S&P Global
Commodity Insights

Food & Agricultural Commodities

Strategic report

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Food prices and inflation

Lessons from the last 50 years

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- **In 2022, food inflation became a global challenge, rising to the highest levels in 40 years in the US and Europe as the global food system struggled to recover from the shocks of the Covid-19 pandemic and the war in Ukraine created historic volatility for food and energy commodities.**

- **But the stage for inflation was set before these most recent shocks, with rising commodity demand, tightening stocks, and fiscal and monetary stimulus placing both upstream and downstream pressure on food prices.**

- **Viewed in a historical context, there is significant variation in inflationary episodes for food prices due to policy responses and underlying economic conditions. Though certain factors such as high energy or wheat prices almost always have systemic effects.**

- **Long-term trends in the food system such as rising livestock production, increased investment activity in commodity markets, and the energy transition to biofuels have created more potential for volatility across food and agricultural commodities, even as food prices have declined in real terms.**

The return of global inflation

Inflation has become the central economic story of the last year. Rising pressures on consumer prices became apparent in mid-2020, driven predominantly (though not exclusively) by the disruptions of the COVID-19 pandemic. However, upstream pressures on food and agricultural commodities were intensifying well before 2020, driven by ongoing structural changes in the global economy such as the energy transition and increased production of biofuels. Then in early 2022 Russia invaded Ukraine, sending global food and energy prices soaring. Now, more than a year into the war in Ukraine and three years past the initial COVID-19 lockdowns, inflation for food prices – and consumer prices more broadly – have seen the highest levels since the 1970s.

In the US, annual inflation measured using the Consumer Price Index (CPI) for all items ("headline inflation") hit a peak of 8.9% in June 2022. Inflation for food-at-home prices (i.e., retail food prices paid at the grocery store) reached a peak of 13.5% in October 2022. But over roughly the last year, inflation in the US has been gradually subsiding following falls in commodity prices and a string of interest rate hikes by the US Federal Reserve. As of May 2023, the CPI for all items registered an annual inflation rate of 4.0%, with food price inflation sitting at 5.8%.

Europe saw peak headline inflation a few months after the US. The eurozone Harmonized Index of Consumer Prices (HICP) hit a peak of 11.5% annual inflation in October 2022. The UK Consumer Price Index including owner occupiers' housing costs (CPIH) hit a peak of 9.6% in October 2022. Inflation for food prices in Europe was slower to arrive than in the US but saw a sharper rise due to more severe supply shocks stemming from the war in Ukraine, such as sunflower oil shortages and record-high energy prices. It appears Europe may have finally reached peak food inflation in March 2023 (at 17.5% in the eurozone and 19.2% in the UK), but it remains too early to state this with certainty.

In middle income and developing countries, inflation can be an even larger challenge as consumers spend a greater share of their income on food. Countries in the Middle East and North Africa (MENA) have been particularly hard-hit by the price spikes over the last year as they also tend to be larger importers of food supplies from Russia and Ukraine. In Egypt, for example, headline consumer price inflation in in April 2023 was 30.6% y/y, slowing slightly from a five-year high of 32.7% in March.

Many middle and lower-income countries also face macroeconomic challenges that have exacerbated the current situation. Argentina, for example, has faced a monetary crisis since 2018. In March, the country saw headline inflation reach 105% - the highest level since exiting a period of hyperinflation in the early 1990s. Some countries have seen both sets challenges. Lebanon has also faced an ongoing currency crisis and is highly reliant on food supplies from the Black Sea. Annual inflation in Lebanon was 262% in March 2023.

The return of high global inflation has prompted numerous comparisons to the 1970s, notably because of the similarities in food and energy supply shocks triggering both episodes. Some even warned of the return of "stagflation" in the US and Europe – concurrent high inflation and high unemployment that confounded economists in the 1970s. However, taking a longer-term view, periods of high food and energy commodity prices have not always triggered widespread global inflation, instead sometimes only having short-lived or regional effects. In this paper, we review the differences in inflationary episodes for commodity prices since the 1970s and assess why some inflationary episodes for agricultural commodities and food prices have been worse than others.

This paper looks at previous price shocks for food and agricultural commodities and how these highlight longer-term structural changes in the global food system. When we look at the most recent bout of food price inflation in historical context, there are two key insights. First is that the recent inflationary episode is likely to have a sustained impact on relative food prices in Europe. Food products that use cereals or vegetable oils as significant inputs, or which are highly sensitive to energy prices such as processed foods, are likely to remain comparatively more expensive relative to other food products than before this most recent inflationary episode.

The second and larger point of this paper is that food price movements are becoming more volatile. After the inflation of the 1970s, there were only modest surges in commodity prices and relatively stable food prices in much of the world for roughly 25 years. But in the last 20 years, we have experienced two waves of significant price volatility for agricultural commodities.

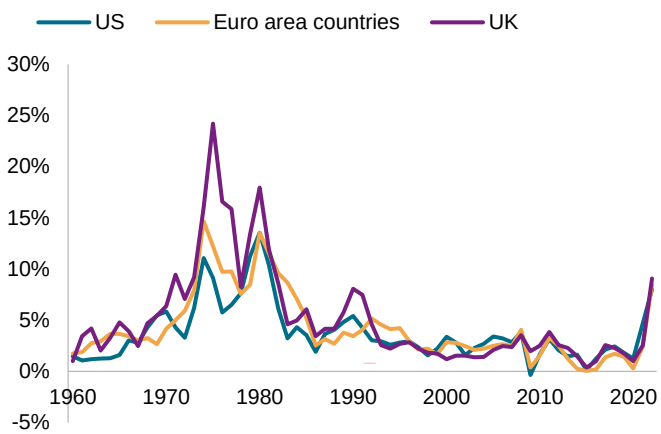
While it is tempting to attribute this to "black swan" events like the war in Ukraine, over the long-term we see that various agricultural commodity prices have become more volatile in percentage terms, even as prices in real terms have declined. Some prices, such as soybeans, have become less volatile in percentage terms, though this can be attributed to structural shifts which have driven up the overall price level.

Increased volatility has significant real-world implications. It has more immediate inflationary effects on food prices in developing countries where consumers spend a larger share of their income on staple foods, which can contribute to civil unrest. It also can spark inflation for consumer food prices in high-income countries in the right circumstances, particularly when coupled with shocks in the energy sector.

The 1970s: The decade of inflation

In a 1982 paper for the National Bureau of Economic Research, economist Alan Blinder declared: "The 1970s was the decade of inflation." Between 1970 and 1979, there were seven years with annual headline inflation above 5% and two years (1974 and 1979) where it exceeded 10%. Over the course of the decade the US CPI more than doubled. The inflationary period also overflowed into the 1980s, with the CPI registering a 10.8% increase in 1980 and a 7.9% increase in 1981 before finally tempering in 1982 to 3.5%. Blinder's paper focused on the US, but inflation in the 1970s was a global problem and was in fact more severe in many countries that were more sensitive to global food and energy prices. A combination of long-run and short-run factors contributed to the high levels of inflation in the 1970s, including both macroeconomic forces as well as changes in the global landscape for food and energy commodities.

Annual headline inflation rate



Data compiled Apr. 13, 2023.
Source: S&P Global Commodity Insights; World Bank

First looking at the macroeconomic environment, inflationary pressures in the US were already present in the late 1960s. The US CPI rose less than 2% a year between 1960-1965, but in the second half of the decade it began climbing, reaching an annual rate of 5.5% by 1969. The generally accepted explanation is that the US pursued more expansive fiscal policy during this time to push down unemployment, and even when inflation was becoming apparent, the US Federal Reserve did not intervene to the necessary extent to address the problem.

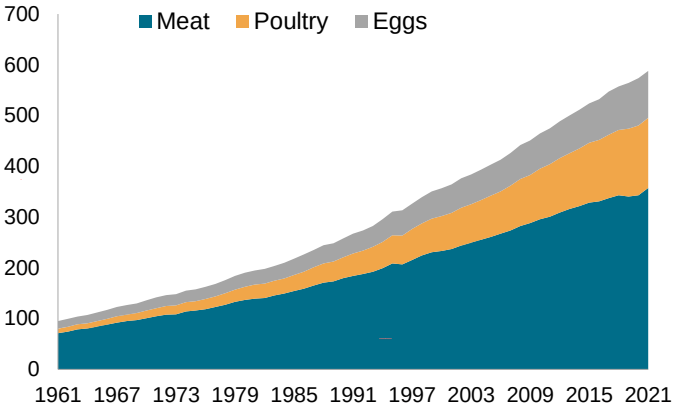
For global food prices, it must also be pointed out that in the run-up to the 1970s demand pressure on food commodities had been increasing considerably. After World War 2 developed countries saw a sharp rise in both meat production and consumption, mostly beef, which increased demand for grain and oilseed feedstocks. Limited data is available for the 1950s, but between 1961 and 1971, global meat production (excluding poultry and eggs) rose 51% from 71.4 million metric tons to 107.8 million metric tons. Production of corn, wheat, and soybeans rose 56% from 454.2 million metric tons to 706.8 million metric tons over the same period, but the larger volumes required for livestock production ultimately tightened supply and demand. The global population also rose during this time by approximately 700 million people, a 23% increase. As demand continued to rise, relatively flat grain production in the late 1960s led many countries to draw down stocks.

