



United States
Department
of Agriculture

LDPM-270-01
November 2016



Approved by USDA's
World Agricultural
Outlook Board

A Report from the Economic Research Service

www.ers.usda.gov

Growth of U.S. Dairy Exports

Jerry Cessna, Lindsay Kuberka (USDA/FAS),
Christopher G. Davis, Roger Hoskin

Abstract

From 2004 to 2014, the value of U.S. dairy product exports more than quadrupled, and the United States became the world's third-largest dairy product exporter, behind New Zealand and the European Union (EU). This export status was a significant change for an industry previously focused primarily on domestic rather than international demand. Demand for dairy products increased with soaring income growth in developing countries. Moreover, policies of the United States and its trading partners became more market-oriented, allowing trade that responds more to market forces. As the United States became more of a global dairy-market player, the U.S. dairy market faced greater variability in demand and prices. In 2015, as global conditions changed, the value of U.S. dairy exports fell by almost 30 percent. The United States, as both a top producer and exporter, has a pivotal role to play, but will have to compete with other large dairy exporters such as New Zealand, the EU, and Australia to increase export market share in the future.

Keywords: Dairy, dairy exports, dairy policy, dairy trade, dairy products, agricultural trade, world trade organization, WTO, free trade agreement, FTA

Acknowledgments

The authors thank the following technical peer reviewers for their comments and insight: Shawn Arita (USDA/ERS), Uthra Raghunathan (USDA/AMS), Paul Kiendl (USDA/FAS), Sharon Sydow (USDA/OCE), and Cameron Thraen (The Ohio State University). This report was reviewed and cleared by Shayle Shagam of USDA's World Agricultural Outlook Board. Thanks also to ERS editors Mark Farrell and Dale Simms and to ERS designer Curtia Taylor.

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Introduction

Despite being one of the top milk-producing countries and home to an extensive milk-processing sector, historically, the United States did not play a major role in international dairy trade. Exports accounted for a minor share of milk use as the U.S. dairy industry focused primarily on domestic rather than international markets. In the early 2000s, the situation began to change, and adjusted for inflation, U.S. dairy product exports grew from just under \$1.6 billion in 2004 to almost \$6.8 billion in 2014, more than a fourfold increase (values in 2015 dollars).¹ This far exceeds the overall inflation-adjusted growth rate in total U.S. agricultural exports, which rose from \$76.7 billion in 2004 to \$150.2 billion in 2014, almost a twofold increase (values in 2015 dollars).²

There are several reasons for the rapid increase in U.S. dairy product exports. Income growth in East Asia, Southeast Asia, Latin America, and other regions led to an increase in dairy product consumption facilitated by rising imports. Free trade agreements (FTAs) have provided the United States with greater access to world markets, especially to Mexico, through the North American Free Trade Agreement (NAFTA). China's market-based reforms, including those related to its accession to the World Trade Organization (WTO) in 2001, opened what is now one of the world's largest markets for dairy product imports. Both the European Union (EU) and the United States have reduced domestic support and export subsidies for dairy products in recent years, bringing about greater openness of world markets.

Since 2003, prices of U.S. domestic dairy products and export prices in Oceania (Australia and New Zealand) and the EU have tended to converge and become more correlated, reflecting changes in government policies. The improved price competitiveness of U.S. dairy products, greater market access, reductions in U.S. and EU support measures, and growing world demand have led to rapid growth in U.S. dairy product exports.

However, as global conditions changed in 2015, the value of U.S. dairy exports fell to \$4.9 billion, a 28-percent decrease from 2014. Proportionally, the fall in dairy exports in 2015 was greater than the 11-percent decrease in total agricultural exports, which totaled \$133 billion in 2015. There are several reasons why dairy exports fell substantially in 2015, including weaker or slower growth in global demand for dairy products (especially from China), a Russian ban on dairy imports from several countries, a strong U.S. dollar, and the discontinuation of milk supply quotas in the EU.

This report provides an overview of current markets for U.S. dairy product trade and explores conditions in competing countries. The report also discusses how trends in global supply and demand, as well as changes in trade and domestic policies, could affect future growth in U.S. dairy trade. Rising demand in developing countries provides major opportunities for continued export growth. However, this growth is dependent on the ability of U.S. dairy producers to remain competitive with other major dairy exporters.

¹ See Appendix A, Value of Dairy Exports and Imports, for an explanation of how dairy products are valued in this report.

² The source for total U.S. agricultural exports is Foreign Agricultural Trade of the United States (FATUS) values from USDA Foreign Agricultural Service, Global Agricultural Trade System (GATS) Online. The primary source for GATS data is the U.S. Census Bureau Trade Data.

Background

The United States' role in global dairy trade has historically been as a residual supplier and net importer of dairy products. Although the United States occasionally supplied substantial volumes of dairy products to the international market, the EU and Oceania had long dominated commercial dairy product exports. The EU was historically the world's top dairy producer and exporter, but a large proportion of EU exports were subsidized. Low production costs and relatively low domestic consumption positioned New Zealand and Australia as top dairy exporters.

In the mid and late 1990s, establishment of the WTO and the associated Uruguay Round Agreement on Agriculture (URAA) provided more liberalized global trade through greater market access, reduced government support, and reduced export subsidies. Since the late 1990s, FTAs, most notably with Mexico under NAFTA, have enhanced U.S. dairy trade. In the 2000s, budgetary pressures in the EU led to declining domestic support and export subsidies for dairy products. With the reduction in government support, EU exports declined, and growth in EU milk production slowed. At the same time, New Zealand experienced rising costs of production due to increasing prices of land and labor. Years of drought hampered growth in Australia's milk production. U.S. support-price purchases and export subsidies for dairy products fell substantially in the 2000s, and the Dairy Product Price Support Program (DPPSP) and the Dairy Export Incentive Program (DEIP) were repealed with the Agricultural Act of 2014 (2014 Farm Act). Over the years, the National Dairy Promotion and Research Program increased funding for the U.S. Dairy Export Council. These conditions, along with an increase in dairy demand from developing countries, allowed the U.S. dairy industry to become more competitive in world markets.

Dairy Products Traded Internationally

Nonfat dry milk and skim milk powder: Nonfat dry milk is manufactured by removing water from skim milk, usually through a spray drying process. Skim milk powder is a very similar product, but the protein content may be adjusted to a standard percentage. In this report, the abbreviation SMP refers to both skim milk powder and nonfat dry milk, collectively. When specifically referring to either skim milk powder or nonfat dry milk, the terms are spelled out in this report.³

Milk powder is traded internationally at higher volumes than liquid milk products, since liquid products are bulky and often perishable, making them costly to ship and store. Due to U.S. consumption patterns, frequent surpluses of skim milk solids are manufactured into SMP. Rising demand for skim milk solids from foreign countries helps to balance skim solids utilization of the U.S. milk supply. SMP is usually the leading export dairy product for the United States in terms of both volume and value.

In low-income countries, where infrastructure is poor and refrigeration is scarce, consumers commonly reconstitute SMP for personal consumption. SMP may be instantized in order to increase the rate of powder dispersal and dissolution when water is added to reconstitute the powder into liquid form. Recombined milk can be made from SMP and butterfat or vegetable oil. SMP is used as an ingredient in many food products such as fluid milk fortification, frozen desserts, cheese, yogurt, and others. SMP may also be used as animal feed or as an ingredient for calf milk replacer.

Dry whole milk and whole milk powder: Dry whole milk is manufactured by removing water from whole milk. There are two similar types of powders made from whole milk: dry whole milk and whole milk powder. The protein content may be adjusted for the latter but not the former. In this report, the abbreviation WMP refers to both whole milk powder and dry whole milk, collectively. When specifically referring to either whole milk powder or dry whole milk, the terms are spelled out in this report.⁴

WMP may be reconstituted and processed into ultra-high temperature (UHT) milk, a shelf-stable product that does not need refrigeration until the container has been opened. UHT milk is common in some countries with scarce domestic milk production, poor transportation infrastructure, or a lack of refrigeration. WMP is used as an ingredient in many food products such as confections, bakery products, and dairy products.

The United States produces much more SMP milk than WMP. This contrasts with New Zealand, which produces and exports large quantities of WMP. Since New Zealand is heavily reliant on the export market, WMP provides an opportunity to export both milk fat and skim milk solids. Although the United States is a small supplier compared with New Zealand, U.S. WMP production has grown in recent years, from 72 million pounds in 2013 to 109 million pounds in 2015 (USDA, National Agricultural Statistics Service (NASS), 2016).

³ For more details about nonfat dry milk and skim milk powder, see Appendix B, Discussion of Domestic and International Standards for Milk Powders.

⁴ For more details about dry whole milk and whole milk powder, see Appendix B, Discussion of Domestic and International Standards for Milk Powders.

Cheese: A wide variety of natural and processed cheeses is traded internationally. Developed countries are the top destinations for cheese exports, but cheese consumption in developing countries has been growing in recent years as incomes have grown. In 2015, cheese was the leading export product for the United States by value. However, the United States was a distant second to the European Union (EU) in cheese-export value and ranked third behind the EU and New Zealand in cheese-export quantity.

Infant formula: Infant formula is usually made from milk or whey constituents. Trade data do not consistently distinguish infant formula made from milk ingredients from other types of infant formula.⁵ For this report, infant formulas traded in international markets are assumed to be dairy products. The European Union was the leading exporter of infant formula in 2015, with largest proportions to China and Hong Kong. U.S. exports of infant formula have been small by comparison.

Butter and butterfat products: For this report, butter, most dairy spreads, and other fats and oils derived from milk are included in the same category. In the United States, standard butter contains at least 80 percent milk fat. In many other countries, the standard milk-fat level for butter is 82 percent. Dairy spreads usually contain substantial proportions of milk fat, but the percentages of milk fat are less than butter. Some butterfat products, such as anhydrous milk fat (AMF) or butter oil, are composed almost 100 percent of milk fat. AMF is suitable for use as an ingredient in chocolate, confectionery products, ice cream mixes, and cheese processing. In years where the domestic butter price is lower than prevailing prices of foreign competitors, the United States exports significant volumes of butter.

Whey products: Fluid whey is a byproduct derived from cheese production. Only small quantities of fluid whey are exported since its water content makes it bulky and expensive to transport. Dry whey is produced through a spray drying process. Whey is often fractionated to produce whey protein concentrate (WPC), whey protein isolate (WPI), whey permeate, and other modified whey products. WPC varies in protein levels, while WPI has protein levels of 90 percent or higher. Generally, prices for whey products increase with protein content. Butter and other butterfat products are often made from whey cream that is often separated from the other whey components. Whey ingredients are used in many foods for human consumption, such as baked goods, beverages, confections, dairy foods, and meat products. They are also often used for animal feed. The United States is a leading exporter of whey products.

Casein products⁶: Casein is the main protein found in milk. It is separated from pasteurized skim milk through either a precipitation or a coagulation process. Casein is often further processed into caseinate, which is produced by dissolving casein in an alkaline solution of sodium or calcium. It is more water soluble than casein, making it more functional for certain food applications. Casein products are used as ingredients in a wide variety of foods such as baked goods, cheese products, coffee whiteners, confections, and many others. Casein also has nonfood uses, such as casein glue, coatings for paper or cardboard, and plastics.

⁵ For example, U.S. import data make a distinction between infant formulas containing milk solids from other types, but U.S. export data do not.

⁶ Some countries include milk protein isolate as a casein product while others do not. See Appendix C, Discussion of Milk Protein Products.

Casein was produced domestically in the 1940s and 1950s, but little casein is currently manufactured in the United States. Production shifted from casein to nonfat dry milk, since the Government purchased nonfat dry milk through the Milk Price Support Program. By the mid-1960s, almost all casein was imported (USDA, Economics and Statistics Service, 1981). The United States manufactures significant quantities of caseinate from imported casein, and some of it is exported to other countries.

Lactose: Lactose is the primary sugar found in milk, and is usually extracted from whey permeate, a byproduct of WPC and WPI. Lactose is a bland sugar, and it is used as an ingredient in foods such as infant foods, chemicals/pharmaceuticals, dairy products, prepared dry mixes, and many others. It can be added as a constituent in the manufacture of milk powder, in order to lower the protein percentage of powder to a specified standard level. The United States is a leading exporter of lactose.

Other dairy products traded internationally: Fluid milk and cream, ice cream, evaporated and condensed milk, yogurt, buttermilk and other curdled milk products, and other dairy products have relatively low trade volumes for all of the countries included in this report. However, collectively, these items make up a substantial share of dairy trade.⁷

⁷ Milk protein concentrate (MPC) is a product that is widely traded, but it is difficult to account for the trade internationally. See Appendix C, Discussion of Milk Protein Products.

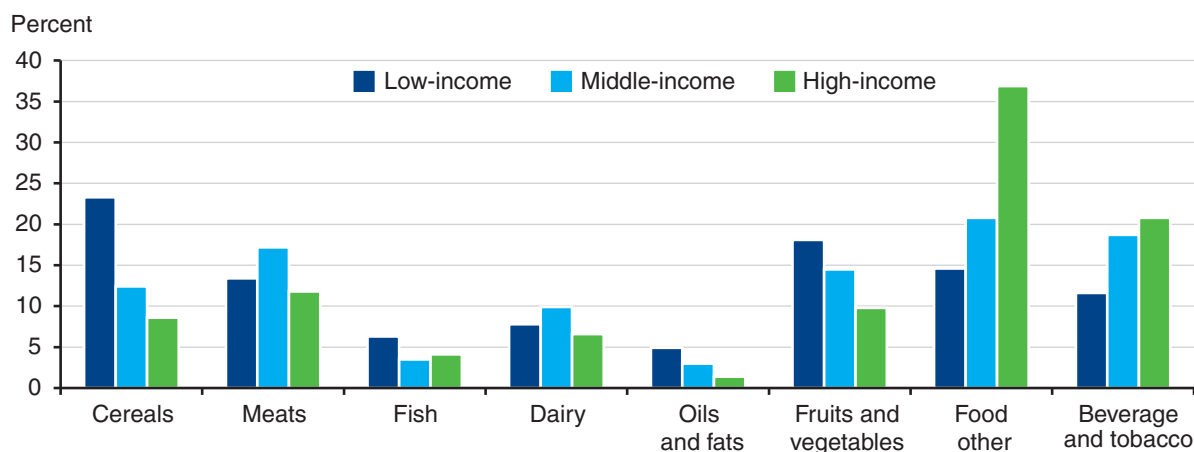
Overview of Changing Global Demand for Dairy Products

Much of the growth in U.S. dairy exports reflects rising demand for dairy products in developing countries. Generally, as incomes rise from very low levels, food consumption increases, and higher protein products, such as meats and dairy, make up a larger proportion of household food budgets while the share of cereal products declines (fig. 1). For countries with per capita incomes less than 15 percent of the U.S. level (low income), people spent 23.3 percent of their food budgets on cereal products in 2005 and 7.8 percent on dairy products. For countries with per capita incomes from 15 to 45 percent of the U.S. level (middle income), the cereal share falls to 12.4 percent, but the dairy share grows to 9.9 percent. For countries with per capita incomes from 45 percent of the U.S. level (high income), the cereal share falls to 8.2 percent, but the dairy share grows to 6.3 percent.

While consumption of total dairy products increases with income, this relationship does not necessarily hold for each product. Changes in per-capita consumption of WMP, SMP, and cheese for selected countries are displayed in figures 2-4.⁸

Countries with relatively low incomes, Indonesia and China, both had increases in per capita consumption of WMP and SMP from 2004 to 2014 (figs. 2, 3). The increase for WMP in China was impressive, more than double from 1.5 to 3.1 pounds per capita. For Mexico, substitution between SMP and WMP appears likely, as WMP per capita consumption decreased while SMP per capita consumption increased. The United States consumes only small quantities of WMP, mostly for the confectionery industry. For developed countries, consumption of SMP depends on its price as an ingredient compared with that of fresh skim milk and other alternatives. Per capita consumption of SMP has declined for Japan and the United States while it has increased for Canada. For cheese, per

Figure 1
Household food budget shares for countries by per capita income level in 2005



Low income countries: < 15 percent of U.S. level.

Middle income countries: 15 percent U.S. level ≤ U.S. level < 45 percent U.S. level.

High income countries: ≥ 45 percent U.S. level.

Classification is to facilitate analysis and is not based on any generalized accepted criteria.

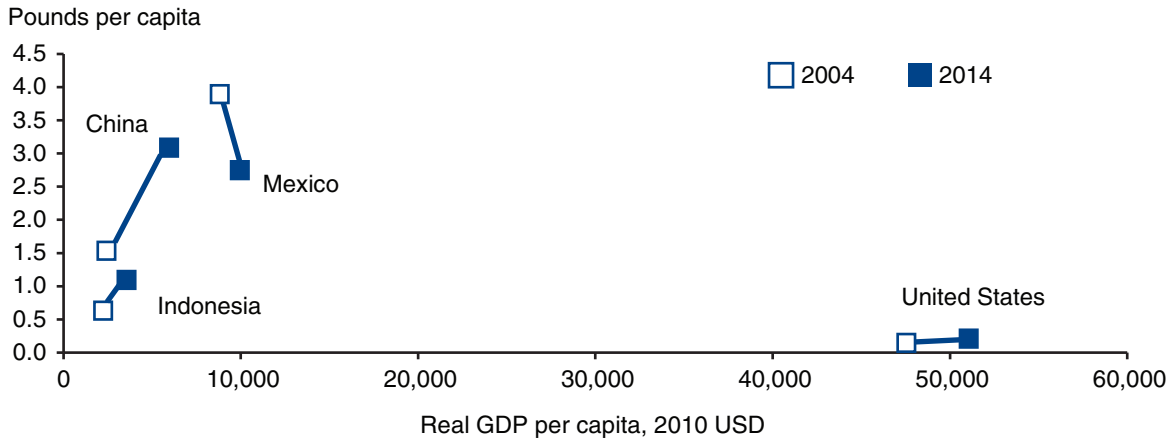
Data for 144 countries grouped by per real capita income level.

Source: USDA/Economic Research Service calculations, World Bank International Comparison Program.

⁸ The same countries are not displayed in figures 2 through 4. The countries were limited to keep the figures simple and to illustrate interesting comparisons and contrasts.

Figure 2

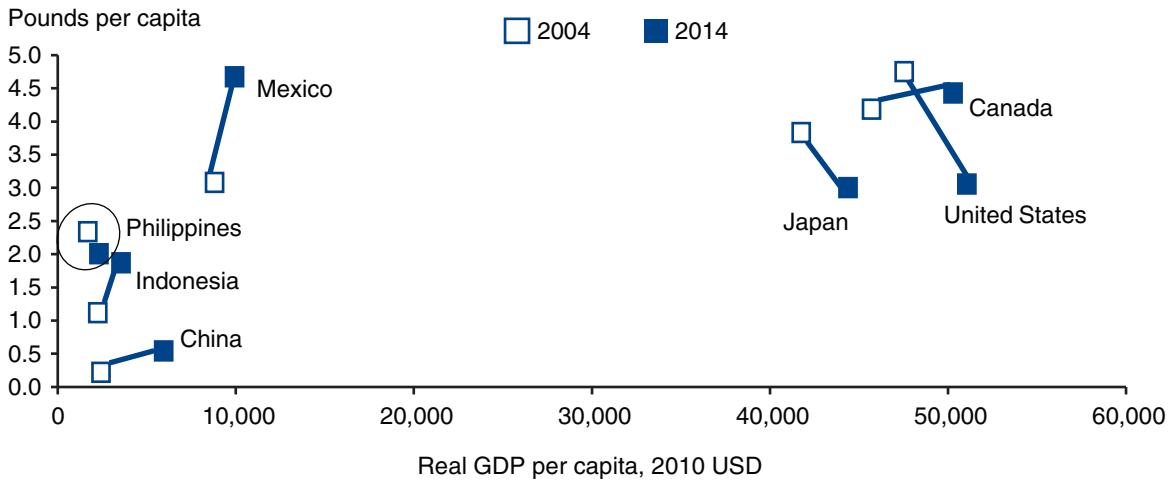
WMP¹ consumption per capita and real GDP per capita, selected countries



¹WMP includes dry whole milk and whole milk powder.
Sources: USDA/Economic Research Service and USDA/Foreign Agricultural Service.

