996	1997	1998	1999	2000	2001	2002
	Value *(1,000 dollars)*						
Milk protein concentrate	1,728	1,143	5,168	1,544	175	1,406	1,739
Casein/Milk protein concentrate	1,432	4,193	1,743	928	607	586	348
Casein	12,595	2,034	977	621	1,248	1,989	710
Caseinate	799	166	157	419	1,875	13,111	9,769
Total	16,554	7,536	8,045	3,512	3,905	17,092	12,566
	Quantity *(metric tons)*						
Milk protein concentrate	700	519	2,720	875	59	624	660
Casein/Milk protein concentrate	600	1,800	840	454	231	167	100
Casein	3,177	575	260	185	309	588	273
Caseinate	149	38	40	133	434	2,896	2,510
Total	4,627	2,931	3,859	1,647	1,033	4,275	3,543
	Unit value *(dollars per metric ton)*						
Milk protein concentrate	2,467	2,205	1,900	1,764	2,962	2,252	2,637
Casein/Milk protein concentrate	2,388	2,330	2,075	2,043	2,631	3,511	3,483
Casein	3,964	3,540	3,763	3,357	4,038	3,384	2,598
Caseinate	5,353	4,402	3,925	3,154	4,322	4,527	3,892
Total	3,578	2,570	2,032	2,132	3,780	3,998	3,547

[1] HTS 0404.90.10, 3501.10.10, 3501.10.50 and 3501.90.60.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-23
Milk protein concentrate:[1] U.S. exports by destination, 1992-2002

Market	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars										
Mexico	1,679	1,439	1,186	1,363	2,791	3,181	2,673	2,375	5,954	289	1,478
European Union	464	247	204	79	326	518	875	574	230	628	684
Korea	78	592	702	259	203	73	49	46	21	179	499
Canada	5,208	4,706	3,049	519	986	667	458	502	310	486	470
Switzerland	14	8	0	0	4	0	70	7	255	60	315
China	0	0	17	40	0	548	0	392	552	4,800	273
Bahamas	26	24	39	3	34	0	6	0	3	111	195
Panama	0	0	0	0	62	23	23	31	72	65	152
All other	3,259	2,458	1,144	1,656	1,322	2,246	1,282	3,320	4,804	1,710	854
Total	10,728	9,474	6,341	3,919	5,728	7,256	5,436	7,247	12,201	8,328	4,920
	Metric tons										
Mexico	541	664	1,266	782	1,947	1,643	1,442	1,270	2,004	99	724
European Union	138	76	69	37	92	124	215	173	72	181	332
Korea	72	111	241	132	59	20	28	36	5	55	279
Canada	2,792	1,938	1,146	187	340	299	211	555	195	153	165
Switzerland	1	2	0	0	1	0	9	2	88	9	85
China	0	0	5	13	0	172	0	69	140	1,493	207
Bahamas	9	9	31	1	12	0	7	0	2	89	46
Panama	0	0	0	0	74	19	8	22	25	43	87
All other	788	752	534	814	611	898	685	850	2,009	721	398
Total	4,341	3,552	3,292	1,966	3,136	3,175	2,605	2,977	4,540	2,843	2,323
	Dollars per ton										
Mexico	3,104	2,167	937	1,744	1,433	1,937	1,853	1,871	2,972	2,906	2,040
European Union	3,356	3,244	2,941	2,125	3,547	4,185	4,065	3,313	3,183	3,476	2,062
Korea	1,086	5,310	2,908	1,967	3,422	3,682	1,756	1,294	3,911	3,283	1,790
Canada	1,865	2,429	2,660	2,782	2,899	2,227	2,166	905	1,591	3,188	2,843
Switzerland	13,628	4,031	-	-	3,540	-	7,644	3,125	2,902	6,806	3,702
China	-	-	3,127	3,126	-	3,193	-	5,676	3,930	3,215	1,319
Bahamas	2,974	2,488	1,260	2213	2,825	-	779	-	1,469	1,248	4,266
Panama	-	-	-	-	839	1,247	2,752	1,418	2,876	1,505	1,738
All other	4,136	3,269	2,142	2,034	2,164	2,501	1,872	3,906	2,391	2,372	2,146
Total	2,471	2,667	1,926	1,993	1,827	2,285	2,087	2,434	2,687	2,929	2,118

[1] Schedule B number for milk protein concentrate 0404.90.0000.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-24
Casein:[1] U.S. exports by destination, 1996-2002

Market	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
Canada	240	120	577	127	2,356	1,362	997
Mexico	4,607	5,576	8,217	6,612	5,792	2,438	795
European Union	306	299	209	744	305	138	303
China	0	3	23	5	12	227	51
Colombia	401	51	4	3	0	0	44
Ecuador	40	0	0	0	0	0	23
Japan	0	70	617	165	1,673	1,387	22
Philippines	17	7	22	20	116	0	15
Other	973	639	411	1,858	2,407	1,485	20
Total	6,584	6,765	10,080	9,534	12,661	7,037	2,270
	Metric tons						
Canada	50	31	117	28	546	257	209
Mexico	606	778	1,148	932	946	360	141
European Union	28	36	46	87	61	18	63
China	0	45	2	70	1	9	6
Colombia	75	7	0	0	0	0	19
Ecuador	6	0	0	0	0	0	3
Japan	0	6	98	32	244	216	2
Philippines	3	1	4	4	23	0	3
Other	194	133	89	364	300	212	2
Total	962	1,037	1,504	1,517	2,121	1,072	448
	Dollars per ton						
Canada	4,792	3,800	4,928	4,616	4,312	5,305	4,769
Mexico	7,603	7,165	7,156	7,094	6,126	6,770	5,651
European Union	11,079	8,215	4,577	8,563	4,993	7,573	4,815
China	-	63,578	13,116	66,471	8,261	26,609	8,750
Colombia	5,347	7,696	7,562	6,805	-	-	2,257
Ecuador	7,124	-	-	-	-	-	8,265
Japan	-	12,667	6,279	5,085	6,865	6,415	11,638
Philippines	5,667	10,882	5,576	5,304	5,019	-	5,000
Other	5,015	4,805	4,618	5,104	8,023	7,005	10,000
Total	6,844	6,524	6,702	6,285	5,969	6,564	5,067

[1] Schedule B number for casein 3501.10.0000.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-25
Caseinate:[1] U.S. exports by destination, 1996-2002

Market	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
Canada	9,770	9,040	12,243	14,052	7,204	4,002	2,506
Mexico	623	1,313	1,084	670	1,645	4,464	2,489
Philippines	0	0	0	0	265	1,174	1,140
Brazil	61	83	0	10	7,539	548	420
China	16	911	12	387	27	14	417
European Union	217	701	455	255	659	261	197
Hungary	0	0	0	0	0	0	136
Other	967	1,632	987	541	18,698	1,637	596
Total	11,654	13,680	14,781	15,915	36,037	12,100	7,901
	Metric tons						
Canada	1,762	1,872	4,548	3,335	1,684	955	667
Mexico	118	265	202	127	272	738	510
Philippines	0	0	0	0	42	183	147
Brazil	3	3	0	2	164	82	58
China	3	160	2	82	3	4	372
European Union	32	155	75	35	89	32	27
Hungary	0	0	0	0	0	0	26
Other	215	479	52	117	599	284	164
Total	2,133	2,934	4,951	3,698	2,853	2,278	1,971
	Dollars per ton						
Canada	5,545	4,829	2,692	4,214	4,277	4,193	3,759
Mexico	5,264	4,945	5,363	5,270	6,048	6,052	4,876
Philippines	-	-	-	-	6,264	6,410	7,772
Brazil	24,394	24,650	-	6,144	46,034	6,706	7,226
China	5,918	5,699	5,287	4,733	8,522	3,444	1,122
European Union	6,762	4,531	6,073	7,306	7,414	8,168	7,344
Hungary	-	-	-	-	-	-	5,187
Other	4,498	3,407	11,216	4,624	31,215	5,764	3,634
Total	5,464	4,663	3,007	4,312	12,631	5,312	4,009

[1] Schedule B numbers for caseinate 3501.90.2000 and 3501.90.6000.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-26
Fluid whole milk:[1] U.S. exports by destination, 1996-2002

Market	1996	1997	1998	1999	2000	2001	2002
				1,000 dollars			
Mexico	9,555	15,438	9,865	3,229	6,408	5,969	6,151
Hong Kong	4,603	3,961	4,032	3,524	3,845	3,274	2,919
Taiwan	2,239	2,549	2,779	1,893	2,485	2,406	2,345
Malaysia	0	0	30	81	248	200	218
Philippines	17	0	0	0	0	0	133
Vietnam	0	0	111	57	134	177	125
French Polynesia	52	41	49	27	37	77	66
European Union	26	30	82	0	0	0	0
Other	1,002	1,027	1,906	1,758	984	168	103
Total	17,494	23,046	18,854	10,569	14,141	12,271	12,060
				Thousand liters			
Mexico	15,210	22,521	13,708	4,120	8,948	9,163	9,423
Hong Kong	3,897	2,788	2,655	2,472	2,581	2,008	2,366
Taiwan	1,395	1,507	1,805	1,169	1,586	1,644	1,580
Malaysia	0	0	41	95	320	205	288
Philippines	16	0	0	0	0	0	75
Vietnam	0	0	152	48	107	183	108
French Polynesia	71	52	67	37	45	106	91
European Union	35	42	113	0	0	0	0
Other	691	867	2,401	2,026	1,208	183	132
Total	21,315	27,777	20,942	9,967	14,795	13,492	14,063
				Dollars per liter			
Mexico	628	686	720	784	716	651	653
Hong Kong	1,181	1,421	1,519	1,426	1,490	1,631	1,233
Taiwan	1,605	1,691	1,540	1,619	1,566	1,464	1,483
Malaysia	-	-	727	859	776	976	756
Philippines	1,032	-	-	-	-	-	1,782
Vietnam	-	-	727	1,198	1,259	968	1,149
French Polynesia	726	787	726	726	817	727	726
European Union	727	727	727	-	-	-	-
Other	1,450	1,185	794	868	815	918	780
Total	821	830	900	1,060	956	910	858

[1] Schedule B number for fluid whole milk 0401.20.0000.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-27
Fluid skim milk:[1] U.S. exports by destination, 1996-2002

Market	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
Mexico	912	2,837	2,151	1,114	888	805	574
Bahamas	279	39	48	27	5	34	132
Turks and Caicos Islands	0	0	0	0	0	34	46
Cayman Islands	0	3	13	34	11	10	33
Singapore	7	0	163	0	7	0	3
Aruba	27	64	0	0	0	0	0
Barbados	0	0	0	0	3	0	0
European Union	0	21	0	5	15	0	0
Other	3,006	1,873	1,410	261	369	90	0
Total	4,231	4,837	3,785	1,441	1,298	973	788
	1,000 liters						
Mexico	1,856	5,420	3,224	2,053	1,623	838	723
Bahamas	351	60	46	32	5	43	181
Turks and Caicos Islands	0	0	0	0	0	16	9
Cayman Islands	0	4	18	47	15	16	52
Singapore	9	0	224	0	9	0	4
Aruba	37	63	0	0	0	0	0
Barbados	0	0	0	0	3	0	0
European Union	0	29	0	7	12	0	0
Other	3,940	1,693	1,851	338	508	119	0
Total	6,193	7,269	5,363	2,477	2,175	1,032	969
	Dollars per liter						
Mexico	491	523	667	543	547	960	793
Bahamas	794	647	1,049	839	1,022	789	731
Turks and Caicos Islands	-	-	-	-	-	2,161	5,354
Cayman Islands	-	726	727	727	727	608	634
Singapore	727	-	727	-	726	-	727
Aruba	727	1,021	-	-	-	-	-
Barbados	-	-	-	-	1,214	-	-
European Union	-	727	-	727	1,233	-	-
Other	763	1,106	762	772	726	756	-
Total	683	665	706	582	597	943	813

[1] Schedule B number for fluid skim milk 0401.10.0000.
Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-28
Concentrate milk:[1] U.S. exports by destination, 1992-2002

Market	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
Yemen	0	0	0	0	0	0	2,575
Mexico	276	236	59	137	584	462	855
Burma	0	0	0	0	0	77	326
Hong Kong	0	5	3	0	0	982	135
Venezuela	9	28	68	0	8	62	116
Thailand	0	0	0	0	0	235	108
European Union	4	20	8	3	0	210	91
Other	2,140	3,792	2,273	837	451	1,469	371
Total	2,429	4,081	2,411	977	1,043	3,497	4,577
	Metric tons						
Yemen	0	0	0	0	0	0	2,000
Mexico	497	646	143	191	805	569	930
Burma	0	0	0	0	0	102	427
Hong Kong	0	2	1	0	0	1,432	204
Venezuela	8	6	50	0	1	39	70
Thailand	0	0	0	0	0	306	154
European Union	1	8	11	5	0	104	17
Other	2,915	4,827	2,562	807	360	1,316	364
Total	3,421	5,489	2,767	1,003	1,166	3,868	4,166
	Dollars per ton						
Yemen	-	-	-	-	-	-	1,287
Mexico	554	365	411	717	725	812	919
Burma	-	-	-	-	-	761	764
Hong Kong	-	2,539	3,711	-	-	686	663
Venezuela	1,213	5,069	1,363	-	10,038	1,578	1,655
Thailand	-	-	-	-	-	766	700
European Union	2,576	2,497	725	725	-	2,009	5,401
Other	734	786	887	1,037	1,253	1,116	1,019
Total	710	743	871	974	895	904	1,099

[1] Schedule B number for concentrate milk 0402.91.0000.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-29
Dried whole milk:[1] U.S. exports by destination, 1996-2002

Market	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
Yemen	84	0	0	0	4,087	6,023	5,665
Philippines	958	67	123	27	63	3,582	4,692
Pakistan	0	0	0	0	0	0	4,293
Indonesia	112	862	84	140	291	0	4,000
Taiwan	3,904	3,592	718	222	452	3,141	3,074
Thailand	3	0	0	14	0	805	2,924
Bangladesh	0	0	0	0	362	0	2,178
European Union	186	166	6,414	800	304	668	40
Other	13,564	71,500	65,001	20,216	32,368	41,825	17,941
Total	18,811	76,187	72,340	21,419	37,927	56,044	44,807
	Metric tons						
Yemen	141	0	0	0	3,091	2,767	4,587
Philippines	395	65	44	11	73	1,556	3,152
Pakistan	0	0	0	0	0	0	3,561
Indonesia	92	613	67	115	194	0	3,250
Taiwan	3,393	2,923	566	211	457	2,265	2,263
Thailand	3	0	0	5	0	424	2,368
Bangladesh	0	0	0	0	234	0	1,472
European Union	76	197	2,576	633	90	767	14
Other	12,081	44,811	48,041	16,630	21,301	38,291	17,159
Total	16,181	48,609	51,294	17,605	25,440	46,070	37,826
	Dollars per ton						
Yemen	598	-	-	-	1,322	2,177	1,235
Philippines	2,424	1,041	2,772	2,343	863	2,302	1,489
Pakistan	-	-	-	-	-	-	1,206
Indonesia	1,216	1,406	1,253	1,222	1,502	-	1,231
Taiwan	1,150	1,229	1,268	1,051	988	1,387	1,358
Thailand	934	-	-	3,056	-	1,901	1,235
Bangladesh	-	-	-	-	1,547	-	1,479
European Union	2,442	841	2,490	1,264	3,386	870	2,799
Other	1,123	1,596	1,353	1,216	1,520	1,092	1,046
Total	1,163	1,567	1,410	1,217	1,491	1,216	1,185

