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The Coronavirus and the Food Supply Chain

Ellen M. Bruno, Richard J. Sexton, and Daniel A. Sumner

The spread of COVID-19, and the public responses and policies it has engendered, have interrupted some food availability and prompted concerns among consumers about the reliability of the food supply chain. Some farm producers have faced plummeting prices, while some prices, especially at retail, have spiked. We seek to explain what has been happening within the food supply chain and what is likely to happen as society deals with the pandemic and its aftermath. Our main conclusion is that, despite worrisome but understandable disruptions, the food system in the United States is resilient and there is little reason for alarm about food availability.

Food shoppers in the United States and around the world have experienced empty shelves for some products, while there are ample quantities of others. We have seen higher prices for some food products, while other prices are stable. We explore the economics of what is happening in the

food supply chain now, in the midst of the pandemic, and how the food supply chain is likely to evolve as the economy gradually recovers from the COVID-19 disaster.

The Situation and Near-term Outlook

Empty retailer shelves for some products are the consequence of multiple disruptions affecting retail demand and food supply to retailers. Overall, neither consumption of food nor farm supply of food in aggregate has changed much. But temporary changes in the location and form of demand have caused shortages and higher prices for some items, and excess supplies and low prices for other food products and commodities.

In normal times, food demand is regular and predictable. Although individual consumers adjust their market baskets from week to week and eat out more or less often, this variation evens out across consumers. Typically, each retail product has a shelf location and available space, which determines how much of the product the store will stock. Normally, the food

supply chain operates efficiently on a “just in time” basis. Retail shelves are restocked by suppliers just in time to avoid “stockouts,” given predictable turnover and because there is no space for extra products at the store.

Empty shelves resulted first because the COVID-19 shock caused some consumers to stockpile storable staple goods, such as rice and pasta, due to concerns that the pandemic would lead to shortages later. Shelves remained empty for days or weeks while distant warehouses shipped more product and processing plants temporarily worked overtime to increase the supply. Many consumers are also shopping less frequently during the pandemic and purchase more when they do shop, further contributing to temporary stockouts.

Increased food demand at retail is also due to consumers wanting to consume (not just stockpile) more of certain products during times of economic and emotional stress. Baking supplies, eggs, and similar “comfort-food” items have seen increased demand. Finally, demand in retail stores has

increased because food consumption is happening more at home rather than away from home at restaurants, fast food chains, schools, and events.

Most food consumers shop primarily in large supermarkets or supercenters. Most of these stores practice “everyday low pricing,” meaning they stabilize prices for consumers, especially for key staples, so that shoppers can expect to see similar prices from week to week. Retailers absorb price fluctuations that occur at the farm or wholesale levels. Such a strategy helps insulate consumers from market flux. But stable prices contribute to shortages when higher prices do not ration the scarce supplies. For most retailers, allowing empty shelves is better for their reputations than appearing to exploit the pandemic by raising prices. Instead, these stores allocate the limited products by rules such as first come, first served, or rationing how much each customer may buy.

As consumers who stockpiled goods consume from their own inventories, the supply chain has an opportunity to adjust and respond. However, additional waves of stockpiling may occur if consumers feel ongoing anxiety, or if those who missed out originally now seek to accumulate their own inventories as products return to the shelves.

Three immediate challenges on the supply side of the food chain are:

- rearranging production, packaging, and shipment from the food-services market to retail stores;
- managing the impact of COVID-19 on farm workers and food processing and transport workers; and
- ramping up farm production of items that are now facing higher demand.

Farmers and marketers specializing in sales to food service establishments have had to reconfigure operations completely. For example, an egg operation that had specialized in liquid

eggs for restaurants may not have the packaging line to put eggs into cartons, or a connection to a retail buyer, if they could even find the cartons with the appropriate branding. Similarly, a fluid milk plant that focused on packaging small school-milk cartons and large food-service containers will face challenges in redesigning its operations to supply gallons and half gallons to retail.

The biggest health and safety concerns for the food chain labor force have been in meat processing plants where COVID-19 outbreaks have forced plant closures. Recent reports show that up to 10% of capacity for processing has been affected. For retail consumers, this disruption will cause a shortfall in supply until the plants return to production or if production can be rerouted to operational plants. Reduction in processing capacity will also cause a reduction in the demand for farm production, meaning that prices for farm animals will fall.

How quickly supply can ramp up in response to stockouts depends greatly upon the product. The full year’s supply of canned fruits and vegetables are often processed shortly after the fall harvest and can be moved from storage to retail fairly quickly. Other products take longer. The retail demand for in-shell eggs has increased due to a surge of at-home uses. However, it takes months to add to the flock of laying hens, making supply essentially fixed in the short term. When stores seek more eggs to satisfy their retail customers, egg prices naturally rise substantially to ration limited supplies among buyers.

Table 1 shows the pattern of a variety of egg prices for the five weeks prior to April 10. The Midwest delivered prices and California benchmark prices more than doubled from March 13 to April 3, but have since moderated a little. Note the moderate price increase for cage-free eggs, which were much more expensive initially.

