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Effects of the COVID-19 Pandemic on the Western Dairy Industry

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Abstract

Western dairy accounts for 46% of U.S. milk production and was hit by the COVID-19 pandemic in complex ways. The pandemic led to large fluctuations in U.S. prices of milk and dairy products. High prices during the summer made up for steep declines in the spring. Western milk production was up over 2019. Farm milk receipts were about the same as in 2019, and about 12% higher than in 2018. However, due to large government payments, 2020 was a relatively high net income year for the Western dairy industry, despite the variability and stresses caused by the pandemic.

Introduction

The dairy industry in the United States is driven by production in the Western States, where almost half of total U.S. production originates. In 2020, half of the top 10 milk producing states were in the West, accounting for 46% of total production (U.S. Department of Agriculture, 2021g). In general, dairies in the West tend to be larger, with more milk cows per dairy and higher milk per cow on average, when compared to their counterparts in the rest of the country.

Closures of schools and restaurants in response to the COVID-19 pandemic reduced demand for dairy products and led to large fluctuations in milk prices received by farmers. Based on data from 2013 through 2016, about 20% of dairy products were consumed away from home, with 40% of cheese and 25% of butter consumed away from home (Lin, 2020). Some months in 2020 saw prices for milk and dairy products that were both lower and higher than in previous years. While this led to uncertainty over prices throughout the year, when averaged across the year prices were comparable to 2019.

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Taken in combination with 2020 milk production, which was higher than in either 2018 or 2019, revenue in the dairy industry was about 12% higher than 2018 and about the same as in 2019 (U.S. Department of Agriculture, 2021e). Since it is beyond our scope to estimate what prices and production would have been in the absence of the COVID-19 pandemic, we compare 2020 milk production and dairy product prices to recent trends to assess the effect of the pandemic on the dairy industry. We also discuss payments made to the dairy industry through programs implemented by the Federal Government in response to the pandemic. We show that the main effects of the pandemic were increased price fluctuations, reduced production during the spring, and a large increase in direct payments to farmers and domestic dairy product consumers.

Effects of the Pandemic on Dairy Markets

Milk Production

Between 2018 and 2020, the dairy industry in the Western States accounted for an average of 45% of total U.S. production (U.S. Department of Agriculture, 2021g). Five Western States are among the top 10 milk producing states in the country and accounted for 86% of Western milk production in 2020: California, Idaho, Texas, New Mexico, and Washington. The other seven Western States (Arizona, Colorado, Wyoming, Montana, Utah, Nevada, and Oregon) combine for about 14% of production (Figure 1).⁴

Milk production per day was higher in every month of 2020 compared to 2018 or 2019 and generally followed the same patterns, but production dropped between March and April, a period where production usually ramps up during a normal spring flush (Figure 2). A large decline between April and May reduced production to almost the same levels observed in January, before continuing the typical decline seen during the summer months.

At the onset of the pandemic in spring of 2020, producers responded in the near term to changes in demand by adjusting supply at the farm. While farmers do not respond to short-term low prices by implementing large scale changes to their operations, such as tearing down milking parlors, they can reduce production by culling cows or adjusting feed rations. Fewer milk cows are typically sent to slaughter during the spring flush, with average slaughter per day decreasing through March, April, and May (Figure 3). However, the average daily number of milk cows sent to slaughter increased from March 2020 to April 2020, resulting in about 20,700 more milk cows slaughtered in April 2020 when compared to April 2018 and 2019. Average daily

⁴ We include Texas in our definition of Western States since the majority of dairy production in Texas takes place in West Texas near New Mexico and the dairies that produce most of the milk in Texas are similar to the large-scale operations in other Western States. We do not include Hawaii and Alaska which produce very little milk.

slaughter fell sharply in May and stayed at low levels through June as herds were rebuilt, increasing the US milk cow inventory on July 1, 2020 relative to the inventory on January 1. Average daily slaughter remained low through November, contributing to a 1% increase in milk cow inventory on January 1, 2021 relative to January 1, 2020, and increasing the milk cow inventory to its highest level since 1995 (U.S. Department of Agriculture, 2021f).

In regions regulated by the Federal Milk Marketing Orders (FMMOs), processors that participate in the order may contribute to a revenue pool regulated by the marketing order. The marketing orders set minimum prices that plants must pay for farm milk, depending on the products that are produced with that milk. Plants that produce beverage milk must pay into the revenue pool. However, plants that produce other dairy products may choose whether or not to participate in the revenue pool. Complex rules that differ by order cover entry to and exit from the pool.