Returning to the events of the 1970s – concerned about the threat of rising inflation in the US, the Nixon Administration enacted a series of wage-and-price controls in 1971, thinking that the government could use these to keep inflation in

check while continuing to pursue its expansionary policy to push down unemployment. In January 1971, the Nixon administration submitted an ambitious “full-employment” budget for the 1972 fiscal year. The administration claimed that the budget would be noninflationary, which “[strained] credulity” according to one New York Times journalist.

The Nixon administration also began transitioning the US dollar off the gold standard in 1971, ultimately completing the process in 1973. Increased US deficit spending was resulting in larger amounts of dollar reserves held by foreign governments, and there was growing concern at the time about the risks of insufficient US gold reserves underpinning them. Ending the gold standard would allow the continued pursuit of expansionary fiscal policy without concern about an international run on US gold.

Global meat, poultry, and egg production (million metric tons)



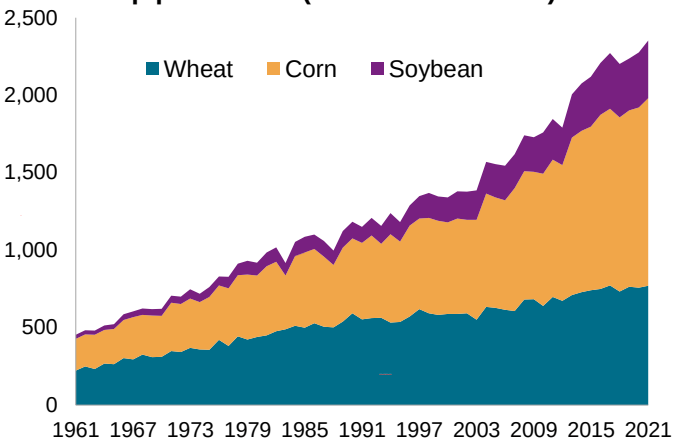
Data compiled Apr. 19, 2023.
Source: S&P Global Commodity Insights, FAOstat

At first the approach seemed to work. The wage and price controls were enacted for a temporary period of 90 days then gradually relaxed. Nixon’s approval rating went up and he won reelection in 1972. But unemployment was still high, and the groundwork had been laid for significant food and energy shocks in 1973.

Bad weather throughout much of the world in 1972 resulted in a poor global grain crop. A poor Peruvian anchovy catch the same year also reduced the availability of fishmeal protein for animal feed. Grain prices rose sharply, and soybean prices soared as buyers clamored for substitute animal feed with sufficient protein content. Global soybean production also subsequently increased more than 25% in 1973 as farmers chased higher prices.

The Soviet Union also entered the global market in 1973, buying large amounts of grain after domestic crop failures in 1971 and 1972, including a purchase of roughly 10 million short tons of grain from the United States. The massive surge in import demand from the USSR kept global prices high despite a better global crop in 1973. And the end of the gold standard for the US dollar caused a depreciation of the currency throughout the 1970s, driving greater demand for US agricultural exports and higher prices.

Global crop production (million metric tons)



Data compiled Apr. 19, 2023.
Source: S&P Global Commodity Insights, FAOstat

In October 1973, amid this turmoil in agricultural commodities, Arab states in the Organization of Petroleum Exporting Countries (OPEC) announced oil production cuts and an embargo on the US to protest US support for Israel in the Yom Kippur war. The Nixon administration reimposed wage and price controls that this time clearly didn’t work. Artificially low prices made it too expensive for farmers to send animals to market, and shortages of various products at became commonplace at supermarkets. The price controls were largely removed by April of 1974 with the notable exception of oil. Prices for US domestic oil were kept artificially low which limited expansion of production and effectively subsidized foreign oil imports. Shortages of oil and gas became recurrent in the US through the 1970s and global prices remained volatile.

The US also embargoed grain exports to the Soviet Union in 1975 on reports of another bad Soviet crop and fear of a repeat of 1973. Countries around the world enacted various export controls, price controls, and subsidies for food and energy commodities, all of which exacerbated inflation.

The food and energy price spikes in the first half of the 1970s, alongside various market-distorting policies, spurred inflationary pressure across the global economy. In 1974, consumer price inflation rose to 11.1% in the US, 14.7% in the countries that now make up the euro area, and 16% in the UK. In 1975, inflation slowed only slightly to 9.1% in the US and 12.2% in the now euro area countries. The United Kingdom saw inflation skyrocket to 24.2% in 1975.

In the US, retail food prices hit a peak of 22.4% in February 1974. With the US the world's dominant agricultural exporter at the time, there were delayed but severe effects in other countries. Food inflation in Greece hit a peak of 64.3% in September 1974. Italy peaked at 28% in November 1974. The UK reached a peak of 28.4% in July 1975.

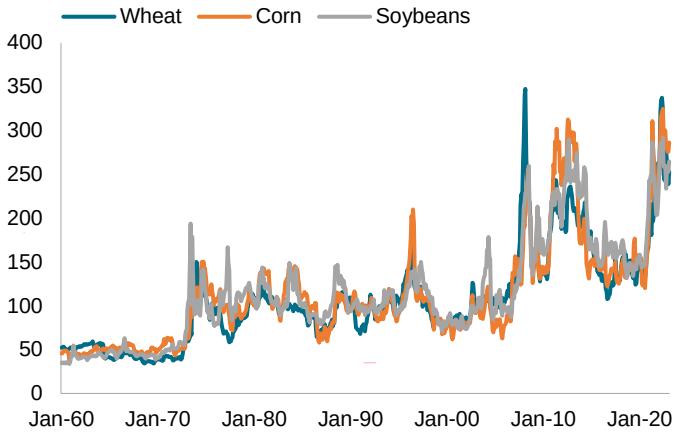
Inflation showed signs of gradual calming in the immediately following years but remained high. Then another poor global wheat crop in 1977 helped reignite the problem. World wheat production fell 9% y/y. US food price inflation began rising again, eventually hitting a peak of 14.3% in February 1979. This time, however, food prices were a comparatively smaller contributor to inflation. Another oil crisis in 1979 stemming from the Iranian Revolution sent energy prices soaring, with US consumer energy price inflation rising to a peak of 47.2% in March of 1980.

The results, nonetheless, were still systemic both in the US and globally. Core inflation (which excludes food and energy prices) began rising in 1978 alongside higher food prices, ultimately peaking at 13.6% in June 1980. Core inflation in the UK rose to a peak of 22.2% in May 1980, and throughout much of Europe inflation remained high well into the 1980s.

In the US, the prolonged nature of inflation in the 1970s had led to faster-rising wages, adding to inflation pressures. But inflation finally came down in the 1980s due to aggressive monetary policy by the US Federal Reserve and other central banks around the world as well as a recovery from the supply shocks of the late 1970s.

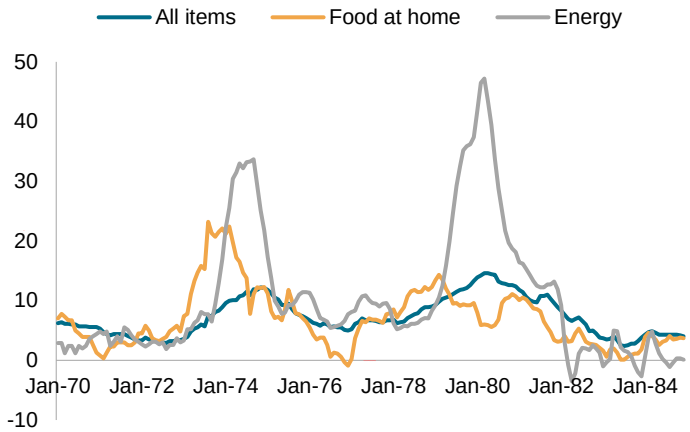
Disinflation for food prices, however, occurred at considerably varied rates across countries. US food price inflation peaked at 13.8% in February 1979. Food price inflation peaked at 16.4% in April 1980 in the UK. Food inflation in Canada peaked at 16.2% in April 1981.