Table 1. Pattern of a Variety of Egg Prices for the Five Weeks before April 10

	Midwest Delivered to Warehouses	California, Benchmark	National Retail (Advertised) Cage Free
-----Price per Dozen-----			
Mar 13	\$0.94	\$1.76	\$2.44
Mar 20	\$1.46	\$2.28	\$2.65
Mar 27	\$2.55	\$3.07	\$2.57
Apr 3	\$2.93	\$3.77	\$3.09
Apr 10	\$2.83	\$3.47	\$2.47

Source: USDA-AMS, Egg Market News Reports. <https://www.ams.usda.gov/market-news/egg-market-news-reports>

Many perishable produce items are planted, harvested, packed, and shipped according to a precise schedule to replenish stores’ inventories “just in time.” The amount of product in the various stages of the supply pipeline is largely fixed. Shifts in demand across specific items, largely a reflection of differences in produce items demanded by food services and retail, have caused major disruption and losses for grower-shippers.

Figure 1 shows retail price ratios for five weeks of 2020 compared to the same weeks in 2019. These data for red potatoes, green bell peppers, and navel oranges show how produce items differ substantially. Red potatoes, a storable and, thus, stockpiled product, have seen prices surge by 25%. Navel orange prices, however, have been relatively steady. Bell pepper prices fell in the middle of March only to rise more recently.

Why Have Some Retail Prices Surged While Farm Prices Have Declined?

The coronavirus pandemic, as with other disasters, has brought charges of “price gouging,” along with plans from politicians to curtail it. California state law defines price gouging as price increases of more than 10% during a declared emergency and applies to all suppliers, farm to

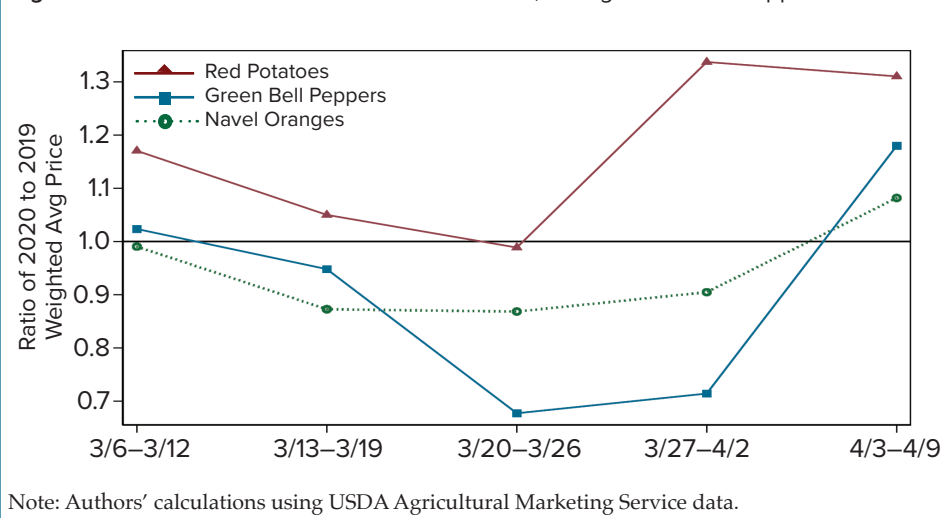
processor to retailer. Such price spikes, however, can be a result of the supply and demand shifts addressed in this article. Such price increases serve as incentives to stimulate additional supplies and to allocate available supplies among users. Regulations that interrupt these functions can cause shortages to be more severe and long-lasting. Government-set caps on price increases often simply result in shippers and retailers not stocking a product if their prices cannot reflect their higher costs.

The milk supply chain provides examples of problems for farms, processors, and consumers. Milk supplies are difficult to adjust immediately to an unanticipated shift in consumer demand. Farm milk production rises or falls in response to price changes mainly by increasing or reducing the number of cows, an adjustment process that takes months. Processing plants also have capacity limits that are hard to adjust. When the specific dairy demand shifts, say to more retail packages of fluid milk, the price of fluid milk will rise at retail. At the same time, however, overall demand for dairy products has fallen due to reduced dairy exports and loss of cheese sales to food service, which has caused the farm price of milk to fall.

The situation in California is especially difficult because less than 20% of California milk is used for consumer products like fluid milk, yogurt, or ice cream where demand is surging. Instead, most California milk goes to more heavily processed products that often enter food manufacturing, food service, or export channels, where demand has declined.

Table 2 shows farm-level milk futures prices (May 2020) for milk used to make cheese, and milk used for milk powder and butter. The milk used for these products is identical, but prices differ at the farm level because of federal regulations. The price of milk for

Figure 1. National Retail Price Ratios for Potatoes, Oranges and Bell Peppers



both uses has fallen by 36% over the same period.

Challenges in the Next Weeks and Months

Sheltering in place has placed incredible stress on the whole food supply chain. In normal times, Americans spend nearly half of their food budgets on food away from home (FAFH). Closure of restaurants, schools, company cafeterias, and other away-from-home food venues has crashed the food-service segment of the market and increased demand for food at retail stores. Sales of takeout food and food boxes have only made up a small portion of the sales loss.