When demands shift, such as when schools and cafes close, some farm milk shifts from beverage milk to the manufacturing of products that can be stored, such as cheese, dry milk powder, and butter. In FMMO regions, the share of milk used in beverage products decreased by about 1.6% between March and April 2020, with a corresponding increase in the share of milk used in other dairy products (U.S. Department of Agriculture, 2021h; U.S. Department of Agriculture, 2021g). Compared to a decrease in overall milk production of just over 1%, this was a relative shift towards production of storable dairy products. This shift continued through the summer months, with the quantity of milk used for beverage products and milk used for other products changing by the same amount as overall production. Because sales did not keep up with the increase in dairy product manufacturing, stocks of butter, cheese, and nonfat dry milk increased by the end of April (U.S. Department of Agriculture, 2021b; U.S. Department of Agriculture, 2021d).

The minimum price paid for milk used in beverage products (Class I) is based on dairy product prices from the previous month, with some complicated adjustment for mid-month projections and lags.⁵ For example, the minimum price for milk used in Class I products in March was based on dairy product prices from February, while the March minimum prices for milk used in other dairy products were based on prices from March. As prices for butter, cheese, and nonfat dry milk fell throughout April, the corresponding minimum prices for milk used in those products fell, but the minimum Class I price was based on higher prices from March.

⁵ The Class I price formula is based on an “advanced” calculation of the Class III and Class IV prices using the dairy product prices from the previous month. Until May 2019 the base Class I price was the higher of the Class III and Class IV prices. The calculation was changed to the average of the Class III and Class IV prices plus a 74-cent differential.

Producers receive a payment that is equal to the average of the minimum prices, weighted by the share of milk used for products in each class plus whatever “over-order” premiums for which they are eligible based on quality or market scarcity. Therefore, producers who shipped milk to plants that contributed to the revenue pool in April received a payment that was inflated by the high minimum price for Class I milk. Even as milk production decreased and manufacturing shifted towards storable dairy products, the quantity of milk delivered to plants that participated in marketing orders increased by 6% between March and April. After the Class I minimum price incorporated the low product prices from April, a corresponding decrease occurred in the quantity of milk delivered to plants that contributed to the revenue pool of about 11% in both May and June.

During the early months of the pandemic, many news articles focused on farmers dumping milk in response to decreased demand due to school and restaurant closures (Yaffe-Bellany and Corkery, 2020). Despite the headlines, milk that was either used as feed, dumped on farm, or dumped at processing plants was a small share of total production. For example, the California FMMO reported that producers participating in the FMMO dumped 16 million pounds of milk in April, less than 1% of the total milk regulated by the FMMO (Hunter, 2020). Dairy cooperatives in the Western States sometimes implement programs that limit the quantity of milk that members may deliver in a given month. These programs could result in more on-farm dumping of milk; however, industry sources suggest that these limits were not tightened in response to the pandemic.

Dairy Prices

Farm demand for milk is derived from demand for dairy products. Prices of both cheese and nonfat dry milk rose steadily through 2019 and early 2020. Both prices declined in March 2020 (from February) before falling below the corresponding 2019 prices in April and May (Figure 4). Low product prices in April and May led to a collapse in the “all-milk price” received by farms in the Western States (Figure 5).⁶ Cheese prices rebounded through June and July, causing the all-milk price to jump above 2019 prices. The cheese price continued to fluctuate through the end of 2020. The all-milk price followed cheese prices, with some months below comparable 2019 prices and some months above.

The large fluctuations in the cheese and all-milk prices seen in Figures 4 and 5 underlie the broader effect of the COVID-19 pandemic on dairy prices. On average, prices across 2020 were similar to or higher than those in 2019. The average nonfat dry

⁶ The all-milk price is a measure of the gross price received by farmers, including any premiums paid for milk quality but before any hauling fees or co-op dues. The average all-milk price for the Western States depicted in Figure 5 is weighted by production.

milk price for 2020 was the same as in 2019, while the average cheese price was nearly 10% higher. The average all-milk price was about 1% lower than in 2019, due to competing effects of low beverage milk prices and high prices paid for milk used in cheese production (U.S. Department of Agriculture, 2021a). While average prices compare favorably to 2019, large variations in prices from month to month created concerns that had to be dealt with by farms and milk handlers.

Exports

Western States are major exporters of dairy products to Asia, Mexico, and parts of Central America. Exports tend to follow a similar temporal pattern to milk production, with both 2018 and 2019 exhibiting peaks in the spring and lower export levels over the summer months. Exports were lower in March and April of 2020 as the pandemic began. Exports recovered and reached their highest level for 2020 in May and June (Figure 6). This pattern is almost the opposite of the trends observed in 2018 and 2019.