[1] Schedule B number for dried whole milk 0402.21.000, and 0402.29.0000.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-30
Dried skim milk:[1] U.S. exports by destination, 1996-2002

Market	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
Mexico	9,349	3,028	24,563	87,711	51,755	111,002	62,907
Thailand	1,854	9,494	5,236	4,617	3,910	3,278	8,259
Philippines	3,835	11,469	6,642	7,655	9,435	11,505	7,188
Korea	970	276	367	25	34	10	6,967
Malaysia	2,301	2,909	2,991	2,725	2,268	17,360	6,259
Indonesia	22	9,113	639	5,605	6,335	8,416	4,776
China	45	620	77	1,541	481	2,955	3,969
European Union	588	474	1,691	320	878	359	309
Other	15,975	71,850	78,395	57,510	82,353	34,647	13,899
Total	34,939	109,233	120,601	167,709	157,449	189,532	114,533
	Metric tons						
Mexico	5,442	1,850	14,578	60,882	30,503	57,191	42,964
Thailand	928	6,026	3,616	3,230	2,215	1,521	4,513
Philippines	1,865	6,811	4,167	6,018	5,962	5,714	3,725
Korea	683	309	234	37	33	4	4,130
Malaysia	674	1,649	1,940	1,781	1,480	7,804	3,665
Indonesia	34	6,131	425	4,929	3,303	3,860	2,826
China	34	441	111	1,185	575	1,393	2,045
European Union	317	225	779	248	490	237	521
Other	8,445	38,628	47,066	42,548	56,487	18,435	9,674
Total	18,422	62,070	72,916	120,858	101,048	96,159	74,063
	Dollars per ton						
Mexico	1,718	1,637	1,685	1,441	1,697	1,941	1,464
Thailand	1,999	1,575	1,448	1,429	1,765	2,155	1,830
Philippines	2,056	1,684	1,594	1,272	1,583	2,014	1,930
Korea	1,422	893	1,570	686	1,026	2,252	1,687
Malaysia	3,414	1,764	1,541	1,530	1,532	2,225	1,708
Indonesia	656	1,486	1,503	1,137	1,918	2,180	1,690
China	1,324	1,406	700	1,301	836	2,122	1,941
European Union	1,856	2,101	2,171	1,292	1,789	1,513	594
Other	529	538	600	740	686	532	696
Total	527	568	605	721	642	507	647

[1] Schedule B number for dried skim milk 0402.10.000.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-31
Whey:[1] U.S. exports by destination, 1996-2002

Market	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
Canada	1,183	1,584	1,564	1,015	604	1,476	1,148
Korea	387	0	22	107	0	137	445
Colombia	0	122	0	0	0	0	40
China	12	0	0	0	0	32	33
Mexico	1,042	1,028	2,131	2,091	345	71	31
Israel	10	0	15	0	0	0	9
Taiwan	753	0	39	0	0	0	3
European Union	57	8	0	17	4	0	3
Other	747	354	398	527	49	39	0
Total	4,191	3,096	4,169	3,757	1,002	1,755	1,712
	Metric tons						
Canada	716	959	947	615	366	894	857
Korea	744	0	13	65	0	80	270
Colombia	0	74	0	0	0	0	24
China	18	0	0	0	0	19	20
Mexico	764	622	1,293	1,285	216	43	19
Israel	6	0	9	0	0	0	19
Taiwan	1,384	0	74	0	0	0	2
European Union	79	5	0	10	2	0	2
Other	784	292	241	393	41	24	2
Total	4,495	1,952	2,577	2,368	625	1,060	1,211
	Dollars per ton						
Canada	1,651	1,651	1,651	1,651	1,651	1,651	1,341
Korea	519	-	1,651	1,651	-	1,711	1,651
Colombia	-	1,651	-	-	-	-	1,651
China	661	-	-	-	-	1,651	1,651
Mexico	1,364	1,654	1,648	1,627	1,596	1,651	1,651
Israel	1,651	-	1,651	-	-	-	468
Taiwan	544	-	536	-	-	-	1,650
European Union	726	1,651	-	1,651	1,651	-	1,650
Other	953	1,212	1,651	1,341	1,195	1,625	0
Total	932	1,586	1,618	1,587	1,603	1,656	1,414

[1] Schedule B number for whey 0404.10.2000.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-32
Dried whey:[1] U.S. exports by destination, 1996-2002

Market	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
Mexico	19,475	19,417	17,943	14,438	36,411	17,080	20,194
Canada	20,984	15,602	14,938	21,333	30,651	28,349	18,051
China	3,061	4,885	9,258	8,420	6,945	11,415	18,005
Philippines	4,164	5,628	4,500	5,069	8,699	8,047	5,401
Japan	25,193	19,479	12,771	9,320	8,393	4,057	4,683
Thailand	2,540	2,787	2,451	5,249	5,269	3,715	4,143
European Union	4,362	2,054	614	702	558	1,329	1,148
Other	27,605	27,649	24,483	27,225	31,051	22,058	19,287
Total	107,384	97,501	86,958	91,756	127,977	96,050	90,912
	Metric tons						
Mexico	14,033	15,494	16,393	12,581	36,446	16,854	20,297
Canada	27,001	21,577	22,153	31,462	37,901	35,701	30,248
China	4,800	8,598	11,604	12,431	15,838	25,533	39,979
Philippines	5,230	7,178	6,827	11,355	14,226	13,315	9,494
Japan	17,865	11,786	10,956	10,057	10,460	7,215	9,596
Thailand	2,841	4,128	4,380	9,285	12,785	9,157	10,539
European Union	2,327	792	590	221	255	708	199
Other	36,622	36,329	27,311	34,010	53,833	37,743	34,494
Total	110,719	105,882	100,214	121,402	181,744	146,226	154,846
	Dollars per ton						
Mexico	1,388	1,253	1,095	1,148	999	1,013	995
Canada	777	723	674	678	809	794	597
China	638	568	798	677	439	447	450
Philippines	796	784	659	446	611	604	569
Japan	1,410	1,653	1,166	927	802	562	488
Thailand	894	675	560	565	412	406	393
European Union	1,875	2,593	1,040	3,180	2,185	1,879	5,775
Other	754	761	896	800	577	584	559
Total	970	921	868	756	704	657	587

[1] Schedule B numbers for dried whey 0404.10.0850 and 0404.10.4000.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-33
Whey protein concentrate:[1] U.S. exports by destination, 1996-2002

Market	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
Japan	2,310	8,060	12,865	11,286	15,973	22,326	23,639
Canada	2,018	3,407	4,524	5,495	9,053	16,402	23,115
European Union	958	3,834	9,053	7,664	9,611	14,566	11,299
Mexico	1,008	3,390	3,307	4,282	5,079	5,231	5,436
Korea	1,255	1,327	1,917	2,917	4,142	6,836	3,744
Taiwan	76	634	760	702	901	748	2,203
Thailand	65	1,620	456	728	975	1,269	1,527
Other	1,307	3,482	6,217	9,811	6,287	12,565	8,942
Total	8,997	25,754	39,099	42,885	52,021	79,943	79,905
	Metric tons						
Japan	723	3,710	6,185	4,656	4,884	7,718	8,440
Canada	894	1,124	1,358	1,454	2,345	3,744	5,018
European Union	305	160	917	836	838	1,648	869
Mexico	747	1,303	2,304	2,313	3,110	2,983	3,271
Korea	485	751	1,525	896	1,493	2,537	1,795
Taiwan	124	427	997	984	488	375	1,549
Thailand	101	1,041	754	863	746	1,081	1,120
Other	1,127	2,419	6,322	4,867	4,459	6,501	6,321
Total	4,506	10,935	20,362	16,869	18,363	26,587	28,383
	Dollars per ton						
Japan	3,195	2,173	2,080	2,424	3,271	2,893	2,801
Canada	2,256	3,033	3,330	3,778	3,860	4,381	4,606
European Union	3,134	23,898	9,868	9,172	11,469	8,839	13,004
Mexico	1,349	2,602	1,436	1,851	1,633	1,753	1,662
Korea	2,258	1,766	1,257	3,253	2,774	2,694	2,086
Taiwan	613	1,485	762	714	1,845	1,994	1,422
Thailand	644	1,556	604	843	1,307	1,173	1,363
Other	1,160	1,439	983	2,016	1,410	1,933	1,415
Total	1,997	2,355	1,920	2,542	2,833	3,007	2,815

[1] Schedule B numbers for whey protein concentrate 3502.20.0000, 3502.90.0000, and 0404.10.0500.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-34
Milk protein products: U.S. exports by product type,[1] 1996-2002

Product	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
Dried whey	107,384	97,501	86,958	91,756	127,977	96,050	90,912
Whey protein concentrate	8,997	25,754	39,099	42,885	52,021	79,943	79,905
Skim milk powder	34,939	109,233	120,601	167,709	157,449	189,532	114,533
Whole milk powder	18,811	76,187	72,340	21,419	37,927	56,044	44,807
Fluid whole milk	17,494	23,046	18,854	10,569	14,141	12,271	12,060
Caseinate	11,654	13,680	14,781	15,915	36,037	12,100	7,901
Milk protein concentrate	5,728	7,256	5,436	7,247	12,201	8,328	4,920
Concentrated milk	2,429	4,081	2,411	977	1,043	3,497	4,577
Casein	6,584	6,765	10,080	9,534	12,661	7,037	2,270
Whey	4,191	3,096	4,169	3,757	1,002	1,755	1,712
Fluid skim milk	4,231	4,837	3,785	1,441	1,298	973	788
Total	222,442	371,436	378,514	373,209	453,757	467,530	364,385
	Metric tons						
Dried whey	110,719	105,882	100,214	121,402	181,744	146,226	154,846
Whey protein concentrate	4,506	10,935	20,362	16,869	18,363	26,587	28,383
Skim milk powder	18,422	62,070	72,916	120,858	101,048	96,159	74,063
Whole milk powder	16,181	48,609	51,294	17,605	25,440	46,070	37,826
Fluid whole milk	21,315	27,777	20,942	9,967	14,795	13,493	14,063
Caseinate	2,133	2,934	4,951	3,698	2,853	2,278	1,971
Milk protein concentrate	3,136	3,175	2,605	2,977	4,540	2,843	2,323
Concentrated milk	3,421	5,489	2,767	1,003	1,166	3,868	4,166
Casein	962	1,037	1,504	1,517	2,121	1,072	448
Whey	4,495	1,952	2,577	2,368	625	1,060	1,211
Fluid skim milk	6,193	7,269	5,363	2,477	2,175	1,032	969
Total	191,483	277,129	285,495	300,741	354,870	340,688	320,269

[1] Casein 3501.10.0000; caseinate 3501.90.2000, and 3501.90.6000; milk protein concentrate 0404.90.0000; skim milk powder 0402.21.0000; whey protein concentrate 3502.20.0000, 3502.90.0000, 0404.10.0500; whole milk powder 0402..21.000 and 0402.29.0000; whey 0404.10.2000: fluid whole milk 0401.20.0000; concentrated milk 0402.91.0000; dried whey 0404.10.0850, 0404.10.4000; and fluid skim milk 0401.10.0000.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table F-35
Milk protein products: U.S. exports by destination, [1] 1996-2002

Market	1996	1997	1998	1999	2000	2001	2002
	1,000 dollars						
Mexico	50,978	106,815	120,261	125,198	116,547	153,461	102,086
Canada	36,286	31,723	35,481	43,160	51,826	54,057	48,092
Japan	29,139	31,252	30,207	23,978	28,486	29,129	28,668
China	3,260	8,505	10,631	11,727	11,187	26,709	24,093
Philippines	9,315	17,355	11,619	15,860	20,636	26,228	19,962
Thailand	4,540	13,901	8,183	10,995	10,934	10,060	16,983
Korea	8,000	7,582	11,423	12,326	11,551	15,341	14,517
Taiwan	14,780	13,168	9,074	7,310	9,765	11,237	11,065
Indonesia	1,940	11,559	1,527	9,871	8,974	9,579	9,677
Yemen	558	0	30	0	4,111	6,023	8,240
Other	72,488	129,575	140,078	112,785	179,744	125,705	81,001
Total	231,104	371,435	378,514	373,211	453,758	467,529	364,385
	Metric tons						
Mexico	44,362	80,539	89,829	88,715	87,471	92,243	80,451
Canada	32,001	27,239	29,902	37,859	44,052	42,641	38,267
Japan	21,154	21,151	22,386	19,200	18,308	15,635	18,314
China	4,998	10,548	13,794	14,975	18,513	30,532	43,704
Philippines	7,907	14,365	11,488	18,982	21,804	22,776	17,888
Thailand	3,902	11,195	8,807	13,484	15,966	12,639	18,715
Korea	8,824	11,073	14,095	12,987	16,080	21,469	12,679
Taiwan	17,302	13,256	9,407	8,875	11,852	14,299	12,328
Indonesia	1,985	8,876	1,258	7,733	6,138	5,177	7,361
Yemen	0	0	17	0	3,108	2,767	6,587
Other	47,876	78,843	84,513	77,862	111,577	80,511	63,975
Total	192,564	277,085	285,496	300,672	354,869	340,689	320,269

[1] Casein 3501.10.0000; caseinate 3501.90.2000, and 3501.90.6000; milk protein concentrate 0404.90.0000; skim milk powder 0402.21.0000; whey protein concentrate 3502.20.0000, 3502.90.0000, 0404.10.0500; whole milk powder 0402.21.000 and 0402.29.0000; whey 0404.10.2000: fluid whole milk 0401.20.0000; concentrated milk 0402.91.0000; dried whey 0404.10.0850, 0404.10.4000; and fluid skim milk 0401.10.0000.

Source: Compiled from official statistics of the U.S. Department of Commerce.

APPENDIX G
TARIFF TERMS AND TABLES

Tariff and Trade Agreement Terms

In the ***Harmonized Tariff Schedule of the United States*** (HTS), chapters 1through 97 cover all goods in trade and incorporate the internationally adopted Harmonized Commodity Description and Coding System through the 6-digit level of product description. Subordinate U.S. 8-digit rate lines, either enacted by Congress or proclaimed by the President, allow more narrowly applicable duty rates; nonlegal 10-digit statistical reporting numbers provide data of national interest. Chapters 98 and 99 contain special U.S. classifications and temporary rate provisions, respectively. The HTS replaced the ***Tariff Schedules of the United States*** (TSUS) effective Jan. 1, 1989. The HTS is updated by published supplements and by electronic revisions at *http://www.usitc.gov/taffairs.htm#HTS*; see preface pages and change records in each document.

Duty rates in the ***general*** subcolumn of HTS column 1 are normal trade relations rates; many general rates have been eliminated or are being reduced due to concessions resulting from the Uruguay Round of Multilateral Trade Negotiations. General duty rates apply to all countries except those listed in HTS general note 3(b) (Cuba, Laos, and North Korea) plus Serbia and Montenegro, which are subject to the statutory rates set forth in ***column 2***. Specified goods from designated general-rate countries may be eligible for reduced rates of duty or duty-free entry under preferential tariff programs, as set forth in the ***special*** subcolumn of HTS rate of duty column 1 or in the general notes. If eligibility for special tariff rates is not claimed or established, goods are dutiable at general rates. The HTS does not list countries covered by a total or partial embargo; it likewise does not contain antidumping or countervailing duties (consult the International Trade Administration of the Department of Commerce).