Figure 3

SMP¹ consumption per capita and real GDP per capita, selected countries



¹SMP includes nonfat dry milk and skim milk powder.
Sources: USDA/Foreign Agricultural Service and USDA/Economic Research Service.

capita consumption generally increases as real⁹ per capita income increases (fig. 4). The Philippines is the outlier, with very small per capita consumption that declined slightly. Although Japan has higher per capita income than Mexico, per capita cheese consumption is less. This is consistent with other East Asian and Southeast Asian countries, where cheese consumption tends to be relatively low. China's per capita cheese consumption would not be discernible from zero on the chart. The selected countries with the highest incomes, Canada and the United States, had the highest levels of cheese consumption per capita.

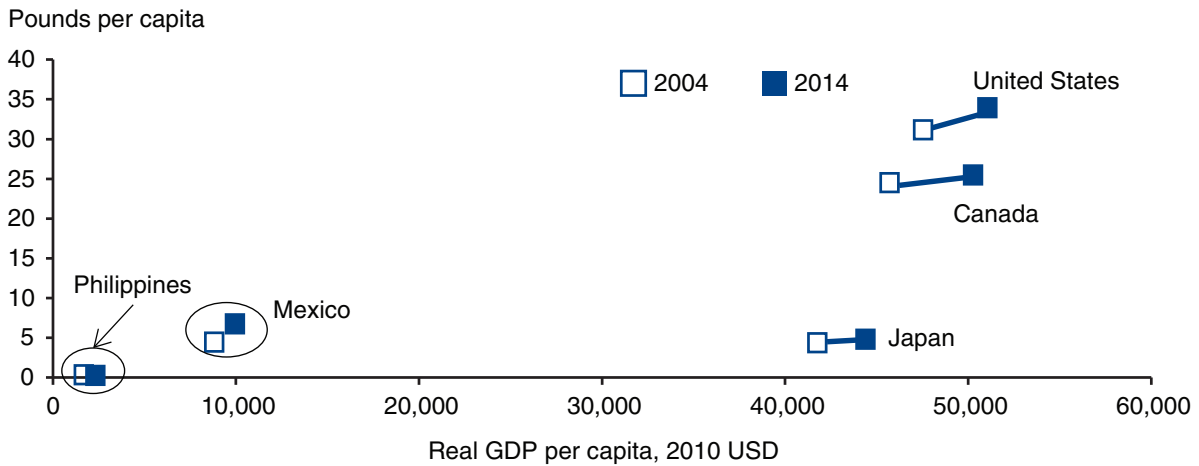
Figures 5 through 7 report total consumption of dairy products for the selected countries from 1995 to 2015. Although China's WMP per-capita consumption is only a little more than that of Mexico

⁹ The word "real" in an economic context means that prices or income values have been adjusted for the general rate of inflation.

(fig. 2), total WMP consumption has grown to be much greater due to the much larger population of China (fig. 5). Although per capita consumption of SMP for China is much less than that of Mexico (fig. 3), Chinese total consumption of SMP exceeded that of Mexico in 2013 and 2014; however, it fell below Mexico in 2015 (fig. 6). While the United States has the highest total consumption of SMP for the selected countries, the long-term trends suggest that SMP use in China and Mexico could equal that of the United States in a few years. For total cheese consumption, the United States far exceeds any of the selected countries (fig. 7). Mexico's cheese consumption has grown to be nearly equal to that of Canada in 2015, while the total cheese consumption of Japan has been less than that of Mexico since 2008.

Figure 4

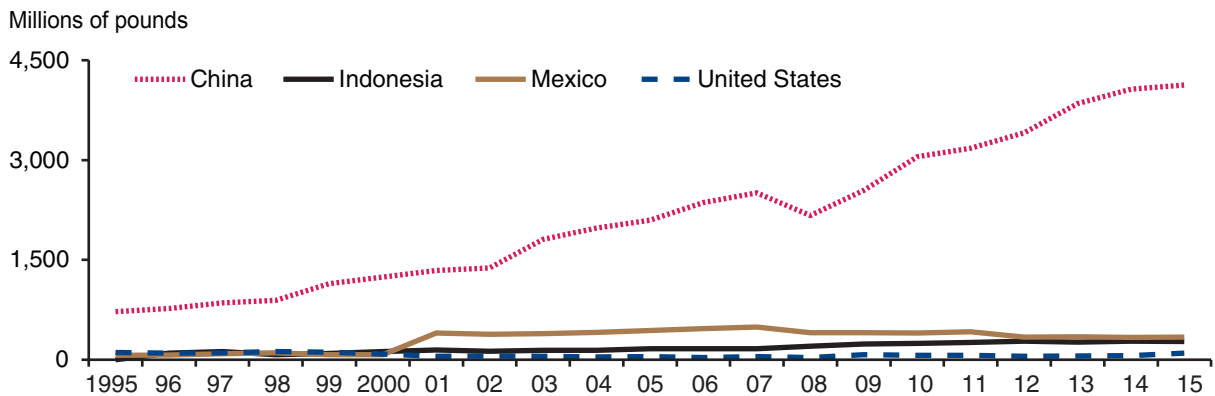
Cheese consumption per capita and real GDP per capita, selected countries



Sources: USDA/Foreign Agricultural Service and USDA/Economic Research Service.

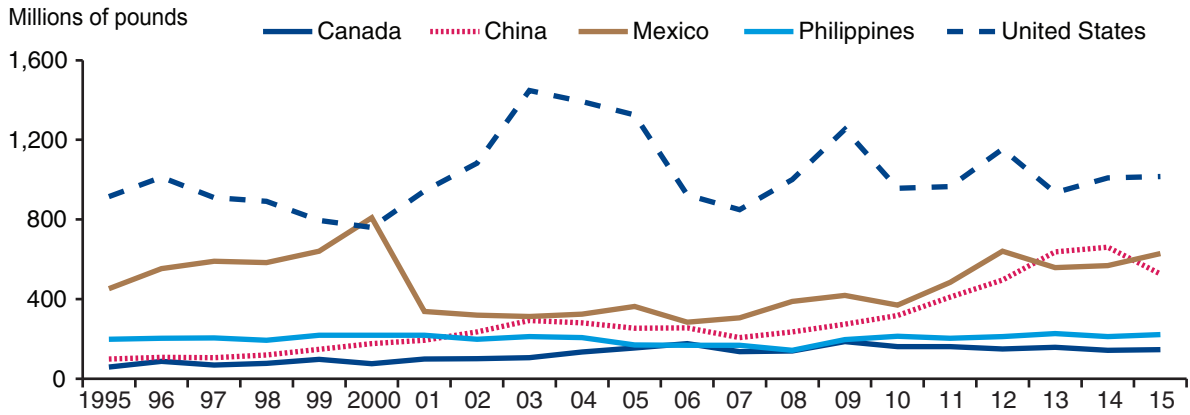
Figure 5

WMP¹ consumption



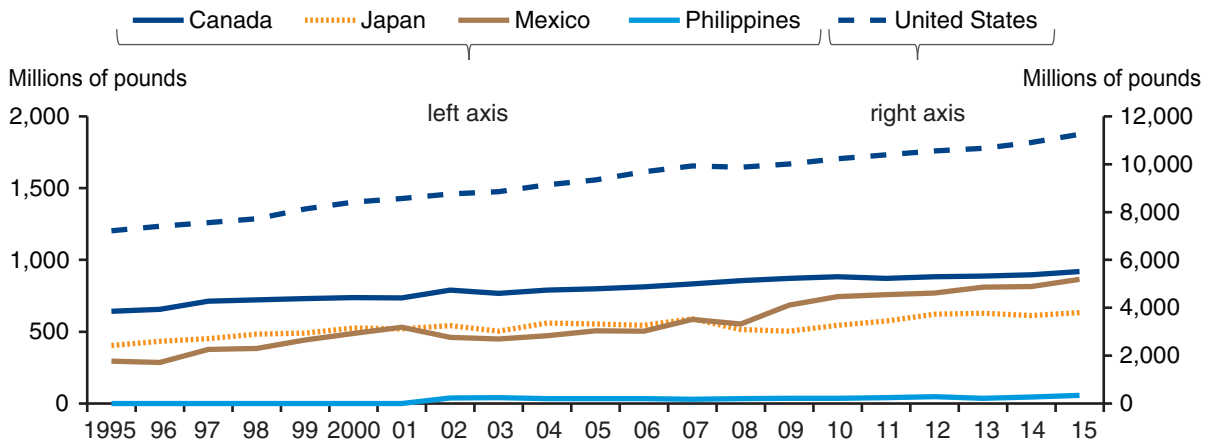
¹WMP includes dry whole milk and whole milk powder.
Source: USDA/Foreign Agricultural Service.

Figure 6
SMP¹ consumption



¹SMP includes nonfat dry milk and skim milk powder.
 Sources: USDA/Foreign Agricultural Service.

Figure 7
Cheese consumption



Source: USDA/Foreign Agricultural Service.

Profile of U.S. Dairy Product Exports

Growth in the value of U.S. dairy product exports more than tripled from 2004 to 2015, from more than \$1.6 billion in 2004 (valued in 2015 U.S. dollars) to almost \$4.9 billion in 2015 (Table 1). Mexico has consistently been the leading export destination for the United States, and the growth in the value of U.S. dairy exports to Mexico was the greatest of any major export destination, an increase of \$787 million from 2004 to 2015. Canada was the second-leading destination for U.S. exports in 2015, with an increase of \$208 million from 2004 to 2015.¹⁰ Notably, the increases in dairy exports to China and South Korea were very large, each growing by about sixfold. Dairy exports to Japan and the Philippines also increased significantly, by \$150 million and \$165 million, respectively.

While increasing demand from foreign countries has been very important in the growth of U.S. dairy exports, structural changes in domestic supply conditions have also played an important role. From 2004 to 2015, U.S. milk production grew from 170.8 billion pounds to 208.6 billion pounds. Much of this growth was generated by yield-per-cow gains from 18,960 pounds in 2004 to 22,393 pounds in 2015. Improved genetics, feed rations, and management practices have contributed to improved yields. In addition, as dairy farms have consolidated, they have become more efficient. In 2002, the midpoint herd size in the United States was 275 milk cows.¹¹ By 2012, the midpoint herd size had grown to 900 milk cows. The shift to larger farms is highly associated with a decrease in the cost of milk production. According to data from the USDA Agricultural Resource Management Survey, in 2010, U.S. herds with 200-499 head had total costs per hundredweight (cwt) of milk that were more than 1.3 times higher than herds with 1,000-1,999 head (MacDonald, Cessna, and Mosheim, 2016).

While the United States produces and exports a large variety of dairy products, four product categories—cheese, SMP, whey products, and lactose—accounted for about 80 percent of the total value of dairy exports in 2015. In terms of value, cheese was the top export product for the United States in 2015, growing from \$248 million in 2004 (valued in 2015 dollars) to \$1.388 billion in 2015. SMP was a close second, growing from an export value of \$559 million (valued in 2015 dollars) to \$1.386 billion in 2015. Whey products ranked third, with an export value in 2015 about 3.5 times higher than 2004. The United States was also a leading exporter of lactose, and 2015 lactose exports were more than double the 2004 value. Other products, such as butterfat products, infant formula, milk protein concentrate, ice cream, milk powders other than SMP, and other dairy products made up small but collectively substantial volumes.

Dairy manufacturers separate and reassemble milk components to produce a wide array of diverse products. To analyze aggregate dynamics of domestic and foreign demand for U.S. milk products, the products are often converted to a common milk equivalent. For example, based on the milk-fat content of typical U.S. cow's milk, it takes a relatively large amount of milk (21.8 pounds) to produce 1 pound of butter, but butter contains only a small amount of skim solids¹² (the equivalent

¹⁰ For 2015, Canada ranked as the second-highest import destination, ahead of China, using U.S. export data. However, using import data from the U.S. trading partners, China ranked second, ahead of Canada. See Appendix A, "Value of Dairy Exports and Imports," for an explanation of why export values do not equal corresponding import values of trading partners.

¹¹ Half of all cows are in herds larger than the midpoint, and half are in smaller herds.

¹² Skim solids include protein, lactose, and minerals found in milk.

Table 1

U.S. dairy product export values by trading partner and product, 2015 and 2004, in millions of constant U.S. 2015 dollars

2015							
Trading Partner	Cheese	SMP ¹	Whey products	Lactose	Other dairy products	Value per partner	Percent per partner
Mexico	379.6	570.7	56.9	26.8	192.2	1,226.2	25.0
Canada	69.5	5.9	125.3	7.4	228.3	436.4	8.9
China	53.5	70.9	196.5	54.2	57.8	432.9	8.8
Korea, South	237.8	13.1	27.5	10.8	14.6	303.9	6.2
Japan	162.7	11.8	58.9	27.8	11.2	272.4	5.6
Philippines	23.0	165.2	38.0	9.3	10.4	245.8	5.0
Rest of world	461.9	548.1	307.3	179.2	482.0	1,978.5	40.4
Value per product	1,388.0	1,385.6	810.5	315.5	996.5	4,895.9	100.0
Percent per product	28.3	28.3	16.6	6.4	20.4	100.0	
2004							
Trading Partner	Cheese	SMP ¹	Whey products	Lactose	Other dairy products	Value per partner	Percent per partner
Mexico	81.3	217.2	37.7	12.1	91.0	439.3	27.7
Canada	31.5	6.2	50.8	12.7	127.0	228.1	14.4
China	0.6	10.2	41.3	16.3	4.8	73.2	4.6
Korea, South	20.4	5.1	10.5	4.6	6.7	47.4	3.0
Japan	33.6	3.4	26.5	36.4	22.0	121.9	7.7
Philippines	7.6	56.0	9.6	7.2	1.0	81.3	5.1
Rest of world	72.9	261.0	57.9	43.1	160.5	595.5	37.5
Value per product	247.8	559.1	234.4	132.5	413.0	1,586.8	100.0
Percent per product	15.6	35.2	14.8	8.3	26.0	100.0	

¹SMP includes nonfat dry milk and skim milk powder.

Totals may not add precisely due to rounding.

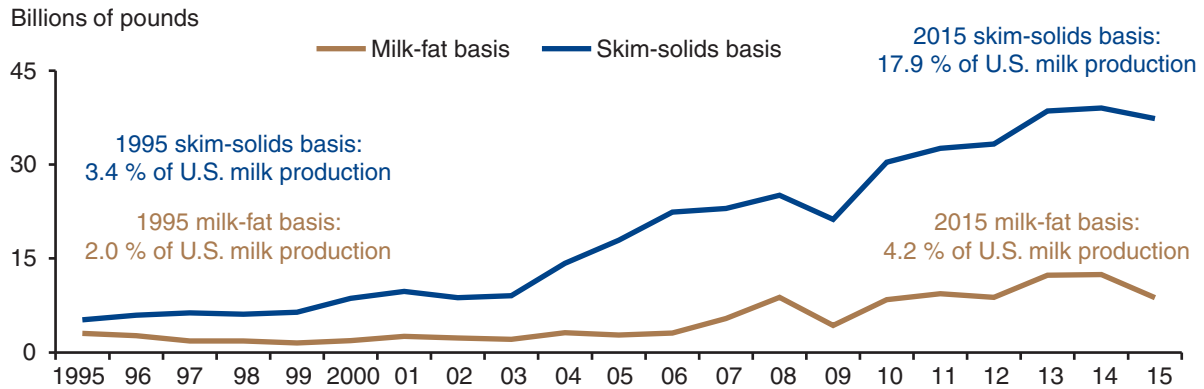
Source: Global Trade Atlas.

of 0.12 pounds of milk) (USDA/Economic Research Service, 1992). Therefore, the milk equivalent of butter is much higher on a milk-fat basis than a skim-solids basis. By contrast, 1 pound of nonfat dry milk requires a large amount of skim solids (the equivalent of 11.6 pounds of milk) but very little milk fat (the equivalent of only 0.22 pounds of milk).

Figure 8 shows total U.S. commercial exports since 1995 on both a skim-solids milk-equivalent basis and a milk-fat milk-equivalent basis. From 1995 to 2003, dairy product exports averaged 2.2 billion pounds per year on a milk-fat basis and 1.4 percent of total milk production. Since 2003, milk-fat basis exports have grown, reaching 12.4 billion pounds (6.0 percent of milk production) in 2014, but then falling to 8.8 billion pounds (4.2 percent of milk production) in 2015. Skim-solids basis exports have grown more, increasing from 5.2 billion pounds (3.4 percent of milk production) in 1995 to 39.0 billion pounds (18.9 percent of milk production) in 2014, before falling to 37.3 billion pounds (17.9 percent of milk production) in 2015.

Figure 8

U.S. commercial exports of milk in all products, milk equivalent bases



Sources: USDA National Agricultural Statistics Service, USDA Farm Service Agency, USDA Foreign Agriculture Service, U.S. Department of Commerce Bureau of the Census, California Department of Food and Agriculture, USDA Economic Research Service calculations. Numerous sources were used for conversion factors. See the workbook “Trade data conversion factors and sources” at <http://www.ers.usda.gov/data-products/dairy-data.aspx>.

The increase in skim-solids basis exports from 1995 to 2015 largely reflects the increase in exports of SMP, whey products, and lactose—products containing relatively high levels of skim solids and lower amounts of milk fat. Exports of products with relatively high milk fat, such as butter and most food preparations containing dairy ingredients, have had less growth. The increase in exports of skim solids complement trends in the domestic market, since the U.S. consumption of products with relatively high milk-fat content have grown at a faster pace than products with relatively high skim-solids content (Cessna and Kuberka, 2015). For example, U.S. butter consumption rose from 4.6 pounds per person in 1995 to more than 5.6 pounds in 2015, an increase equivalent to about 22 pounds of milk per person on a milk-fat basis. Over the same period, consumption of beverage fluid milk, a product usually containing a relatively low ratio of milk fat to skim-milk solids,¹³ declined from 205 pounds per person per year to 155 pounds.

In 2015, U.S. dairy exports declined for several reasons:

- Global demand for dairy products was relatively weak, especially from China.
- Since August 2014, Russia has banned imports of most dairy products from the United States, the European Union (EU), Canada, Australia, and Norway. Although the United States is not a major supplier for Russia, the ban caused the EU to export to alternative markets in competition with the United States. Russian dairy imports declined due to the ban and recession in the country, contributing to lower global dairy prices (see box, “Russian Trade Ban”).
- The value of the U.S. dollar was strong relative to other currencies, causing U.S. exports to be less attractive.
- In April 2015, the EU discontinued its milk supply quotas. EU dairy farmers thereafter increased their level of milk production, boosting their exports and crowding out dairy product imports from the United States.