While the unit values (prices) of export products do not always follow the same patterns as domestic dairy product prices, in 2018 and 2019, unit values followed similar trends to domestic prices (Figure 7). In 2020, export unit values fell in April and May and stayed low through most of the summer, unlike the all-milk price and domestic product prices which began to recover over the summer. Despite lower summer prices, across all of 2020, the average export price per pound of milk solid equivalent was about 3% higher than the average value from 2019 (U.S. Department of Commerce, 2021).

Coronavirus, Dairy Farm, and Consumer Payments

The Coronavirus Aid, Relief, and Economic Security (CARES) Act directed the USDA to support farmers and ensure consumer access to food. The Coronavirus Food Assistance Program (CFAP) announced on April 17, 2020 authorized payments to farms affected by the pandemic. CFAP distributed payments in two rounds, and milk was one of several eligible farm commodities.

The CARES Act also established the Paycheck Protection Program (PPP) under the Small Business Administration, which allowed businesses, including dairy farms, to apply for loans to cover up to 8 weeks of payroll costs. The program initially operated between April and early August, and many applicants received complete loan forgiveness when funds were used to cover payroll and employees were retained.

As part of the CFAP, the USDA also authorized purchases of fresh produce, dairy, and meat products through the Farmers to Families Food Box Program. Several products were combined in boxes for distribution to consumers by food banks and other charitable organizations.

CFAP Farm Payments

The first round of CFAP, known as CFAP 1, paid dairy producers a lump sum payment based on milk production in January, February and March 2020. Payments were limited to \$250,000 per person and legal entity, extending to \$250,000 per shareholder for up to three shareholders if the business was a corporation, limited liability company or limited partnership, with all shareholders contributing at least 400 hours of labor to the business. This cap applied to the sum of payments for all commodities under which the producer applied to CFAP.

Dairy producers received a single payment calculated from two funding sources: the CARES Act and the Commodity Credit Corporation (CCC). The total CFAP 1 payment was \$6.20 per hundredweight for milk production from January, February, and March 2020.

CFAP 2 was funded entirely with CCC funds and required that applicants derive at least 75% of their income from farming or have an average income of less than \$900,000 in 2016, 2017 and 2018. Applicants with dairy operations must have produced and marketed milk commercially. Eligible dairy applicants received \$1.20 per hundredweight for milk produced from April through August and for estimated milk production from September through December. Payments received through CFAP 1 did not count towards the payment cap under CFAP 2.

Producers received 80% of their maximum total payment upon approval of their application, with 20% reserved for payment if funds remained at the end of the application period. Since all available funds were expended, the reserved payments were never distributed. Accounting for these reserved payments, producers below the payment limit received \$4.96 per hundredweight for milk, meaning CFAP 1 dairy payments were worth up to 27% of the all-milk price in the first quarter of 2020 for western dairies. CFAP 1 dairy payments to producers below the payment limit were worth up to 6.8% of the value of milk sales for western dairies in 2020. CFAP 1 payments to dairy operations in the twelve Western States were \$593 million, about 12% of the \$4.77 billion of milk revenue from Western States in January, February and March 2020. Dairy operations in the Western States received 33% of the \$1.8 billion of CFAP 1 payments to dairy operations in the US, despite producing 46% of milk.

CFAP 2 payments to dairy operations in the twelve Western States were \$437 million, equivalent to 37% of the approximately \$1.2 billion of CFAP 2 payments to dairy operations in the US. CFAP 2 dairy payments to dairy producers below the payment limit were worth up to 5.1% of the all-milk price for western dairies in the period of April through December 2020.

Total CFAP payments to dairy producers below the payment limit were worth 11.9% of the all-milk price for Western States in 2020. According the US Census of Agriculture in 2017, there were 143 dairies in the Western States with 5,000 or more milk cows (U.S. Department of Agriculture, 2019). For a 5,000 lactating cow herd, total

CFAP payments were worth about 7% of the all-milk price in 2020, based on monthly average milk yield for Western States and a maximum CFAP payment in 2020 of \$1.5 million (U.S. Department of Agriculture, 2021a; U.S. Department of Agriculture, 2021g).

The payment cap impacted dairies in the Western States. Table 1 shows the milking herd size, at an average milk yield, that would meet the payment caps for both CFAP 1 and CFAP 2. Large dairies are likely to have more than one actively engaged shareholder and qualify for the higher payment caps of \$500,000 or \$750,000. Based on Census of Agriculture data from 2017, 94% of the value of milk sales in Texas, Idaho, and California was from dairies with more than 500 cows (U.S. Department of Agriculture, 2019). Dairy herds with greater than 2,500 milk cows were responsible for 71% of the value of milk sales in Texas, 70% in Idaho, and 45% in California. Any dairies of this size received a CFAP 1 payment equivalent to less than \$4.96/cwt (80% of the total payment of \$6.20/cwt) for milk production in January, February, and March 2020. The payment cap is less likely to apply to dairy operations in the Midwest and East Coast. Only 0.5% of dairy operations in Wisconsin and New York had greater than 2,500 milk cows in the 2017 Census.