The ***Generalized System of Preferences*** (GSP) affords nonreciprocal duty-free entry to certain goods of designated beneficiary developing countries. The U.S. GSP, under title V of the Trade Act of 1974, as amended, now applies to merchandise imported on or after Jan. 1, 1976, and before the close of Dec. 31, 2006. Indicated by the symbol "A", "A*", or "A+" in the special subcolumn, The legal framework of the GSP is set forth in HTS general note 4; eligible articles must be the product of and imported directly from designated beneficiary developing countries. Eligible products of listed sub-Saharan African countries may qualify for duty-free entry under the ***African Growth and Opportunity Act*** (AGOA) (see HTS gen. note 16) through Sept. 30, 2008, as indicated by the symbol "D" in the special subcolumn; see subchapter XIX of chapter 98.

The ***Caribbean Basin Economic Recovery Act*** (CBERA) affords nonreciprocal tariff preferences to designated Caribbean Basin developing countries. The CBERA--enacted in title II of Pub. Law 98-67, implemented by Presidential Proclamation 5133 of Nov. 30, 1983, and amended by the Customs and Trade Act of 1990, applies to goods entered, or withdrawn from warehouse for consumption, on or after Jan. 1, 1984. Indicated by the symbol "E" or "E*" in the special subcolumn, CBERA provides duty-free entry to eligible articles, and reduced-duty treatment to certain other articles, which are the product of and imported directly from designated countries (see HTS gen. note 7). Other eligible products of listed beneficiary countries may qualify for duty-free or reduced-duty entry under the ***Caribbean Basin Trade Partnership Act*** (CBTPA) (see HTS gen. note 17), through Sept. 30, 2008, as indicated by the symbol "R" in the special subcolumn; see also subchapter XX of chapter 98. Free rates of duty in the special subcolumn followed by the symbol "IL" are applicable to products of Israel under the ***United States-Israel Free Trade Area Implementation Act*** of

1985 (IFTA), as provided in general note 8 to the HTS; see also subchapter VIII of chapter 99.

Nonreciprocal duty-free treatment in the special subcolumn followed by the symbol "J" or "J*" in parentheses is afforded to eligible articles from designated beneficiary countries under the ***Andean Trade Preference Act*** (ATPA), enacted as title II of Pub. Law 102-182 (effective July 22, 1992; see HTS gen. note 11) and renewed through December 31, 2006, by the ***Andean Trade Promotion and Drug Eradication Act*** of 2002. Goods eligible for new benefits under the latter act are designated by a "J+" in the special subcolumn; see also subchapter XXI of chapter 98.

Preferential free rates of duty in the special subcolumn followed by the symbol "CA" are applicable to eligible goods of Canada, and rates followed by the symbol "MX" are applicable to eligible goods of Mexico, under the ***North American Free Trade Agreement*** (NAFTA), as provided in general note 12 to the HTS and implemented effective Jan. 1, 1994, by Presidential Proclamation 6641 of Dec. 15, 1993. Goods must originate in the NAFTA region under rules set forth in general note 12(t) and meet other requirements of the note and applicable regulations.

Preferential rates of duty in the special subcolumn followed by the symbol "JO" are applicable to eligible goods of Jordan under the ***United States-Jordan Free Trade Area Implementation Act***, (JFTA) effective as of Dec. 17, 2001; see HTS gen. note 18 and subchapter IX of chapter 99.

Other special tariff treatment applies to particular ***products of insular possessions*** (gen. note 3(a)(iv)), ***products of the West Bank and Gaza Strip*** (gen. note 3(a)(v)), goods covered by the ***Automotive Products Trade Act*** (APTA) (gen. note 5) and the ***Agreement on Trade in Civil Aircraft*** (ATCA) (gen. note 6), ***articles imported from freely associated states*** (gen. note 10), ***pharmaceutical products*** (gen. note 13), and ***intermediate chemicals for dyes*** (gen. note 14).

The ***General Agreement on Tariffs and Trade 1994*** (GATT 1994), pursuant to the Agreement Establishing the World Trade Organization and based upon the earlier GATT 1947 (61 Stat. (pt. 5) A58; 8 UST (pt. 2) 1786), is the primary multilateral system of discipline and principles governing international trade. The agreements mandate most-favored-nation treatment, maintenance of scheduled concession rates of duty, and national treatment for imported goods; GATT provides the legal framework for customs valuation standards, "escape clause" (emergency) actions, antidumping and countervailing duties, dispute settlement, and other measures. Results of the Uruguay Round of multilateral tariff negotiations are set forth in separate schedules of concessions for each participating contracting party, with the U.S. schedule designated as Schedule XX. Pursuant to the **Agreement on Textiles and Clothing** (ATC) of the GATT 1994, member countries are phasing out restrictions on imports under the prior "Arrangement Regarding International Trade in Textiles" (known as the **Multifiber Arrangement** (MFA)). Under the MFA, a departure from GATT 1947 provisions, importing and exporting countries negotiated bilateral agreements limiting textile and apparel shipments, and importing countries could take unilateral action to control shipments. Quantitative limits were established on textiles and apparel of cotton, other vegetable fibers, wool, man-made fibers or silk blends in an effort to prevent or limit market disruption in the importing countries. The ATC establishes notification and safeguard procedures, along with other rules concerning the customs treatment of textile and apparel shipments, and calls for the eventual complete integration of this sector into the GATT 1994 and the phase-out of quotas over a ten-year period, or by Jan. 1, 2005.

Table G-1
Milk protein products: Harmonized Tariff Schedule (HTS) subheadings; description; U.S. column-1 rate of duty as of January 1, 2003; U.S. exports, 2002; and U.S. imports, 2002

HTS subheading	Brief description	Column-1 rate of duty as of January 1, 2003: General	Column-1 rate of duty as of January 1, 2003: Special[1]	U.S. exports 2002	U.S. imports 2002
				—Value (*1,000 dollars*)—	
0401.10.00	Milk and cream, not concentrated or sweetened, fat content, by weight, not exceeding 1 percent	0.34¢/liter	Free (A+,CA,D,E,IL,J,JO,MX)	788	120
0401.20.20	Milk and cream, not concentrated or sweetened, fat content, by weight, exceeding 1 percent, but not exceeding 6 percent, for not over 11,356,236 liters entering in any calendar year	0.43¢/liter	Free (A+,CA,D,E,IL,J,JO,MX)	([3])	2,525
0401.20.40	Milk and cream, not concentrated or sweetened, fat content, by weight, not exceeding 1 percent, but not exceeding 6 percent, over 11,356,236 liters entering in any calendar year	1.5¢/liter	Free (CA,IL,MX) 0.6¢/liter (JO)	([3])	31
0402.10.05	Milk and cream, concentrated or sweetened, in powder, granules, or other solid form, fat content, by weight, not exceeding 1.5 percent, not counted towards tariff-rate quota	3.3¢/kg	Free (A+,CA,D,E,IL,J,JO,MX)	([4])	454
0402.10.10	Milk and cream, concentrated or sweetened, in powder, granules, or other solid form, fat content, by weight, not exceeding 1.5 percent, under tariff-rate quota	3.3¢/kg	Free (A+,CA,D,E,IL,J,JO)	([4])	6,967
0402.10.50	Milk and cream, concentrated or sweetened, in powder, granules, or other solid form, fat content, by weight, not exceeding 1.5 percent, over tariff-rate quota	86.5¢/kg	Free (MX) ([2])	([4])	1,197
0402.21.02	Milk and cream, concentrated, not sweetened, in powder, granules, or other solid form, fat content, by weight, exceeding 1.5 percent, but not exceeding 3 percent, not counted towards tariff-rate quota	3.3¢/kg	Free (A+,CA,D,E,IL,J,JO,MX)	([5])	13
0402.21.05	Milk and cream, concentrated, not sweetened, in powder, granules, or other solid form, fat content, by weight, exceeding 1.5 percent, but not exceeding 3 percent, under tariff-rate quota	3.3¢/kg	Free (A+,CA,D,E,IL,J,JO)	([5])	919
0402.21.25	Milk and cream, concentrated, not sweetened, in powder, granules, or other solid form, fat content, by weight, exceeding 1.5 percent, but not exceeding 3 percent, over tariff-rate quota	86.5¢/kg	Free (MX) ([2])	([5])	901

See footnotes at end of table.

Table G-1—*Continued*

Milk protein products: Harmonized Tariff Schedule (HTS) subheadings; description; U.S. column-1 rate of duty as of January 1, 2003; U.S. exports, 2002; and U.S. imports, 2002

HTS subheading	Brief description	Column-1 rate of duty as of January 1, 2003: General	Column-1 rate of duty as of January 1, 2003: Special[1]	U.S. exports 2002	U.S. imports 2002
				——Value *(1,000 dollars)*——	
0402.21.27	Milk and cream, concentrated, not sweetened, in powder, granules, or other solid form, fat content, by weight, exceeding 3 percent, but not exceeding 35 percent, not counted towards tariff-rate quota	6.8¢/kg	Free (A+,CA,D,E,IL,J,JO,MX)	([5])	103
0402.21.30	Milk and cream, concentrated, not sweetened, in powder, granules, or other solid form, fat content, by weight, exceeding 3 percent, but not exceeding 35 percent, under tariff-rate quota	6.8¢/kg	Free (A+,CA,D,E,IL,J,JO)	([5])	5,027
0402.21.50	Milk and cream, concentrated, not sweetened, in powder, granules, or other solid form, fat content, by weight, exceeding 3 percent, but not exceeding 35 percent, over tariff-rate quota	$1.092/kg	Free (MX) ([2])	([5])	2,326
0402.21.73	Milk and cream, concentrated, not sweetened, in powder, granules, or other solid form, fat content, by weight, exceeding 35 percent, not counted towards tariff-rate quota	13.7¢/kg	Free (A+,CA,D,E,IL,J,JO,MX)	([5])	0
0402.21.75	Milk and cream, concentrated, not sweetened, in powder, granules, or other solid form, fat content, by weight, exceeding 35 percent, under tariff-rate quota	13.7¢/kg	Free (A+,CA,D,E,IL,J,JO)	([5])	0
0402.21.90	Milk and cream, concentrated, not sweetened, in powder, granules, or other solid form, fat content, by weight, exceeding 35 percent, over tariff-rate quota	$1.556/kg	Free (MX) ([2])	([5])	56
0402.29.05	Milk and cream, concentrated or sweetened, in powder, granules, or other solid form, fat content, by weight, exceeding 1.5 percent, not counted towards tariff-rate quota	17.5%	Free (A+,CA,D,E,IL,J,JO,MX)	([6])	93
0402.29.10	Milk and cream, concentrated or sweetened, in powder, granules, or other solid form, fat content, by weight, exceeding 1.5 percent, under tariff-rate quota	17.5%	Free (A+,CA,D,E,IL,J,JO)	([6])	33
0402.29.50	Milk and cream, concentrated or sweetened, in powder, granules, or other solid form, fat content, by weight, exceeding 1.5 percent, over tariff-rate quota	$1.104/kg + 14.9%	Free (MX) ([2])	([6])	11
0402.91.03	Milk and cream, concentrated, not sweetened, in other than powder, granules, or other solid form, in airtight containers, not counted towards tariff-rate quota	2.2¢/kg	Free (A+,CA,D,E,IL,J,JO,MX)	([7])	250

See footnotes at end of table.

Table G-1—*Continued*

Milk protein products: Harmonized Tariff Schedule (HTS) subheadings; description; U.S. column-1 rate of duty as of January 1, 2003; U.S. exports, 2002; and U.S. imports, 2002

HTS subheading	Brief description	Column-1 rate of duty as of January 1, 2003: General	Column-1 rate of duty as of January 1, 2003: Special[1]	U.S. exports 2002	U.S. imports 2002
				—Value *(1,000 dollars)*—	
0402.91.06	Milk and cream, concentrated, not sweetened, in other than powder, granules, or other solid form, in other than airtight containers, not counted towards tariff-rate quota	3.3¢/kg	Free (A+,CA,D,E,IL,J,JO,MX)	([7])	0
0402.91.10	Milk and cream, concentrated, not sweetened, in other than powder, granules, or other solid form, in airtight containers, under tariff-rate quota	2.2¢/kg	Free (A+,CA,D,E,IL,J,JO)	([7])	1,161
0402.91.30	Milk and cream, concentrated, not sweetened, in other than powder, granules, or other solid form, in other than airtight containers, under tariff-rate quota	3.3¢/kg	Free (A+,CA,D,E,IL,J,JO)	([7])	0
0402.91.70	Milk and cream, concentrated, not sweetened, in other than powder, granules, or other solid form, in airtight containers, over tariff-rate quota	31.3¢/kg	Free (MX) ([2])	([7])	25
0402.91.90	Milk and cream, concentrated, not sweetened, in other than powder, granules, or other solid form, in other than airtight containers, over tariff-rate quota	31.3¢/kg	Free (MX) ([2])	([7])	19
0404.10.05	Whey protein concentrates	8.5%	Free (A+,CA,D,E,IL,J,MX) 2.1% (JO)	40,579	8,545
0404.10.08	Modified whey, other than whey protein concentrates, whether or not concentrated or sweetened, not counted towards tariff-rate quota	13%	Free (A,CA,E,IL,J,JO,MX)	([8])	0
0404.10.11	Modified whey, other than whey protein concentrates, whether or not concentrated or sweetened, under tariff-rate quota	13%	Free (A+,CA,D,E,IL,J,JO)	([8])	60
0404.10.15	Modified whey, other than whey protein concentrates, whether or not concentrated or sweetened, over tariff-rate quota	$1.035/kg + 8.5%	Free (MX) ([2])	([8])	3
0404.10.15	Modified whey, other than whey protein concentrates, whether or not concentrated or sweetened, over tariff-rate quota	$1.035/kg + 8.5%	Free (MX) ([2])	([8])	3
0404.10.20	Fluid whey, whether or not concentrated or sweetened	0.34¢/liter	Free (A+,CA,D,E,IL,J,JO,MX)	1,712	0
0404.10.48	Dried whey, whether or not concentrated or sweetened, not counted towards tariff-rate quota	3.3¢/kg	Free (A+,CA,D,E,IL,J,JO,MX)	([9])	147
0404.10.50	Dried whey, whether or not concentrated or sweetened, under tariff-rate quota	3.3¢/kg	Free (A+,CA,D,E,IL,J,JO)	([9])	0
0404.10.90	Dried whey, whether or not concentrated or sweetened, over tariff-rate quota	87.6¢/kg	Free (MX) ([2])	([9])	2
0404.90.10	Milk protein concentrate	3.7¢/kg	Free (A+,CA,E,IL,J,JO,MX)	([10])	114,619

See footnotes at end of table.