¹³ In the United States, raw milk, as it comes from the cow, usually has about 3.7 percent milk fat. Retail fluid milk typically has less milk fat. The most commonly consumed type of beverage fluid milk is reduced-fat milk, which has about 2 percent milk fat. Even whole milk sold to consumers usually has had some milk fat removed, with a typical milk-fat content of 3.25 percent.

Russian Trade Ban

On August 6, 2014, Russian President Vladimir Putin issued an immediate ban on certain agricultural products from the United States, Canada, the European Union, Australia, and Norway. The ban included beef, pork, poultry, fruits, vegetables, fish, seafood, dairy products, and a variety of other products. The ban has been extended and is currently scheduled to continue through the end of 2017 (USDA FAS 2014e and 2016d).

U.S. dairy exports to Russia were very small even before the ban. U.S. dairy exports to Russia fell from \$7.2 million in 2013 to \$1.4 million in 2015 (GTA, 2016).¹ While the Russian dairy market has been small for the United States, it was a large market for the EU before the ban. EU dairy exports to Russia fell from \$2.0 billion in 2013 to less than \$0.2 billion in 2015. In 2013, the value of EU dairy exports to Russia was 11.6 percent of total EU dairy exports. The percentage fell to 6.5 percent in 2014 before falling to 1.1 percent in 2015.

Russia's dairy imports have fallen from \$4.6 billion in 2013 to \$2.1 billion in 2015. The decline is generally attributed to both the trade ban and a recession in Russia. After rising by 1.3 percent in 2013 and 0.7 percent in 2014, Russia's GDP fell by 3.7 percent in 2015 (World Bank, 2016, adjusted for inflation in Russian currency).

Cheese makes up a large proportion of Russia's dairy product imports. EU cheese exports to Russia fell from 566 million pounds in 2013 to 10 million pounds in 2015. Russia's imports increased from some countries not included in the ban. In particular, Russian cheese imports from Belarus increased from 244 million pounds in 2013 to 369 million pounds in 2015. However, the increase in imports from other countries was not enough to make up for the loss of imports from the EU. Overall, Russian cheese imports fell from 971 million pounds in 2013 to 458 million pounds in 2015.

Although New Zealand was not included in the ban, Russian imports from New Zealand have not increased since the ban. In fact, Russia's dairy imports from New Zealand decreased from \$139 million in 2013 to \$44 million in 2015. New Zealand has not been a significant exporter of cheese to Russia, and Russian cheese imports from New Zealand were zero in 2014 and 2015.

With the loss of Russia as a trading partner for most dairy products and the increase in EU milk production, Europeans have become more competitive in other global markets. For example, while U.S. dairy exports to China fell by \$243.9 million from 2014 to 2015, EU exports to China grew by \$263 million. While U.S. dairy exports to Mexico fell by \$360.4 million from 2014 to 2015, EU exports to Mexico rose by \$1.5 million.

¹ Countries included in the ban continue to export small quantities of dairy products to Russia. While the ban includes most major dairy products, it does not include certain lactose-free products, lactose, infant formula, ice cream, casein, caseinate, or milk albumin (USDA FAS 2014e and 2016d).

The 2015 decline in U.S. dairy exports contributed to a substantial fall in milk prices received by dairy farmers. The all-milk price fell from a record high of \$24.00 per cwt in 2014 to \$17.10 per cwt in 2015 (USDA NASS, 2016), a 29-percent fall.

Over the years, relationships between U.S. imports and exports have changed significantly by value and by quantity on both a milk-fat basis and a skim-solids basis. By value, the United States was a net importer of dairy products until 2007 (fig. 9). Since then, the United States has been a net exporter of dairy products, with the exception of 2009, when the value of imports and exports was

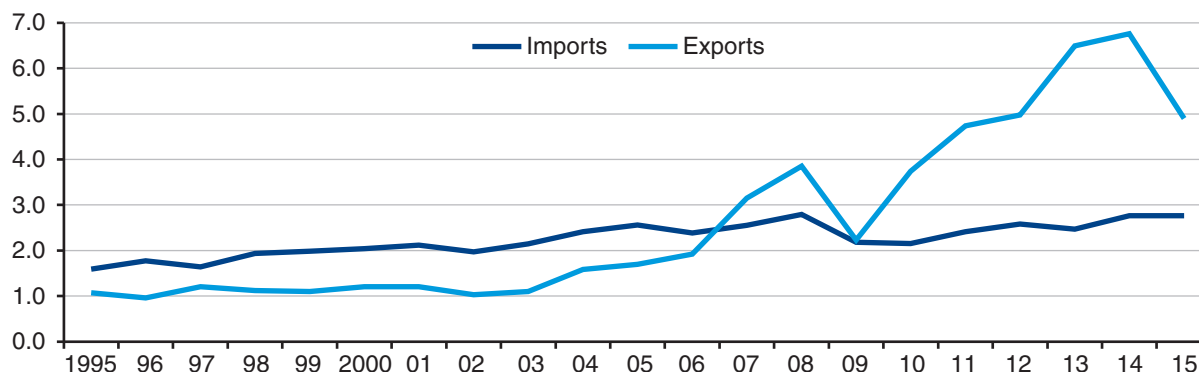
about the same. By 2014, the value of dairy exports had grown to \$6.8 billion while the value of dairy imports was \$2.8 billion. In 2015, the value of dairy exports fell to \$4.9 billion while the value of dairy imports remained at \$2.8 billion.

On a milk-fat basis, imports trended upward, reaching a peak of 7.5 billion pounds in 2006, and then falling to about 4 billion pounds from 2011 to 2014 (fig. 10). After 2006, milk-fat basis commercial exports showed significant growth, with the exceptions of 2009 and 2012. In 2014, milk-fat basis exports (12.4 billion pounds) were almost 3 times more than milk-fat basis imports. In 2015, milk-fat basis exports fell to 8.8 billion pounds, and imports rose to 5.7 billion pounds.

On a skim-solids basis, the United States has consistently been a net exporter, but the difference between commercial exports and imports has grown substantially (fig. 11). In 2014, skim-solids basis exports (39.0 billion pounds) were almost 7 times more than skim-solids basis imports (5.6 billion pounds). In 2015, skim-solids basis exports fell to 37.3 billion pounds while skim-solids basis imports rose to 6.0 billion pounds.

Figure 9
U.S. dairy import and export values

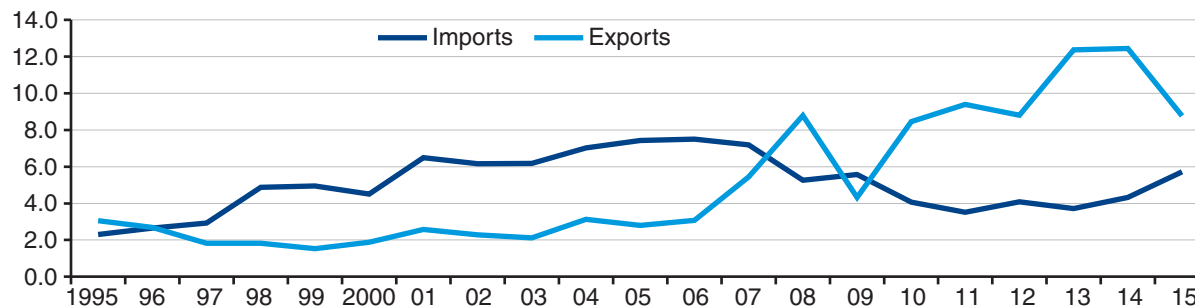
Constant 2015 U.S. dollars in billions



Sources: Global Trade Atlas, U.S. Bureau of Labor Statistics.

Figure 10
U.S. imports and commercial exports of milk in all products on a milk-fat milk-equivalent basis

Billions of pounds

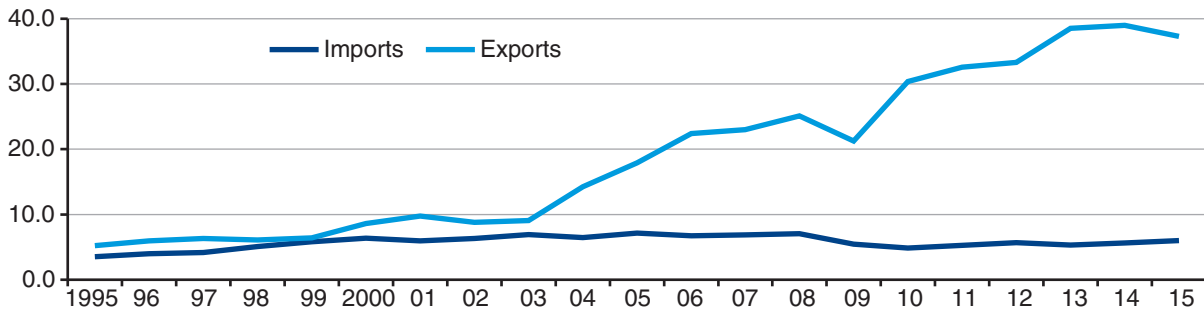


Sources: USDA/National Agricultural Statistics Service, USDA Farm Service Agency, USDA/Foreign Agriculture Service, U.S. Department of Commerce Bureau of the Census, California Department of Food and Agriculture, USDA/Economic Research Service calculations. Numerous sources were used for conversion factors. See the workbook, "Trade data conversion factors and sources" at <http://www.ers.usda.gov/data-products/dairy-data.aspx>.

Figure 11

U.S. imports and commercial exports of milk in all products on a skim-solids milk-equivalent basis

Billions of pounds



Sources: USDA/National Agricultural Statistics Service, USDA/Farm Service Agency, USDA/Foreign Agriculture Service, U.S. Department of Commerce Bureau of the Census, California Department of Food and Agriculture, USDA/Economic Research Service calculations. Numerous sources were used for conversion factors. See the workbook "Trade data conversion factors and sources" at <http://www.ers.usda.gov/data-products/dairy-data.aspx>.

The World Trade Organization and Dairy Trade

Following a series of multilateral trade negotiations known as the Uruguay Round,¹⁴ the World Trade Organization (WTO) was established, effective January 1, 1995. The WTO was charged with administering rules for trade among member countries. The rules pertaining to agricultural market access and subsidies are known as the Uruguay Round Agreement on Agriculture. According to a 2001 ERS report:

The Uruguay Round of the General Agreement on Tariffs and Trade (GATT) concluded in 1994 with an agreement that fundamentally changed the treatment of national agricultural policies under the multilateral rules of global trade. In the Uruguay Round Agreement on Agriculture (URAA, or the Agreement), members determined that trade-distorting policies are to be disciplined, or constrained, so that agricultural markets can be increasingly directed by market forces rather than government intervention (Burfisher, 2001).

Implementation of the agreement was phased in over a 6-year period ending in 2000/2001 for developed countries and over a 10-year period ending in 2004/2005 for developing countries. While the changes were limited, leaving many protections in place, they provided some impetus for the increase in global dairy trade in the years to follow.

Under the URAA, member countries, including the United States, converted non-tariff trade barriers to tariff rate quotas (TRQs). A TRQ is a two-tiered tariff (tax) where a lower (in-quota) tariff is charged on imports within a quota volume, while a higher (over-quota) tariff is charged on imports in excess of the quota volume. Market access was expanded for member countries through both higher in-quota quantities allowed and lower tariffs. TRQ commitments for selected dairy products implemented under the URAA have been aggregated for selected regions in table 2.¹⁵ Countries

Table 2

Tariff rate quota quantities for major dairy products under Uruguay Round commitments for selected regions (millions of pounds)

Region	Milk powder, condensed/ evaporated milk (HS 0402)		Butter and butter oil (HS 0405)		Cheese (HS 0406)	
	Initial TRQ	Final TRQ	Initial TRQ	Final TRQ	Initial TRQ	Final TRQ
Western Europe	93.2	156.4	174.8	200.7	81.1	270.7
Central and Eastern Europe	11.3	14.6	27.7	46.0	15.3	19.4
North America	273.7	291.3	4.3	7.2	334.6	378.7
Southeast Asia	99.2	121.3	0.0	0.0	0.0	0.0
East Asia	209.8	210.4	4.7	5.1	0.0	0.0
Oceania	0.0	0.0	0.0	0.0	25.4	25.4

Access opportunities conferred through aggregate tariff rate quotas which do not provide for a breakdown into the product categories of this table are not included.

Source: General Agreement on Tariffs and Trade, Summary of the Results of the Uruguay Round in the Dairy Sector.

¹⁴ The Uruguay Round was launched in Punta del Este, Uruguay, in September 1986.

¹⁵ Detailed commitment information under the Uruguay Round by country is complicated and beyond the scope of this report.

agreed to lower dairy tariffs by specific percentages. For example, the United States agreed to lower over-quota tariffs by 15 percent on most dairy products while the EU agreed to lower over-quota tariffs by 36 percent for butter, 20 percent for SMP, and 36 percent for cheese (Secretariat, General Agreement on Tariffs and Trade (GATT), 1994). Although the percentage reductions for the EU were more than for the United States, the levels of dairy-product tariffs for the EU remain higher than for the United States. Based on data from 2013 and 2014, the WTO estimated that the EU Most Favored Nation (MFN)¹⁶ applied duties for dairy products averaged 42.1 percent on an ad valorem equivalent basis,¹⁷ while they averaged 17.2 percent for the United States (WTO, 2015b).

Under the URAA, developed countries also agreed to reduce export subsidies gradually, by 21 percent from the 1986-90 average over a period of 6 years. The URAA also required developed countries to reduce their total trade-distorting domestic support, aggregated across all commodities, by 20 percent over 6 years, from a 1986–88 base (Secretariat, GATT, 1994).

The next round of WTO negotiations is known as the Doha Round.¹⁸ Over the years, there have been several stages of negotiations under the Doha Round. In December 2015, at a conference in Nairobi, Kenya, developed countries of the WTO agreed to eliminate export subsidies immediately for many products. However, exceptions were made for processed products, dairy products, and swine meat. For these products, developed member countries would eliminate export subsidies for products destined for least developed countries as of January 1, 2016, and eliminate all export subsidies at the end of 2020 (WTO, 2015a). For matters involving market access and domestic support, a comprehensive agreement for further trade liberalization has not been reached. In the absence of a multi-lateral agreement, some countries have turned to preferential bilateral and regional trade agreements.

¹⁶ According to the World Bank, “In current usage, MFN tariffs are what countries promise to impose on imports from other members of the WTO, unless the country is part of a preferential trade agreement (such as a free trade area or customs union). This means that, in practice, MFN rates are the highest (most restrictive) that WTO members charge one another.” (World Bank, 2010).

¹⁷ An ad valorem tariff is a tariff rate charged as a percentage of the price while a specific tariff is charged as a fixed amount per quantity, such as \$0.20 per pound. To compare tariffs across countries, which may use either or both types of tariffs, ad valorem equivalent estimates are often used.

¹⁸ The Doha Round was launched at the Fourth Ministerial Conference in Doha, Qatar, in November 2001.

Price Relationships and Effects of Exchange Rates

Since about 2003, U.S. domestic prices for dairy products have begun to track more closely with prices of other major dairy exporters. Since SMP has historically accounted for the largest value of U.S. dairy exports, SMP is used as an example here and several other places throughout this report. U.S. domestic prices for nonfat dry milk have converged with skim milk powder export prices of Oceania (New Zealand and Australia) and Europe (fig. 12).¹⁹ Notice that the U.S. nonfat dry milk price has become more variable. This is the case with most other major dairy products as well well.

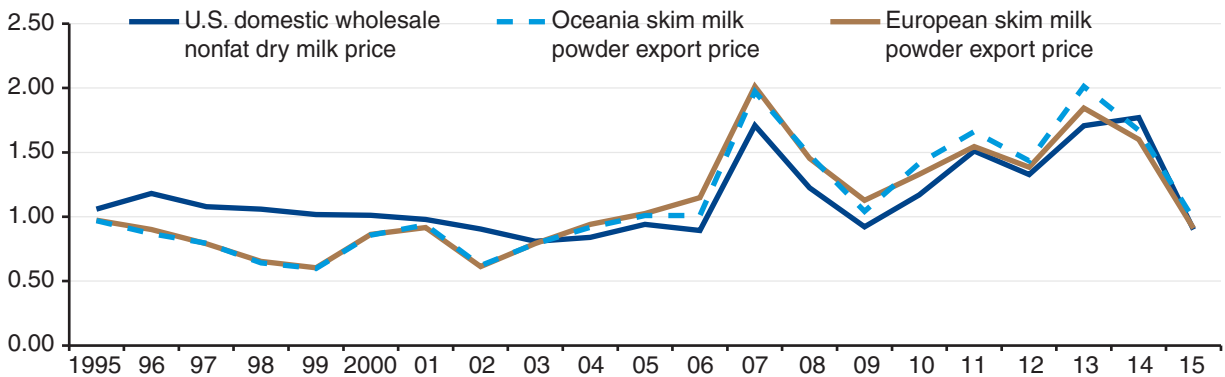
For products with a lower proportion of exports, price relationships have also tended to converge, but not to the same extent. For example, U.S. domestic prices for butter became more closely tied to international export prices in 2007 (fig. 13). However, in 2015, the U.S. domestic butter price was higher than the Oceania and European export prices by about \$0.60 per pound on average. For cheddar cheese, the U.S. domestic price in 2015 exceeded the Oceania price by \$0.14 per pound on average.

In 2015, U.S. domestic butter and cheese prices were higher than the Oceania and European export prices for several reasons. First, U.S. domestic demand for products with substantial milk-fat content was particularly strong. While U.S. milk production grew by 1.3 percent from 2014 to 2015, domestic use of butter and cheese grew by 2.6 and 3.5 percent, respectively. In addition, some international shocks had a more direct impact for Europe and Oceania than for the United States. The Russian trade ban had a direct impact on EU dairy industry (see box, “Russian Trade Ban”) while

Figure 12

U.S. and international prices for nonfat dry milk and skim milk powder

U.S. dollars per pound



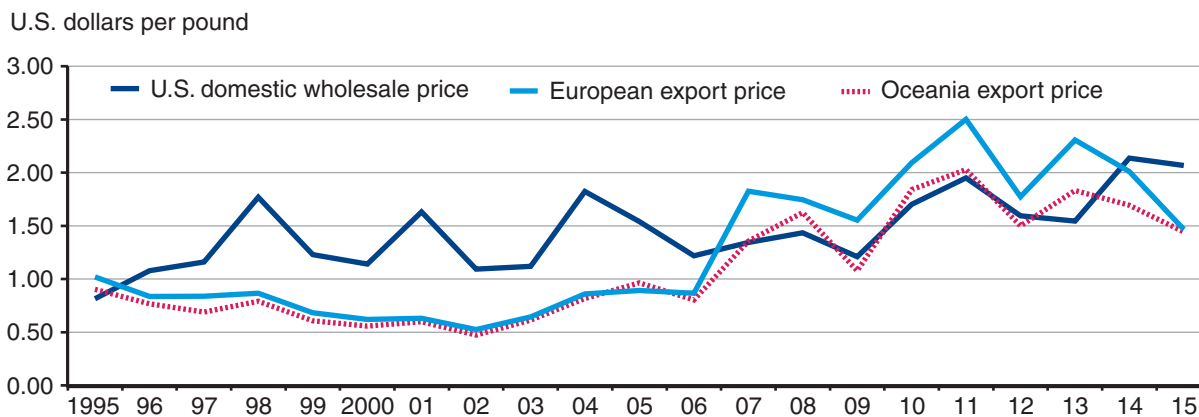
The U.S. domestic wholesale price is a national weighted average price. Export prices for Oceania and Europe are midpoints of reported ranges.