Paycheck Protection Program Payments to Dairy Operations

Between April and August 2020, businesses in the Western States received a total of \$149 billion in loans through the PPP, with loans totaling \$364 million granted to dairy farms, or just over 2% of the total. As of March 2021, about 34% of PPP loans were forgiven, equivalent to about \$179 billion. Loan totals in each state were roughly proportional to milk production. However, California received a larger share of PPP loans relative to its share of western milk production, while Texas and Utah received a smaller share. When considered on a cents per hundredweight basis, with total loan amounts divided by milk production between April and August, loans range from 36 cents per hundredweight in Utah to 94 cents per hundredweight in California, and about 76 cents per hundredweight on average.

After a hiatus of four months, the Consolidated Appropriations Act of December 2020 included an extension of the PPP from January to March 2021. Under the reauthorization, PPP loans were separated into “first draw,” with conditions identical to the original 2020 round of loans, and “second draw” loans. Second draw loans are only available to businesses with fewer than 300 employees that used all of their first PPP loan and incurred a 25% reduction in gross receipts in at least one quarter of 2020 relative to 2019 performance. Out of \$42 billion in loans to businesses in Western States in 2021 thus far, about \$36 million have gone to dairy operation, or just under 0.1% of the total.

Farmers to Families Food Box Program

The Farmers to Families Food Box Program initially authorized \$3 billion in purchases, with the intent of purchasing \$100 million per month each of fruit and vegetable products, meat products, and dairy products (U.S. Department of Agriculture, 2020). The program received additional funding authorized in three additional rounds through the end of 2020. By the end of the fourth round on December 31 just over \$4 billion of food products were purchases for use in food boxes (U.S. Department of Agriculture, 2021i). A fifth round was authorized by the Consolidated Appropriations Act of December 2020, with an intent to purchase an additional \$1.5 billion of food products by the end of April 2021.

Food boxes compiled and distributed with food purchased by this program could contain fresh beverage milk, cheese, and butter. While the share of total purchases that went to dairy products is not clear, if we assume that purchases continued along the lines suggested in the initial announcement, with one-third of the available funds used to purchase dairy products, then about \$1.3 billion in dairy products were purchased by the end of 2020. This is equivalent to about 3.3% of U.S. milk production in 2020 (U.S. Department of Agriculture, 2021a; U.S. Department of Agriculture, 2021g).

Demand for dairy products was also supported during the pandemic by other provisions in the CARES Act and related programs that provided less restrictive or supplemental support for USDA food assistance programs. These programs helped maintain food demand in poor households. Broader income supplements, such as direct payments to U.S. taxpayers and extended and supplemental unemployment insurance, helped maintain personal income during the pandemic. Despite added food assistance and income supplements, USDA reports that reported food insufficiency rose substantially during 2020 compared to 2019 (U.S. Department of Agriculture, 2021c).

Conclusion

The COVID-19 pandemic created conditions that led to large fluctuations in prices received by dairy farmers and responses that reduced milk production. However, these effects did not last throughout the year, as high prices during the summer made up for steep declines in the spring. For the dairy industry, cash receipts were about the same as in 2019, and about 12% higher than in 2018. Across agriculture as a whole, net cash income increased by about \$27 billion over 2019, almost entirely due to a \$24 billion increase in government payments (U.S. Department of Agriculture, 2021e). This relationship may hold for the dairy industry. Due to more milk production and large government payments, 2020 was a relatively high net income year for the western dairy industry, despite the variability and stresses caused by the pandemic.