US Producer Price Index by commodity (1982=100)



Data compiled May 18, 2023.
Source: S&P Global Commodity Insights; Federal Reserve Bank of St. Louis

Consumer price inflation (annual % change), US



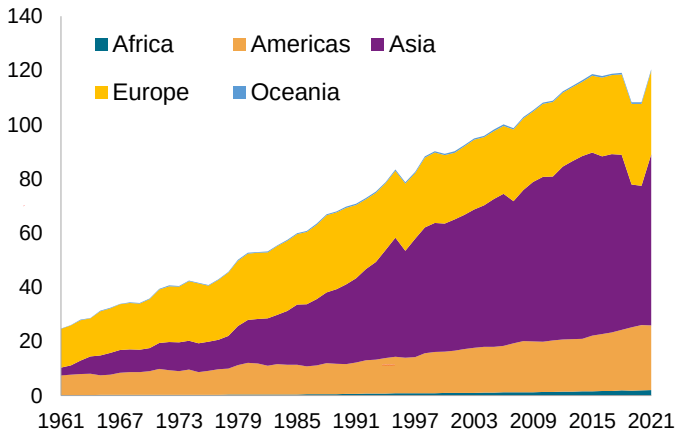
Data compiled Apr. 19, 2023.
Source: S&P Global Commodity Insights; BLS

The 1990s: Commodity prices surge, but inflation doesn't follow

In the 1990s, the world again saw consecutive years of poor grain crops. Global wheat production fell 6.6% y/y in 1991, saw little recovery in production in 1992 and 1993, then declined 5.3% y/y in 1994. This time though, the price surge was largely contained to commodity prices, without broadly systemic effects.

Again, the global demand landscape was changing prior to the commodity price spikes of the 1990s. Many Asian countries were seeing robust economic growth which spurred greater food demand, particularly for animal proteins. The increase in livestock production, notably the growth of the pig herd in mainland China, increased demand for grains and oilseeds for animal feed. The US dollar had also again been depreciating relative to other currencies, fueling demand for agricultural exports since most international trade is conducted in dollars.

Pork production by region (million metric tons)

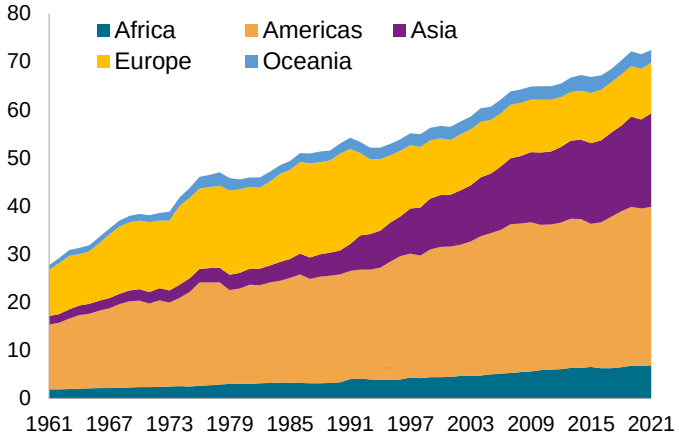


Data compiled May 3, 2023.
Source: S&P Global Commodity Insights, FAOstat

By May 1996, global corn prices had surged to $204 per metric ton, 82% higher compared with the previous year, according to International Monetary Fund data compiled by the Federal Reserve Bank of St. Louis. Global wheat prices rose to $249 in May of 1996, up 57% compared with the previous year. Energy prices, however, saw little pressure in 1996 and 1997.

There were no systemic inflationary impacts in the global economy this time. Consumer food prices saw some modest pressure from higher commodity prices, but nothing like the 1970s. The subdued impact on downstream food prices is generally attributed to two factors. First is that global trade was much more liberalized. Years of efforts to reduce trade barriers had resulted in the establishment of the World Trade Organization (WTO) in 1995. Easier global trade of agricultural commodities allowed markets to be more flexible in response to price spikes. Policymakers also generally did not enact trade barriers in response to higher commodity prices in the 1990s, which had exacerbated the problem in the 1970s.

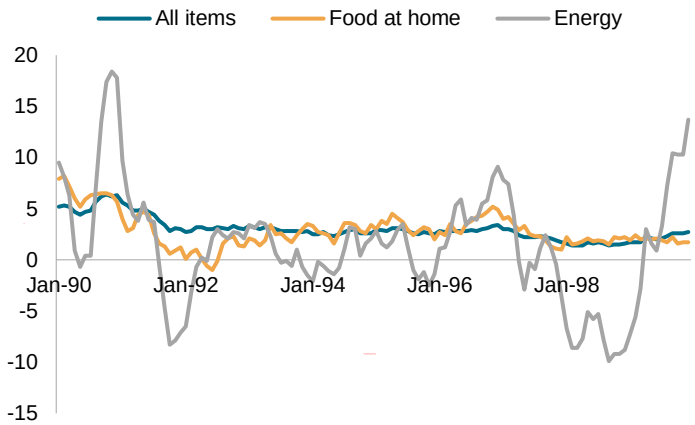
Beef production by region (million metric tons)



Data compiled May 3, 2023.
Source: S&P Global Commodity Insights, FAOstat

The second key factor was the 1997-99 Asian financial crisis. In July 1997, the Thai baht transitioned to a floating currency (after previously being pegged to the dollar) and sparked a wave of currency devaluations in the region. Financial liberalization in the period leading up to the crisis created an environment where foreign debt was rapidly accumulated without sufficient foreign exchange reserves and allowed for volatile shifts in capital flows that destabilized the financial sector. By January of 1998, the currencies of Indonesia, Thailand, South Korea, the Philippines, and Malaysia had all lost 50% or more of their value against the dollar.

Consumer price inflation (annual % change), US



Data compiled Apr. 19, 2023.
Source: S&P Global Commodity Insights; BLS

The crisis created a severe recession and intensified poverty in the region. It also snowballed into a global crisis affecting many middle-income countries. Russia experienced a financial crisis in 1998, followed by Brazil in 1999, and then Argentina and Turkey in 2001. Ultimately, the global economic slowdown reduced global demand for food and agricultural commodities and helped to mitigate the supply-side pressure on prices.

The 2000s: Biofuels and "financialization" begin to pressure the global food system

The spike in food and agricultural commodity prices in the 1990s was modest compared with the next price surge that occurred between 2006-08. Global wheat production again saw consecutive years of decline, falling 1.2% y/y in 2005, 2.0% in 2006, and 1.3% in 2007. Corn production declined 2.1% in 2005 and 0.9% in 2006, though did recover 12.1% in 2007 largely due to increased planted area in the US.

Other than wheat, the contraction in supplies of agricultural commodities was limited. However, commodity prices skyrocketed between 2006 and 2008. Wheat prices doubled, corn prices nearly doubled, and soybean prices more than doubled. Rice prices tripled in late 2007/early 2008 driven by a combination of panic buying and export restrictions in key supplier countries.

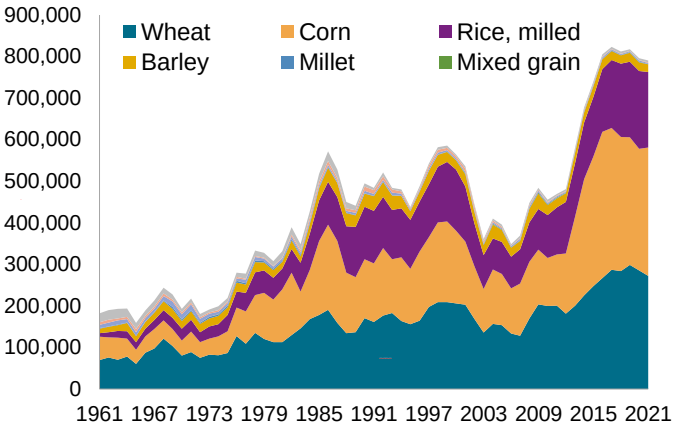
With only a modest contraction in supplies for some food commodities, what drove such a severe price shock? Some factors leading up to the price spikes mirrored the 1970s and 1990s: Rapid economic growth, notably in mainland China and other developing countries, which increased food demand, particularly for animal proteins and necessary feedstocks. The US dollar also weakened against other global currencies, driving international demand for agricultural exports.