Source: USDA/Agricultural Marketing Service.

¹⁹ Although the U.S. nonfat dry milk prices and foreign export prices for skim milk powder are comparable, there are some significant differences in how they are collected and reported. The products are slightly different since the U.S. price is for nonfat dry milk but the foreign export prices are for skim milk powder. The U.S. price is reported through a mandatory program, while foreign prices are reported voluntarily. While the U.S. price is a domestic price reported free on board (f.o.b.) plant or storage facility, the foreign export prices are f.o.b. port of the exporting country. The U.S. domestic prices are weighted average prices from a comprehensive survey, including only prices for products shipped within 30 days of the contract, and recorded at the time of shipment and transfer of title. The foreign export prices in our figures are the midpoints of reported price ranges (not averages), including products under forward contract, and are recorded at the time of contract.

Figure 13

U.S. and international prices for butter



Note: The U.S. domestic wholesale price is a national weighted average price. Export prices for Oceania and Europe are midpoints of reported ranges.

Source: USDA/Agricultural Marketing Service.

the decline in export demand from China had a direct impact on the New Zealand dairy industry. With over-quota tariffs of \$0.70 per pound for butter and \$0.56 for cheddar cheese (more or less for other types of cheeses), U.S. dairy imports were constrained, providing some insulation for the U.S. dairy industry and allowing for the gap between the U.S. domestic and international prices.

Although many factors contribute to the relative value of U.S. products to those of competitors, exchange rates play a major role. In 2015, the U.S. dollar appreciated considerably against other major currencies. A recent USDA Economic Research Service report states the following:

The appreciation of the dollar relative to a wide range of currencies largely reflects increased demand for dollars needed for investment and business activity in the United States. Stronger growth in the U.S. economy relative to other developed-country economies, along with geopolitical conflicts in the Middle East, the former Soviet Union, and elsewhere, attracts investors to the relative strength and safety of U.S. markets (Cooke, Landes, and Seeley, 2016).

All other things being equal, U.S. exports move in inverse direction with the value of the U.S. dollar compared with other currencies. Two types of relationships among exchange rates matter with respect to U.S. dairy exports:

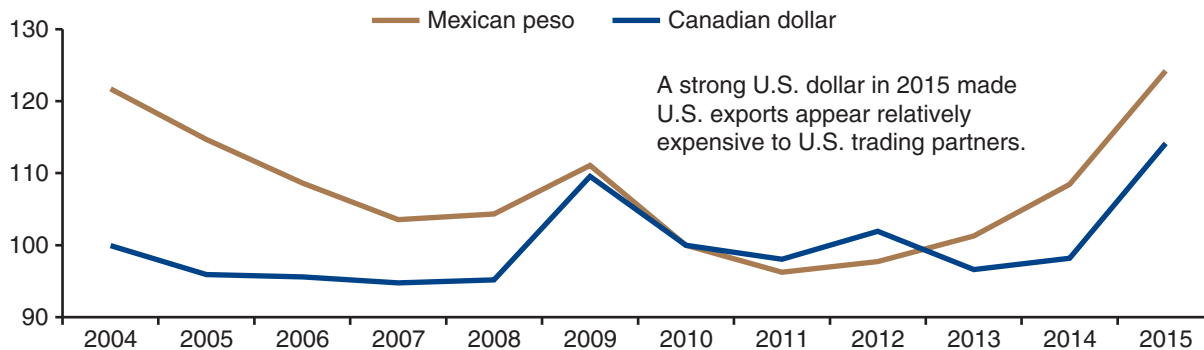
1. If the U.S. dollar appreciates relative to currencies of countries that import U.S. products, U.S. exports tend to decrease because U.S. products are relatively more expensive to those countries in terms of their currencies. This was the case for Mexico, Canada, and most other leading U.S. export destinations in 2015 (fig. 14). In addition, U.S. producers are motivated to produce and export lesser quantities because the trade price converted to the domestic currency is lower.
2. If the U.S. dollar appreciates relative to currencies of other major dairy product exporters, U.S. exports become less competitive as U.S. prices tend to rise relative to prices of other countries. This was the case for the European Union, New Zealand, and most other leading competitors in 2015 (fig. 15). Most global dairy trade is denominated in U.S. dollars, making comparisons relatively easy for importers. In addition, U.S. producers are less motivated to produce and export greater quantities because the trade price in U.S. dollars appears less to U.S. producers than to competing producers.

Changes in price relationships over time are closely associated with changes in economic conditions and government policies, as discussed in following sections.

Figure 14

Real exchange rate indices of leading U.S. dairy export destinations

Index, 2010 = 100



Note: Exchange rate indices in this table show the exchange rates compared to a 2010 base level of 100. For example, since the index value for the Mexican peso is 124 in 2015, the value of the U.S. dollar has appreciated 24 percent relative to the Mexican peso, adjusted for inflation, from 2010 to 2015.

Source: USDA/Economic Research Service, Agricultural Exchange Rate Data Set.

Figure 15

Real exchange rate indices of leading U.S. dairy export competitors

Index, 2010 = 100



Note: Exchange rate indices in this table show the exchange rates compared to a 2010 base level of 100. For example, since the index value for the Euro is 127 in 2015, the value of the U.S. dollar has appreciated 27 percent relative to the Euro, adjusted for inflation, from 2010 to 2015.

Source: USDA/Economic Research Service, Agricultural Exchange Rate Data Set.

Changes in U.S. Dairy Policy Affecting Exports

U.S. Price Support for Dairy Products

Until recently, the United States set floors on dairy prices through a price support program. The Milk Price Support Program (MPSP) was established by the Agricultural Act of 1949 and was amended several times over the years. Through the program, the Federal Government purchased dairy products in order to support milk prices at specified levels. The Food, Conservation, and Energy Act of 2008 (2008 Farm Act) changed the name of the program to the Dairy Product Price Support Program (DPPSP) and specified support prices of purchased manufactured products instead of the price of milk. The U.S. Government generally disposed of the products in ways that were designed to have minimal impacts on U.S. domestic prices—through donations to needy people, donations to foreign countries needing aid, sales restricted to animal feed use, and export sales. However, at times of relatively high domestic prices, the Government sold products to the U.S. domestic market for unrestricted use.

In recent years, government purchases under the DPPSP dwindled as U.S. dairy market prices rose while support prices were set at relatively low levels. Government stock levels and price relationships for nonfat dry milk are illustrated in figure 16 as an example. The declining real value of price supports contributed to the increase in exports as dairy products that would have been sold to the Government were made available for commercial export. The program was repealed in accordance with the 2014 Farm Act. While the nonfat dry milk price was \$0.90 per pound on average during 2015, the price fell below \$0.80 per pound (the previous support price level) in August and December. If the program had remained in effect, there would likely have been some Government price support purchases in 2015.

Figure 16
U.S. nonfat dry milk prices and Government ending stocks



Sources: USDA/Agricultural Marketing Service, USDA/Farm Service Agency.

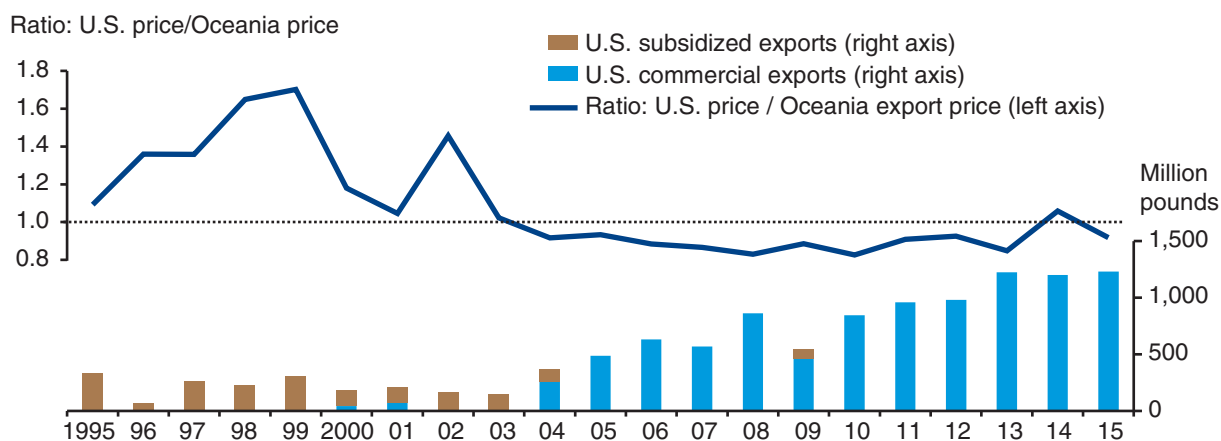
U.S. Dairy Export Subsidies

Prior to 2004, U.S. commercial exports²⁰ of major dairy products were usually low and were often exceeded by subsidized exports through the Dairy Export Incentive Program (DEIP). Authorized by the Food Security Act of 1985, DEIP allowed exporters to buy at U.S. prices and sell abroad at prevailing (lower) international prices by paying cash bonuses. DEIP removed nonfat dry milk, butterfat, and certain cheeses from the domestic market and helped develop export markets. It also helped reduce the expenditure burden on storage costs of the domestic price support program, since products that the Government would have bought and stored were instead exported to foreign markets. The relationships among U.S. nonfat dry milk price, the Oceania skim milk powder price, subsidized exports, and commercial exports for SMP are illustrated in figure 17. Since 2004, U.S. commercial exports have grown substantially, and exports are no longer subsidized. DEIP was repealed in accordance with the 2014 Farm Act.

Milk Income Loss Contract Program

The Farm Security and Rural Investment Act of 2002 introduced the Milk Income Loss Contract (MILC) program for all dairy producers who produced milk for the commercial market. Participating farmers received payments for 45 percent of the difference between \$16.94 per cwt and a benchmark milk price (the Class I Federal milk marketing order price in Boston²¹). When the benchmark price was above \$16.94 per cwt, no payments were made. Participants could receive payments on at most 2.4 million pounds of milk marketed in a fiscal year (equivalent to a relatively small herd of roughly 150 cows producing an average milk yield). Congress made various changes to the program through the years. Notably, the 2008 Farm Act added an adjustment for feed costs, and the cap on eligible production was increased to 2.985 million pounds from October 1, 2008, through August 31, 2012. The program was repealed with the 2014 Farm Act.

Figure 17
U.S. SMP¹ exports and the U.S./Oceania price ratio



¹ SMP includes nonfat dry milk and skim milk powder.

Sources: USDA/Agricultural Marketing Service, U.S. Bureau of the Census, USDA/Foreign Agricultural Service.

²⁰ Commercial exports exclude U.S. Government donations to foreign countries and exports subsidized under the Dairy Export Incentive Program.

²¹ Class I milk is milk marketed through the Federal order system used for fluid beverage purposes. Class I prices differ according to location of the plant. For more information, see <http://www.ams.usda.gov/rules-regulations/moa/dairy>.

Direct payments to producers under the MILC program likely encouraged at least some additional milk production, resulting in lower prices.²² To the extent that U.S. prices for dairy products were lower, U.S. exports became more competitive in world markets. Due to the cap on eligible production, the program was of greater proportional benefit to smaller dairy farmers, and the production response to the program may have been greater for producers producing less than the eligible cap because payments increased with each additional pound of production. Participating dairy farmers producing more than the eligible cap per year would receive the same benefit regardless of the volume produced above the cap. Thus, while large farmers gained from the direct payments, the lower prices brought about by the supply response may have offset the gains to some extent.

U.S. Dairy Export Council

The U.S. Dairy Export Council (USDEC) promotes U.S. dairy exports throughout the world. The program is funded by Dairy Management Inc. (DMI), the USDA Foreign Agricultural Service (FAS) Market Access Program, the FAS Foreign Market Development program, other FAS programs, and membership dues. Most of the funding for USDEC comes from DMI, which receives its funding from the National Dairy Promotion and Research Program, commonly known as the Dairy Checkoff Program. To fund the Dairy Checkoff Program, U.S. dairy farmers are assessed 15 cents per hundredweight of milk, and importers are assessed at the rate of 7.5 cents per hundredweight of milk, or the equivalent thereof, for dairy products imported into the United States.²³ The program provides both domestic and international dairy product promotion, research, and nutrition education.

USDEC leverages market development, market access, and trade policy to improve sales to overseas customers. USDEC's funding increased by about 60 percent from \$15.8 million in 2005 to \$25.4 million in 2012 (values for both years in 2015 dollars). A study of the Dairy Checkoff program, provided in the annual Report to Congress for 2012 Activities, reported the benefit-cost ratio, in terms of dairy farmer profit from export promotion through the program, was \$5.12 per dollar invested (USDA Agricultural Marketing Service (AMS), 2005 and 2012).

Margin Protection Program for Dairy Producers

The Margin Protection Program for Dairy Producers (MPP-Dairy) is a voluntary risk management program for dairy farmers established by the 2014 Farm Act. It offers protection when the national average margin (the difference between the U.S. all-milk price and the estimated average feed cost) falls below a level selected by the dairy farmer. The program offers catastrophic coverage for no cost, other than a \$100 registration fee, and various levels of buy-up coverage. Dairy farmers selecting catastrophic coverage only receive Government payments when the average margin falls below \$4.00 per cwt. Dairy farmers may buy additional coverage, in 50-cent increments, up to \$8 per cwt, selecting to cover 25 to 90 percent of an established production history. For operations that existed when the program was implemented, the production history is the highest annual milk production marketed during 2011, 2012, or 2013. Procedures are available for new operations to establish production history. Production history is adjusted each year, reflecting the percentage change in national milk production.

²² Estimates of supply effects from MILC have varied depending on the estimation methods used and the periods studied (Brown, 2003; Price, 2004; Antoni, Mishra, and Blayney, 2012).

²³ The Dairy Production Stabilization Act of 1983, as amended through May 7, 2010, States that use import assessments for the National Dairy Promotion and Research Program "shall not be used for foreign market promotion."

In 2015, 54.6 percent of licensed dairy operations (representing 80.7 percent of U.S. milk production) participated in the program (USDA, Farm Service Agency (FSA), 2015). The largest proportion of participating operations (44.0 percent) chose \$4.00 per cwt coverage, and there was a significant cluster (41.6 percent) choosing \$6.00 and \$6.50 coverage. For coverage distribution by milk production history, 61.5 percent was covered at the \$4.00 level. Dairy farmers who bought coverage at the highest level, \$8.00 per cwt, received small payments during the year (USDA FSA, 2016).

The effect of the program on exports will depend on the extent to which dairy farmers increase production in response to Government payments received through the program. Since MPP-Dairy payments are based on a dairy farmer's production history but are not impacted by the individual farmer's changes in milk production, they can best be described as partly decoupled. They do not depend on a farmer's production level, but they are impacted by current market conditions (i.e., milk and feed prices), and the farmer must remain in production to participate. Decoupled payments can have production impacts because they affect farmer wealth, risk attitudes, and liquidity (Westcott, 2005).

Supply impacts from MPP-Dairy (and thus its effects on exports from greater supplies of products and lower U.S. export prices) are likely to be limited. Since MPP-Dairy does not increase per-unit net returns from increased production, the additional funds from Government payments are more likely to be spread among many uses in addition to farming (household consumption, savings, and investment) than a Government program closely tied to production. Additionally, low participation at buy-up levels may limit the supply impact. So far, most farmers have chosen to participate, but the majority of the participants' milk production history has been covered at only the \$4.00 per cwt level. In years when premiums paid by dairy farmers exceed Government payments, such as 2015, expected supply effects are ambiguous as negative wealth effects from the premiums paid may be mitigated by the decrease in risk attributable to the program (Mark, Burdine, Cessna, and Dohlman, 2016).

Dairy Product Donation Program

The Dairy Product Donation Program (DPDP) was established by the 2014 Farm Act. Through the program, the Government would purchase dairy products for donation to public and private nonprofit organizations that provide nutrition assistance to low-income populations. Government purchases would be triggered when the margin (the same as calculated for MPP-Dairy) is less than \$4 per cwt for 2 consecutive months. DPDP purchases would terminate if:

- Government purchases are made for 3 consecutive months, even if the actual dairy production margin remains \$4 per cwt or less per cwt of milk.
- The national average margin has been greater than \$4 per cwt of milk for the immediately preceding month.
- The national average margin has been \$4 per cwt or less, but more than \$3 per cwt, for the immediately preceding month and during the same month.

To the extent that milk production is higher due to the DPDP, the program could have a positive impact on dairy exports, as more supplies would be available for export and U.S. dairy export prices would be lower. However, the impact of DPDP on the U.S. milk supply is expected to be small. Events that would trigger activation of the program have been unusual in recent years. In 2009, there were 6 consecutive months when the national average margin, as calculated for the program, would have been \$4.00 per cwt or less. In 2012, there were 4 such consecutive months. Otherwise, the margin has been greater than \$4.00 per cwt in recent years.

Profiles of Major Dairy Exporting Countries

The majority of world dairy trade originates from four suppliers: the European Union, New Zealand, the United States, and Australia. Available data of milk-producing and -consuming countries show that these four suppliers have accounted for the vast majority world dairy exports in recent years, about 75 percent of world dairy trade value (Global Trade Atlas (GTA), 2016).²⁴

European Union

Milk supply and export conditions

The European Union (EU) is the largest producer of milk globally, with production of 329.8 billion pounds of cows' milk in 2015 (USDA FAS, 2016c). Due to its high level of production and government policies, the EU has historically been the world's top dairy supplier. In comparison to some other major dairy exporters, EU farm-milk production costs have been relatively high on average, but they vary considerably among member states. In 2012, Western European farm-milk production costs were in the range of US\$18-25 per cwt²⁵ compared to US\$19 per cwt in the United States²⁶ and US\$16 per cwt in Oceania (IFCN, 2013).

In recent years, just over three-quarters of milk produced in the EU has been processed into dairy products, while less than a quarter has been consumed as fluid milk (USDA FAS, 2016c). EU dairy product exports totaled almost \$15.7 billion in 2015, a 63.6 percent increase from the 2004 value, with infant formula and cheese accounting for a combined 50.7 percent of total value (table 3). EU exports of infant formula increased by nearly 4 times from 2004 to 2015, with greatest export shares in 2015 going to China and Hong Kong (GTA, 2016). The EU is generally highly competitive on cheese exports, selling to countries with strong consumer preferences for European cheeses. From 2002 to 2015, the EU exported more than 40 percent more cheese than New Zealand and the United States combined (USDA FAS, 2016c).

Shift in perception of EU dairy export prices as prevailing world prices

Traditionally, the EU dominated world exports, and European dairy export prices were considered the prevailing world prices. For example:

- A 1982 International Monetary Fund report by Anjaria, Iqbal, Kirmani, and Perez states, “World dairy prices are influenced to a considerable extent by the export subsidy levels of the world’s largest dairy exporter, the European Community.”²⁷

²⁴ Belarus, Argentina, Switzerland, and Uruguay were also significant dairy exporters in 2015.