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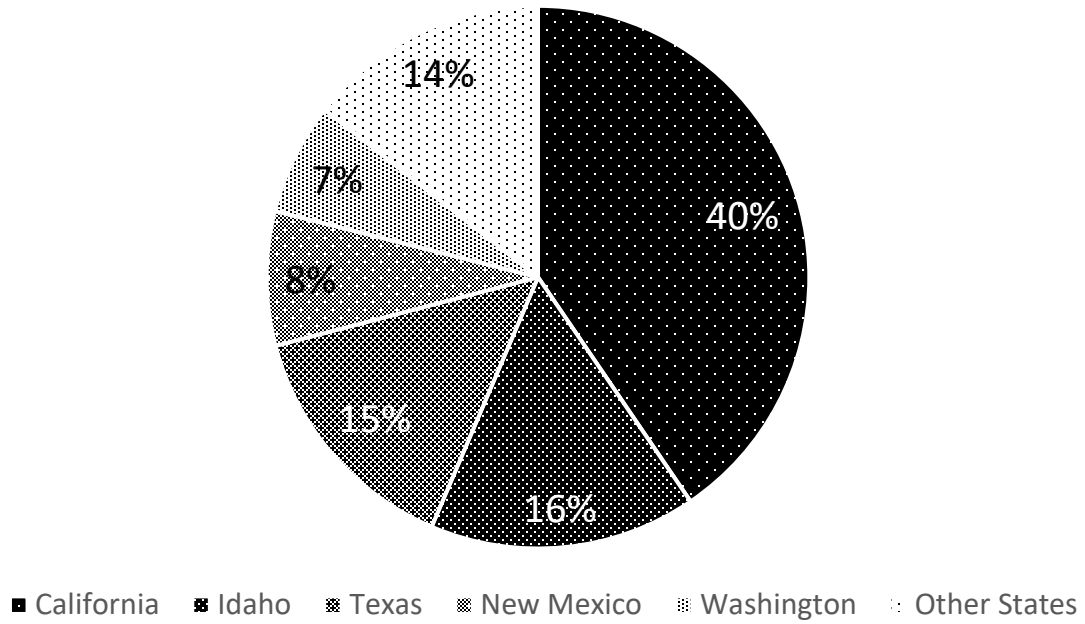
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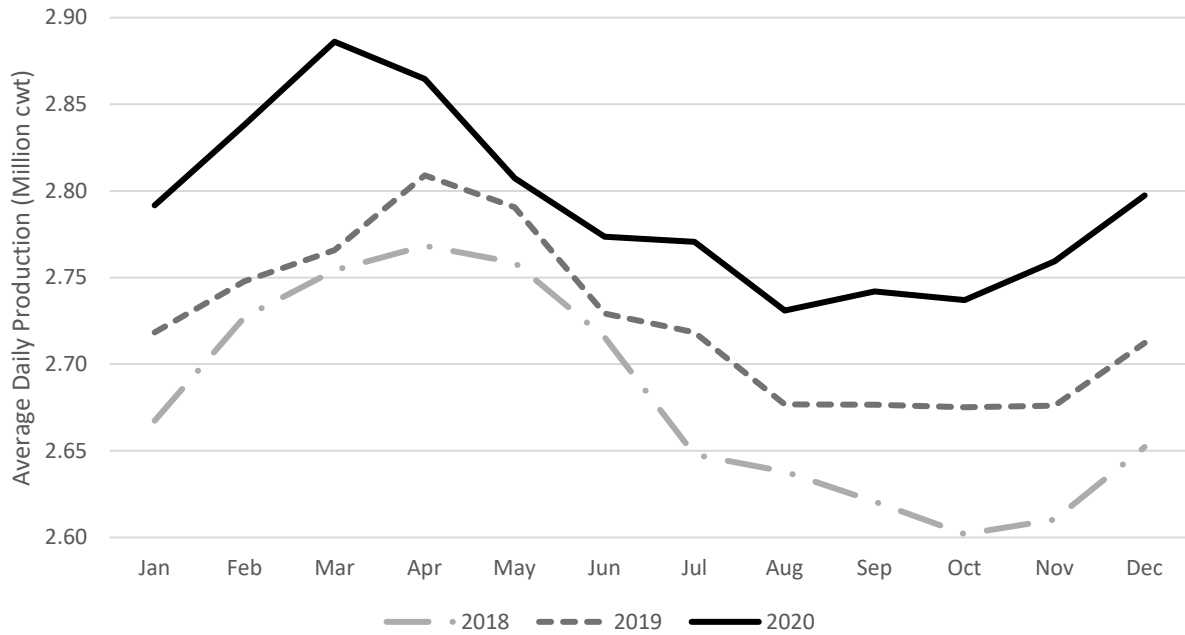
Tables and Figures