But during this time there were also two new developments changing the landscape for food and agricultural commodities. The first was the expansion of biofuel production in developed countries, adding even more demand pressure on major commodities such as corn and oilseeds. In the US, ethanol production (predominantly from corn feedstocks) rose from 1.62 million gallons per year in 2000 to 9.3 million gallons in 2008. In the European Union, biofuel production capacity (predominantly from vegetable oils) rose from 478,550 metric tons to 15.34 million metric tons between 2000 and 2008. The tightening of supply and demand also led to a significant drawdown in stocks in the early 2000s.

The second development is generally referred to as the "financialization" of commodity markets, where financial investors began holding noticeably larger positions in commodities as an asset class. Investment funds had always been present in commodity markets, but the use of commodities as a diversification tool attracted more attention after the "dotcom bubble" US stock market crash in 2000. In 2001, congress and the Bush administration cut taxes aimed at bolstering the economy, and the Federal Reserve slashed interest rates over the course of the year. Rates were kept low through 2002 and 2003 as the US economy struggled to rebound. Low interest rates created a surge in highly leveraged investments, including in commodity markets.

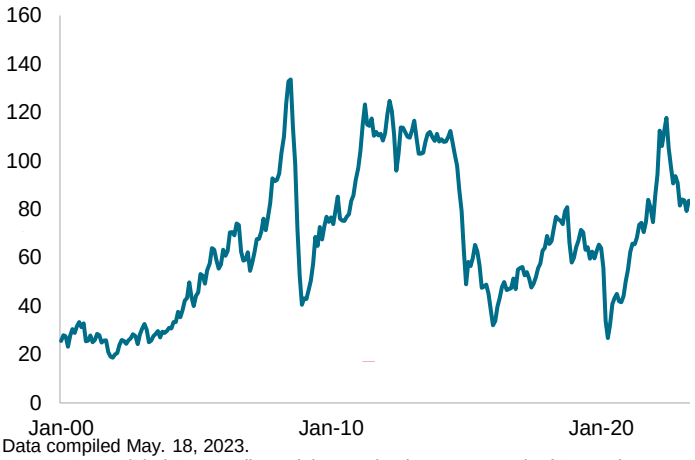
Between 2001 and 2010, the annual number of commodities futures contracts traded globally increased from 418 million to 2.5 trillion, according to a 2011 UN report. Commodities became a larger share of the global derivatives market over this period, and price movements across commodities became increasingly synchronized. An important distinction seen between 2006-2008 and previous episodes was that nearly all major commodity prices (i.e., not just food) rose in tandem. Energy and metals, in fact, saw much larger price rises than agricultural commodities at the time.

World grain ending stocks ('000 metric tons)



Data compiled May 18, 2023.
Source: S&P Global Commodity Insights, USDA

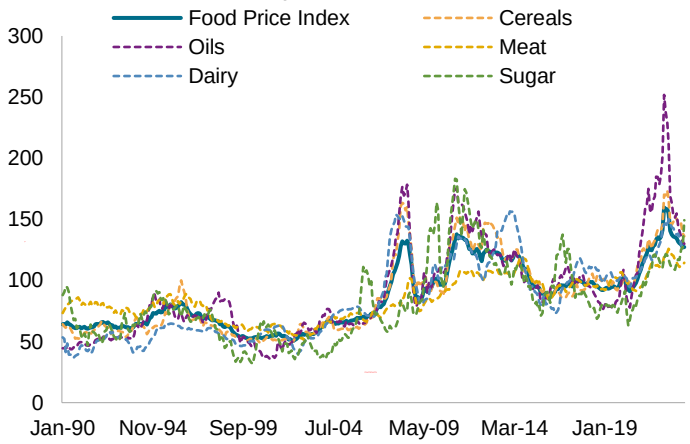
Global price of Brent Crude ($/barrel)



Data compiled May. 18, 2023.
Source: S&P Global Commodity Insights; Federal Reserve Bank of St. Louis, IMF

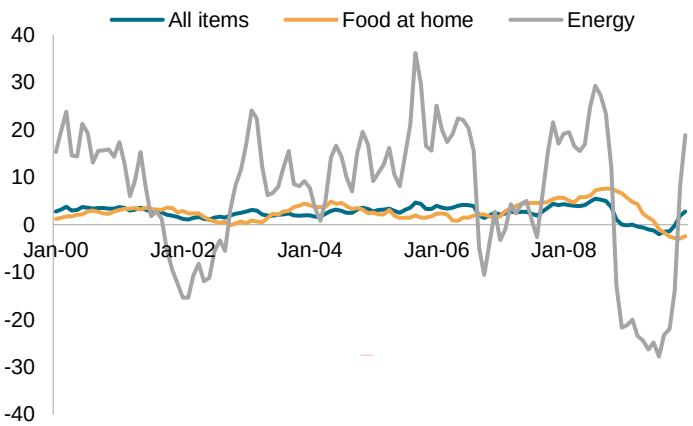
By 2007, it was clear rising commodity prices were beginning to drive higher food prices. Various countries including Argentina and mainland China began implementing export controls to temper domestic prices. In many lower and lower-

FAO Food Price Index, 2014-2016=100



Data compiled Jun 11, 2023.
Source: S&P Global Commodity Insights, FAO

Consumer price inflation (annual % change), US



Data compiled Apr. 19, 2023.
Source: S&P Global Commodity Insights; BLS

middle income countries the price rise hit crisis levels by 2008. Annual food price inflation in January 2008 reached a peak of 54% in Guinea. In April 2008 it rose to 52% in Cambodia. And in July 2008 it hit a peak of 92% in Ethiopia. The FAO Food Price Index, which tracks prices for an international basket of agricultural commodities with strategic importance for global food security and trade, hit a then-record measure of 132.5 in June 2008, increasing more than 45% over a one-year period.

Then, like the impacts of the Asian financial crisis in the late 1990s, rising food prices were buffered by the 2007-08 Global Financial Crisis, which triggered a severe global recession and depressed demand for agricultural and other commodities. 2008 was also a good year for global food production. World wheat production bounced back 12.1% compared with 2007. Corn and rice production increased 4.6% and 4.7% respectively. And soybean production rose 5.2% y/y.

By December 2008, wheat and rice prices had both fallen by around 50% from their peaks earlier in the year. Global corn prices in 2009 were 25.8% lower compared with 2008. By mid-2009, consumer food prices were either in decline or had returned to normal levels of inflation in many developing countries. Annual food price inflation in June 2009 was -5% in Cambodia, -3% in Ethiopia, and 4% in Guinea.

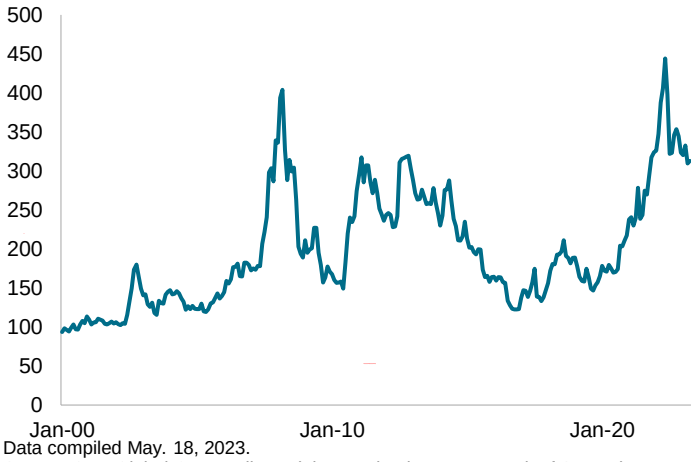
The 2010s: High food prices lead to unrest

Like the second shock in food prices in the late 1970s, the relief for commodity prices after the Global Financial Crisis was short lived. World agricultural production recovered only modestly after 2008, and in the wake of the financial crisis central banks again slashed interest rates to buoy the economy, fueling investment in commodity markets.

After recovering in 2008, global wheat production increased just 0.5% in 2009, while corn and soybean production fell 1.1% and 2.4% respectively. Then in 2010 corn production rose 3.9% and soybean production jumped 18.7%, but wheat production contracted 6.3% largely due to widespread drought across the Eurasian steppe. Despite some rebuilding of stocks between 2008 and 2010, levels were still low by historical standards. By the second half of 2010, wheat, corn, and soybean prices were all rising again. Wheat prices more than doubled between June 2010 and February 2011.