Many food manufacturers, wholesalers, grower-shippers, and distributors specialize in serving retail or food service. Those who serve both will have dedicated lines to serving each

segment. Often products and packages for food service differ from those destined for retail. Supplies cannot simply shift from one channel to the other. For example, packing plants that prepare large bulk salad packages for restaurants have no way to package into retail-ready bags that require consumer labels. Given delays, some produce rotted or was plowed under before growers could implement the needed adjustments.

Food manufacturers and grower-shippers who specialize in food service sales face a difficult decision—do they recalibrate what they produce, and how they package it, to try to sell to retail when such sales opportunities may exist only in the short term until the economy reopens, or do they consolidate operations, scale down costs, and wait until the food-service sector recovers. The answer that will minimize losses to these operations hinges on how long the shutdown will last, and, at present, nobody really has these answers.

Most U.S. farmers' ability to produce is little affected by the coronavirus. The key concern is with commodities that rely heavily on farm labor. Farms are adjusting practices and equipment to allow for social distancing, such as spacing of workers across a field or installing temporary separators on equipment that carries many workers.

Table 2. Farm-Level Milk Futures Prices

	Price of Milk Used for Cheese	Price of Milk Used for Powder and Butter
May Contract Farm Price \$/hundredweight		
Feb 3	\$17.17	\$17.17
Mar 2	\$16.38	\$15.74
Mar 30	\$13.15	\$11.53
Apr 13	\$10.98	\$11.01

Source: Farm Bureau, <https://www.fb.org/market-prices/overview>

The potential for COVID-19 to become established within farmworker communities is even more worrisome. The impacts could be devastating for the workers and their families. Given the collapse of the non-farm economy, labor supply to farms is now more plentiful than in recent seasons, but localized outbreaks could shut down farms and regions, as they have for some meat-processing facilities. The California legislature is considering a series of bills called The California Farmworker COVID-19 Relief Package designed to protect and incentivize farm workers. That legislation would also grant a tax credit to employers who offer overtime hours.

Emerging risks to the supply chain are the closure of processing plants and a recent spike in freight rates for refrigerated trucking. These rates spiked 10–15% in just a matter of a few days in the second half of March. Processing lines for key California vegetables, fruits, and nuts are set to ramp up in summer and run through fall in many instances. These lines involve workers operating in close proximity. These operations could be jeopardized if the coronavirus persists.

What Does the Future Hold?

The U.S. economy has shifted from one of expansion and low unemployment to a major recession. There is considerable debate as to how prolonged the recession will be and whether it will resemble a “V” shape, matching the present steep decline with a swift and steep recovery.

Farm prices for many basic commodities have dropped, in some cases precipitously, over fears of the impacts of the worldwide recession on demand. The key consideration in how much a commodity’s demand declines in a recession is its income elasticity. This is the statistic that measures how much quantity demanded will respond to the sharp reduction in consumer income expected in this

recession. Total food consumption in the U.S. has an income elasticity near zero, meaning little or no reduction in overall food consumption during the recession.

Many individual foods, however, have somewhat income-elastic demands, and consumption of these products will fall during the recession. Examples are specialty products and products that are expensive within their category. The income elasticity for food in restaurants (with fast food representing an exception) is also relatively high. People eat out less as their household income declines. These businesses will have been hammered twice by the pandemic—first through forced closure and, second, through the recession.

Meat products have higher income elasticities (and higher rates of consumption in restaurants) than staples such as bread, rice, and potatoes. Demand for many meat products is likely to decline during the recession, which explains why some farm commodity futures prices are dropping amidst rising prices at retail. This seeming disconnect has led to charges of futures market manipulations and market power by meat processors (<https://www.ams.usda.gov/mnreports/lstdhps.pdf>). More likely, these patterns reflect the normal dynamics of the market.

Demand for some meat products is spiking today for reasons we have discussed but for the rest of the year and into 2021, the traders fear a recession and reduced demand. Beef calves and yearlings being sold at auction today won’t become meat products at retail or food service for a year or more, long past the pandemic-induced demand spike and when many believe we may still be in the midst of a severe recession.

Moreover, we might expect only a gradual return among consumers to their previous “normal” eating habits,

especially if the forced closures of restaurants and food service persists into the summer. Even when sheltering-in-place restrictions officially end, we expect that some consumers will continue to be reluctant to resume a normal public presence for an additional period of time, including eating in restaurants. Hence, we may see only a gradual return in demand for food away from home.

A Resilient Food-Supply Chain

Despite the incredible disruptions that the coronavirus and economic shutdown have caused, our food supply chain from our farms to our tables has continued to supply Americans (and many others around the world) with the foods that allow a safe and healthy diet. Over the next weeks and months, there will surely be more uncertainty, controversy, and troubles. But, nothing in the data or the underlying economics suggests that there will be a lack of healthy, safe food available.

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