Figure 1: 2020 Dairy Milk Production in Western States, 1.02 Billion cwt



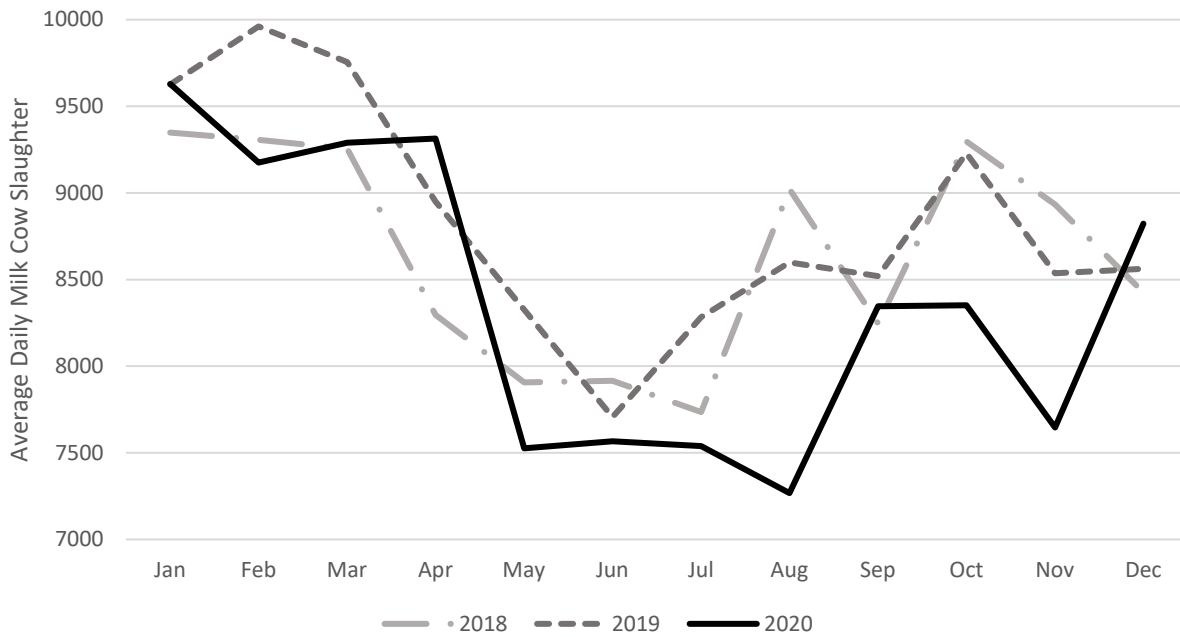
Source: USDA National Agricultural Statistics Service, *Milk Production*.

Figure 2: Milk Production in Western States, 2018-2020



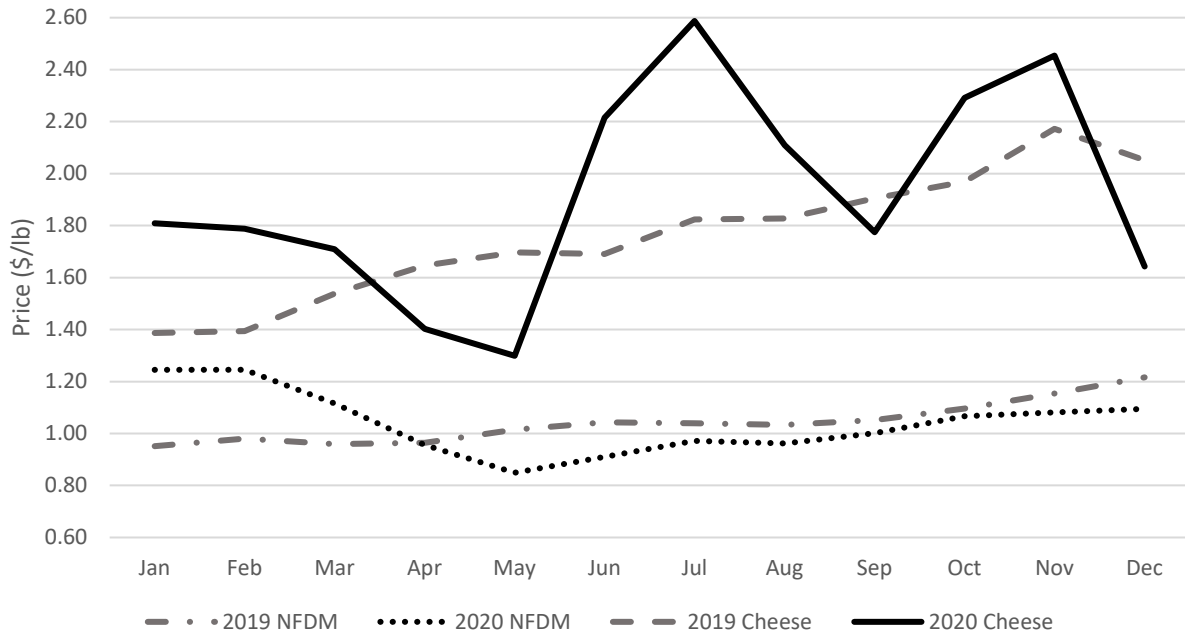
Source: USDA National Agricultural Statistics Service, *Milk Production*.