Energy prices also rebounded from their fall in 2009. Between the Q1 2009 and Q1 2011, brent crude oil prices increased 138%. High energy prices continued to encourage biofuel production, supporting prices for corn and oilseeds. Animal feed demand in Asia also continued to rise, further supporting prices. With global stocks still low and demand pressures persistent, prices surpassed 2008 levels. The FAO Food Price Index reached a new record of 137.6 in February 2011.

Global price of wheat ($/metric ton)

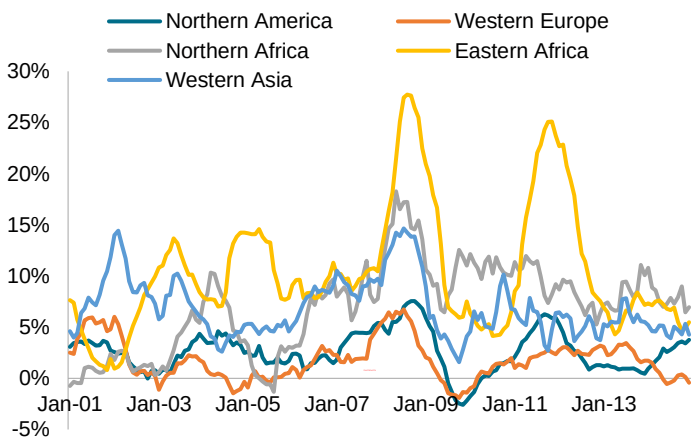


Data compiled May. 18, 2023.
Source: S&P Global Commodity Insights; Federal Reserve Bank of St. Louis, IMF

With the 2008 price spike still a recent memory, many countries tightened trade barriers over concerns about food supplies. Russia banned wheat exports, whereas during 2007-08 the country had only imposed an export tax to deter exports. And as was the case in the 1970s, these policies exacerbated the problem globally.

The brunt of the price shock was again felt in the developing world. East Africa saw the worst impacts, compounded by a severe drought in the region. In July 2011 the UN declared a famine in southern Somalia, the first of the 21st century. By October 2011 food inflation was nearly 52% in Ethiopia. Food inflation in South Sudan reached nearly 100% in May 2012, prior to the severe macroeconomic instability and high inflation that gripped the country in later years.

Annual food price inflation by region

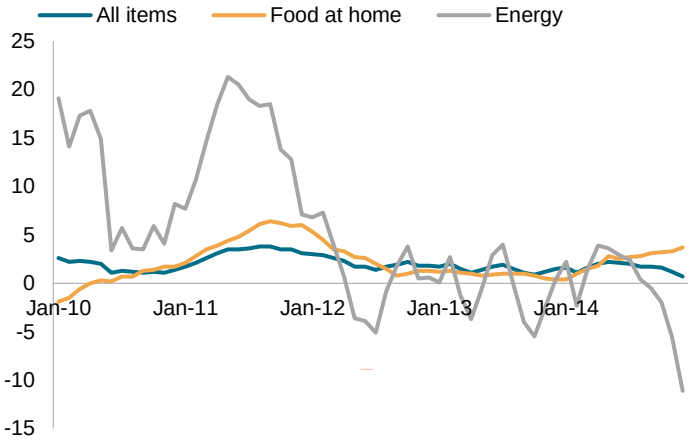


Data compiled May 18, 2023.
Source: S&P Global Commodity Insights; FAOStat

Food prices remained uncomfortably high in much of the world. In the three years between February 2011 and 2014, the FAO Food Price Index only declined 13.9% from its peak. With the global economy still limping back from the Global Financial Crisis, food had become an even larger share of household expenditures for many consumers in developing economies. Meanwhile, food prices remained generally stable in the US and Europe. Food inflation in the US only rose to a peak of 6.4% in September 2011. In the eurozone food inflation hovered at a slightly elevated level of around 3% between October 2011 and March 2012.

Many have pointed to the period of high food prices between 2007 and 2011 as a contributing factor for the Arab Spring, the wave of political protests which started in Tunisia in late 2010 and spread across North Africa and the Middle East. In Egypt, crowds famously chanted “bread, freedom, social justice.” The protests had widespread and varied impacts across the Arab world. The leaders of Egypt and Tunisia were ousted in relatively short order, while civil unrest in Yemen and Syria ultimately devolved into civil wars.

Consumer price inflation (annual % change), US



Data compiled Apr. 19, 2023.
Source: S&P Global Commodity Insights; BLS

Commodity prices finally retreated in 2015, led by a glut in global oil supplies brought on by the US shale boom with slow response from OPEC to cut production and support oil prices. Biofuel production growth had also noticeably slowed by this time, easing the growth in demand for feedstocks. Between 2010 and 2015, US ethanol production increased just 11.3%. Between 2012 and 2015, global wheat, corn, and soybean production increased 10.1%, 20.4%, and 34% respectively. Global grain stocks grew more than 50% during the same period. Agricultural commodity prices and global food price inflation remained relatively stable through the second half of the 2010s.

The 2020s: The decade starts with a pandemic and a war in Europe

The combined impacts of the Covid-19 pandemic and the war in Ukraine have created perhaps the most unusual landscape for the global food and agriculture sector in living memory. However, as with the previous episodes above, it is important to consider the developments preceding the shocks from both events. First, biofuel production reaccelerated in the late 2010s as part of global efforts to decarbonize motor fuels. Between 2015 and 2019, world biodiesel production increased more than 64% to 844 million barrels per day. World ethanol production increased 15% to 1,927 million barrels per day.

The second key development in the lead-up to 2020 was the widespread outbreaks of African Swine Fever (ASF) in 2018 and 2019. The disease decimated pig populations, especially in mainland China, and sharply reduced demand for animal feed. Some estimates put the losses from the disease or culling as high as 25% of the global pig population over this period.

Then in early 2020 the Covid-19 pandemic hit. As countries locked down in early 2020 in response to growing outbreaks, food prices jumped due to panic buying in many areas as well as restrictions on movements that constrained supplies. As governments figured out how to allow agriculture and other “essential” industries to function these price shocks largely eased by the second half of 2020.

But as lockdowns, travel restrictions, and other measures attempting to limit the spread of Covid-19 remained in place, supply chains at practically all levels faced disruption. Agricultural commodities such as Malaysian palm oil saw production fall due to labor challenges. And with consumers confined at home unable to spend money on services, there was a significant shift in spending to consumer goods and food products. With increased demand but supply chain capacity limited, shipping rates skyrocketed in 2021. Higher-priced consumer goods such as electronics outbid lower-priced agricultural products for available space, further pressuring food supplies.

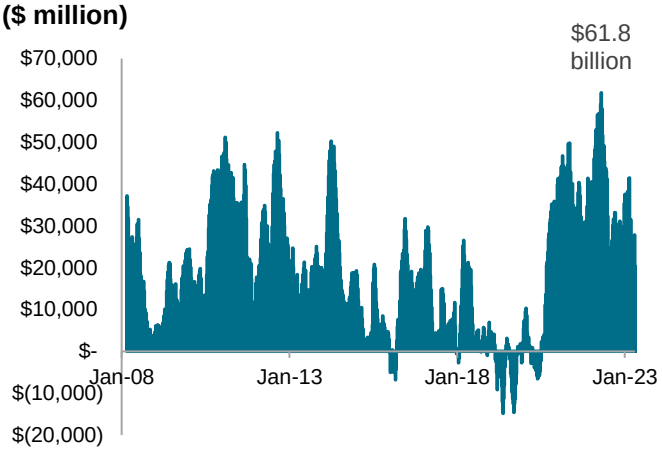
As supply struggled to keep up with the sudden shift in the demand landscape, demand growth was unrelenting. After declining 8% in 2020 because of lockdowns, world biofuel production quickly rebounded 9% in 2021, surpassing 2019 levels. And as the pig herd in mainland China recovered from ASF, so did animal feed demand. In the 2020-21 marketing year, mainland China’s coarse grain (cereals excluding wheat and rice) imports surged 189% to 50.5 million metric tons.

Larger fiscal stimulus measures in the US further skewed the supply-demand imbalance, and food price inflation began accelerating in mid-2021. Europe, which saw both a slower emergence from Covid-19 lockdowns and slower economic recovery, also saw signs of rising food inflation in the second half of 2021.

As these various supply and demand pressures on commodities became apparent, there was a surge in net-long positions of managed money in commodity markets starting in late 2020, fueling higher prices. By late April 2021, total managed money positions in agricultural commodities reached nearly $50 billion, near the peak levels seen in the commodity price spikes in the early 2010s.