Table G-1—*Continued*

Milk protein products: Harmonized Tariff Schedule (HTS) subheadings; description; U.S. column-1 rate of duty as of January 1, 2003; U.S. exports, 2002; and U.S. imports, 2002

HTS subheading	Brief description	Column-1 rate of duty as of January 1, 2003: General	Column-1 rate of duty as of January 1, 2003: Special[1]	U.S. exports 2002	U.S. imports 2002
				——Value *(1,000 dollars)*——	
0404.90.28	Dairy products consisting of natural milk constituents, whether or not concentrated or sweetened, not elsewhere specified or included, containing over 5.5 percent by weight of butterfat and not packaged for retail sale, not counted towards tariff-rate quota	14.5%	Free (A+,CA,D,E,IL,J,JO,MX)	([10])	0
0404.90.30	Products consisting of natural milk constituents, whether or not concentrated or sweetened, not elsewhere specified or included, containing over 5.5 percent by weight of butterfat and not packaged for retail sale, under tariff-rate quota	14.5%	Free (A+,CA,D,E,IL,J,JO)	([10])	83
0404.90.50	Products consisting of natural milk constituents, whether or not concentrated or sweetened, not elsewhere specified or included, containing over 5.5 percent by weight of butterfat and not packaged for retail sale, over tariff-rate quota	$1.189/kg + 8.5%	Free (MX) ([2])	([10])	201
0404.90.70	Products consisting of natural milk constituents, whether or not concentrated or sweetened, not elsewhere specified or included, containing not over 5.5 percent by weight of butterfat and not packaged for retail sale	8.5%	Free (A+,CA,D,E,IL,J,MX) 2.1% (JO)	([10])	3,875
2106.90.03	Products derived from dried milk, dried buttermilk, or dried whey, containing not over 5.5 percent by weight of butterfat and which are mixed with other ingredients, including sugar, not counted towards tariff-rate quota	2.9 ¢/kg	Free (A,CA,E,IL,J,JO,MX)	([11])	26
2106.90.06	Products derived from dried milk, dried buttermilk, or dried whey, containing not over 5.5 percent by weight of butterfat and which are mixed with other ingredients, including sugar, under the tariff-rate quota	2.9 ¢/kg	Free (A,CA,E,IL,J,JO,MX)	([11])	0
2106.90.09	Products derived from dried milk, dried buttermilk, or dried whey, containing not over 5.5 percent by weight of butterfat and which are mixed with other ingredients, including sugar, over the tariff-rate quota	86.2¢/kg	Free (MX) ([2])	([11])	68
3501.10.10	Casein, milk protein concentrate	0.37¢/kg	Free (A*,CA,E,IL,J,JO,MX)	([12])	31,290
3501.10.50	Casein, other than milk protein concentrate	Free		([12])	230,320
3501.90.60	Caseinates and casein derivatives, nesoi	0.37¢/kg	Free (A*,CA,E,IL,J,JO,MX)	4,415	156,605
3502.20.00	Milk albumin, including concentrates of two or more whey proteins	Free		25,760	42,202

See footnotes at end of table.

Table G-1—*Continued*

Milk protein products: Harmonized Tariff Schedule (HTS) subheadings; description; U.S. column-1 rate of duty as of January 1, 2003; U.S. exports, 2002; and U.S. imports, 2002

HTS subheading	Brief description	Column-1 rate of duty as of January 1, 2003: General	Column-1 rate of duty as of January 1, 2003: Special[1]	U.S. exports 2002	U.S. imports 2002
				——Value *(1,000 dollars)*——	
3502.90.00	Other albumin	Free		13,567	22,363

[1] Programs under which special tariff treatment may be provided and the corresponding symbols for such programs as they are indicated in the "Special" subcolumn are as follows: North American Free Trade Agreement: Goods of Canada (CA); North American Free Trade Agreement, Goods of Mexico (MX); Caribbean Basin Economic Recovery Act (E); United States-Israel Free Trade Act (IL); Andean Trade Preference Act (J); U.S.-Jordan Free Trade Area Implementation Act (JO); General System of Preferences (A*). See below for more information on tariff and trade agreement terms.

[2] Imports of this product from Jordan and enter under this HTS subheading. Duties applying to imports from Jordan are given in subchapter 9 of chapter 99 of the HTS.

[3] The value of U.S. exports is not available for this individual HTS subheading. However, exports of milk and cream, not concentrated or sweetened of fat content exceeding 1 percent but not exceeding 6 percent (schedule B subheading 0401.20.0000) was $12.1 million in 2002.

[4] The value of U.S. exports is not available for this individual HTS subheading. However, exports of milk and cream, concentrated or sweetened in powder, granules or other solid forms of fat content not exceeding 1.5 percent (schedule B subheading 0402.10.0000) was $114.5 million in 2002.

[5] The value of U.S. exports is not available for this individual HTS subheading. However, exports of milk and cream, concentrated or sweetened in powder, granules or other solid forms of fat content not exceeding 1.5 percent and not containing added sugar or other sweetening (schedule B subheading 0402.21.0000) was $31.4 million in 2002.

[6] The value of U.S. exports is not available for this individual HTS subheading. However, exports of milk and cream, concentrated or sweetened in powder, granules or other solid forms of fat content not exceeding 1.5 percent (schedule B subheading 0402.29.0000) was $13.4 million in 2002.

[7] The value of U.S. exports is not available for this individual HTS subheading. However, exports of milk and cream, concentrated or sweetened in powder, not in granules or other solid forms of fat content not exceeding 1.5 percent and not containing added sugar or other sweetening (schedule B subheading 0402.91.0000) was $4.6 million in 2002.

[8] The value of U.S. exports is not available for this individual HTS subheading. However, exports of modified whey other than whey protein concentrates (schedule B subheading 0404.10.0850) was $6.8 million in 2002.

[9] The value of U.S. exports is not available for this individual HTS subheading. However, exports of dried whey (schedule B subheading 0404.10.4000) was $84.1 million in 2002.

[10] The value of U.S. exports is not available for this individual HTS subheading. However, exports of milk protein concentrates and products consisting of natural milk constituents (schedule B subheading 0404.90.0000) was $4.9 million in 2002.

[11] The value of U.S. exports is not available for this individual HTS subheading. Further, Schedule B subheadings for 2106.90 does not break out dairy products. Therefore, there is no meaningful schedule B data that has a concordance with these import HTS subheadings.

[12] The value of U.S. exports is not available for this individual HTS subheading. However, exports of casein (schedule B subheading 3501.10.0000) was $2.3 million in 2002.

Source: U.S. Department of Commerce.

APPENDIX H
TECHNICAL MODELING

Technical Modeling: Overview

This technical appendix includes two sections. First is a summary of the vector autogregression (VAR) modeling analysis that establishes the existence of a statistically significant relationship among monthly U.S. imports of milk proteins concentrates (MPCs) under HTS Chapter 4 from the EU (hereinafter, MPC 4 imports) and net potential revenue presented in chapter 5 of this report. This first component tests the findings and opinions uncovered in fieldwork that net potential revenue[1] influences MPC 4 imports. This is done by specifying a monthly econometric time series model of these two variables and demonstrating the model's strong statistical evidence that this relationship exists. More specifically, this section includes a specification summary of the VAR model; an analysis of the estimated VAR model's diagnostic evidence to establish the VAR model's appropriateness as a model choice and to demonstrate the statistical strength of the model's causal relationship between net potential revenue and MPC 4 imports; and, a summary of VAR econometric results that illuminate the dynamic nature of the statistically strong relationship between net potential revenue and MPC 4 imports.

The second section of this appendix is a review of directly relevant literature. Over the last two decades, there has been a plethora of published research with empirical and econometric modeling of dairy policy issues. Much of this literature is not directly relevant to the modeling of U.S. markets for imports of MPCs, casein, and caseinates. To limit this literature review to relevant literature, only four studies are reviewed here. These four studies attempt to directly model U.S. markets for MPC, casein, and caseinate imports (hereinafter MCC imports).

Two other groups of literature were considered, but not reviewed. First, there are studies that have not directly modeled MCC markets, but which appear adaptable to the direct modeling of U.S. (or non-U.S.) markets for MCC imports: Cox and Chavas;[2] Bouamra-Mechemache, Chavas, Cox, and Requillart;[3] Zhu, Cox, and Chavas;[4] Cox, Coleman, Chavas, and Zhu;[5] and Meilke, Sarker, and Le Roy.[6] Second, there are a number of nonempirical and primarily descriptive inquiries about MCC-related markets: USITC, Section 22 Investigation No. 22-

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[1] As discussed fully in chapter 5, returns (economic rents) resulting from U.S. and EU policy generated from U.S. imports of a low-protein, blended MPC from the EU, provided substantial incentives to trade during 1998-2000. These returns are defined by the term, "net potential revenue."

[2] Thomas Cox and Jean-Paul Chavas, "An Interregional Analysis of Price Discrimination and Domestic Policy Reform in the U.S. Dairy Sector," *American Journal of Agricultural Economics* (Feb. 2001), vol. 83, No. 1, pp. 89-106; Dr. Thomas Cox, interview by USITC staff, July 29, 2003.

[3] Zohra Bouamra-Mechemache, Jean-Paul Chavas, Thomas Cox, and Vincent Requillart, "EU Dairy Policy Reform and Future WTO Negotiations: A Spatial Equilibrium Analysis," *Journal of Agricultural Economics* vol. 53, No. 2 (July 2002), pp. 235-240.

[4] Yong Zhu, Thomas Cox, and Jean-Paul Chavas, "An Economic Analysis of the Effects of the Uruguay Round Agreement and Full Trade Liberalization on the World Dairy Sector," Canadian Journal of Agricultural Economics, vol. 47 (1999), pp. 187-200.

[5] Thomas Cox, Jonathan Coleman, Jean-Paul Chavas, and Yong Zhu, "An Economic Analysis of the Effects on the World Dairy Sector of Extending Uruguay Round Agreement to 2005," *Canadian Journal of Agricultural Economics*, vol. 47 (1999), pp. 169-183.

[6] Karl Meilke, Rahkal Sarker, and Danny Le Roy, "The Potential for Increased Trade in Milk and Dairy Products Between Canada and the United States Under Trade Liberalization," *Canadian Journal of Agricultural Economics*, vol. 46 (1998), pp. 149-169.

44;[7] USITC, Investigation. No. 332-105 (1979);[8] USDA, Economic Research Service (ERS) (1982);[9] USDA, ERS (1986);[10] U.S. Government Accounting Office (GAO);[11] and Sparks Companies, Inc.[12]

Vector Autoregression Modeling Analysis of Monthly Net Potential Revenue and MPC 4 Imports

Chapter 5 develops a relationship among monthly MPC 4 imports and net potential revenue during the 1998-2002 period. This section's aim is to specify a model incorporating a causal relationship among net potential revenue and MPC 4 imports; to provide diagnostic evidence that the model and underlying relationship is statistically sound; and to then provide model results and analysis to illuminate the dynamic nature of this statistically strong relationship.

Vector Autoregression Model: Specification Issues

The two series, net potential revenue and MPC 4 imports, were estimated as a VAR model for two reasons. First, field work findings[13] suggest that net potential revenue drives U.S. MPC 4 imports from the EU. And second, statistical evidence emerged that these two variables are likely stationary in levels.

When a vector system of individually nonstationary variables moves in tandem in a stationary manner, the variables are said to be cointegrated and should be estimated as a

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[7] U.S. International Trade Commission, "Casein, Mixtures in Chief Value of Casein, and Lactalbumin," *Report to the President on Investigation No. 22-44 Under Section 22 of the Agricultural Adjustment Act*, USITC publication No. 1217 (Jan. 1982).

[8] U.S. International Trade Commission, "Casein and its Impact on the Domestic Dairy Industry," *Report to the Committee on Ways and Means of the United States House of Representatives on Investigation No.332-105 Under Section 332 of the Tariff Act of 1930, as Amended*, USITC publication No. 1025 (Dec. 1979).

[9] USDA, ERS, *Casein and Lactalbumin Imports: An Economic and Policy Perspective,* Economics and Statistics Service Staff Report No. AGESS810521 (1982).

[10] USDA, ERS, *Effects of Casein Imports,* Staff Report No. AGES860321 (Washington, DC: USDA/ERS, Apr. 1986).

[11] U.S. General Accounting Office, *Dairy Products: Imports, Domestic Production, and Regulation of Ultra-filtered Milk*, GAO–1-326 (Mar. 2001).

[12] Sparks Companies, Inc. *Imports of MPCs, Casein, and Caseinates and Market Impacts: A Special Study for the U.S. Coalition for Nutritional Ingredients* (McLean, VA: Sparks Companies, May, 2003).

[13] European Dairy Association, selected EU milk protein processors/members, interviews by USITC staff, Brussels, Belgium, Oct. 15, 2003.

vector error correction, or VEC model.[14] These two variables were posited as a monthly VAR model, and not a cointegrated (VEC) model, because evidence suggested that the two variables were stationary in levels, thereby precluding the need for a cointegration or vector error correction model. Augmented Dickey-Fuller (ADF) T_τ tests and the stationarity test of Kwiatowski et. al. (hereinafter, KPSS test) were conducted on the levels of the two endogenous variables and suggested that the variables were likely stationary in levels.[15] The net potential revenue variable and MPC 4 import variables generated ADF T_τ values ranging from -2.3 and -2.4, which suggests that evidence is sufficient to reject the null hypothesis of nonstationarity (see footnote 15). And as supplemental evidence, KPSS tests were conducted on these two variables. Because the following KPSS test values fall below the critical values of 0.176 (5 percent significance level) and 0.216 (1 percent significance level), evidence from KPSS tests at both the 1 percent and 5 percent significance levels was insufficient to reject the null hypotheses that both variables were stationary: 0.14 for net potential revenue and 0.135 for MPC 4 imports. As a result, and following the recommendations and procedures of Harris; Kwiatowski, et. al.; and Babula, Bessler, and Payne, net potential revenue and MPC 4 imports were treated as stationary, thereby justifying their estimation as a VAR.[16] Consequently, the issue of cointegration is precluded as a valid concern and there is no need to model the two variables as a VEC model.

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[14] See Soren Johansen, and Katarina Juselius, "Maximum Likelihood and Inference on Cointegration: With Applications to the Demand for Money," *Oxford Bulletin of Economics and Statistics*, vol. 52 (1990), pp. 169-10; Soren Johansen, and Katarina Juselius, "Testing Structural Hypotheses in Multivariate Cointegration Analysis of the PPP and UIP for UK," *Journal of Econometrics*, vol. 53 (1992), pp. 103-25.

[15] Following recommendations of Harris and of Kwiatowski et al., ADF T_τ tests were conducted at weaker levels of statistical significance ranging from 10 percent to 20 percent, rather than at the 5 percent or 1 percent levels because of well-known ADF test problems in generating results biased towards nonstationarity when, as in this study, samples are finite and/or when an otherwise stationary variable has a unit root approaching unity and is "almost nonstationary." As noted by these researchers, and summarized by Babula, Bessler, and Payne, in cases where variables such as net potential revenue and MPC 4 imports are represented by finite samples and are "almost stationary," these variables should be treated as stationary and should not be differenced. As a result, 10 percent to 20 percent significance levels were chosen for the ADF tests to avoid an excessive tendency or bias of ADF tests to suggest that the variables are nonstationary. Following Kwiatowski et al.'s recommendations, and Babula, Bessler, and Payne's recent procedures, the KPSS stationarity test (with a null hypothesis of stationarity rather than the ADF null of nonstationarity) was used as supplemental evidence when ADF test results suggested stationarity at the weaker 10 percent or 20 percent significance levels. See Richard Harris. *Cointegration Analysis in Econometric Modeling* (New York: Prentice-Hall, 1994), pp. 24-27; Denis Kwiatowski, Peter Phillips, Peter Schmidt, and Yongcheoul Shin, "Testing the Null Hypothesis of Stationarity Against the Alternative of a Unit Root: How Sure Are We that Economic Time Series Have a Unit Root?", *Journal of Econometrics*, vol. 54 (1992), pp. 159-78; Ronald Babula, David Bessler, and Warren Payne, "Dynamic Relationships Among U.S. Wheat-Related Markets: Applying Directed Acyclic Graphs to a Time Series Model," *Journal of Agricultural and Applied Economics*, vol. 36, No. 1 (2004), pp. 5-6.

[16] Richard Harris. *Cointegration Analysis*, pp. 24-27; Denis Kwiatowski, et al. "Testing the Null Hypothesis of Stationarity," pp. 159-78; Ronald Babula, David Bessler, and Warren Payne, "Dynamic Relationships Among U.S. Wheat-Related Markets," pp. 5-6.