Figure 3: Average Daily Milk Cows Slaughtered, 2018-2020



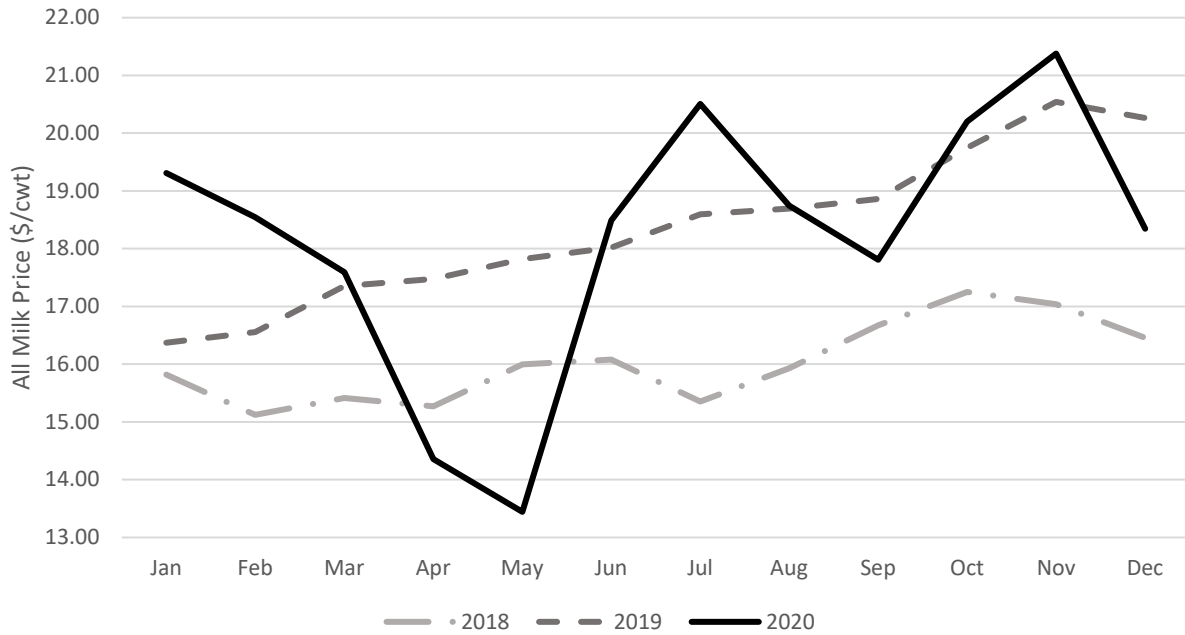
Source: USDA National Agricultural Statistics Service, *Livestock Slaughter*.

Figure 4: Cheese and Nonfat Dry Milk Prices, 2019-2020



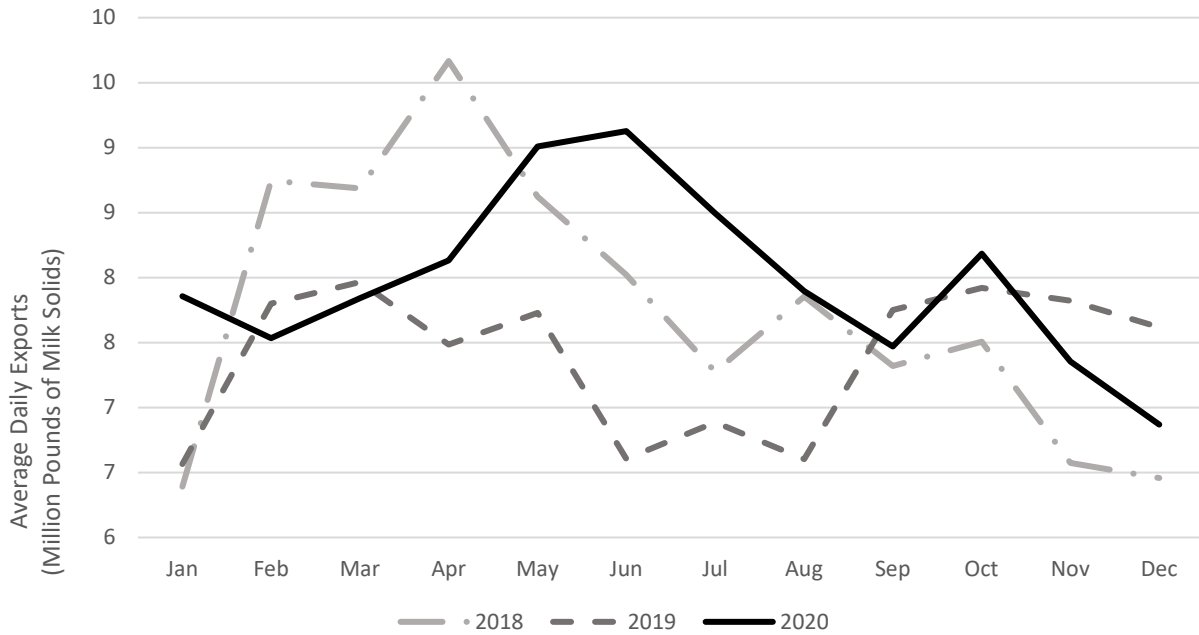
Source: USDA Agricultural Marketing Service, *Announcement of Class and Component Prices*.