But the problem exploded when Russia invaded Ukraine in February 2022. Following news of the initial invasion, wheat and corn futures jumped to 14-year highs practically overnight, and commodity markets saw historic levels of volatility in the immediately following months. Western countries responded with unprecedented economic sanctions, including removing Russia from the SWIFT international payment system. The initial sanctions excluded food and energy commodities as well as fertilizers, but nonetheless caused significant disruption in Russian trade flows. Russia also imposed a naval blockade on Ukraine, preventing exports from the country via the Black Sea, the main export avenue prior to the war. In addition to the price spike in grains, energy commodity and vegetable oil prices saw extreme levels of volatility, driven by factors including a fall in Russian oil shipments and a three-week ban in Indonesian palm oil exports. By late April 2022, nearly 17% of global trade in food calories was subject to export restrictions, according to figures from the International Food Policy Research Institute (IFPRI), though many of these restrictions were removed by the middle of the year.

Total net managed money in agricultural commodities ($ million)



Data compiled May 2, 2023
Source: S&P Global Commodity Insights; CFTC

The war caused such a severe shock to commodity markets because Ukraine and Russia have both become major suppliers of agricultural commodities in the last 20 years. Russia's share of world wheat exports rose from around 7% in the early 2000s to an average of 19% in the late 2010s. Ukraine's share of world wheat exports increased from 4% to 10% over this period. Ukraine has also become a major corn exporter, increasing from around 2% to 15% of world exports. Both countries are major vegetable oil suppliers, prior to the war accounting for around 76% of world sunflower oil exports (25% from Russia, 51% from Ukraine). Russian and Ukrainian sunflower oil exports accounted for around 10% of world vegetable oil trade prior to the conflict.

The disruption in both Ukrainian and Russian exports and the spikes in commodity markets drove the FAO Food Price Index to a record-high measure of 159.7 in March 2022, increasing 13.1% in just one month. On top of the other pressures on food commodities from the pandemic, the index sat 34% higher compared with March 2021 and 68% compared with March 2020. While price increases were seen across all commodities in the index, the pressure in vegetable oils was especially severe. The vegetable oils component of the Food Price Index rose 25% m/m in March 2022 and had nearly tripled between March 2020 and 2022.

With commodity supplies threatened and inflation accelerating, investment funds further increased their net-long positions in commodities. By April of 2022, the total managed money net position in agricultural commodities reached a record $61.8 billion.

Then in May, Russia began limiting gas supplies to Europe, citing unscheduled maintenance issues. EU member state governments accused Russia of cutting energy supplies in retaliation for sanctions. The reduction in gas flows and uncertainty around Russian energy supplies prompted EU governments to buy large quantities of gas to fill storage

Dutch TTF gas futures, monthly average (€/KWh)

Data compiled Feb. 23, 2023.
Source: S&P Global Commodity Insights; Investing.com

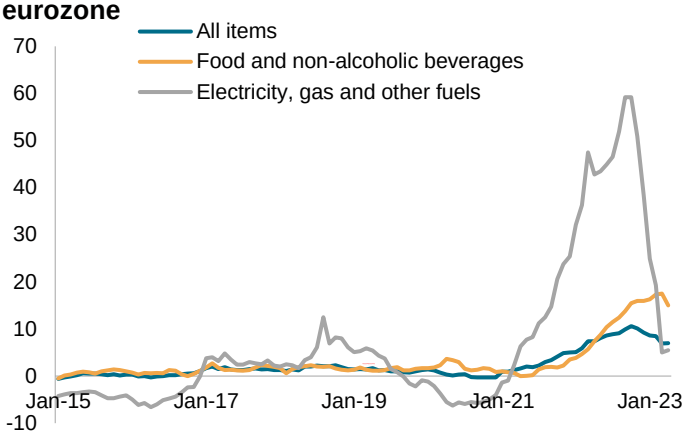
capacity ahead of the winter. The stockpiling effort – on top of reduced Russian supplies and already-surging commodity prices – pushed gas prices to record highs.

By the summer, the pressure on agricultural commodity prices began easing, as the EU implemented a host of measures to facilitate Ukrainian land and rail exports via its western border with EU countries, and a deal brokered by the UN and Turkey allowed resumption of exports via cargo ships from certain Ukrainian ports. Russia also saw a bumper wheat crop, which it has been forced to sell at discounted prices – mostly to India and China – due to limited ability to conduct financial transactions with Western countries. The result has been downward pressure on global food prices. Also, after peaking in August 2022, gas prices finally returned to pre-war levels by January 2023 as Europe experienced a mild winter which limited demand pressure on gas supplies for heating.

As of April 2023, the FAO Food Price Index has fallen more than 20% from its peak last March, largely driven by relief in cereals and vegetable oil prices. The cereals component of the index has fallen 20% since last March, and the vegetable oils component has fallen 48%.

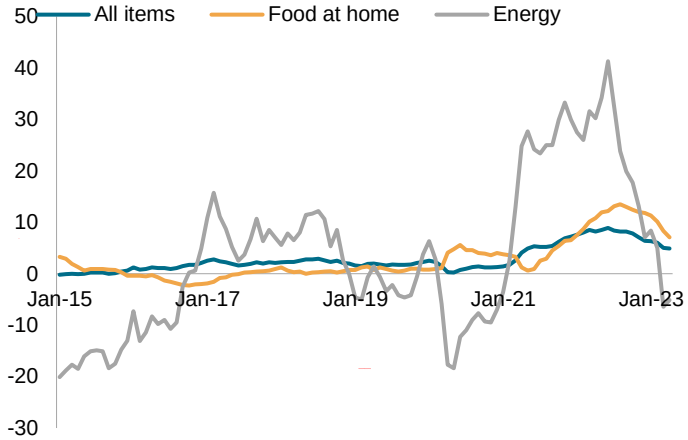
Like the 1970s, the combination of food and energy supply shocks supercharged inflation pressures in much of the world. Even with measures aimed to shield consumers from energy price shocks, electricity price inflation in the eurozone rose to a peak of 46% y/y in October but has since subsided to just 6.4% y/y as of April. In the UK, which had limited ability to build up gas reserves, consumer electricity price inflation reached a government-capped level of 66.7% y/y in January and stayed there for several months, but in April finally fell to 17.3%.

Consumer price inflation (annual % change), eurozone



Data compiled Jun. 12, 2023.
Source: S&P Global Commodity Insights; ECB

Consumer price inflation (annual % change), US



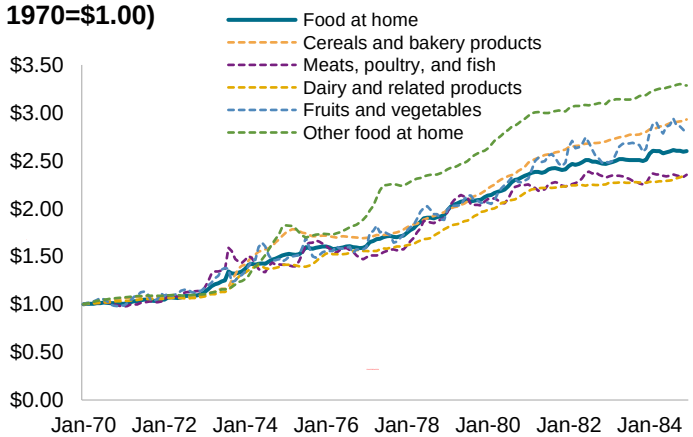
Data compiled Jun. 11, 2023.
Source: S&P Global Commodity Insights; BLS

While the worst may be over for the commodity price surge brought on by the war, inflation remains high in much of the world, with many delayed impacts still felt on consumer food prices. Europe only finally saw relief in food price inflation in April. Annual inflation for food and non-alcoholic beverage prices in the eurozone registered 15.0%, a notable easing from 17.5% in March, though it remains to be seen whether the slowdown is sustained. In the UK, inflation for food and non-alcoholic beverages in April was 19.1%, mostly unchanged from March at 19.2%.