Monthly net potential revenue and MPC 4 imports were located for 1997:07-2003:03.[17] The VAR model was estimated over the 1998:01-2003:03 period, to permit six observations to be "saved" to implement the lag search procedures of Tiao and Box, which suggested a six-lag order.[18] As a result, the VAR model of net potential revenue and MPC 4 imports is as follows:

(H.1) POTREV(t) = a_0 + a(s, t-1)*POTREV(t-1) + . . . + a(s, t-6)*POTREV(t-6)

+ a(m, t-1)*MPC 4(t-1) + ... + a(m, t-6)*MPC 4(t-6) + R(s,t)

(H.2) MPC 4(t) = b_0 + b(s, t-1)*POTREV(t-1) + . . . + b(s, t-6)*POTREV(t-6)

+ b(m, t-1)*MPC 4(t-1) + ... + b(m, t-6)*MPC 4(t-6) + R(m, t)

Above, POTREV and MPC 4 represent net potential revenue and MPC 4 imports, respectively, with the parenthetical t referring to the current period-t value, and the parenthetical (t-1) through (t-6) terms referring to the six lags. The a and b terms refer to the estimated regression coefficients on the net potential revenue and MPC 4 imports, respectively, and the parenthetical terms on these coefficients refer as follows: s and m refer to coefficients on POTREV and MPC 4 in each equation, and the t-i, where i = 1, . . . 6, refers to the lagged values. R(s,t) and R(m,t) refer to the white noise residuals on the POTREV and MPC 4 equations, respectively. The nought-subscripted coefficients refer to the intercept estimates.

Following recent commodity-based VAR econometric studies, a number of binary variables were also included in each of the two equations.[19] Eleven seasonal binary variables were included to capture seasonal effects, while a binary variable defined for April 2000 and ensuing observations was included to account for the establishment of effective reduction coefficients.

Diagnostic Evidence of Adequate Vector Autogression Model Specification

Following recent VAR econometric research, Ljung-Box portmanteau and Dickey-Fuller (DF) tests were applied to the estimated residuals of each VAR equation, and evidence strongly suggested that the estimated VAR above has been adequately specified by literature-established standards, rendering credence to the hypothesized causal relationship from

[17] Chapter 5 defines the sources and calculation methods for the net potential revenue data. The MPC 4 imports are the U.S. imports of milk proteins under Chapter 4 of the HTS, and are from the U.S. Department of Commerce. Throughout, monthly dates are denoted numerically, with the digits 1 through 12 right of the colon denoting the months of January through December, respectively.

[18] George Tiao and George Box, "Modeling Multiple Time Series: With Applications," *Journal of the American Statistical Association*, vol. 76 (1978), pp. 802-16.

[19] Ronald Babula and Karl Rich, "Time Series Analysis of the U.S. Durum Wheat and Pasta Markets," *Journal of Food Distribution Research*, vol. 32, No. 2 (2001), pp. 7-9; Ronald Babula, David Bessler, and Warren Payne, "Dynamic Relationships Among U.S. Wheat-Related Markets," pp. 4-5.

POTREV to MPC 4.[20] Ljung-Box portmanteau, or Q-values, test the hypothesis that an equation is adequately specified.[21] Since the following VAR equation Q-values fall far below the critical chi-square value (15 degrees of freedom) of 30.58, evidence at the 1 percent significance level was insufficient for both equations to reject the null hypothesis of model adequacy: 12.8 for POTREV and 27.3 for MPC 4. Following Granger and Newbold's recommendation that one not rely exclusively on portmanteau tests to discern time series model adequacy, DF T_τ tests were conducted on the two VAR equations' estimated residuals, with stationary residuals suggesting model adequacy.[22] Given the pseudo-t values of -7.7 for SHREV and -8.3 for MPC 4 imports, evidence at the 1 percent and 5 percent significance levels strongly rejected the null hypotheses that each equation's residuals were nonstationary, having led to the conclusion that the model equations have likely been adequately specified. These diagnostics strongly support the existence of the modeled relationship among net potential revenue and MPC 4 imports.

As well, evidence suggested that the VAR equations did not experience structural change, such that the estimated coefficients were likely time-invariant and not subject to structural change. Chow tests of structural change were conducted for two junctures in each equation: March 2000 to account for the establishment of the first effective EU reduction coefficient for export refunds and July 2000 to account for the ending of EU WTO carryover commitments on export refunds (see chapter 5 of this report). The Chow test procedure tests the null hypothesis that there was no structural change at a chosen date or juncture (here March 2000 and July 2000).[23] The critical F-values for tests of structural change at both dates (degrees of freedom 24/15) were 3.29 at the 1 percent and 2.29 at the 5 percent significance levels. Since the following Chow test values were far below the critical F-values at both levels of significance, evidence at the 1 and 5 percent significance levels was insufficient to reject the null hypotheses that either the net potential revenue or MPC 4 import equation was subject to structural change at either March or July 2000: 0.40 for POTREV and 1.2 for MPC 4 for the March 2000 tests; and 0.4 for POTEV and 1.3 for MPC 4 for the July 2000 tests.

Analysis of Forecast Error Variance Decompositions

Analysis of decompositions of forecast error variance (FEV) is a well-known tool of VAR econometrics for discerning relationships among the two modeled VAR variables. Closely related to Granger causality analysis, FEV decompositions also provide evidence concerning the simple existence of a causal relationship among two variables, here POTREV and MPC

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[20] Ronald Babula and Karl Rich, "Time Series Analysis of the U.S. Durum and Pasta Markets," p. 7; Ronald Babula, David Bessler, and Warren Payne, "Dynamic Relationships Among U.S. Wheat-Related Markets," p. 6.

[21] A summary of the Ljung-Box portmanteau test is provided in C.W.J. Granger and Paul Newbold, *Forecasting Time Series* (New York: Academic Press, 1986), pp. 99-101.

[22] For the recommendation, see C.W.J. Granger and Paul Newbold, *Forecasting Time Series*, pp. 99-101. For recent application of the Ljung-Box and DF tests to discern model adequacy of VAR econometric studies of U.S. commodity-based markets, see Ronald Babula and Karl Rich, "Time Series Analysis of the U.S. Durum and Pasta Markets," p. 7; Ronald Babula, David Bessler, and Warren Payne, "Dynamic Relationships Among U.S. Wheat-Related Markets," p. 7.

[23] The well-known Chow test procedure is summarized in Peter Kennedy, *A Guide to Econometrics* (Cambridge, MA: The MIT Press, 1985), p. 87.

4.[24] However, analysis of FEV decompositions goes further than Granger causality tests: a modeled endogenous variable's FEV is attributed at alternative time horizons to shocks in each modeled endogenous variable (including itself), and not only provides evidence of the existence of a relationship among two variables, but illuminates the strength and dynamic timing of such a relationship.[25] We provide the FEV decompositions at alternative monthly time horizons for MPC 4 imports, as estimated in the above VAR model. These provide the percentage of MPC 4 variation attributable to movements in net potential revenue and to movements in itself.

Sims and Bessler noted that for a VAR model to generate reliable FEV decompositions, one must fully account for both serial correlation (causal relationships over time) and contemporaneous correlations (causal relationships in current time) among a VAR model's endogenous variables.[26] Bessler and Bessler and Akleman noted that a VAR typically accounts for serial causality or correlations over time via the chosen lag structure, but says little about contemporaneously correlated current errors or causality relations.[27] A common and traditional way to handle such contemporaneous correlations has been to impose a Choleski decomposition, whereby one imposes a theoretically based Wold causal ordering on the variance/covariance matrix of the estimated VAR.[28] Given that there are only two variables comprising the VAR model (POTREV and MPC 4), the choice of orderings was straightforward: POTREV causes MPC 4 or MPC 4 causes POTREV in contemporaneous time. Evidence from EU fieldwork clearly suggested that POTREV has been influencing U.S. MPC 4 imports both in contemporaneous time and over time.[29] As a result, the chosen ordering of the two-variable VAR was that POTREV causes MPC 4, with no apparent need to pursue other other alternative ways of ordering systems of endogenous VAR variables in contemporaneous time.[30]

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[24] David Bessler, "An Analysis of Dynamic Economic Relationships: An Application to the U.S. Hog Market," *Canadian Journal of Agricultural Economics*, vol. 32 (1984), p. 111.

[25] David Bessler, "An Analysis of Dynamic Economic Relationships," p. 111; Ronald Babula and Karl Rich, "Time Series Analysis of the U.S. Durum and Pasta Markets," pp. 14-15; Ronald Babula, David Bessler, and Warren Payne, "Dynamic Relationships Among U.S. Wheat-Related Markets," pp. 15-17.

[26] Christopher Sims, "Macroeconomics and Reality," *Econometrica*, vol. 48 (1998), pp. 1-48; David Bessler, "An Analysis of Dynamic Economic Relationships," p. 111.

[27] David Bessler, "An Analysis of Dynamic Economic Relationships," p. 112; David Bessler and D. Akleman, "Farm Prices, Retail Prices, and Directed Graphs: Results for Pork and Beef," *American Journal of Agricultural Economics*, vol. 80, No. 5 (1998), pp. 1144-49.

[28] Ibid., p. 111.

[29] European Dairy Association, selected EU milk protein processors/members, interviews by USITC staff, Brussels, Belgium, Oct. 15, 2003.

[30] Given the fieldwork findings just noted and the simplicity of the two-variable VAR, there was no apparent need to explore alternative methods of ordering variables in contemporaneous time. These include structural VAR modeling orderings developed by Bernanke and orderings based on analysis of directed acyclic graphs developed by David Bessler and D. Akleman. See Benjamin Bernanke, "Alternative Explanations of Money-Income Correlation," *Carnegie-Rochester Conference Series on Public Policy*, vol. 25 (1986), pp. 183-99; David Bessler and D. Akleman, "Farm Prices, Retail Prices, and Directed Graphs," pp. 1144-1146. A summary of these two alternative methods is provided in Ronald Babula, David Bessler, and Warren Payne, "Dynamic Relationships Among U.S. Wheat-Related Markets," pp. 8-9.

The well-specified VAR model above clearly establishes evidence supporting the fieldwork findings that there is a strong statistical relationship among net potential revenue and MPC 4 imports. The FEV decomposition patterns in table H-1 emerged.

Table H-1
Forecast error variance (FEV) decompositions of U.S. MPC 4 imports

Monthly horizon	Percent explanation of MPC 4 variation from POTREV movements	Percent explanation of MPC 4 variation from own-variation
Month 1	3.60	96.4
Month 2	9.48	90.52
Month 3	9.93	90.07
Month 4	17.82	82.18
Month 6	17.00	83.00
Month 9	20.17	79.83
Month 12	23.45	76.55
Month 18	28.05	71.95

Source: Compiled by Commission from estimations of the VAR model.

A number of points are noted. First, FEV decompositions suggest that up to about 28 percent of MPC 4 imports' variation is driven or attributable to movements in net potential revenue by the 18-month horizon.[31] Second, there is a gradual unfolding of this POTREV influence on MPC 4 imports. More specifically, movements in net potential revenue have MPC 4 influences that are initially negligible (3.6 percent at the month-1 horizon), gain in strength through month-6 where they explain up to 17 percent or 18 percent of MPC 4 variation, and ultimately explain about 28 percent of the variation in MPC 4 imports. Pronounced POTREV-induced effects on MPC 4 imports take a few months to arise.

Review of Studies Directly Modeling MPC and Casein-Related Product Markets and Effects

Burke and Cox (2003, ongoing)

Burke and Cox built a mathematical program that directly models U.S. markets for MPCs, casein, and caseinates (hereafter, U.S. milk protein imports) and the effects of such imports

[31] Note that this 28 percent is not the coefficient of determination or r-square value used to summarize the percent of the dependent variable's total variation explained collectively by the equations regressors.

on the U.S. dairy industry.[32] Burke and Cox[33] combined two models: the U.S. dairy sector Interregional Competition Model (IRCM) developed by Cox and Chavas[34] (detailed in the next section) with another model of a representative cheese making process (that is, a representative cheese vat) recently developed at the University of Wisconsin (UW) and called the U.S. Dairy Processing Sector Optimal Component Allocation Model (or OCAM model). The IRCM model, when combined with OCAM, updates and in some ways expands and aggregates the ICRM model (hereinafter denoted the IRCM-new model).

Model component 1, Cox-Chavas ICRM model: current and proposed

Cox and Chavas[35] built a mathematical programming model of the U.S. dairy industry based on the work of Takayama and Judge,[36] and of Samuelson[37] (hereinafter, Samuelson/Takayama/Judge framework). They claim to have extended this Samuelson/Takayama/Judge framework in two ways: (1) they investigated the interregional allocation and pricing of dairy products, based on the allocation and pricing of three milk components (protein, fat, and other solids) involved in dairy product transformation, and (2) modeled the 12 U.S. subregional markets subject to federal or California milk marketing order regimes. In their model, Leontief-type milk component input proportions are assumed and the demands in the welfare measure and the milk supply cost measure are defined in terms of the three milk components.[38] Two types of dairy products are defined in terms of the three components by Leontief coefficients: a single primary or intermediate product, raw milk, used as an ingredient input for further dairy processing, and nine final or processed dairy products. There are 12 U.S. regions (California and 11 FMMO regions).[39] The comparative static model simulates postulated policy changes and results are compared with those of a baseline scenario. The 1995 baseline includes 1995 U.S. dairy market conditions,

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[32] University of Wisconsin dairy economists, interviews by USITC staff, Madison, WI, Aug. 19, 2001; telephone conversation with Dr. Thomas Cox, University of Wisconsin dairy economist, Sept. 22, 2003.

[33] Joseph Burke and Thomas Cox, "University of Wisconsin-Madison/ITC Proposal: Assessing the Impacts of Off-Shore Dairy-Based Ingredients on the U.S. Dairy Sector," unpublished and undated paper, Department of Agricultural Economics, University of Wisconsin, Madison, WI, received by Commission staff on Sept. 30, 2003; University of Wisconsin dairy economists, interviews with USITC staff, Madison, WI, Aug. 19, 2001; telephone conversation with Dr. Thomas Cox, University of Wisconsin dairy economist, Sept. 22 and Oct. 1, 2003.

[34] Thomas Cox and Jean-Paul Chavas, "An Interregional Analysis of Price Discrimination and Domestic Policy Reform in the U.S. Dairy Sector," *American Journal of Agricultural Economics*, vol. 83, No. 1 (Feb. 2001), pp. 89-106.

[35] Ibid., pp. 89-90; Dr. Thomas Cox, interview by USITC staff, July 29, 2003.

[36] T. Takayama and George Judge. *Spatial and Temporal Price and Allocation Models* (Amsterdam, Netherlands: North Holland, 1971).

[37] Paul Samuelson, "Spatial Price Equilibrium and Linear Programming," *American Economic Review*, vol. 42 (June 1952), pp. 283-303.

[38] Thomas Cox and Jean-Paul Chavas, "An Interregional Analysis," pp. 89-90; and Dr. Thomas Cox, interview by USITC staff, July 29, 2003. See also Zohra Bouamra-Mechemache, Jean-Paul Chavas, Thomas Cox, and Vincent Requillart, "EU Dairy Policy Reform and Future WTO Negotiations: A Spatial Equilibrium Analysis," *Journal of Agricultural Economics*, vol. 53, No. 2 (July 2002), pp. 338-40.

[39] The nine dairy products include fluid milk, soft products, American cheese, Italian cheese, other cheese, SMP, butter, frozen products, and a residual "other" category. Thomas Cox, and Jean-Paul Chavas, "An Interregional Analysis," pp. 89-90; Dr. Thomas Cox, interview by USITC staff, July 29, 2003.