²⁵ Throughout this report, with a few exceptions, metric units have been converted to English units because they are more commonly used in the United States.

²⁶ According to data from IFCN, milk production costs in the United States vary significantly by region. In 2012, a typical small dairy farm in New York or Wisconsin had a cost of \$23 per cwt, while a typical large farm in California had a cost of \$14 per cwt. IFCN U.S. milk cost of production estimates differ from those produced by the USDA Economic Research Service due to differences in methodology and farms surveyed. IFCN estimates for the United States are presented in this report in order to provide consistent comparisons to cost of production estimates of other countries.

²⁷ The European Community (also known as European Communities) was the forerunner to the European Union, which was founded by the Maastricht Treaty in 1993.

Table 3

European Union (28 countries) dairy product export values by trading partner and product, 2015 and 2004, in millions of constant U.S. 2015 dollars

2015							
Trading Partner	Infant formula	Cheese	SMP ¹	WMP ²	Other dairy products	Value per partner	Percent per partner
China	1,364.1	51.4	161.0	79.0	817.9	2,473.4	15.8
United States	3.5	1,004.0	1.4	7.2	308.7	1,324.8	8.5
Hong Kong	852.1	22.9	39.5	60.4	207.4	1,182.3	7.5
Saudi Arabia	301.7	165.9	59.7	54.0	260.0	841.4	5.4
Algeria	144.1	95.7	245.8	108.2	20.9	614.9	3.9
Switzerland	15.4	342.8	0.7	3.1	130.4	492.5	3.1
Japan	0.4	294.5	32.0	0.4	104.1	431.3	2.8
Egypt	75.6	98.9	128.3	18.8	86.4	408.1	2.6
United Arab Emirates	42.9	99.1	41.2	56.3	155.7	395.3	2.5
Rest of world	1,287.3	1,687.5	948.8	966.6	2,623.6	7,513.8	47.9
Value per product	4,087.3	3,862.6	1,658.5	1,354.0	4,715.2	15,677.6	100.0
Percent per product	26.1	24.6	10.6	8.6	30.1	100.0	
2004							
Trading Partner	Infant formula	Cheese	SMP ¹	WMP ²	Other dairy products	Value per partner	Percent per partner
China	11.7	5.0	24.2	1.9	111.2	154.1	1.6
United States	3.1	893.5	1.0	1.7	367.5	1,266.9	13.2
Hong Kong	49.2	10.9	1.1	0.3	50.0	111.5	1.2
Saudi Arabia	112.7	144.5	24.9	188.0	209.9	679.9	7.1
Algeria	27.5	56.2	129.5	226.1	38.6	477.8	5.0
Switzerland	8.9	282.7	1.4	1.6	68.9	363.5	3.8
Japan	0.7	304.6	1.0	0.5	134.6	441.4	4.6
Egypt	12.6	23.7	39.9	35.7	77.8	189.8	2.0
United Arab Emirates	15.6	52.1	7.2	70.3	91.5	236.7	2.5
Rest of world	828.4	1,360.7	458.4	1,125.5	1,884.5	5,657.5	59.1
Value per product	1,070.5	3,133.7	688.7	1,651.4	3,034.7	9,579.1	100.0
Percent per product	11.2	32.7	7.2	17.2	31.7	100.0	

¹ SMP includes nonfat dry milk and skim milk powder.

² WMP includes dry whole milk and whole milk powder.

Totals may not add precisely due to rounding.

Source: Global Trade Atlas.

- In a May 2004 report by the U.S. International Trade Commission (USITC), *Conditions of Competition for Milk Protein Products in the U.S. Market*, USITC’s analysis uses the USDA North European free on board (f.o.b.) SMP export price as the representative world SMP price.

Perceptions of EU dairy prices as consistently the prevailing world prices gradually changed over time, with Oceania prices, and sometimes U.S. prices, perceived as the prevailing world prices. There is not a clear demarcation as to when the situation changed. For example:

- An October 2009 report for the Innovation Center for U.S. Dairy by Bain & Company states, “As recently as the early 1990s, the European Union (EU) was the global leader in dairy trade. However, Oceania (New Zealand and Australia) has since supplanted the EU as the world’s leading dairy exporter by leveraging their low-cost position and increasingly global capabilities.”
- The July 2006 issue of *Dairy: World Markets and Trade* reported that the U.S. support price for SMP effectively set a price floor for the world at that time. When the report was published, EU exports of SMP were expected to be limited for the foreseeable future.

While European dairy prices are still an important part of the international dairy market landscape, they are no longer consistent benchmark prices for the world. The shift was largely the result of the evolution of government policies.

Government policies influencing dairy exports

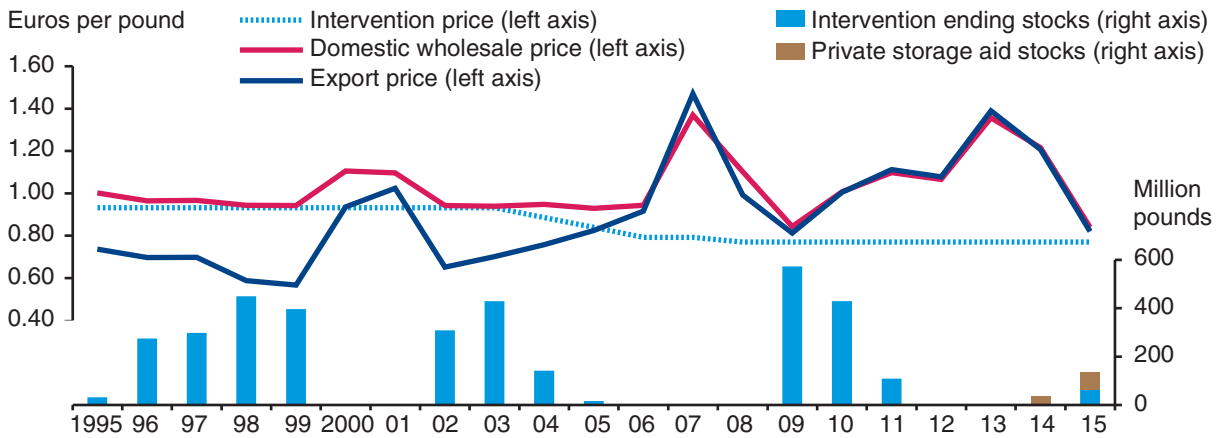
The European Union sets price floors, called intervention prices, for dairy products. The program operates similarly to the U.S. DPPSP (terminated by the 2014 Farm Act) in that producers of dairy products have the option to sell into intervention at prices set by the EU Commission. With reforms to the EU Common Agricultural Policy in 2003, dairy intervention prices were lowered in the mid-2000s (Council of the European Union, 2003). In addition to intervention prices, direct payments were made to dairy farmers. Over several years, with variation depending upon each Member State, these payments were decoupled from milk production levels as part of the EU’s comprehensive non-commodity-specific Single Payment Scheme (SPS). Since payments did not depend upon levels of production, they were much less trade distorting. Before the reforms, EU domestic-market dairy prices closely tracked intervention prices. Even after the reforms, intervention was used again in response to the exceptionally low price margins of 2009 and 2015.

In addition to dairy intervention, the EU uses a Private Storage Aid (PSA) program. Producers of dairy products can obtain financial support for storage costs. The PSA program is designed to stabilize seasonal price fluctuations by encouraging dairy processors and manufacturers to take product temporarily off the market during peak production periods. While the PSA program has been used for butter stocks for several years, it has only been used since September 2014 for SMP. Use of the PSA program since September 2014 was prompted by Russia’s ban on food imports from the EU and other selected countries (see box, “Russian Trade Ban”). Figure 18 illustrates the relationships between EU stock levels (intervention and PSA stocks) and price relationships for SMP.

The EU has significantly reduced export subsidies in recent years. A reduction in export subsidies goes hand-in-hand with a reduction in domestic support prices. With prices set at artificially high levels, prices can be supported by reducing supply to the domestic market through domestic government purchases or by subsidizing exports. The relationships among EU prices, subsidized exports, and commercial exports are illustrated in figure 19. With the exception of 2009, exports have not been subsidized since 2006, as both EU domestic market and export prices have been sufficiently

Figure 18

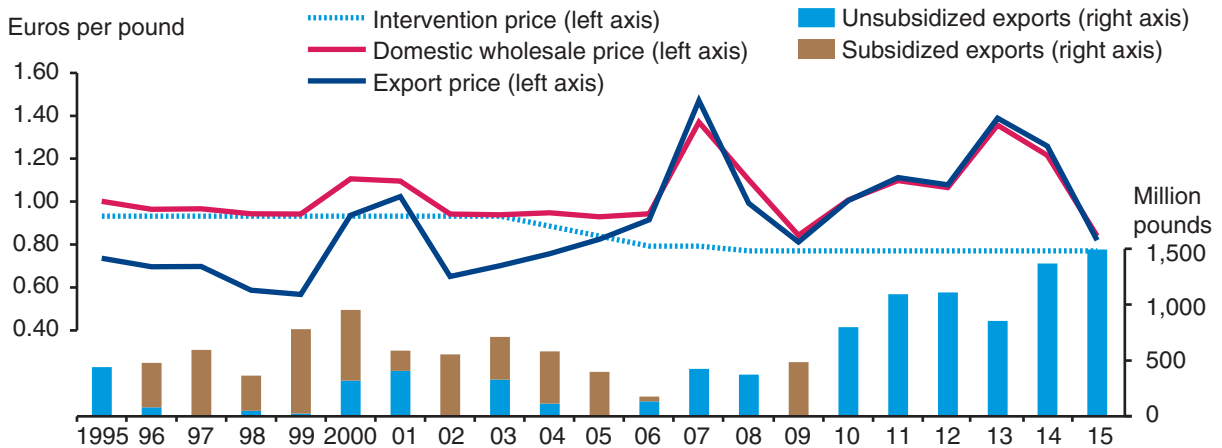
European Union skim milk powder prices and ending stocks



The export price is the midpoint of the range as reported by the USDA Agricultural Marketing Service.
 Sources: European Commission, USDA/Agricultural Marketing Service, Organisation for Economic Co-operation and Development.

Figure 19

European skim milk powder prices and exports



The export price is the midpoint of the range as reported by USDA/Agricultural Marketing Service (reported in U.S. dollars/pound) and converted to euros per pound using exchange rates from the USDA/ERS Macroeconomic Data Set.
 Sources: European Commission, USDA/Agricultural Marketing Service, Organisation for Economic Co-operation and Development.

higher than the intervention price. As subsidized exports disappeared, commercial exports became more viable.

In 1984, milk production quotas were introduced in the EU to restrict the growth in surplus production and limit growth in government spending for domestic support and export subsidies. By limiting supply, quotas generally raised prices paid by consumers and received by dairy farmers. Since prices were higher with the quotas, they improved the sustainability of the intervention program. However, production-quota systems can be maintained only if the domestic market is largely isolated from foreign supplies through TRQs or other trade constraints. Production quotas are income-generating assets, and over time the value of the assets are reflected in the cost structures of dairy farms. Eventually, it becomes less profitable, or perhaps infeasible, for dairy farmers to produce milk if they

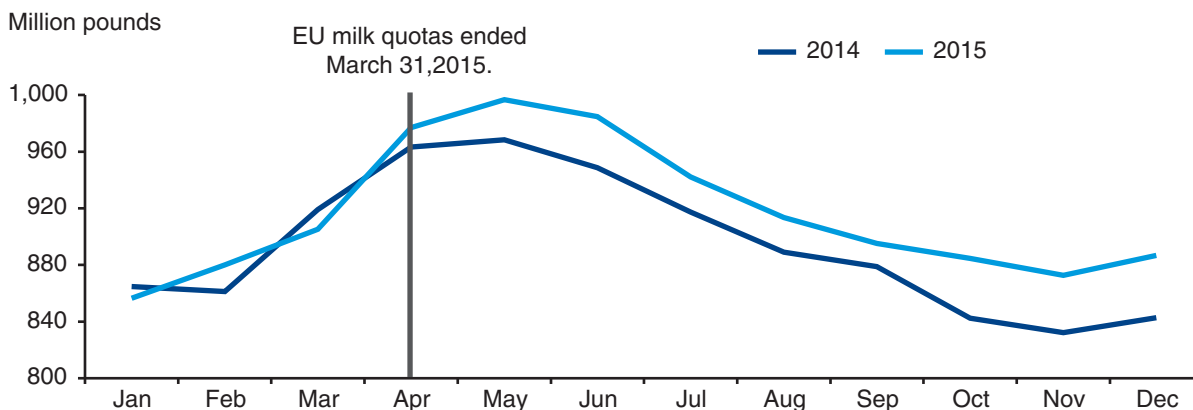
do not own quota. Thus, quotas generally provide gains for producers that initially receive quota but result in higher costs for subsequent generations (Organisation for Economic Co-operation and Development, 2005).

As domestic support and export subsidies were reduced, the need for production quotas subsided. On November 20, 2008, the EU agriculture ministers reached a political agreement on the Health Check²⁸ of the Common Agricultural Policy. The agreement increased milk quotas gradually until their abolition at the beginning of April 2015. According to the European Commission (EC), “As milk quotas will expire by April 2015 a ‘soft landing’ is ensured by increasing quotas by one percent every year between 2009/10 and 2013/14” (EC, 2009). However, after the abolition of dairy quotas, EU milk production and exports increased significantly (fig. 20).

The Russian trade ban, which began on August 6, 2014, and unfavorable economic conditions in Russia have had a substantial negative impact on EU trade with Russia. EU dairy exports to Russia fell from \$2.0 billion in 2013 to \$1.3 billion in 2014 and less than \$0.2 billion in 2015 (see box, “Russian Trade Ban”). Although Russia’s dairy imports from some other countries have increased, they have not made up for the losses from countries included in the ban. With the EU’s loss of Russia as a trading partner for most dairy products, the EU has become more competitive in other world markets, contributing to the weaker global dairy prices.

On June 23, 2016, citizens of the United Kingdom voted to leave the EU in a referendum, a situation commonly known as Brexit. Any impacts of Brexit on U.S. dairy exports are likely to be indirect, stemming from the highly uncertain effects of Brexit on global macroeconomic conditions and international trade negotiations. U.S. dairy trade between the United States and the United Kingdom is small in both directions. The United Kingdom is a net importer of dairy products, with about 99 percent of its imports by value coming from other EU countries in 2015. U.S. dairy imports from the United Kingdom are small, \$74 million in 2015 (mostly cheese).

Figure 20
European Union (EU) daily cows' milk marketings per month



Source: The European Commission.

²⁸ Health Check is “a set of measures which aims at simplifying the Common Agricultural Policy (CAP) and helping them to respond better to signals from the market and face new challenges” (European Commission, 2009).

Due to lower dairy product prices caused by high supplies, the Russian trade ban, and the slowdown in global dairy demand, the European Commission (EC) has described the EU dairy situation as “a prolonged crisis” (EC, 2016). On April 12, 2016, EC rules went into effect that allowed dairy producer organizations to set up schemes for compensating members for reducing milk supply on a temporary basis (USDA FAS, 2016a). On July 18, 2016, the EC announced a new €500 million support package. The package includes an EU-wide measure providing €150 in compensation to provide incentives for dairy farmers to reduce milk supply. It also includes a conditional adjustment aid of €350 to be allocated among EU member countries. Member countries have some flexibility in how to use the funds to support dairy farms (EC, 2016).

New Zealand

Milk supply and export conditions

New Zealand operates a pasture-based system of milk production. Cows graze on pasture all year and calve during spring, leading to a highly seasonal pattern of milk production. Output spikes during the spring (peaking in October) and is mostly converted to less-perishable products such as milk powder. The use of pasture for feed also allows milk to be produced at comparatively low cost: US\$16 per cwt for an average dairy farm compared with US\$19 per cwt for an average U.S. dairy farm²⁹ in 2012 (IFCN, 2013).

As purchased feed costs represent a relatively small proportion of costs for New Zealand dairies, principal production costs are land and labor. Land and labor costs have risen in recent years, eroding some price advantages enjoyed by New Zealand producers, although productivity has increased (IFCN, 2013). Weather continues to represent a major risk factor for producers. In years of drought, including the most recent severe drought in 2013, milk yields tend to fall due to poor fodder and farmers drying off cows earlier.³⁰ Excluding drought years and the downturn due to weak global demand in 2015, productivity has increased in recent years. From 2003/04 to 2013/14,³¹ yield per cow increased by 12.3 percent from 8,510 pounds to 9,555 pounds. With New Zealand’s pasture-based system, yields are often stated in terms of milk solids per land area, and efficiency gains in terms of land usage have exceeded efficiency gains in terms of milk per cow. From 2003/04 to 2013/14, milk solids per acre rose by 19.6 percent, from 793 to 948 pounds. From 2003/04 to 2013/14, the average dairy farm increased from 302 to 413 head (DairyNZ, 2014).

Dairy cows in New Zealand compete with beef cattle and sheep for land. As dairy production has become more profitable, land has shifted away from beef cattle and sheep into dairy. From 2002 to 2014, the beef cow inventory fell 18 percent and sheep inventory fell 25 percent, while dairy cow inventory rose 30 percent. With low returns in 2015, milk cow numbers fell by more than 3 percent in 2015 (fig. 21). Assuming that milk production recovers to resume its long-term trend, dairy conversion is likely to continue. In 2015, New Zealand milk production was 47.6 billion pounds, about 1.7 times the level of production in 2000 (USDA FAS, 2016c).

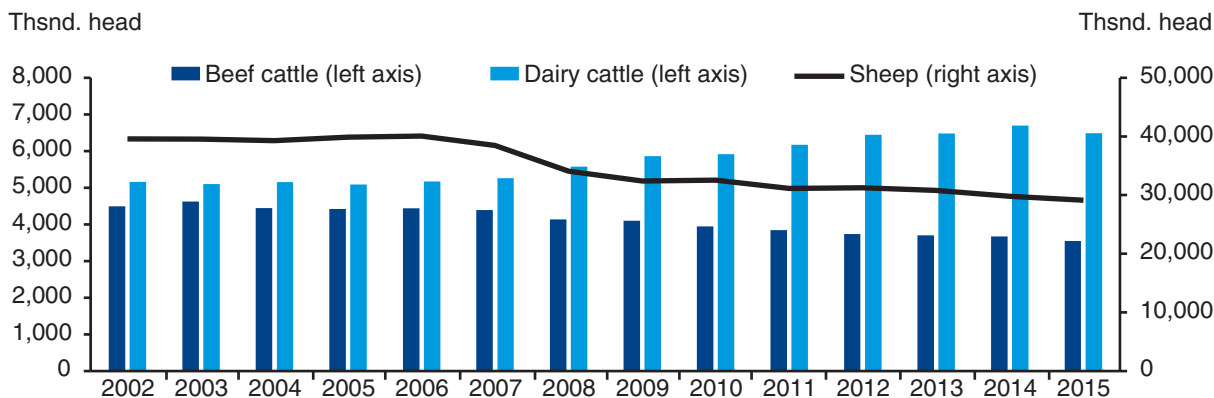
²⁹ Milk production costs vary significantly by region. In 2012, a small dairy farm in New York or Wisconsin had a cost of \$23 per cwt while larger farms in California had a cost of \$14 per cwt (IFCN, 2013).