The uneven effects of food price inflation

Inflation is not only characterized by a change in the overall price level, i.e., how much currency is required to purchase something. Inflationary episodes also have impacts on relative prices – how much products cost in comparison with each other. Due to different nature of each inflation episode for agricultural commodities in the last 50 years, we see distinct differences in the effects on relative food prices for each period. In the 1970s, consumer price inflation in the US was more predominantly driven by energy prices. As a result, there was greater inflation for “other food” (a category that includes processed foods such as snacks and frozen meals) since energy is a significant input cost in food manufacturing. Between January 1970 and January 1982, US retail prices for cereals and bakery products increased 136%, while

Relative price changes, US food at home (Jan. 1970=$1.00)



Data compiled May 23, 2023.
Source: S&P Global Commodity Insights, BLS

prices for “other food” increased 197%. In dollar terms, this means that in January 1982 it cost consumers $2.97 to buy the same volume of “other food” that $1.00 would have bought in 1970.

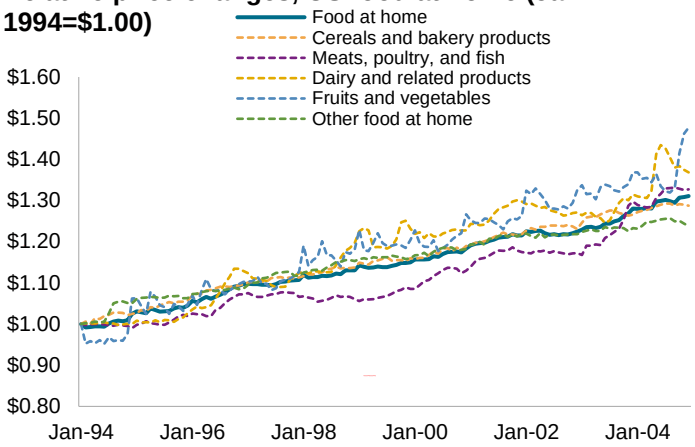
In the 1990s, price rises in commodities had little impact on US food inflation. However, we still see a notable shift in relative prices. As the Asian financial crisis depressed food demand in the region, there was a notable impact on meat consumption due to it being a higher-priced product. With global demand for meat reduced amid steadily rising production, US consumers saw meat become relatively more affordable compared with other food products in the late 1990s. Between January 1994 and January 1999, prices for cereals and bakery products in the US increased 14.9%, but meat prices increased just 5.5%.

In the global food crises between 2006 and 2011, US consumers still saw cereals and other bakery products become relatively more expensive, even though overall food inflation was modest. Other products such as fruits and vegetables also became relatively less expensive compared with other products as the Global Financial Crisis pushed US consumers to reduce spending. Between January 2006 and January 2011, cereals and bakery products prices increased 20.3%, where other products increased between 10-15% over the same period. By January 2014, cereals and bakery product prices had risen 28.5% and meat, poultry, and fish prices increased 39.4%, while fruit and vegetable prices were still only 15.1% higher compared with January 2008.

In the most recent inflationary episode, meat became relatively more expensive (beef especially) in the US due to a combination of supply chain production challenges and increased consumer demand during lockdowns. However, the price rises for meat, poultry, and fish have mostly tempered since autumn 2022. Prices for cereals and bakery products and “other foods” caught up to meat price inflation in late 2022 driven by the disruptions in global food and energy prices caused by the war in Ukraine. Also, with food inflation at higher levels and US consumers looking to reduce their spending, we again see fruit and vegetable prices become less expensive relative to other products as consumers reduce purchases. Between January 2020 and January 2023, cereals and bakery products prices increased 26.6%, meat, poultry, and fish prices increased 23.3%, and “other food” prices increased 25.6%.

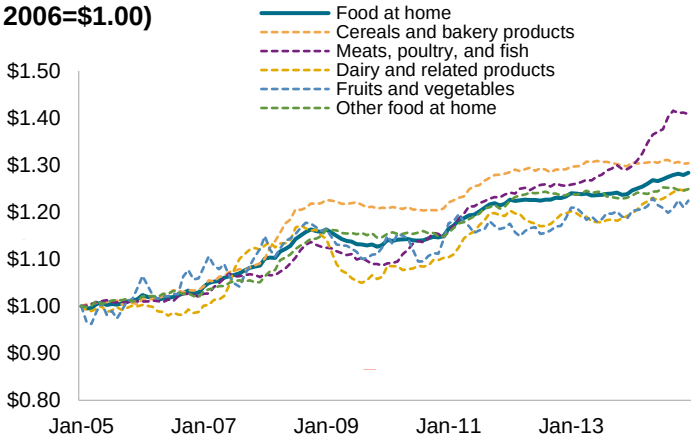
While the recent bout of food price inflation has drawn comparisons to the 1970s, relative price movements show clear differences in US food price increases between then and now. The combination of global food commodity supply shocks and high energy prices in the late 1970s instead more closely mirror the energy challenges in Europe over the last year. In the eurozone, prices for food products not elsewhere classified, the equivalent measure to “other food” in the US, increased 17.2% between April 2022 and 2023. Other processed products sugar, jam, honey, chocolate, and confectionery increased 17.9%. Bread and cereals prices increased 17.1% and oils and fats increased 23.5%.

Relative price changes, US food at home (Jan 1994=$1.00)



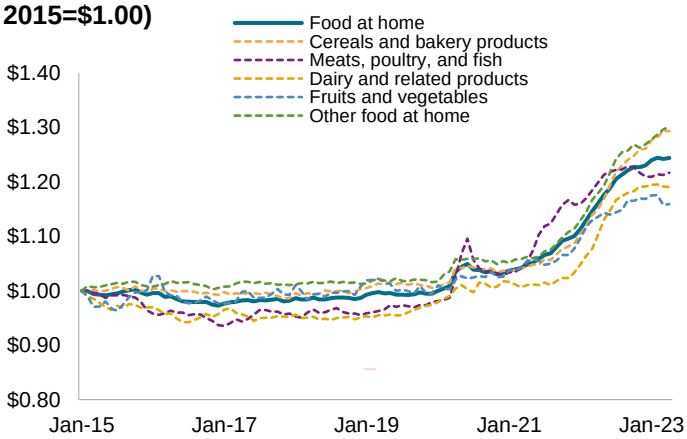
Data compiled May 23, 2023.
Source: S&P Global Commodity Insights, BLS

Relative price changes, US food at home (Jan 2006=$1.00)



Data compiled May 23, 2023.
Source: S&P Global Commodity Insights, BLS

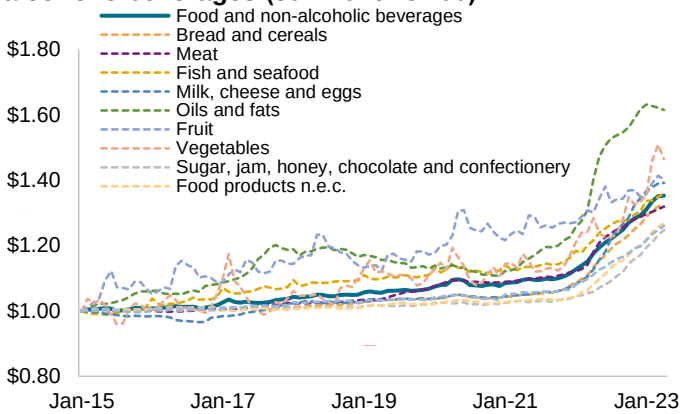
Relative price changes, US food at home (Jan 2015=$1.00)



Data compiled May 23, 2023.
Source: S&P Global Commodity Insights, BLS

While there are significant differences in food systems between the US and Europe, the experience in the US in the 1970s suggests that higher relative prices for cereals, oils and fats, and processed foods in Europe are likely to remain for the foreseeable future. In the US, the relative increase in prices for cereals and bakery products and processed food which took place in the 1970s remained in place until the 1990s, when processed food began seeing prices rise more slowly compared with other products. Between January 1970 and 1994, “other food” prices in the US increased 318% and cereal and bakery products increased 344%. Meat, poultry, and fish prices over this time increased just 223%. Between January 1994 and January 2020, other food prices increased just 59% while cereal and bakery products increased 72% and meat prices increased 84%.