CCC minimum dairy product price floors, and Federal and California MMO pricing (via price wedges).[40]

Burke and Cox[41] made a number of alterations to this Cox-Chavas IRCM component of the IRCM-new model. The IRCM-new model calibrates to a 2002 baseline; the 12 U.S. subregions based on MMO regimes are aggregated into a single region; the 3 intermediate products are expanded to 5 (fat, casein protein, whey protein, lactose, and other solids); and the 9 processed dairy products are expanded to 15.[42]

Model Component No. 2, the Optimal Component Allocation Model or OCAM[43]

Burke and Cox noted that the Cox-Chavas IRCM component did not address the substitutability issue among domestically sourced and imported milk components: whether they are perfect substitutes, completely nonsubstitutable, or imperfectly substitutable. This is because the Cox-Chavas model lacks a representative cheese vat or production process that accounts for MPC's unique nature and its effect on the cheese-making process and the process' generation of whey and lactose byproducts. Burke and Cox note that cheese makers face a natural constraint on permitted levels of lactose in cheese which is binding when non-MPC milk components are used (e.g., SMP). They further note that when MPC, with its relatively lower levels of lactose, are used in the cheese vat, the natural constraint of lactose for the process is partly relaxed: cheese yields rise and the cheese output's functionality is enhanced.[44] Consequently, Burke and Cox incorporate the recently developed OCAM model into the aggregated, expanded, and updated Cox-Chavas framework to render the IRCM-new model. With its endogenization of the cheese vat's natural lactose constraint, IRCM-new reflects MPC's comparative advantage over domestically sourced milk components in terms of higher yields and functionality and lower lactose content. Such is done by minimizing costs of allocation of milk components across dairy processes to satisfy dairy production constraints and final demand for each envisioned dairy product.

Currently, the OCAM model processes milk components into the following products which include both directly consumed processed products as well as intermediate outputs used in processing of products:

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[40] Federal MMO prices are included for class I (fluid) milk, class II (soft and frozen products), class III (cheese), and class IV (SMP). California MMO prices are included for class 1 (fluid) milk, class II (soft products), class III (frozen products), and class IV. Thomas Cox, and Jean-Paul Chavas, "An Interregional Analysis," p. 90; Dr. Thomas Cox, interview by USITC staff, July 29, 2003.

[41] Joseph Burke and Thomas Cox, "University of Wisconsin-Madison/ITC Proposal," University of Wisconsin dairy economists, interview with USITC staff, Madison, WI, Aug. 19, 2003; telephone conversations with Dr. Thomas Cox, University of Wisconsin dairy economist, Sept. 22 and Oct. 1, 2003.

[42] Joseph Burke and Thomas Cox, "University of Wisconsin-Madison/ITC Proposal," Wisconsin dairy economists, interview with USITC staff, Madison, WI, Aug. 19, 2001; telephone conversation with Dr. Thomas Cox, University of Wisconsin dairy economist, Sept. 22 and Oct. 1, 2003. See Thomas Cox and Jean-Paul. Chavas, "An Interregional Analysis," pp. 89-90.

[43] Joseph Burke and Thomas Cox, "University of Wisconsin-Madison/ITC Proposal."

[44] Ibid.

processed cheese	condensed whole milk	caseinates
farm milk	condensed skim milk	whey fat
fluid milk	ultrafiltered milk	whey casein
skim milk	milk protein concentrate	whey protein
whole milk powder	soft products	lactose
cream	frozen products	whey minerals
butter	natural cheese	whey water
buttermilk	casein	

The OCAM component treats the production of soft products, frozen products, and natural cheese as optimization processes that select the most cost-effective method of production given relative component/ingredient prices and technological/nutrient mass balance constraints.[45]

There are three kinds of OCAM milk component equations:

Milk component supply:[46] $\underline{a}_k * \underline{q}_m + \sum_i \delta_{ik} * \sigma_{imp} * IMP_i + \sum_i \gamma_{ik} * \sigma_{i,dom} * INT_i$, where

$\underline{q}_m$ = farm milk with average composition,

IMP_i = imports of the ith dairy based ingredient commodity (whole milk, powder, skim milk powder, condensed whole milk, condensed skim milk, milk protein concentrates (EU 7 non-EU), casein, caseinates, and whey products) with average composition δ_{ik} of the kth component (delta=imported MPC protein content), and $\sigma_{i,imp}$ or the percent utilization level of imported dairy based ingredients by the dairy industry (as opposed to nondairy sectors);

INT_i = usage of the ith domestically sourced intermediate commodity (whole milk powder, skim milk powder, condensed whole milk, condensed skim milk, and whey products) with average composition γ_{ik} of the kth component, and $\sigma_{i,dom}$ or percent utilization (by dairy industry) of domestically sourced dairy based ingredients.

k = 1 ... 5 components; i = 1, . . . ,23 products; subscript "m" refers to milk as opposed to commodities or "c."

Milk component usage or demand/utilization:[47] $\sum_{ik} \eta_{ik} * q_{ci}$ + $WHEYLOSS_k$, where

q_{ci} = production of ith dairy product with average composition η_{ik} of the kth component.

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[45] Ibid.

[46] All equations, definition of terms and explanations are provided by Joseph Burke and Thomas Cox, "University of Wisconsin-Madison/ITC Proposal," USITC staff telephone communication with Dr. Thomas Cox, University of Wisconsin dairy economist and author of proposal, Oct. 1, 2003.

[47] Ibid.

$WHEYLOSS_k$ = implied whey loss of the kth component associated with the cheese processing profile, implied by USDA dairy product production data, ADPA intermediate product utilization, and an aggregate component balance worksheet.

k = 1, . . . ,5 components; i = 1, . . . , 23 products; and "c" refers to the product rather than to "m" or milk.

Nutrient balance equations:[48] milk component availability must be greater than/equal to milk component utilization for each of k = 1, . . .,5 components.

Comments on the resulting IRCM-new model

Trade (imports and exports) is exogenous.[49] Two milk protein exporters supply the U.S. market: the EU and non-EU. Burke and Cox's primal programming model generates otherwise unknown trade flows through an interative series of calibrations. In these iterative calibrations, equation intercepts are adjusted to ultimately replicate NASS prices as the Lagrangian multipliers or shadow prices on linear trade flow constraints. Such NASS price multipliers are formulas based on quantities and prices of the basic four milk components.

IRCM-new model simulations

Burke and Cox use their model (IRCM-new model) to conduct five experiments or scenarios that focus on the U.S. market effects of the elimination of MPC imports (scenarios 1 and 2), unlimited MPC imports with relaxation of standards of identity of cheese making (scenario 4), and implementation of two butter/powder tilts (scenarios 3 and 5).[50] Focus is placed on a number of market variables: market prices and commercial disappearance levels for an array of dairy products,[51] farm milk price, milk supply, farm revenue, and CCC purchases of SMP.

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[48] All equations, definition of terms and explanations are provided by Joseph Burke and Thomas Cox, "University of Wisconsin-Madison/ITC Proposal," and USITC staff telephone communication with Dr. Thomas Cox, University of Wisconsin dairy economist and author of proposal, Oct. 1, 2003.

[49] Wisconsin dairy economists, interview with USITC staff, Madison, WI, Aug. 19, 2001; telephone conversation with Dr. Thomas Cox, University of Wisconsin dairy economist, Sept. 22, 2003.

[50] Joseph Burke and Thomas Cox, "Executive Summary," pp. 1-6.

[51] Whole milk, skim milk, butter, cheese, SMP, condensed skim milk, buttermilk, soft products, and frozen products.

Burke and Cox's first two scenarios simulate elimination of U.S. MPC imports under two extreme assumptions of substitutability of cheese/noncheese proteins:[52] where noncheese proteins and cheese proteins are fully/perfectly substitutable, to render a low-effect experiment, and where cheese and noncheese proteins are completely nonsubstitutable, to render a high-effects experiment of MPC import elimination.[53] Import elimination under both import-eliminating settings resulted in negligible increases (0.1 percent or less) on farm milk price, milk supply, and farm revenue; led to declines in CCC purchases of from 180 million to 580 million pounds (or declines of 22 percent to 70 percent); and had negligible effects on prices and commercial disappearance of U.S. dairy products.[54]

Burke and Cox's fourth scenario examines the market effects of unlimited MPC imports while assuming a full liberalization of FDA domestic cheese standards to permit MPC use in all production. They assume a perfectly elastic world MPC supply such that the U.S. sector can fully satisfy MPC demand at a world protein price equivalent of $0.70 per pound.[55] While MPC imports rise substantially (a ten-fold increase); there are no changes in farm milk price, milk supply, and farm revenue. However, CCC purchases of SMP escalate to 2.6 billion pounds or by 219 percent.[56] A number of U.S. dairy product price changes emerge: increases of 1 percent to 2 percent for soft and frozen products and for butter, and declines of no more than 3.0 percent for skim milk, SMP, and cheese.[57] Commercial disappearance levels are largely unchanged, by less than a percent.[58]

Burke and Cox simulated two scenarios (3 and 5) that mimic the implementation of two tilts: where the CCC decreases its SMP price and raises its butter price so as to maintain the 2002 milk support price of $9.90 per cwt.[59] The two tilt levels include a mild tilt where the CCC support price for SMP falls to $0.80 per pound and a more pronounced one where the CCC SMP support price falls to $0.70 per pound. These tilts have rather noticeable market impacts relative to those generated by the IRCM-new model in the three other scenarios. Burke and Cox note that (1) the effects of the mild tilt would likely be largely offset by the 2002 Farm Bill's Milk Income Loss Contracts (MILC) program, and (2) simulating the more pronounced tilt is equivalent to eliminating the CCC dairy price support program.[60] A number of model-proscribed market effects emerged under the two tilts: declines in farm

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[52] Joseph Burke and Thomas Cox define "cheese proteins" as those gleaned from SMP and MPC (primarily casein), and these exclude whey stream products. Joseph Burke and Thomas Cox define "noncheese proteins" as those which are not used in cheese making, and include whey stream products. See Joseph Burke and Thomas Cox, "Summary of the Impact of MPC Imports on Farm-Gate Milk Prices and CCC Purchases of Dry Milk, 12/11/03-2/16/04," unpublished paper, Department of Agricultural and Applied Economics, University of Wisconsin -Madison (undated but received by Commission staff, Feb. 27, 2004), p. 14. Also see Joseph Burke and Thomas Cox, "Executive Summary," pp. 1-6.

[53] See Joseph Burke and Thomas Cox, "Summary of the Impact of MPC Imports on Farm-Gate Milk Prices and CCC Purchases of Dry Milk, 12/11/03-2/16/04," p. 14. Also see Joseph Burke and Thomas Cox, "Executive Summary," pp. 1-6.

[54] Joseph Burke and Thomas Cox, "Executive Summary," pp. 2 and 5.

[55] Joseph Burke and Thomas Cox acknowledge that this assumption of a perfectly elastic MPC supply may be unrealistic, and is made to provide an extreme upper bound of impacts from CCC SMP purchases. See Joseph Burke and Thomas Cox, "Executive Summary," p. 3.

[56] Joseph Burke and Thomas Cox, "Executive Summary," pp. 2 and 5-6.

[57] Ibid., pp. 2 and 5.

[58] Ibid.

[59] Ibid., pp. 1-2.

[60] Ibid.

milk price of from 2 percent to 4 percent, declines in milk supply of from 1.0 percent to nearly 2 percent, and declines in farm revenue of from 3 percent to 6 percent.[61] Tilt-induced effects on CCC purchases of SMP were particularly noteworthy: a decline of 254 million pounds or 31 percent under the mild tilt to a decline of 673 million pounds or 81 percent under the more pronounced tilt.[62] Generally speaking, the model suggests that market effects are about double for the pronounced tilt relative to effects under the milder tilt. Burke and Cox suggest that U.S. imports of MPC disappear when the pronounced tilt is implemented.[63] As well, model results suggested several notable ranges of tilt-induced price increases of 12 percent to 24 percent for cheese, 8 percent to 15 percent for soft products, and 5 percent to 9 percent for frozen products.[64] Noted ranges of tilt-induced price declines included 13 percent to 26 percent for skim milk, 12 percent to 23 percent for SMP, and 8 percent to 16 percent for buttermilk.[65] The more notable ranges of tilt-induced changes in commercial disappearance included: increases of 13 percent to 25 percent for buttermilk and 9 percent to 18 percent for SMP, and decreases of 3 percent to 6 percent for butter and for soft products.[66]

Bishop and Nicholson (2003, ongoing)

Having built a mathematical programming model along the lines of Samuelson/Takayama/Judge, Bishop and Nicholson[67] claim to extend the product and detail levels characterizing many U.S. dairy models.[68] Their model accounts for shipments of one dairy plant to another and of one region to another to permit an assessment of proposed alternative policies for the milk protein product complex.[69] Such alternative policy levels include quota, tariff, and domestic subsidies for milk protein product imports. The model focuses on assessing not only how changes in such alternative policies affect milk protein product imports, but also how the alternative policy changes indirectly influence more traditional U.S. dairy product markets.[70] Bishop and Nicholson incorporate an accounting and balance of three milk components (milk fat, milk protein, and other milk solids) into their framework and link changes in alternative dairy protein policies with a reallocation of the remaining two milk components, so as to render influences on both the traditional dairy

[61] Ibid., pp. 1-2 and 5-6.
[62] Ibid.
[63] Ibid., p. 5.
[64] Ibid., pp. 1-2 and 5-6.
[65] Ibid.
[66] Ibid.
[67] Phillip Bishop and Charles Nicholson, Market Impacts of Milk Trade Policy: Brief Model Description," unpublished paper, Department of Applied Economics and Management, Cornell University, Ithaca, NY, Sept. 25, 2003; Phillip Bishop and Charles Nicholson, "Assessing the Market Impacts of Dairy Protein Trade Policy: Comments on Current Status," unpublished summary of project status, Department of Applied Economics and Management, Cornell University, Ithaca, NY, July 21, 2003; Cornell University dairy economists, interviews with USITC staff, Ithaca, NY, July 21, 2003; telephone conversations with Dr. Charles Nicholson, Cornell University dairy economist, Sept. 15 and 16, 2003.
[68] Phillip Bishop and Charles Nicholson, "Market Impacts of Milk Trade Policy," Sept. 2003; P. Bishop and Charles Nicholson, "Assessing the Market Impacts," July 2003; Cornell University dairy economists, interviews with USITC staff, Ithaca, NY, July 21, 2003; telephone conversations with Dr. Charles Nicholson, Cornell University dairy economist, Sept. 15, 16, and 22, 2003.
[69] Ibid.
[70] Ibid.

and milk protein product markets.[71] Their working hypothesis is that U.S. dairy protein imports do not simply displace domestic SMP use, and that there may be import-induced impacts from reallocation of the other two milk components (milk fat, other solids) from changes in such alternative policy changes for imported dairy proteins.[72]

A model solution requires that prices in one market are explicitly linked to prices in another as a strict equality for cases of nonzero physical product flows between two markets.[73] And conversely for cases of where such physical stock flows are zero, a price linkage between the two markets is expressed as a strict inequality. While a typical Samuelson/Takayama/Judge model with a quadratic objective function and linear constraints is solvable as a quadratic program, Bishop and Nicholson built a model with a key departure from this well-known framework. Bishop and Nicholson's model is a nonlinear programming model defined as a mixed complementarity problem where both of the following are simultaneously constrained: the primal values explicitly modeling physical quantities and the dual variables such as the monetarily valued Langrangian multipliers (or shadow prices) on trade flow constraints.[74] They offer two primary reasons for this departure.[75]

- First, ad valorem tariffs are easily incorporated; and there is no need to solve a sequence of model runs containing specific tariffs while iterating towards a desired solution.