³⁰ Droughts have a comparatively smaller effect on dry-lot dairies common in the United States, as feed can be brought from outside the production area.

³¹ The New Zealand dairy marketing year used by this source (DairyNZ) is from June 1 to May 31.

Figure 21

New Zealand cattle and sheep inventory numbers



Source: Statistics New Zealand.

New Zealand is the world’s top dairy exporting country, accounting for almost a quarter of global dairy trade value in 2015.³² Dairy contributes significantly to the overall economy of New Zealand, accounting for 28 percent of New Zealand export value in 2015 (GTA, 2016). About 95 percent of milk is exported in some form, making the industry almost entirely export-focused (Dairy Companies Association of New Zealand, 2016). Dairy export growth has been rapid, rising from about \$4.9 billion in 2004 (valued in 2015 U.S. dollars) to \$13.5 billion in 2014 before falling to \$9.5 billion in 2015 (table 4).

China was the destination for only 6.3 percent of New Zealand dairy exports by value in 2004, but in 2015, it was the top destination, with a market share of 20.0 percent (the United States is a distant second export destination for New Zealand’s dairy products). WMP accounts for the greatest share of exports to China, with the value of WMP exports increasing from \$193 million in 2004 (valued in 2015 U.S. dollars) to \$858 million in 2015.³³ A decrease in dairy demand from China (discussed in a later section) has contributed directly to a decrease in New Zealand exports in 2015. New Zealand’s dairy exports to China fell from US\$3.8 billion in 2014 to US\$1.9 billion in 2015.

Government policies influencing dairy exports

New Zealand undertook major agricultural reforms in 1984. All government supports were withdrawn as part of more general economic reforms. The Government discontinued price supports as well as capital and input subsidies. Tax, interest rate, and lending concessions were terminated. Despite the rapid institution of these changes, transitional assistance to producers was modest, limited to some debt rescheduling, exit aid, and living expense grants (Johnson, 2000).

Subsequent to reform, land values dropped by 50 percent in 4 years; however, by 1995 they had recovered to 86 percent of pre-reform levels. Dairy farm profits per hectare returned to pre-reform levels by the late 1990s. Farm sizes grew, use patterns changed, and some marginal land was retired

³² The export market share for New Zealand is based on world trade of 52 major exporting countries assembled in the Global Trade Atlas. Altogether, exports from the EU countries have been more than from New Zealand, about 35 percent of global dairy trade.

³³ In research for this report, some sources were found stating that New Zealand has a proximity advantage for exporting to China. It is notable that the distance from Auckland, New Zealand, to Beijing, China, is 6,460 miles. The distance from Los Angeles, California, to Beijing, China, is less: 6,245 miles (Google Maps, 2016).

Table 4

New Zealand dairy product export values by trading partner and product, 2015 and 2004, in millions of constant U.S. 2015 dollars

2015							
Trading Partner	WMP ¹	Butter and butterfat	Cheese	SMP ²	Other dairy products	Value per partner	Percent per partner
China	858.2	224.7	163.5	299.5	351.2	1,897.2	20.0
United States	9.1	55.4	57.5	0.7	666.3	788.9	8.3
United Arab Emirates	321.6	79.7	15.4	18.7	3.1	438.5	4.6
Australia	25.8	60.9	185.0	10.5	144.6	426.8	4.5
Japan	2.2	31.8	191.4	26.9	173.4	425.8	4.5
Malaysia	205.3	46.4	35.1	76.0	40.8	403.7	4.3
Algeria	300.7	30.2	11.9	8.4	4.3	355.4	3.8
Philippines	40.3	90.5	52.5	78.3	72.7	334.3	3.5
Rest of world	1,758.1	1,017.5	452.2	442.2	728.1	4,398.1	46.4
Value per product	3,521.4	1,637.1	1,164.4	961.3	2,184.6	9,468.8	100.0
Percent per product	37.2	17.3	12.3	10.2	23.1	100.0	
2004							
Trading Partner	WMP ¹	Butter and butterfat	Cheese	SMP ²	Other dairy products	Value per partner	Percent per partner
China	192.6	19.4	9.8	62.5	24.0	308.4	6.3
United States	9.3	75.2	125.9	2.0	360.9	573.2	11.7
United Arab Emirates	26.1	17.9	7.4	1.9	1.0	54.3	1.1
Australia	28.7	25.7	125.7	12.9	42.9	235.9	4.8
Japan	13.4	0.7	158.1	31.6	123.7	327.5	6.7
Malaysia	102.9	14.8	11.1	72.6	16.0	217.4	4.4
Algeria	59.5	1.3	6.6	8.4	2.0	77.9	1.6
Philippines	79.7	20.1	35.9	99.1	55.5	290.4	5.9
Rest of world	1,057.6	629.2	384.7	307.0	425.8	2,804.3	57.4
Value per product	1,569.9	804.3	865.4	597.9	1,051.9	4,889.5	100.0
Percent per product	32.1	16.5	17.7	12.2	21.5	100.0	

¹ WMP includes dry whole milk and whole milk powder.

² SMP includes nonfat dry milk and skim milk powder.

Totals may not add precisely due to rounding.

Source: Global Trade Atlas.

(Allan and Kerr, 2014 and Vitalis, 1987). In recent years, New Zealand dairy-farm land prices have exhibited volatility resulting from variability of international dairy product prices. Over the last decade, New Zealand farmland prices, in general, have risen by 54 percent. Dairy farms have lead the way, with land prices rising from about NZ\$9,100 per acre in 2005 to NZ\$15,700 per acre in 2015, exhibiting volatility over the period (ANZ Bank of New Zealand Ltd, 2016).

The New Zealand Dairy Board Act of 1961 granted a state trading enterprise (STE), the New Zealand Dairy Board (NZDB), authority to operate as the single-desk monopoly dairy-export entity for New Zealand. New Zealand dairy cooperatives owned NZDB in proportion to their supply of products to the NZDB. WTO member countries have recognized the potential of STEs to distort world trade through price discrimination and have thus required STEs to operate in accordance with commercial considerations.

In a June 1996 investigation of STEs, including NZDB, the U.S. Government Accounting Office (GAO) found that NZDB commanded about 25 percent of world dairy trade at the time. According to the report, NZDB's statutory monopoly control over dairy exports did not allow the organization to cross subsidize exports from domestic sales since NZDB did not have control over the domestic market. However, NZDB's size and monopoly purchasing authority allowed it to benefit from economies of scale and market power. NZDB benefited from a network of international subsidiaries, giving it particular advantages in markets restricted by quotas. GAO did not have sufficient data to determine if NZDB had the ability to differentiate pricing in foreign markets.

Faced with internal and external pressures, New Zealand took steps in the early 2000s to restructure its dairy industry. New Zealand's Dairy Industry Restructuring Act (DIRA) of 2001 authorized the merger of NZDB with two large dairy cooperatives accounting for about 95 percent of New Zealand milk production, Kiwi Cooperative and the New Zealand Dairy Group. The company formed from this merger became Fonterra Cooperative Ltd. (Fonterra). The Dairy Industry Restructuring Act of 2001 ended the official monopoly status that had existed with NZDB by removing "restrictions on the export of dairy products except for exports to designated markets."

Although the act ended NZDB's statutory monopoly status, Fonterra maintained temporary exclusive rights to export to certain dairy products to "designated markets," including Canada, the European Communities, the United States, Japan, and the Dominican Republic. Fonterra's exclusive access to these export quotas varied by market, with expiration dates scheduled from 2007 to 2010 (USDA FAS, 2008). Fonterra has grown considerably since its creation, but its share of the New Zealand milk supply has fallen from about 96 percent in 2001/02 to about 85 percent in 2014/15 (Commerce Commission, New Zealand, 2016).

The New Zealand-China Free Trade Agreement (FTA) has contributed to the rise in New Zealand's exports to China. The agreement became effective in October 2008. Specifically for dairy, tariffs for milk formula, casein, yogurt, and whey were scheduled to be phased out over 5 or 6 years. Tariffs on butter and liquid milk were to be phased out over 10 years, and tariffs on milk powders were to be phased out over 12 years (New Zealand Ministry of Foreign Affairs and Trade, 2008). While the FTA has played a role in the higher imports of WMP, much of the increase in China's dairy imports may be attributed to a 2008 dairy safety scandal in China, discussed in a later section.

Australia

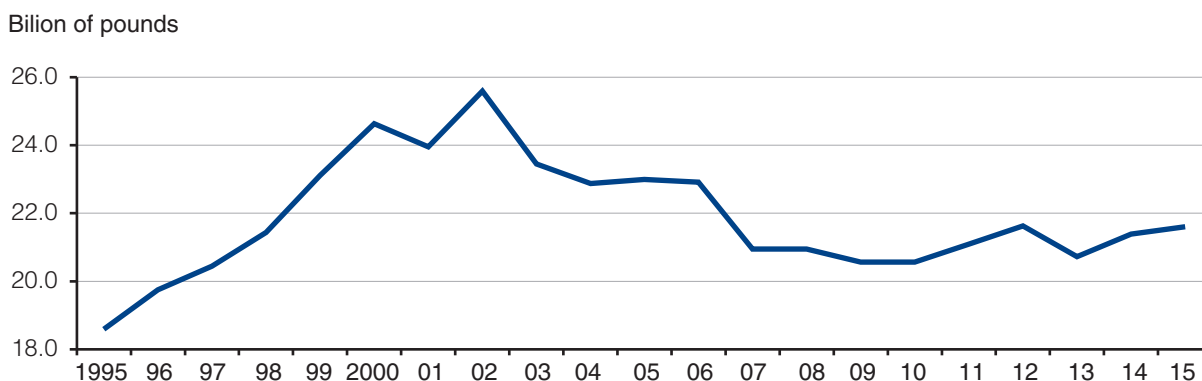
Milk supply and export conditions

Australia's dairy industry shares many features with New Zealand, including a pasture-based system and low domestic consumption relative to production. Yields typically reach a peak during October with spring calving, moderate throughout the summer, and bottom out during the winter months when cows dry off. Because of the reliance on grass for feed (70 to 75 percent feed needs are met by grazing), production is highly sensitive to weather (Dairy Australia, 2013). In drought years, reduced forage can lead to precipitous declines in milk yields as farmers dry off cows sooner and culling rates increase, leading to a smaller dairy herd.

Most dairy farming is in the Southeast part of the country, although there are dairy operations in other areas. From the middle of the 1990s through the late 2000s, Southeast Australia experienced a severe “millennial” drought.³⁴ For dairy farming, the drought was particularly severe during the production season of July 2002 to June 2003 (Dairy Australia, 2013). Australian milk production reached a peak of 25.6 billion pounds in 2002 and trended downward to a low point of 20.6 billion pounds in 2009 (fig. 22). Milk production recovered from the 2009 low point, but drought again contributed to a setback in 2013 (USDA FAS, 2014a). Milk production was 21.6 billion pounds in 2015 (USDA FAS, 2016c).

With lower milk production in 2015 compared to 2004, Australia was not able to meet the growing demand of its dairy export customers to the same extent as its competitors (table 5). The value of Australia's dairy exports dropped by 15 percent over the period, compared with approximate increases of more than 160 percent, nearly double, and about triple for the EU, New Zealand, and the United States, respectively. The allocation of dairy exports among trading partners changed significantly over the period. China received 16.1 percent of Australia's dairy exports in 2015 compared to 2.7 percent in 2004. Japan was Australia's top buyer in 2015, but Australia's dairy exports to Japan declined slightly compared to 2004.

Figure 22
Australia milk production



Source: USDA/Foreign Agricultural Service.

³⁴ Since there is not a universal drought definition, there is not agreement among sources as to the exact period of the drought.

Table 5

Australia dairy product export values by trading partner and product, 2015 and 2004, in millions of constant U.S. 2015 dollars

2015							
Trading Partner	Cheese	SMP ¹	WMP ²	Fluid milk and cream	Other dairy products	Value per partner	Percent per partner
Japan	328.8	14.3	0.0	0.5	30.9	374.5	19.1
China	58.0	49.1	34.9	57.2	115.3	314.4	16.1
Singapore	25.3	36.2	28.5	28.4	37.6	156.0	8.0
Indonesia	14.0	110.3	4.8	1.1	12.7	142.9	7.3
Malaysia	33.8	41.0	8.5	13.7	27.4	124.3	6.3
Rest of world	193.8	228.6	139.7	61.0	223.6	846.7	43.2
Value per product	653.7	479.4	216.5	161.9	447.5	1,958.9	100.0
Percent per product	33.4	24.5	11.0	8.3	22.8	100.0	
2004							
Trading Partner	Cheese	SMP ¹	WMP ²	Fluid milk and cream	Other dairy products	Value per partner	Percent per partner
Japan	334.6	10.4	4.7	8.3	75.5	433.5	18.8
China	10.1	20.3	7.7	1.2	22.0	61.3	2.7
Singapore	11.1	49.5	30.6	15.7	34.5	141.4	6.1
Indonesia	21.0	31.2	40.6	3.2	23.7	119.6	5.2
Malaysia	11.1	46.0	93.2	10.3	11.8	172.4	7.5
Rest of world	415.7	225.2	335.0	140.7	267.1	1,383.7	59.9
Value per product	803.6	382.6	511.7	179.4	434.6	2,311.9	100.0
Percent per product	34.8	16.5	22.1	7.8	18.8	100.0	

¹ SMP includes nonfat dry milk and skim milk powder.

² WMP includes dry whole milk and whole milk powder.

Totals may not add precisely due to rounding.

Source: Global Trade Atlas.

Government policies influencing dairy exports

The Australia dairy industry became unregulated with respect to milk and dairy product prices on July 1, 2000. Previously, the Australian dairy industry had been regulated through National and State policies. Details varied from one State to the next, but the use of production quotas and pooling arrangements for sourcing drinking milk were common. A review by Victoria State in the late 1990s found that public costs of the regulations exceeded public benefits, and dairy farmer and manufacturing representatives supported removing the regulations. Other States, realizing that their own regulations would be unsustainable if Victoria deregulated, agreed that it would be best for the Australian Government to deregulate the industry and develop a restructuring package. An adjustment program was instituted to assist dairy farmers and communities impacted by deregulation. A consumer levy was imposed to pay for the adjustment program (Harris, 2007).

Australia has entered into several FTAs over the years. The U.S.-Australia FTA went into effect in 2005. Australia's access to the U.S. dairy market has been gradually liberalized since the agree-

ment became effective. The FTA established additional TRQs for Australia, with the TRQ quantities increased each year. The agreement also eliminated U.S. tariffs for in-quota imports, but over-quota imports face the same normal trade relation rates as most other WTO countries. After 20 years, either country may request consultations with the other to review dairy market access. Since U.S. dairy exports to Australia entered without restrictions even before the FTA, the agreement does not have any direct effects on U.S. dairy trade flows to Australia (USITC, 2004b). For the most part, since the agreement was established, U.S. dairy imports from Australia have been lower than TRQ levels. While U.S. dairy imports from Australia were \$67 million in 2015 (mostly casein products and cheese), U.S. dairy exports to Australia were \$135 million (mostly cheese).

Australia entered into an FTA with South Korea on December 12, 2014. Under the agreement, South Korea allows duty-free quotas for cheese, butter, and infant formula. High tariffs on many products will be eliminated by 2033 (Australian Government, Department of Foreign Affairs and Trade (AUS DFAT), 2016b). Australia entered into an agreement with Japan on January 15, 2015. Japan's tariff reductions include halving of the 40 percent tariff on processed cheese over a 10-year period and reductions for other cheese types. In addition, tariffs on lactose and milk-protein concentrates will be eliminated (USDA FAS, 2015a). The China-Australia FTA became effective on December 20, 2015. Under the agreement, China will gradually eliminate all tariffs on Australian dairy products between 2019 and 2026. At the time of the agreement, tariffs on some dairy products were as much as 20 percent (AUS DFAT, 2016a).

Principal Markets for U.S. Dairy Product Exports

The United States exported dairy products to over 140 countries in 2015. The following section highlights specific markets that have accounted for the greatest share of U.S. dairy product exports in recent years.

Mexico

From 2004 to 2015, Mexico's milk production grew 19 percent (USDA FAS, 2016c). The growth of milk production has been the result of improved genetics and dairy management practices rather than herd expansion. High-end technology and integrated farms are located in northern and central areas while farms in southern areas rely on cattle grazing in pasturelands (USDA FAS, 2014c).

From 2004 to 2015, Mexico's consumption of major dairy products grew more quickly than its milk production. The increase in dairy consumption can be attributed to higher income and greater availability due to improvements in cold chains and growth in the supermarket sector. From 2004 to 2015, domestic consumption of cheese, butter, and SMP domestic rose by 83, 63, and 114 percent, respectively (USDA FAS, 2016c). Fluid milk consumption differs by region. While northern Mexico consumes mostly fresh milk, UHT³⁵ milk is widely consumed in the central region, and southern Mexico consumes mostly powdered milk or UHT milk due to lack of refrigeration. LICONSA, a government parastatal that runs a nutrition program providing subsidized milk to disadvantaged families, has historically been one of Mexico's top importers of milk powder. In recent years, LICONSA has taken steps to purchase larger quantities of domestic fluid milk in lieu of imports (USDA FAS, 2014c).

Imports have helped Mexico meet its rapid growth in consumption. In 2015, Mexico imported dairy products valued \$1.8 billion (table 6), a 34 percent increase from \$1.3 billion in 2004 (valued in 2015 U.S. dollars). In 2015, imported dairy products from the United States were valued at \$1.2 billion, 65.9 percent of Mexico's dairy import value. SMP made up the largest share of Mexico's dairy-product import value (34.6 percent in 2015). The U.S. market share of Mexico's SMP imports was 84.9 percent in 2015. After SMP, cheese was the second-highest product imported by value, with the United States accounting for 75.7 percent of the import value. Imports from New Zealand and the EU were also substantial in 2015, especially for butterfat and casein products.

The North American Free Trade Agreement (NAFTA), implemented in 1994, played a key role in the increase of U.S. dairy trade to Mexico. Some trade restrictions on U.S. products to Mexico were eliminated immediately upon implementation, while others were phased out over periods of 4, 9, or 14 years. The TRQ on SMP was eliminated in 2008 after a 14-year phase-out period.

Canada

Canada's growth of dairy product imports has been moderate compared to Mexico and China. Unlike Mexico, trade barriers and tariffs were not liberalized through NAFTA since Canada excluded dairy from the FTA. The dairy industry in Canada has operated under a supply management system since the early 1970s. The Canadian Dairy Commission oversees a framework for dairy management, a jurisdiction shared by the Federal Government and the provinces. The system

³⁵ Ultra-high temperature (UHT) milk is a shelf-stable fluid milk product that does not need refrigeration until the container has been opened.