Figure 5: Weighted Average Western States All-Milk Price, 2018-2020



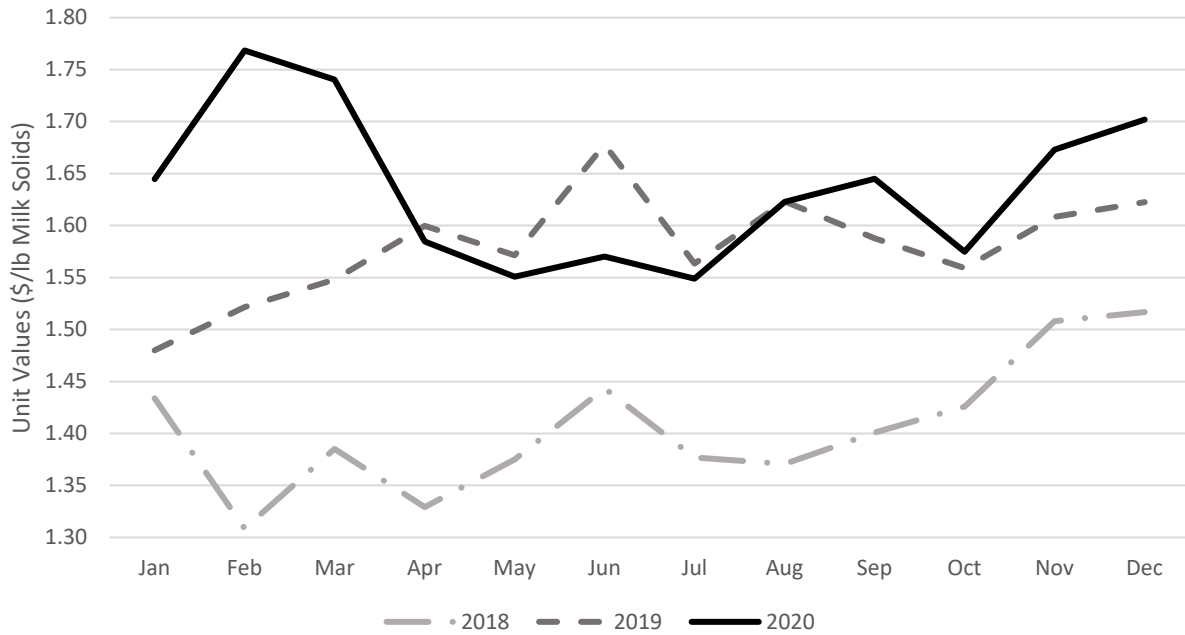
Source: USDA National Agricultural Statistics Service, *Agricultural Prices and Milk Production*, author calculations.

Figure 6: Average Daily Exports from Western Customs Districts, Million Pounds of Milk Solids Equivalent



Source: U.S. Department of Commerce, Bureau of the Census, *U.S. International Trade in Goods and Services*.

Figure 7: Unit Value of Exports from Western Customs Districts, USD per Pound of Milk Solids Equivalent



Source: U.S. Department of Commerce, Bureau of the Census, *U.S. International Trade in Goods and Services*.

Table 1: Approximate Herd Size That Reaches Each Eligible Payment Cap for the Dairy to Receive the Equivalent of \$4.96/cwt From CFAP 1, or \$1.20/cwt From CFAP 2.

Payment Cap	Milking Herd Size	
	CFAP1*	CFAP2**
\$250,000	657	1,157
\$500,000	1,313	6,941
\$750,000	1,970	10,411

*Based on California average milk yield per cow of 20.5cwt/cow/month for January Through March 2020.

**Based on California average milk yield per cow of 20cwt/cow/month for April Through August 2020.

Source: USDA National Agricultural Statistics Service *Milk Production*, author calculations.