- Bishop and Nicholson's framework is highly nonlinear, and a high number of such nonlinearities makes NLP solutions burdensome.[76]

Bishop and Nicholson note that the joint-input and multiple product nature of the dairy processing industry necessitates the disaggregation of all products into milk components (milk protein, fat, and other solids), as well as the imposition of a component accounting balance or accounting system on the model.[77] They note that many models impose such a balance regionally, and through the use of Leontief fixed proportion coefficients.

However, Bishop and Nicholson extend this balance beyond the regional level, and balance component use at the plant levels. They note that a component balance at only the regional level may overstate the flexibility of component uses because constraints on how intermediate products move into processing cycles so often encountered in the real world are

[71] Ibid.
[72] Ibid.
[73] Ibid.
[74] Ibid.
[75] Ibid.
[76] More specifically, NLP solvers with NLP models with a high number of linearities are unable to exploit second-order information, while a mixed complementarity problem solved with GAMS can use such information. Such second-order information is reportedly needed to more easily solve the problem, permits one to avoid imposing excessive constraints and/or bounds on variables in order to narrow the domain over which the model is able to locate a solution. See Phillip Bishop and Charles Nicholson, "Market Impacts."
[77] Phillip Bishop and Charles Nicholson, "Market Impacts," Sept. 2003; Bishop and Nicholson, "Assessing the Market Impacts," July 2003; Cornell University dairy economists, interviews with USITC staff, July 21, 2003; telephone conversations with Dr. Charles Nicholson, Cornell University dairy economist, Sept. 15 , 16, and 22, 2003.

ignored.[78] Bishop and Nicholson contend that this component balancing at both the region and plant levels goes further than many dairy models.[79] As well, they assume a nonlinear function that represents production rather than the constant Leontief proportions of many studies and explicitly incorporate the use of intermediate products. Consequently, after raw milk is shipped to plants and separated into skim and cream, Bishop and Nicholson's model uses it in one of three ways: (1) shipped, as is, between plants, (2) used to produce intermediate products, which are in turn shipped to other plants, or (3) used by itself or combined into other final products.[80]

Their mathematical model calibrates to a 2001 baseline, and has 15 final dairy products, including separate demand and supply relationships for casein, caseinate, HTS Chapter 4 MPCs (MPC 4), and Chapter 35 MPCs (MPC 35).[81] There are seven intermediate or interplant products: SMP, cream, skim milk, ice cream mix, fluid whey, buttermilk, and MPC 4.[82] There are 11 imported products, including separate imports of casein, caseinates, MPC 4, and MPC 35, as well as 7 export products.[83] There are two U.S. regions: California and the rest of the United States. Yield functions appear to be based on textbook equations concerning the physical process of separating cream and skim in a typical dairy plant, and imports and exports are endogenous.[84]

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[78] Ibid.

[79] Ibid.

[80] Ibid.

[81] The 15 final products include: fluid milk, high solids fluid milk, ice cream, yogurt, cottage cheese, cheddar cheese, other cheese, dry whey products, butter, SMP, evaporated/condensed/dry products, casein, caseinate, MPC90, MPC 35. Phillip Bishop and Charles Nicholson, "Market Impacts of Milk Trade Policy," Sept. 2003; Phillip Bishop and Charles Nicholson, "Assessing the Market Impacts," July 2003; Cornell University dairy economists, interview with USITC staff, Ithaca, NY, July 21, 2003; telephone conversations with Dr. Charles Nicholson, Cornell University dairy economist, Sept. 15 , 16, and 22, 2003.

[82] Phillip Bishop and Charles Nicholson, "Assessing the Market Impacts," July 2003; Cornell University dairy economists, interviews with USITC staff, Ithaca, NY, July 21, 2003; telephone conversations with Dr. Charles Nicholson, Cornell University dairy economist, Sept. 15 and 16, 2003.

[83] The 11 imported products include ice cream, cheddar cheese, other cheese, dry whey products, butter, SMP, evaporated/condensed/dry products, casein, caseinate, MPC 35, and MPC 4. Exports include ice cream, cheddar cheese, other cheese, dry whey products, butter, SMP, and evaporated/condensed/dry products. Phillip Bishop and Charles Nicholson, "Market Impacts," Sept. 2003; Phillip Bishop and Charles Nicholson, "Assessing the Market Impacts," July 2003; Cornell University dairy economists, interviews with USITC staff, Ithaca, NY, July 21, 2003; telephone conversations with Dr. Charles Nicholson, Cornell University dairy economist, Sept. 2003. Charles Nicholson and Phillip Bishop, *U.S. Dairy Product Trade: Modeling Approaches and the Impact of New Product Formulations. Final report for NRZ Grant No. 2001-35400-10249*, Cornell Program on Dairy market and Policy, Department of Applied Economics and Management, Cornell University (Mar. 2004), p. 94.

[84] Phillip Bishop and Charles Nicholson, July 2003; USITC staff field notes of meetings with Cornell University dairy economists, July 21, 2003; telephone conversations with Dr. Charles Nicholson, Cornell University dairy economist, Sept. 15 and 16, 2003.

Nicholson and Bishop have provided detailed results of one simulation (compared against a 2001 baseline of U.S. dairy market conditions).[85] The simulation eliminates U.S. imports of MPCs entering only under Chapter 4 of the HTS (MPC 4); U.S. MPC imports under HTS Chapter 35 are not part of the experiment.[86] The simulation involves elimination of U.S. MPC 4 imports under two protein substitutability assumptions: (1) U.S. dairy demanders of milk protein consider MPC 4 and domestic dairy proteins (particularly SMP) as perfect substitutes, and (2) other nondairy users of milk protein have no available substitute protein for the MPC 4 imports, such that import restrictions result in domestic MPC production.[87] Nicholson and Bishop provided results for both California and the rest of the United States, with the U.S. results emphasized here. Market impacts of eliminating U.S. MPC 4 imports are mild.

Nicholson and Bishop's findings suggest that eliminating MPC 4 imports results in an increase of 0.4 percent (6 cents per cwt) in U.S. farm milk price.[88] Milk production would rise 0.1 percent or 200 million pounds, as more milk is required to service the emergent U.S. domestic production of MPC 4.[89] As SMP production drops by 34 million pounds, CCC purchases of SMP also decline by a similar amount, or by nearly 13 percent, and result in a $34 million Federal outlay savings.[90] Reflecting the importance of capturing firm-level and region-level balances of milk components, as well as capturing the market impacts from allocation of nonprotein milk components, there is some downward pressure on the price of butter: the commencement of U.S. MPC production raises demand for raw milk, generates by-product production of fat and whey products, and leads to a 21 million pound rise in butter production and a 4 percent decline in butter price.[91] U.S. prices rise for cheeses (0.7 percent to 1.2 percent) and fall for certain evaporated and condensed milk products (1.8 percent). U.S. production levels for most final dairy products change by less than 0.5 percent, but do manage to rise 1.6 percent for butter and fall 4 percent for SMP.[92]

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[85] Charles Nicholson and Phillip Bishop, *U.S. Dairy Product Trade*, Mar. 2004; as well additional information was provided to USITC staff in a Mar. 2, 2004 telephone communication with Charles Nicholson and Phillip Bishop, Department of Applied Economics and Management, Cornell University.

[86] Ibid

[87] Ibid., pp. 110-11.

[88] Ibid.

[89] Ibid., p. 116.

[90] Ibid., pp. 111 and 118.

[91] Ibid., p. 111.

[92] Ibid.

Sumner and Balagtas (2003)[93]

Sumner and Balagtas[94] examined the effects of imported milk protein[95] on the U.S. dairy industry with a focus on the protein imports' effect on the U.S. all-milk price received by farmers (hereinafter, U.S. farm milk price).[96] Sumner and Balagtas summarize the market relationships of milk and dairy-based products, identify key market parameters driving these markets, and then specify a partial equilibrium comparative static model of these relationships for the 1999-2002 base period.[97] The model focuses on an "intermediate" time horizon of 3 to 5 years,[98] and estimates the impact on the U.S. dairy market and U.S. farm milk price resulting from a series of declines (12.5 percent, 25 percent, and 50 percent) in the availability of imported milk proteins against unfettered imports of such milk proteins during the 1999-2002 base period.[99] Their estimated effects on the U.S. dairy market were generally mild. Depending on the degree of substitutability assumed among domestic and imported proteins, Sumner and Balagtas estimated that a 25 percent decline in imported milk proteins would generate a U.S. farm milk price increase of from 0.1-0.3 percent; a rise in U.S milk quantity of from 0.04 percent to 0.1 percent; price increases for total milk protein ranging from 1.0 to 1.5 percent; and increases in mild farm revenues ranging from 0.2 percent to close to a percent.[100] Given the model's linearity, results for the simulated declines of 12.5 percent and 50 percent in imports are directly proportional with the above results and are not summarized here.

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[93] As well, Daniel Sumner, Bradley Rickard, and Joseph Balagtas (BRS) built a model which discerned the economic effects of imports of milk protein concentrates or MPCs, casein, and caseinates (MCCs) on production, prices and incomes of U.S. dairy producers. The BRS model is a locally log-linear percent change, partial equilibrum specification. Because the BRS model, a potentially usable one in this investigation, was published without any simulation results, the model was not reviewed here. See, Joseph Balagtas, Bradley Rickard, and Daniel Sumner, "The Effects of Proposed Milk Protein Concentrate and Casein Imports on the U.S. Dairy Industry," selected paper presented at the Annual Meeting, American Agricultural Economics Association, Long Beach, CA, July 28-31, 2002.

[94] Daniel Sumner and Joseph Balagtas. "Effects of Imported Milk Protein Concentrate on the U.S. Dairy Situation," Unpublished paper prepared for submission to the U.S. International Trade Commission as background for the Section 332 Investigation and Commission Hearing on Dec. 11, 2003 (Dec. 1, 2003); posthearing submission to the Commission on behalf of the Dairy Companies Association of New Zealand, Dec. 23, 2003; e-mail to Commission staff from Dr. Daniel Sumner, Jan. 13, 2004.

[95] Note that the U.S. milk protein imports that are modeled correspond with those entering under the following HTS lines: 04049010, 35011010, 35011050, and 35019060. Daniel Sumner and Joseph Balagtas. "Effects of Imported MPC," Dec. 2003, p. 9.

[96] Daniel Sumner and Joseph Balagtas. "Effects of Imported MPC," Dec. 2003, p. 7.

[97] Ibid., p. 7; posthearing submission to the Commission on behalf of the Dairy Companies Association of New Zealand, Dec. 23, 2003, pp. 22-26; e-mail to USITC staff from Dr. Daniel Sumner, Jan. 13, 2004.

[98] Daniel Sumner and Joseph Balagtas. "Effects of Imported MPC," Dec. 2003, p. 25.

[99] Ibid., pp. 9-12.

[100] Ibid., pp. 7-8 and 18.

Sumner and Balagtas' model

There are three multiproduct aggregates or "composites": all foreign milk proteins imported under HTS Chapters 4 and 35 into a single import composite, all U.S. domestic dairy products into a single domestic protein composite, and a single U.S. domestic dairy output.[101] They impose a system of milk component accounting where the domestic and imported composites are defined with respect to two common denominators or milk components: milk protein and nonprotein milk solids (hereinafter, protein and nonprotein solids), which are considered minimally substitutable in production.[102] They claim that this system of milk component accounting links the aggregated domestic products, aggregated imported protein composites, and ultimately the total U.S. farm milk price.[103]

Sumner and Balagtas indicate that their model captures major dairy policies and market features, as well as capturing the effects of U.S. protein imports.[104] They chose Gardner's model framework in order to focus on relationships along the vertical chain from the dairy farm to consumers.[105] The model is a log-linear (percentage change) specification of supply and demand for raw milk and milk components.[106] The model's results are highly influenced by the choice of two particular parameters: the elasticity of substitution among imported and domestic milk protein composites and the share of the U.S. total protein market accounted for by the imported protein composite.[107] The larger (smaller) the values of the substitution elasticity and the import market share, the greater (smaller) the effect on U.S. farm milk price that would arise from some change in imported milk protein supply imposed on the model.

Throughout, "E" is a percent change operator such that EX means the change in X divided by X. Since the model is presented entirely in percent changes, the following discussion eliminates "percent change" from variable definitions for ease of expression. For example, U.S. demand for raw milk is understood to be the percentage change in the U.S. demand for raw milk in the ensuing equations.

The demands are specified in price-dependent form. The 12 equations summarizing the model are taken from Sumner and Balagtas.[108] The U.S. supply for raw milk, Q_m in equation 1-, depends on the U.S. farm milk price, P_m, and the price elasticity of raw milk supply, ϵ.

(1) $EQ_m = \epsilon * EP_m$

The supplies of the domestic milk protein composite, (Q_u in equation 2), and the supply of nonprotein solids, (Q_s in equation 3), are obtained by multiplying the supply of raw milk

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[101] Ibid., p. 13; posthearing submission to the Commission on behalf of the Dairy Companies Association of New Zealand, Dec. 23, 2003, pp. 22-26; e-mail to USITC staff from Dr. Daniel Sumner, Jan. 13, 2004.

[102] Daniel Sumner and Joseph Balagtas. "Effects of Imported MPC," Dec. 2003, p. 12.

[103] Ibid., p. 12.

[104] Ibid., p. 13; posthearing submission to the Commission on behalf of the Dairy Companies Association of New Zealand, Dec. 23, 2003, pp. 22-26; e-mail to USITC staff from Dr. Daniel Sumner, Jan. 13, 2004.

[105] Commission staff from Dr. Daniel Sumner, Jan. 13, 2004. For the Gardner's modeling approach, see Bruce Gardner. *The Economics of Agricultural Policies* (New York: Macmillan Publishing Company, 1988), ch. 3.

[106] Daniel Sumner and Joseph Balagtas. "Effects of Imported MPC," Dec. 2003, pp. 13 and 23-27.

[107] Ibid., pp. 22-27.

[108] Ibid., pp. 22-26.

times the respective factor reflecting the component content per hundred weight raw milk, u for domestic milk protein and s for nonprotein milk solids.

(2) $EQ_u = u*EQ_m$

(3) $EQ_s = s*EQ_m$

The exogenous policy lever, θ, is the percentage change in foreign milk protein imports, essentially making the supply of the foreign milk protein composite, equation 4, exogenous. The θ is the variable that is shocked to simulate changes in U.S. milk protein imports:

(4) $EQ_i = \theta$

The supply of total milk protein (Q_r in equation 5) is the weighted sum of all domestic and imported milk protein composites, Q_u, and Q_i. The domestic and imported protein composites are weighted by v_u and v_i, respectively, the cost shares of imported and domestic protein for aggregate protein:[109]

(5) $EQ_r = v_u*EQ_r + v_i*EQ_i$

The supply of the domestically produced dairy product aggregate or composite in equation 6, Q_x, is a weighted sum of both milk component supplies: Q_r, or the total milk protein supplied, and Q_s, the supply of nonprotein solids. The supplies of the two milk components are each weighted by its share of the value of wholesale dairy products (v_r for protein and v_s for nonprotein solids).[110]

(6) $EQ_x = v_r*EQ_r + v_s*EQ_s$

The price-dependent demand for raw milk (P_m in equation 7) is determined by the prices of domestic protein, P_u, and of nonprotein solids, P_s, where each component is weighted by its value share of the price of raw milk (δ_u for domestic protein, δ_s for nonprotein solids).[111]

(7) $EP_m = \delta_u*EP_u + \delta_s*EP_s$

The demand for domestic protein (represented by domestic protein price, P_u in equation 8) is dependent on the price of the total protein component, and the quantities supplied of domestic protein and nonprotein solids. The latter two quantities supplied are weighted by the previously defined imported protein composite share of the total U.S. protein market, v_i, and by the elasticity of substitution of the imported and domestic protein composites, σ_{ui}.