Table 6

Mexico dairy product import values by trading partner and product, 2015 and 2004, millions of constant U.S. 2015 dollars

2015							
Trading Partner	SMP ¹	Cheese	Butter and butterfat	Casein products	Other dairy products	Value per partner	Percent per partner
United States	521.2	380.1	6.3	2.7	257.4	1,167.7	65.9
EU-28	52.7	54.8	3.6	51.2	88.8	251.1	14.2
New Zealand	8.3	16.2	112.4	69.3	15.1	221.4	12.5
Uruguay	8.9	35.3	2.3	3.6	13.6	63.7	3.6
Rest of world	22.6	16.0	8.4	0.6	20.7	68.3	3.9
Value per product	613.7	502.4	133.1	127.6	395.5	1,772.3	100.0
Percent per product	34.6	28.3	7.5	7.2	22.3	100.0	
2004							
Trading Partner	SMP ¹	Cheese	Butter and butterfat	Casein products	Other dairy products	Value per partner	Percent per partner
United States	246.6	119.0	3.5	20.3	174.3	563.7	42.8
EU-28	31.8	36.2	88.4	51.2	52.5	260.1	19.7
New Zealand	51.1	29.0	67.5	26.9	73.9	248.4	18.8
Uruguay	5.1	32.1	4.6	0.0	20.3	62.1	4.7
Rest of world	16.1	64.2	17.8	11.5	74.2	183.8	13.9
Value per product	350.7	280.5	181.9	109.9	395.2	1,318.2	100.0
Percent per product	26.6	21.3	13.8	8.3	30.0	100.0	

¹ SMP includes nonfat dry milk and skim milk powder.

² MPC stands for milk protein concentrate.

Totals may not add precisely due to rounding.

Source: Global Trade Atlas.

is characterized by high support prices for milk and products (consistently above world prices), milk supply quotas, and severe import restrictions. Milk production quotas, set by provincial milk marketing boards, have been relatively stable.

From 2004 to 2015, the value of Canada's imports increased from \$671 million (valued in 2015 dollars) to \$742 million (table 7). The United States is the leading supplier of imports, accounting for 57.5 percent of dairy imports in 2015. Cheese accounted for the greatest value of imports, with imports from the United States ranking second behind the European Union. While the United States was the leading supplier of infant formula and whey products, New Zealand was the leading supplier of butterfat products, and the EU provided the highest value of other dairy products.

Although U.S. dairy product exports to Canada increased significantly, growth continues to be constrained by TRQs. For example, the in-quota rate for most types of cheddar cheese is C\$0.0151 per pound while the over-quota rate is the lesser of 245.5 percent or C\$1.624 per pound (Government of Canada, Canada Border Service Agency, 2015). Canada recently negotiated the Comprehensive Economic and Trade Agreement (CETA) with the EU. The agreement would grant the EU additional access for cheese. To become effective, Canada and the EU must ratify the agreement. If approved,

Table 7

Canada dairy product import values by trading partner and product, 2015 and 2004, millions of constant U.S. 2015 dollars

2015							
Trading Partner	Cheese	Infant formula	Whey products	Butter and butterfat	Other dairy products	Value per partner	Percent per partner
United States	68.2	148.1	122.8	12.7	75.1	426.7	57.5
EU-28	135.3	17.9	2.8	7.9	19.1	183.0	24.7
New Zealand	0.2	0.0	3.9	32.5	15.1	51.7	7.0
Rest of world	39.2	0.9	1.3	3.4	35.3	80.2	10.8
Value per product	242.8	166.9	130.8	56.4	144.7	741.8	100.0
Percent per product	32.7	22.5	17.6	7.6	19.5	100.0	
2004							
Trading Partner	Cheese	Infant formula	Whey products	Butter and butterfat	Other dairy products	Value per country	Percent per partner
United States	31.4	80.1	49.7	11.6	46.1	218.9	32.6
EU-28	140.4	17.9	2.0	13.3	82.2	255.8	38.1
New Zealand	3.6	0.0	2.3	35.9	95.6	137.4	20.5
Rest of world	33.2	0.2	2.9	13.1	9.4	58.8	8.8
Value per product	208.7	98.2	56.8	73.9	233.3	670.9	100.0
Percent per product	31.1	14.6	8.5	11.0	34.8	100.0	

Totals may not add precisely due to rounding.

Source: Global Trade Atlas.

Canada would accept over a hundred geographical indications (GIs),³⁶ restricting use of names such as asiago and feta. Canadian manufacturers currently using the names would have a grandfathered right to use them without any qualifiers, but new Canadian producers of such cheeses would be required to use qualifiers such as “style” or “kind” (USDA FAS, 2014b).

China

China initiated dramatic economic reforms in 1978 and has since transitioned from a rigid centrally planned economy to a more decentralized, market-based economy. China officially acceded to the WTO in December 2001 and, as a result, made a number of changes to its domestic support, export subsidies, and market access policies. For dairy products, tariffs were reduced over a 5-year period. Even before China became a WTO member, it had been in the process of reducing tariffs, eliminating import and export licenses for many products, and eliminating government trading monopolies (Shane and Gale, 2004). Perhaps the greatest consequence to dairy markets of China’s WTO membership is its contribution to China’s economic growth and purchasing power. Although there is no precise way to determine how much China’s WTO membership has contributed to its economic growth, it is worth noting that China’s GDP, adjusted for inflation (in constant 2010 U.S. dollars), grew from \$2.4 billion in 2001 to \$8.2 billion in 2014, about 3.4-fold growth over the period (USDA

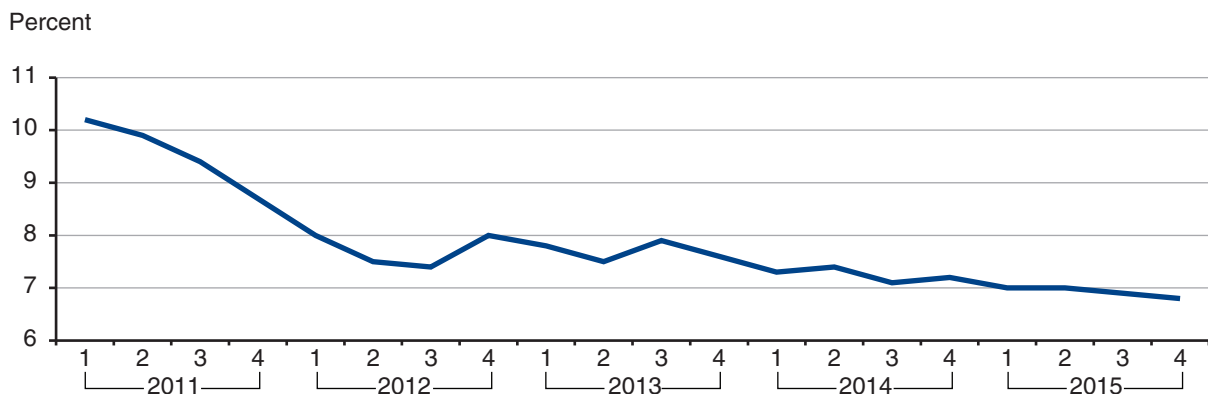
³⁶ Geographical indication is defined by the World Intellectual Property Organization as “a sign used on products that have a specific geographical origin and possess qualities or a reputation that are due to that origin.” Geographical indications prevent third parties that do not conform to the standards from using the indication.

ERS, 2016a). However, in 2015, China's GDP continued to grow, but at a substantially slower rate (fig 23).

Strong consumer demand in China has encouraged milk production expansion. Government programs, such as the China School Milk Program initiated in 2000, have promoted greater milk consumption. However, domestic milk production is constrained by lack of land, labor, and forage (Gale, Hansen, and Jewison, 2015). China has a substantial dairy herd, 8.4 million head in 2015 (lower than the United States, at 9.3 million head), but production has stagnated as entry of commercial-scale farms barely offset the rapid exit of small-scale operators triggered by rising off-farm wages and strict regulatory requirements. Chinese companies have made investments in processing and farms, including a number of overseas investments to secure future supplies of imported milk.

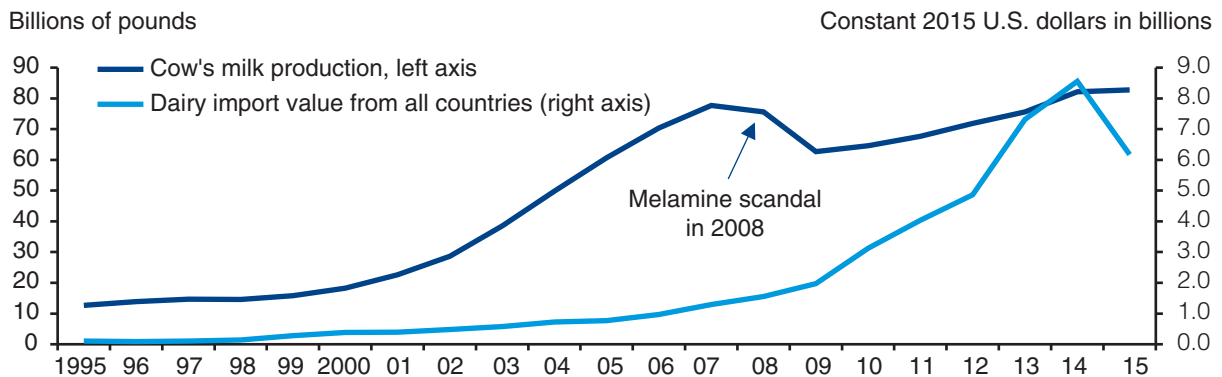
In 2008, the discovery of melamine contamination in domestically produced infant formula reduced consumer confidence in domestic milk products and led to stricter regulation of China's dairy sector. Due to tighter regulations and loss of consumer confidence, milk production decreased, contributing to an increase in imports. China's milk production did not recover to its 2007 level until 2014 (fig. 24).

Figure 23
China GDP year-over-year growth rate



Source: National Bureau of Statistics of China.

Figure 24
China milk production and dairy import value



Sources: USDA/Foreign Agricultural Service, Global Trade Atlas, U.S. Bureau of Labor Statistics.

Chinese imports of dairy products rose from \$727 million in 2004 (valued in 2015 U.S. dollars) to \$8.5 billion in 2014 before falling to \$6.2 billion in 2015 (fig. 24 and table 8). The slower growth of China's GDP in 2015 likely contributed to the reduction in dairy import demand (fig. 23). In the second quarter of 2014, the annual growth rate for GDP in China was 7.4 percent. By the fourth quarter of 2015, it had fallen to 6.8 percent. Another contributing factor was an accumulation of WMP stocks. Since WMP is one of China's main import products, the rise in WMP stocks to 661 million pounds at the beginning of 2015 (more than twice 2014 beginning stocks) had a substantial impact on China's dairy imports (fig. 25).

Imports from the European Union accounted for 45.7 percent of China's total dairy imports in 2015, followed by New Zealand at 33.0 percent and the United States at 7.8 percent. Imports of infant formula accounted for the greatest share of China's dairy import value, with the EU accounting for 72.4 percent of infant formula imports. WMP ranked second by value, with New Zealand as the leading supplier. While accounting for a small share of infant formula and WMP, the United States was second behind the EU for imports of whey products. According to an FAS report from 2013,

Table 8
China dairy product import values by trading partner and product, 2015 and 2004, millions of constant U.S. 2015 dollars

2015							
Trading Partner	Infant formula	WMP ¹	Whey products	SMP ²	Other dairy products	Value per partner	Percent per partner
EU-28	1,822.2	27.4	348.9	104.7	516.9	2,820.1	45.7
New Zealand	195.5	898.0	25.9	299.4	618.7	2,037.5	33.0
United States	74.5	7.0	224.2	52.4	126.1	484.1	7.8
Australia	150.9	49.1	17.0	57.6	148.4	423.0	6.9
Rest of world	275.0	8.3	46.4	3.1	73.2	405.9	6.6
Value per product	2,518.1	989.7	662.3	517.2	1,483.2	6,170.5	100.0
Percent per product	40.8	16.0	10.7	8.4	24.0	100.0	
2004							
Trading Partner	Infant formula	WMP ¹	Whey products	SMP ²	Other dairy products	Value per partner	Percent per partner
EU-28	17.6	5.0	88.6	23.2	29.0	163.4	22.5
New Zealand	34.1	188.5	5.2	66.4	51.0	345.2	47.5
United States	0.3	0.7	40.8	10.5	15.8	68.1	9.4
Australia	4.7	12.7	18.7	24.0	15.0	75.1	10.3
Rest of world	54.7	0.8	4.1	8.0	7.2	74.9	10.3
Value per product	111.4	207.7	157.4	132.1	118.1	726.7	100.0
Percent per product	15.3	28.6	21.7	18.2	16.2	100.0	

¹ WMP includes dry whole milk and whole milk powder.

² SMP includes nonfat dry milk and skim milk powder.

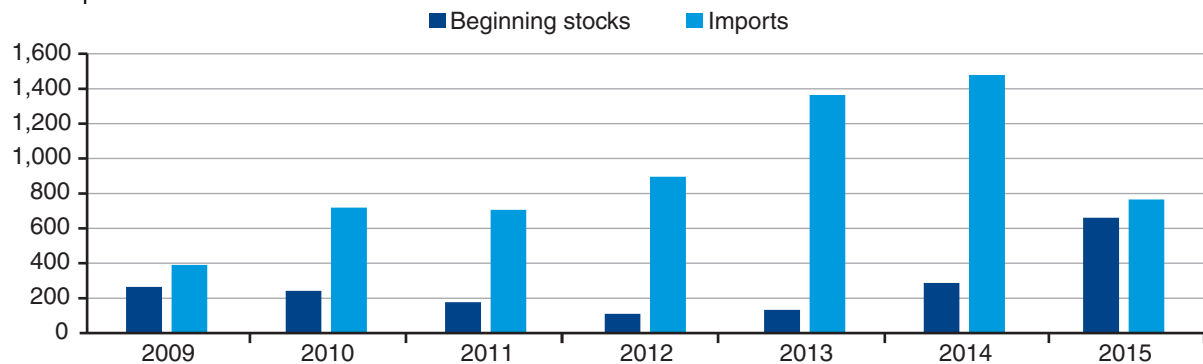
Totals may not add precisely due to rounding.

Source: Global Trade Atlas.

Figure 25

China whole milk powder beginning stocks and imports

Million pounds



Source: USDA/Foreign Agricultural Service.

about half of the protein-product imports at that time were estimated to be used as livestock feed, mainly incorporated into piglet feedlots (USDA FAS, 2013).

South Korea

South Korea has a moderate-sized dairy industry that supplies the country's fluid milk needs. In 2015, 69.5 percent of domestic milk production was consumed as fluid milk (USDA FAS, 2016c). The remainder available for processing is far below the volume required to meet demand; therefore, a large proportion of dairy products consumed in South Korea must be imported. For example, only about 18.5 percent of cheese consumption in 2015 was domestically produced (USDA FAS, 2016c). As in other high-income countries, demand for fluid milk has stabilized, and total fluid milk consumption has been relatively flat since 2004. Increased dairy demand comes mostly from higher consumption of value-added dairy products, including cheese, yogurt, and processed foods that contain milk ingredients (USDA FAS, 2014d).

From 2004 to 2015, the value of South Korean dairy imports more than doubled, from \$374 million (valued in 2015 U.S. dollars) to \$927 million (table 9). Cheese was the product with the greatest import value in 2015, accounting for 54.2 percent of the total. The United States, with a 50 percent share by value, was the leading supplier of cheese. Soft cheese is much more popular in South Korea than hard cheese, with domestic soft cheese sales growing 14 percent in 2014. Sales of shredded mozzarella for pizza make up a large proportion of the soft cheese sales (USDA FAS, 2015b). Following cheese imports were imports of SMP, whey products, and casein products. The United States ranked second, behind the EU, for imports of SMP and whey products, but it was not a significant supplier of casein products.

A free trade agreement (FTA) between South Korea and the United States was initiated in 2012. South Korea's preferential TRQs for the United States have allowed greater U.S. dairy exports. For example, under the agreement, South Korea's TRQ for cheese allowed 15.4 million pounds in cheese imports from the United States to be imported duty-free, while over-quota imports had a tariff of 33.6 percent. By 2015, the duty-free quota had grown to 16.9 million pounds while over-quota imports had a tariff of 26.4 percent. Over-quota tariffs on cheddar cheese will be eliminated after the 10th year of the agreement, and over-quota tariffs on all other cheeses will be eliminated over 15 years (USDA FAS, 2014d). South Korea's total cheese imports from the United States have exceeded

Table 9

South Korea dairy product import values by trading partner and product, 2015 and 2004, millions of constant U.S. 2015 dollars

2015							
Trading Partner	Cheese	Whey products	Infant formula	Casein products	Other dairy products	Value per partner	Percent per partner
EU-28	148.6	34.3	35.5	32.4	136.2	387.0	41.8
United States	250.7	27.9	2.9	1.4	36.4	319.4	34.5
New Zealand	63.6	1.2	19.5	19.8	21.8	126.0	13.6
Australia	32.7	0.8	7.5	0.2	28.9	70.1	7.6
Rest of world	6.1	9.4	0.5	1.3	6.8	24.0	2.6
Value per product	501.7	73.7	65.9	55.1	230.2	926.6	100.0
Percent per product	54.2	7.9	7.1	5.9	24.8	100.0	
2004							
Trading Partner	Cheese	Whey products	Infant formula	Casein products	Other dairy products	Value per partner	Percent per partner
EU-28	27.0	15.0	4.4	15.9	53.1	115.4	30.9
United States	25.9	17.2	2.7	0.0	10.4	56.2	15.0
New Zealand	46.3	4.9	14.0	22.2	10.0	97.4	26.0
Australia	40.5	2.3	0.0	3.9	23.9	70.6	18.9
Rest of world	11.1	2.2	0.3	1.2	19.5	34.4	9.2
Value per product	150.8	41.6	21.5	43.2	116.9	373.9	100.0
Percent per product	40.3	11.1	5.7	11.5	31.3	100.0	

Totals may not add precisely due to rounding.

Source: Global Trade Atlas.

the FTA TRQ amounts each year, growing from 70.3 million pounds in 2012 to 140.8 million pounds in 2014, before falling to 120.9 million pounds in 2015 (GTA, 2016).

Japan

Japan, like South Korea, produces enough milk for drinking use but not enough for all processing needs. Japan imports significant quantities of dairy products in order to make up for the shortfall. Due to high land, feed, and labor costs, milk production costs in Japan are among the highest in the world, at \$58 per hundredweight (cwt) in 2012 compared to \$19 per cwt in the United States (IFCN, 2013). Supply controls and price supports have been in place in some form since 1962 in order to limit price volatility (Obara, Dyck and Stout, 2005). TRQs protect the domestic industry from less expensive foreign products by limiting the volume of imports. Dairy plays a limited role in traditional cuisine, but consumption is more prominent in Japan than in other Asian countries. Since 2000, per capita GDP growth averaged about 0.7 percent per year. Sluggish economic growth, accompanied by an aging and declining population, has limited dairy consumption.

The value of Japan's dairy imports has grown from \$1.4 billion in 2004 (valued in 2015 U.S. dollars) to \$1.7 billion in 2015 (table 10). Although the EU was the largest supplier in 2004 (35.4 percent),

Table 10

Japan dairy product import values by trading partner and product, 2015 and 2004, millions of constant U.S. 2015 dollars

2015							
Trading Partner	Cheese	Whey products	SMP ¹	Casein products	Other dairy products	Value per partner	Percent per partner
EU-28	297.5	52.0	36.4	35.2	70.0	491.0	28.2
New Zealand	222.5	60.6	60.9	84.1	53.8	481.9	27.7
Australia	333.3	19.5	19.8	0.0	9.7	382.2	22.0
United States	176.6	57.7	10.4	0.5	49.7	294.8	16.9
Rest of world	21.5	19.3	0.9	0.8	47.0	89.6	5.1
Value per product	1,051.3	209.1	128.3	120.6	230.1	1,739.5	100.0
Percent per product	60.4	12.0	7.4	6.9	13.2	100.0	
2004							
Trading Partner	Cheese	Whey products	SMP ¹	Casein products	Other dairy products	Value per partner	Percent per partner
EU-28	329.2	56.0	2.3	39.2	81.4	508.0	35.4
New Zealand	160.5	23.5	23.6	67.1	27.3	301.9	21.0
Australia	324.9	10.7	3.5	17.0	43.3	399.4	27.8
United States	37.9	35.1	33.4	0.8	52.0	159.3	11.1
Rest of world	27.4	4.5	22.7	0.6	11.9	67.1	4.7
Value per product	879.9	129.8	85.5	124.7	215.9	1,435.8	100.0
Percent per product	61.3	9.0	6.0	8.7	15.0	100.0	

¹ SMP includes nonfat dry milk and skim milk powder.

Totals may not add precisely due to rounding.

Source: Global Trade Atlas.

the EU share has declined to 28.2 percent in 2015, while shares for New Zealand and the United States have increased to 27.7 percent and 16.9 percent, respectively. Australia's share fell from 27.8 percent to 22.0 percent over the same period.

The Philippines

The dairy industry of the Philippines is very small, currently supplying less than 1 percent of its growing market. The Philippines has one of the highest population growth rates in Asia, and its economy has experienced robust growth, with GDP growth of about 6 percent per year from 2010 through 2015 (World Bank, 2016, adjusted for inflation in Philippine currency). As the cold chain expands—in distribution and retail—more types of dairy products can be sold. The Philippines has relatively low tariffs on dairy product imports (7 percent on yogurt, butter, dairy spreads, and certain types of cheese; and 1 or 3 percent for other types of dairy products), and there are no quotas on imports (USDA FAS, 2015c).

From 2004 to 2015, Philippine imports of dairy products grew from \$698 million (valued in 2015 U.S. dollars) to \$775 million (table 11). In 2015, SMP comprised 33.6 percent of Philippine dairy imports by value. The Philippines also imported substantial quantities of cheese, butter and butterfat

Table 11

Philippines dairy product import values by trading partner and product, 2015 and 2004, millions of constant U.S. 2015 dollars

2015							
Trading Partner	SMP ¹	Cheese	Butter and butterfat	Whey products	Other dairy products	Value per partner	Percent per partner
New Zealand	72.3	46.6	72.1	4.5	72.7	268.2	34.6
United States	92.2	13.8	0.1	32.0	29.2	167.4	21.6
EU-28	57.8	7.8	3.2	19.7	56.2	144.7	18.7
Australia	27.6	10.9	1.9	2.0	18.5	60.9	7.9
Rest of world	11.0	6.9	2.8	13.3	100.1	134.1	17.3
Value per product	260.9	86.1	80.1	71.4	276.8	775.4	100.0
Percent per product	33.6	11.1	10.3	9.2	35.7	100.0	
2004							
Trading Partner	SMP ¹	Cheese	Butter and butterfat	Whey products	Other dairy products	Value per partner	Percent per partner
New Zealand	93.6	34.8	18.6	0.2	117.8	264.9	38.0
United States	47.9	2.0	0.0	10.1	6.6	66.6	9.6
EU-28	24.1	1.8	5.5	12.3	65.3	109.0	15.6
Australia	98.0	11.8	2.8	12.1	43.2	167.9	24.1
Rest of world	10.4	0.9	1.0	3.8	73.0	89.1	12.8
Value per product	274.0	51.3	27.9	38.4	305.9	697.6	100.0
Percent per product	39.3	7.4	4.0	5.5	43.9	100.0	

¹ SMP includes nonfat dry milk and skim milk powder.
Totals may not add precisely due to rounding.
Source: Global Trade Atlas.

products, and whey products. While the United States was the leading supplier of SMP and whey products to the Philippines, it was behind New Zealand in exports of cheese and was not a significant supplier of butter and butterfat products.

Other Southeast Asia countries

While the Philippines was the largest Southeast Asia³⁷ destination for U.S. dairy exports in 2015, other Southeast Asia countries have had large and growing dairy imports. In 2004, U.S. dairy exports to Indonesia, Vietnam, and Malaysia totaled \$125 million altogether (valued in 2015 U.S. dollars). In 2015, the value of U.S. exports to these countries was \$463 million, 3.7 times more than the 2004 value. The increase in U.S. exports to these three countries over the period is reflective of the rapid growth in annual GDP for these countries: 5.6 percent for Indonesia, 6.4 percent for Vietnam, and 5.1 percent for Malaysia (World Bank, 2016, adjusted for inflation in local currencies). In 2015, SMP made up the greatest value of U.S. dairy imports for these countries at \$278 million. Whey products made up a substantial value of U.S. dairy exports at \$72 million (GTA, 2016).

³⁷ USDA Economic Research Service categorizes Burma (Myanmar), Cambodia, Indonesia, Malaysia, Philippines, Thailand, Vietnam, Brunei, Laos, and Singapore as Southeast Asia countries.

Conclusion and Prospects for Future Growth of Exports

The United States positioned itself as a premier exporter of dairy products in recent years. Rapid growth in international dairy demand, notably in middle-income and developing countries, played a significant role. Income growth in developing countries quickly led to higher quantity and quality of food consumption, especially for livestock and dairy products. Higher trade was made possible by implementation of WTO rules and FTAs, which reduced barriers for dairy trade. Policy changes in the EU and the United States helped to make the U.S. dairy industry more price-competitive in world markets. In years to come, the United States, with a large dairy industry and expansion capability, is well positioned to increase dairy exports.

According to USDA long-term (10-year) agricultural projections (which assumes current policies are maintained), U.S. milk production is projected to grow about 23 percent over the next 10 years (2015-2025), mostly due to rising milk production per cow. Domestic commercial use is expected to grow at a slightly slower pace. As estimated on a skim-solids, milk-equivalent basis, exports are expected to expand to 53.4 billion pounds in 2025 (43 percent higher than 2015), accounting for more than 20 percent of milk production. As estimated on a milk-fat, milk-equivalent basis, dairy exports are projected to be 13.6 billion pounds in 2025 (55 percent higher than 2015), accounting for more than 5 percent of milk production.³⁸ Continued expansion of U.S. milk production and strong international demand are expected to allow U.S. dairy products to remain price competitive on the global market.

Future growth in dairy trade is contingent on the ability of U.S. producers to remain cost competitive with foreign suppliers while increasing milk supply and encouraging favorable government policies around the globe. Increasing market share in new and traditional markets may be challenged by growing milk supplies among other major dairy-exporting countries. In addition, demand growth is highly uncertain, as relatively weak global demand in 2015 has continued in 2016. Exchange rates will continue to affect the ability of the United States to compete in world markets. China's role will be a factor after drastically reducing its imports of dairy products in 2015, contributing to a sharp decline in world dairy prices. The elimination of milk production quotas in the EU in 2015 has contributed to an increase in global milk production, but relatively high production costs may limit growth. While production costs are lower in Oceania, it will be a challenge for Australia's milk production to recover from years of dry weather. New Zealand's dairy industry is expected to continue expansion in future years as more land is converted to dairy; however, land and resource constraints may limit future production prospects in its pasture-based system.

New trade agreements may play an important role in the future evolution of U.S. dairy trade. On October 7, 2015, the United States and 11 Pacific Rim nations concluded negotiations for the Trans-Pacific Partnership (TPP). Member countries include the United States, Australia, Brunei Darussalam, Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore, and Vietnam. These economies represent about 40 percent of total global trade. A 2014 USDA Economic Research Service study by Burfisher et al. illustrated that the TPP could have a positive effect on trade through the elimination of tariffs and discussed potential benefits from reduction of nontariff barriers. The agreement would reduce or eliminate tariffs for U.S. exports for some or all dairy products in Brunei, Canada, Japan, Malaysia, Peru, Vietnam, and New Zealand. (Previous agreements had already eliminated tariffs on U.S. dairy exports for Australia, Chile, Mexico, and Singapore.) The

³⁸ See the earlier section, Profile of U.S. Dairy Product Exports, for an explanation of milk equivalent calculations.

United States would eliminate dairy tariffs for Malaysia, Vietnam, and Japan over 20 years and provide new market access for New Zealand, Australia, Peru, and Canada. The agreement is subject to ratification by the member countries (USDA FAS, 2016e). In a May 2016 report, the USITC estimates that if the TPP were to become effective in 2017, by 2032 the value of U.S. dairy-product exports would be 18.0 percent greater than they would be if the TPP were not enacted. According to their estimate, U.S. dairy imports would be 10.3 percent higher by 2032.

In June 2013, U.S. President Obama and European Commission President José Manuel Barroso announced that the United States and the EU would begin negotiations on the Transatlantic Trade and Investment Partnership (TTIP). The agreement would create a free trade area between the world's two largest trading partners. U.S. dairy trade could potentially increase in both directions. Part of the trade enhancement for the dairy industry would come from tariff reductions. In 2010, tariffs applied by the United States to EU dairy imports averaged 20.2 percent while tariffs applied by the EU to U.S. dairy imports were much higher, 42.0 percent (Bureau et al., 2014). In addition, negotiations include a wide range of non-tariff measures. In particular, the EU seeks U.S. recognition of geographical indications (GIs) for certain types of cheeses, such as asiago and feta. Dairy producer and processor groups from the United States, effectively restricted from marketing certain cheeses with GIs in the EU, would like to see the GIs removed (National Milk Producers Federation, 2016). While benefits for U.S. dairy exports would vary based on a final agreement, the TTIP would impact global trade by linking two of the world's largest traders of dairy products.

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Appendix A. Value of Dairy Exports and Imports

The source for dairy product trade values in this report is the Global Trade Atlas database (GTA, 2016). The value of dairy product exports or imports for a trading partner is estimated by aggregating data based on the Harmonized System (HS) nomenclature developed by the World Customs Organization. The HS categorizes goods using 6-digit harmonized codes that are common to all countries participating in the World Trade Organization. Countries often distinguish products beyond the 6-digit level, but these distinctions are not uniform across countries.

Most dairy products are classified in Chapter 4 of the HS, with HS numbers starting 04, but some dairy products are listed in other chapters. For example, ice cream is in Chapter 21. In the U.S. Harmonized Tariff Schedule, some dairy products are identifiable at the 8- or 10-digit level, but not at the 6-digit level. For example, exports of milk-based drinks (other than usual fluid milk and cream) are classified in Chapter 22 under the 8-digit HS code 22029015. At the 6-digit level, such milk-based drinks cannot be identified since they fall under a catchall code, 220290, for nonalcoholic beverages not elsewhere specified or included.

For consistency across trading partners in this report, items that can be reasonably identified as dairy products at the 6-digit HS level are included in dairy value aggregations. For the United States, the valuations may be different from other aggregations used by USDA, including Foreign Agricultural Trade of the United States (FATUS); USDA Foreign Agricultural Service (FAS); and Bulk, Intermediate, and Consumer-Oriented (BICO) reports. The tables in this report only delineate products with the highest trading values. Products with lower trading values are classified as “Other dairy products.” Some products are consistently classified as “Other dairy products” for all countries. See table A-1 for a list of HS numbers included in dairy product valuations in this report.

For 2004 valuations, nominal values have been converted to 2015 U.S. dollar values using the U.S. Consumer Price Index (CPI) for All Products reported by the U.S. Bureau of Labor Statistics. The CPI reported for 2004 is 188.9, and the CPI for 2015 is 237.0. Therefore, nominal values for 2004 have been multiplied by 1.255 (calculated as $237.0/188.9$) to adjust for inflation.

For comparison purposes, tables with 2004 valuations display data for trading partners with the highest trading values in 2015. These countries may not have been those with the highest trading values in 2004. For example, table 3 shows the top nine export destinations for European Union (EU) dairy exports in 2015, with China at the top of the list. Although China ranked number 15 in 2004, the value of 2004 China dairy exports is shown in the table for comparison to 2015. Data for EU exports to Nigeria, which ranked number 7 in 2004 but number 10 in 2014, are not listed in the table.

Export values from a particular country do not equal corresponding import values of the trading partner. There are several explanations for the differences (Ferrantino and Wang, 2008; Martin, 2015):

- Valuations with respect to freight charges—such as free on board (f.o.b.); cost, insurance, and freight (c.i.f.); and free alongside ship (f.a.s.).
- Definitions of territories.
- Trade that crosses periods, recorded as an export in one year but as an import in the next year.
- Declarations of country of origin.
- Exchange rate changes from time of export to import.
- Changes in price due to mid-shipment transfers.

- Intentional under-invoicing to lower tariffs.
- Differences due to intermediation with third-party pass-through countries recorded as countries of origin or destination.

Table A-1

Products included in dairy valuations in this paper

HS	Description	Product aggregation for this report	Comment
0401	Fluid milk and fluid cream	Fluid milk and fluid cream	Includes raw milk from dairy farms, beverage fluid milk, and cream; but does not include concentrated or sweetened milk products
0405	Butter and butterfat	Butter and butterfat	Includes butter, other fats derived from milk, and dairy spreads
0406	Cheese	Cheese	
040210	Skim milk powder and nonfat dry milk	SMP	Includes powders not exceeding 1.5 percent butterfat
040221	Whole milk powder and dry whole milk	WMP	Includes milk powders with more than 1.5 percent butterfat
040229	Sweetened whole milk powder and dry whole milk	WMP	Includes milk powders with more than 1.5 percent butterfat
040291	Evaporated and condensed milk	Consistently included with “Other dairy products” throughout paper	Small trade volume
040299	Evaporated and condensed sweetened milk	Consistently included with “Other dairy products” throughout paper	Small trade volume
040310	Yogurt	Consistently included with “Other dairy products” throughout paper	Small trade volume
040390	Buttermilk and other curdled milk products	Consistently included with “Other dairy products” throughout paper	Small trade volume
040410	Whey and modified whey	Whey products	
040490	Products consisting of natural milk constituents, not elsewhere specified or included	Consistently included with Other dairy products throughout paper	Although trade volume is significant for some trading partners, the types of products being traded cannot be determined. Milk protein concentrates with less than 90 percent protein are included in this category for the United States.
170211	Anhydrous lactose	Lactose	
170219	Lactose other than anhydrous	Lactose	
190110	Infant formula	Infant formula	Includes some infant formula without milk constituents
2105	Ice cream	Consistently included with “Other dairy products” throughout paper	Small trade volume
350110	Casein	Casein products	Includes milk protein isolate for the United States imports but not necessarily for other countries.
350190	Caseinates and casein glues	Casein products	
350220	Milk albumin	Whey products	Includes two or more whey proteins

Appendix B. Discussion of Domestic and International Standards for Milk Powders

The terms “whole milk powder” and “dry whole milk” are often used interchangeably, as are the terms “skim milk powder” and “nonfat dry milk.” However, there are subtle but important differences between the terms. Whole milk powder and skim milk powder are defined by Codex Alimentarius international standards (CODEX STAN 207-1999). Dry whole milk and nonfat dry milk are defined for the U.S. domestic market by U.S. Food and Drug Administration (FDA) Standards of Identity (U.S. Code of Federal Regulations, 21 CFR 131.125 and 21 CFR 131.147). In some countries, additional milk constituents (milk retentate, milk permeate, or lactose) are often included in skim milk powder or whole milk powder in order to meet a desired protein level within a range defined by Codex. While the Codex standards allow these additional milk constituents for skim milk powder and whole milk powder, the FDA standards for nonfat dry milk and dry whole milk do not. For skim milk powder, the protein content is often adjusted to meet the minimum Codex level of 34 percent. Nonfat dry milk and dry whole milk, as defined by FDA standards, usually, but not consistently, have a protein content of more than 34 percent.

Export data do not make a distinction between whole milk powder and dry whole milk or between skim milk powder and nonfat dry milk. In this report, for the sake of brevity, the abbreviation WMP refers to whole milk powder and dry whole milk collectively as milk powder with greater than 1.5 percent milk fat, and SMP refers to skim milk powder and nonfat dry milk collectively as milk powder with milk fat of 1.5 percent or less. When referring to either skim milk powder or nonfat dry milk, the terms are spelled out in this report.

U.S. standards of identity prescribe procedures and ingredients that determine how products may be labeled, but they do not define what can legally be produced or sold in commercial markets. A broad range of cheeses, such as cheddar and mozzarella, has FDA standards of identity that allow the use of nonfat dry milk but not skim milk powder with altered milk constituents. Consequently, U.S. firms have traditionally manufactured nonfat dry milk, rather than skim milk powder, to meet the demand of the domestic cheese industry. Further, the U.S. Government Dairy Product Price Support program (which declined in recent years and was discontinued by the Agricultural Act of 2014) allowed nonfat dry milk to be sold to the Government; skim milk powder with altered milk constituents was not allowed. With a reduction in Government purchases of nonfat dry milk and an increase in skim milk powder demand from foreign customers, some manufacturing has shifted from the former product to the latter. In 2015, the United States produced 1.822 billion pounds of nonfat dry milk and 446 million pounds of skim milk powder for human consumption (USDA National Agricultural Statistics Service, 2016).

Appendix C. Discussion of Milk Protein Products

Milk protein products are often traded internationally. They are used as ingredients in foods such as cheese products, cultured products, dairy-based beverages, pediatric nutrition, and many others. However, there are some difficulties in accounting for certain milk protein products in international trade.

For the United States, milk protein concentrate (MPC) with a protein level of at least 40 percent but less than 90 percent falls within the “not elsewhere specified or included” category under the 6-digit international HS code 0404.90 (U.S. Census Bureau, 2015). U.S. imports of these MPC products are disaggregated from other dairy products at the 8-digit level, 0404.90.10, in the U.S. Harmonized Tariff Schedule. MPC makes up the largest proportion of U.S. imports received within the broader 0404.90 level. For U.S. exports, HS codes do not clearly distinguish MPC; there is no more specific breakout than the 6-digit level for dairy products “not elsewhere specified or included.”

While some countries disaggregate MPC from imports of other products categorized under 0404.90 as the United States does, other countries do not. For countries that do disaggregate MPC imports, HS codes are not consistent beyond the 6-digit level. Therefore, the extent of MPC trade among countries often cannot be readily ascertained from international data.

For U.S. imports, MPC with a protein content of 90 percent or more, also known as milk protein isolate (MPI), is included in the same 6-digit Harmonized Tariff Schedule (HTS) code as casein, 3501.10 (USITC, 2016a). For U.S. imports, MPI is disaggregated under the 8-digit HTS code 3501.10.10. However, this treatment is not consistent among countries even at the 6-digit level (which is supposedly harmonized across countries). For example, Canada categorizes MPC with a protein content of 85 percent or more by weight, on the dry matter, in 3504.00.11 and 3504.00.12. At the 6-digit level, HS 3504.00 is a catchall category that includes “peptones and their derivatives; other protein substances and their derivatives, not elsewhere specified or included; hide powder, whether or not chromed” (Government of Canada, Canada Border Service Agency, 2015). With these inconsistencies and lack of specificity among countries, the extent of MPI trade among countries cannot be readily ascertained from international trade data, and comparison of casein products traded (HS 3501.10) from one country to another have some inconsistency.