[109] More specifically, $v_u = (1-s_i)*(P_u/P_r)$ and vi = $s_i*(P_u/P_r)$. The s_i is the quantity of imported protein of the U.S. total protein market, while P_u, and P_r are the prices of the domestic and total milk protein composites, respectively. Daniel Sumner and Joseph Balagtas, "Effects of Imported MPC," Dec. 2003, pp. 24-25

[110] More specifically, $v_u = (1-s)*(P_s/P_r)$ and $v_s = s*(P_s/P_r)$. The s is the quantity share of nonprotein solids of total component usage, and (1-s) is the analogous share of the milk protein component. Ibid., p. 24.

[111] More specifically, $\delta_u = u*(P_u/P_m)$ and $\delta_s = s*(P_s/P_m)$, where u and s are the component contents of domestic protein and nonprotein solids per hundredweight of raw milk. Ibid., pp. 22-24.

$$(8)\ EP_u = EP_r - (v_i/\sigma_{ui})*EQ_u + (v_i/\sigma_{ui})*EQ_i$$

The demand for the imported milk protein composite, reflected by P_i in equation 9, is dependent on the price of the total protein component, as well as the quantities supplied of the two components, domestic protein and imported protein. The latter two supplies are weighted by the previously defined v_u or the domestic protein composite's cost share of the total protein market, as well as by the substitution elasticity of the imported and domestic protein composites.

$$(9)\ EP_i = EP_r + (v_u/\sigma_{ui})*EQ_u + (v_u/\sigma_{ui})*EQ_i$$

The demand for total protein (P_r in equation 10), depends on demand for the U.S. dairy output composite, as well as the weighted supplies of both components, total milk protein and nonprotein solids, each weighted by nonprotein solids' share of the wholesale value of dairy products, v_s, and by the elasticity of substitution among both milk components, σ_{rs}.

$$(10)\ EP_r = EP_x + (v_s/\sigma_{rs})*EQ_r + (v_s/\sigma_{rs})*EQ_s$$

The demand for nonprotein solids (P_s in equation 11), is similar to the demand for total protein above, in that it is dependent on the demand for the U.S. dairy output composite, as well as by the supplies of both components, here weighted by the total protein component's share of the value of dairy products, v_r, and by the elasticitity of substitution among the two components, σ_{rs}.

$$(11)\ EP_s = EP_x + (v_r/\sigma_{rs})*EQ_r + (v_r/\sigma_{rs})*EQ_s$$

And finally, equation 12 provides the price-dependent demand for the U.S. dairy output composite as dependent on the supply of the composite, Q_x, times the inverse of the own-price demand elasticity, $1/\eta$.

$$(12)\ EP_x = (1/\eta)*EQ_x$$

Critical Analysis of the Sumner and Balagtas model

Sumner and Balagtas aggregate all of the U.S. proteins into one aggregate composite protein product as if they are perfectly substitutable and all foreign proteins (MPC, casein, caseinate) into a non-US aggregate composite, and then assume the two composites to be imperfect substitutes. They made this assumption of imperfect substitutability without offering evidential foundation. Insofar as each composite spans a varied array of milk protein products that are delivered into component equivalent common denominators, Sumner and Balagtas need to explain in more detail their assumption that the domestically produced and imported composites are imperfectly substitutable.[112]

[112] At the hearing and in posthearing brief requests, there were repeated instances where Sumner and Balagtas' assumptions about substitutability among differently sources proteins were challenged. See Daniel Sumner, Department of Agricultural and Resource Economics, University of California, Davis, testimony before the USITC hearing, Dec. 11, 2003, pp. 395-98. Posthearing submission to the Commission on behalf of the Dairy Companies Association of New Zealand, Dec. 23, 2003.

Bailey (2002)

Bailey[113] attempts to test two hypotheses. The first hyposthesis is if the combination of relaxed import restrictions, low world protein prices, and high levels of U.S. support of the SMP price incite the rapidly escalating volumes of U.S. MPC imports (MPC 4 and MPC 35 for milk protein imported into the United States under HTS Chapters 4 and 35 respectively). The second hypothesis is whether increased imports of MPC displace domestic use of SMP and raises Federal SMP purchases. His analysis unfolds in several stages. First, Bailey summarizes the trends of increasing U.S. MPC imports since the mid-1990s.[114] He then provides a detailed graphical analysis of how, under the assumption of perfect substitutability of MPC products with domestically produced SMP and cheese, increased U.S. MPC imports influence the price and quantities of U.S. protein, U.S. cheese, and U.S. SMP, as well as levels of Federal purchases of cheese and SMP. The conceptual model has three subsectors: domestic U.S. milk protein market, wholesale U.S. cheese market, and wholesale market for SMP.

Bailey noticeably simplifies his three-sector conceptual model into a quarterly econometric model estimated over the 1990.I -2000.IV period. He exogenizes the farm price for milk, excludes the supply sides of all subsectors, and excludes the cheese market.[115] What results is a two-subsector demand model of three equations: U.S. wholesale SMP demand and separate U.S. import demands for MPC 4 and MPC 35 products.[116]

The econometrically estimated model of SMP, MPC 4, and MPC 35 demands is simulated under two experiments: (1) a substantial rise in the world price of milk protein, and (2) a substantial reduction of the CCC purchase price for SMP.[117] The model focuses on how each of these two shocks influence demands for domestic SMP, imported MPCs, and the levels and outlays on the Federal support program for SMP.[118]

Econometric specification

The demands for SMP, MPC 4, and MPC 35 were estimated in natural logarithms rendering the coefficient estimates as elasticities. All demands include an intercept, have three seasonal quarterly binary variables, and are measured on a per capita basis. All price and income arguments are deflated by the all-items consumer price index. Relevant information on principal regressors, coefficient estimates, and diagnostics is provided in table H-2.

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[113] Kenneth Bailey, "Implications of Dairy Imports: The Case of Milk Protein Concentrates," *Agricultural and Resource Economics Review*, vol. 31, No. 2 (2002), pp. 254-55.

[114] Ibid., pp. 248-49.

[115] Kenneth Bailey justifies the exclusion of the cheese market by noting that over the 1996.I-2000.IV period, Federal purchases of cheese were limited. Kenneth Bailey, "Implications of Dairy Imports," pp. 253-54.

[116] Kenneth Bailey, "Implications of Dairy Imports," pp. 253-54.

[117] Ibid., pp. 255-56.

[118] Ibid., pp. 256-57.

Table H-2
Bailey's SUR-Estimated Econometric Results (with t-statistics parenthesized)

Regressor	Nonfat dry milk demand	MPC 4 import demand	MPC 35 import demand
SMP price	-0.44 (-0.8)	+5.7 (+6.2)	+0.83 (+0.8)
Cheese price	+0.83 (+2.4)	not included	not included
Per capita income	+1.6 (+1.9)	+20.3 (+2.7)	+8.4 (+3.5)
Trend-squared	not included	+0.0002 (+1.0)	not included
International protein price	+0.6 (+2.5)	-0.3 (-1.0)	+0.21 (+0.4)
Lag 1(international protein price)	not included	-0.3 (-2.1)	-0.39 (-1.6)
Lag 2(international protein price)	not included	-0.3 (-2.0)	-1.0 (-1.5)
Lag 3(international protein price)	not included	-0.36 (-1.1)	not included
First-order autoregressive error correction term	included	not included	included
R-square value	0.44	0.92	0.72

Notes.—Data definitions and sources are detailed in this table source, to which interested readers are referred. Given that all series were estimated in natural logarithms, the estimated coefficients may be considered elasticities. It is not clear that the econometric results generated on the first-order autoregressive error correction term were valid, and consequently, they are not included aside from mention of the term's inclusion or exclusion.

Source: Kenneth Bailey, "Implications of Dairy Imports: The Case of Milk Protein Concentrates," *Agricultural and Resource Economics Review*, vol. 31, no. 2 (2003) pp. 248-59.

The own-price of MPC imports is taken as an international milk protein price, which is assumed to be the North Europe price of SMP.[119] As well, the MPC 4 and MPC 35 import demand equations share this same, identical international milk protein price as own-price.

To account for contemporaneous correlation, Bailey estimated the equations as a three-equation seemingly unrelated regression (SUR) system.[120] Because of allegedly high levels of price risk, Bailey included both current and lagged values of own-price in the MPC 4 and MPC 35 demands. Bailey included a first-order autoregressive error correction term in the demands for SMP and MPC 35.[121] A squared time trend to account for rapid development of MPC ultrafiltration technology is included in the MPC 4, but not the MPC 35, equation.[122]

[119] Readers interested in the exact data sources are referred to the article. See Kenneth Bailey, "Implications of Dairy Imports," pp. 254-55.
[120] Ibid., pp. 254-56.
[121] Ibid., pp. 254-55.
[122] Ibid.

Summary of econometric results

Bailey's[123] wholesale demand for SMP emerged with a likely inadequate goodness of fit level, as reflected by an R-square of 0.44.[124] The SMP estimation generated an insignificant but correctly signed coefficient on own-price; coefficients on cheese and the international milk protein price proxy that were significant and positive suggesting a relationship of substitutability with SMP for both products; and a significant and positive income elasticity of 1.6. MPC 4 demand emerged with an adequate R-square of 0.92, and generated a significant and positively signed SMP price coefficient suggesting substitutability with SMP; a positive and significant income elasticity of 20.3 that intuitively seems excessively elastic; and a series of four negative coefficients of varying statistical significance on current and lagged own-price values.[125] MPC 35 demand has a moderate goodness of fit level, given its R-square value of 0.72. The estimation generated a positive but insignificant coefficient on SMP price suggesting MPC 35/SMP substitutability; a significant and positive income elasticity of 8.4 that far exceeds unity; and three insignificant coefficients of inconsistent and alternating signs on current and two lagged values of own-price.[126]

Simulation of Bailey's econometrically estimated model

Bailey validated the econometrically estimated model over the 1991.I – 2000.IV period.[127] Although he acknowledged that the model simulations generated large errors from observed values, he concluded, without explanation, that the general levels of statistical significance achieved by the coefficient estimates rendered the model adequate for simulation purposes.[128] He simulated two experiments over the 1996.I-2000.IV period: [129]

<u>Experiment 1</u>: Impose a substantial rise in world milk protein price to 99 cents per pound.

<u>Experiment 2</u>: Impose a decline in the CCC purchase price of SMP to 80 cents per pound.

The quarterly simulation results are changing from baseline levels and are summarized here as ranges of changes from base levels. In experiment 1, raising the proxy for the world milk protein price to 99 cents per pound would have resulted in quarterly increases of U.S. SMP use of from 10 percent to 42 percent, as quarterly MPC imports fell from 14 percent to 51 percent over the 1997.I-2000.II portion of the simulation period.[130] Over the entire 1996.I-2000.IV simulation period, as quarterly U.S. usage of SMP rose, U.S. quarterly CCC purchases of SMP would have dropped similarly, such that U.S. purchases of SMP would have fallen by more than 800 million pounds which translates into more than $800 million in program outlay savings.[131]

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[123] Ibid.

[124] Perhaps the sizeable differences in Bailey's three R-square values are driven by inclusion/exclusion of lagged price variables.

[125] Ibid.

[126] Ibid.

[127] Kenneth Bailey, "Implications of Dairy Imports," pp. 255-57. Bailey's validation involved comparing fitted and observed values of relevant variables.

[128] Ibid., p. 256.

[129] Ibid.

[130] Ibid., pp. 256-57.

[131] Ibid.

In experiment 2, reducing the CCC market price to $0.80 per pound would have increased quarterly market prices from 14 percent to 35 percent; quarterly SMP use would have risen from 7 percent to 21 percent; and quarterly U.S. imports of MPCs would have declined substantially over the entire 1996.I-2000.IV simulation period.[132] Over the same period, the CCC would have purchased 555 million less pounds of SMP for a $572 million savings in program outlays.[133]

Critical analysis of Bailey's results

No evidence on the stationarity properties of the modeled data series was provided, and as a result, the modeled series may not be stationary and ergodic, and may violate the basic conditions of regression arising from constant means and variances through time (see Granger and Newbold).[134] As well, there is little or no analysis of goodness of fit, other than some brief comments on R-square values, two of which are far below 90 percent and reflect inadequate or moderate goodness of fit levels.

All three equations have clearly collinear regressors, particularly among the current and lagged own-price values in the two import demands. Bailey fails to mention the potentially severe collinearity of regressors, which may compromise the ability to discern if the coefficients are statistically significant, and compromise the interpretability of single elasticities or coefficient estimates. Much of Bailey's analysis may consequently be of questionable validity.

As well, Bailey may have inappropriately accounted for serially correlated residuals of the three estimated equations with the addition of what he calls a first-order autoregressive error correction term.[135] His chosen method for incorporating information on serially correlated errors has not been frequently used in the literature, and it further exacerbates inference problems by including another variable that is interrelated with sets of already highly collinear regressors. Without explaining, Baily ignores a number of well-known system-wide procedures that adjust the estimated residuals to utilize information on serial correlation in SUR (and other) models (e.g., Cochrane-Orcutt methods with a system-wide rho estimate). Bailey does not justify or support his contention that despite the marginal or submarginal levels of goodness of fit of the SMP and MPC 35 equations (R-square values of 0.44 and 0.72, respectively) these equation estimates were adequate for simulation purposes.[136]

Bailey chose the exact same price proxy as own-price for both equations, guaranteeing a lower goodness of fit level for one import demand over the other, unless they encompass the very similar or the same product baskets, in which case there should not be two separate demand estimations. As well, there is a question over the appropriateness of having chosen the North Europe price of SMP – a product heavily benefitting from EU subsidies and subject to stringent U.S. TRQ measures – for MPCs, a product whose imports are subject to little or no levels of U.S. protection.

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[132] Ibid.
[133] Ibid.
[134] C.W.J. Granger and Paul Newbold. *Forecasting Economic Time Series* (New York, Academic Press, 1986), pp. 1-2.
[135] Kenneth Bailey, "Implications of Dairy Imports," p. 255.
[136] Ibid.

Bailey justifies the decision not to endogenously model, but rather exogenizes the farm price of milk because current milk supply is a function of previous year's price, and the analysis focuses on the current year.[137] But this does not preclude Bailey's modeling of both import demands as a function of lagged own-price: up to two lagged values in the MPC 35 equation and up to 3 lagged values in the MPC 4 equation.[138] Further, Bailey does not clearly justify inclusion of current and multiple lagged values of own-price in the two import demands, other than a reference to high levels of price risk associated with MPC imports.[139]

Bailey mentions that parameter values achieved adequate levels of statistical significance to justify their use in simulations without mentioning (1) that an important subset of the coefficients may be insignificant; (2) the high regressor collinearity, and (3) the poor or marginal goodness of fit levels of two of the three equations. As well, Bailey acknowledges that there were noticeable problems with simulation errors of the estimated endogenous variables from observed baseline values.[140]

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[137] Ibid.
[138] Ibid., p. 254.
[139] Ibid., p. 255
[140] Ibid., pp. 255-56.