Relative price changes, eurozone food and non-alcoholic beverages (Jan 2015=€1.00)



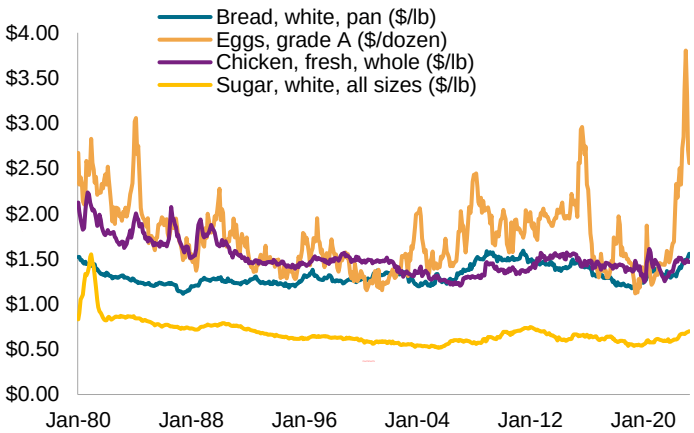
Data compiled May 23, 2023.
Source: S&P Global Commodity Insights, BLS

Despite inflation episodes, real food prices have been in long term decline

While the above discussion of relative prices looks at changes in nominal terms, in real terms (adjusted for inflation) food prices have been in long-term decline in high-income countries. There are numerous causes for this, most notably increased agricultural productivity and global trade.

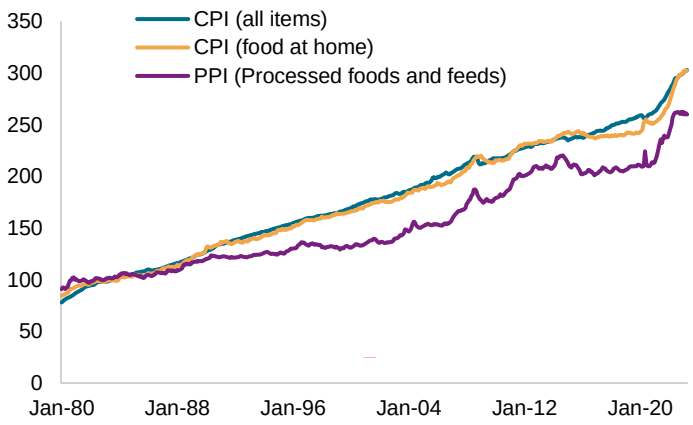
This decline in real terms is also not limited to commodities. Other inputs such as chemicals used in food processing have gotten cheaper over time due to increasing production in mainland China. While data is limited, this is supported by producer price index (PPI) data and information from industry sources. According to one industry source, in the 1990s potassium sorbate – a common food preservative – was around $3.50/lb. The price trended steadily lower for years (following a price-fixing crackdown by antitrust regulators) until prices were approximately $2.50/lb prior to the COVID-19 pandemic. Prices spiked to $4.00/lb amid supply chain disruptions and inflation pressures but have since fallen to below pre-pandemic levels at around $1.75/lb. The long-term price trend in food chemicals has been characterized by some in the food and feed industry as mainland China “exporting deflation.”

Food prices, US city average (Constant 2015$)



Data compiled June 2, 2023.
Source: S&P Global Commodity Insights, BLS, Federal Reserve Bank of St. Louis

Price indices, US (1982=100)



Data compiled June 2, 2023.
Source: S&P Global Commodity Insights, BLS, Federal Reserve Bank of St. Louis

Food prices are becoming more volatile

Over the last 50 years, major economic shifts such as globalization, rising incomes, decarbonization and financialization have exerted varying pressures on the food system. Increases in productivity and trade have made food generally more affordable over the long-term, but the food system has also become more sensitive to shocks around the world. A perhaps obvious lesson to be learned from looking back over the past 50 years is that the fundamental supply-demand

balance in agriculture is still the main determinant of commodity price movements. Each commodity price spike reviewed in this paper was preceded by some combination of falling or stagnating production and tightening of stocks.

Over roughly the last 25 years, global exports of major commodities have concentrated in different regions of the world. Whereas the US was the dominant food exporter in the 1970s, now the largest share of world wheat exports come from the Black Sea (Russia and Ukraine). Brazil has become the world's dominant soybean exporter, and the US has remained the largest exporter of corn – though Brazil is likely to move into the top spot this year. As demand for agricultural commodities has also increased for both human and animal consumption as well as biofuels, the fundamental supply-demand balance has tightened, making prices more exposed to production shocks throughout the world rather than in a few key exporting countries. Larger shares of managed money flowing in and out of commodity markets has also made price swings in either direction more pronounced.

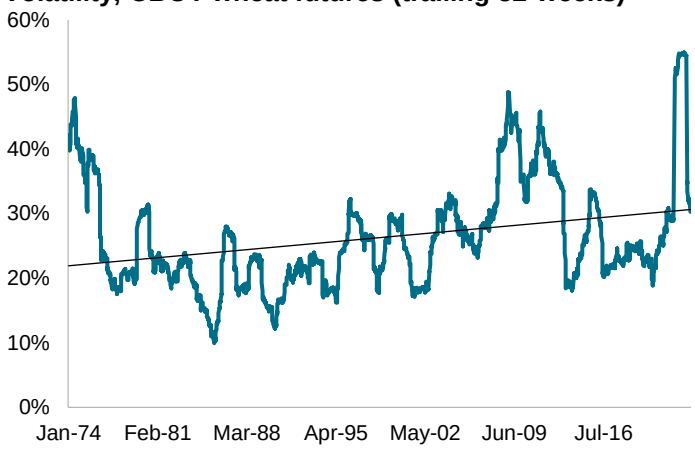
But the growth in global trade has also made markets more responsive to supply shocks, mitigating the duration of price spikes. The political commitment to maintaining trade flows, however, has faced greater scrutiny in recent years. The US-China trade war in 2018 and 2019 marked a major departure from the long-term trend toward liberalized trade, and some tariffs – like for US soybeans – still remain in place. The COVID-19 pandemic also raised concerns about the fragility of global supply chains, prompting many companies to examine potential "decoupling" of their supply chains from mainland China or other regions that are now perceived as riskier. Sanctions against Russia since the invasion of Ukraine last year, despite exempting many food and fertilizer products, have also significantly disrupted trade flows.

On the demand side, a major driver of demand for agricultural commodities has been the increase in livestock production. Recent animal disease challenges such as Highly Pathogenic Avian Influenza (HPAI) and African Swine Fever (ASF) have created supply challenges for poultry and pork, driving up prices for animal proteins and indirectly affecting other commodities. The ASF outbreaks starting in 2018 which decimated the hog herd in mainland China significantly reduced demand for soybean meal imports. Over the longer term, livestock production will be a less consistent source of demand pressure as rising incomes continue to support greater meat consumption in developing economies, but aging population demographics in mainland China slow the country's rising the demand for meat and subsequently animal feed.

Biofuel demand will continue to pressure vegetable oil supplies as the world seeks to decarbonize for both environmental and political reasons. Sunflower oil production in Ukraine remains at risk of war-related disruption, and buyers of soybean and palm oil in high-income countries are increasingly seeking assurances that these products are produced without furthering tropical deforestation. As a result, the price spreads between vegetable oils will likely widen as some buyers are more reluctant to substitute oils, resulting in more volatile price swings when a particular vegetable oil faces production challenges.

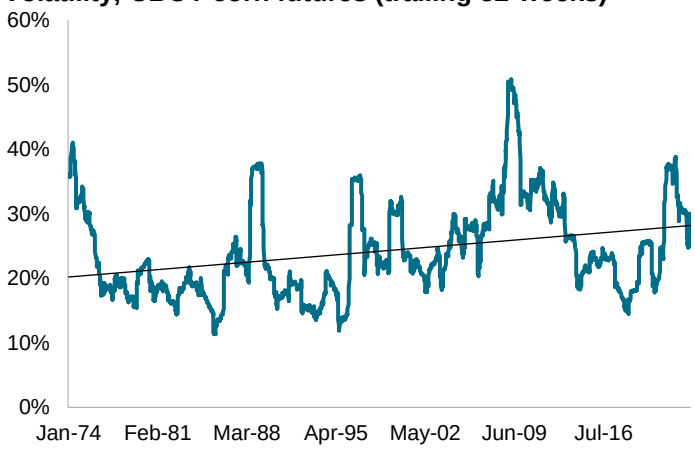
Ultimately, the combination of factors which have changed the food system over the last 25 years have created the potential for both increased upside and downside volatility. This can be seen in volatility measures for agricultural commodity prices on the Chicago Mercantile Exchange. From 1974 to the present, volatility measures for corn and wheat futures have followed a long-term upward trend, even as their prices have declined in real terms. Volatility for cattle and lean hog futures has also trended upward, though at a more subdued pace. Interestingly, soybean and soybean oil futures have become less volatile in percentage terms since the 1970s. This is in part because of how severe the price spike was in the 1970s due to limited alternative high-protein feed at the time, and because biofuel demand has driven

Volatility, CBOT wheat futures (trailing 52-weeks)



Data compiled Jun. 5, 2023.
Source: S&P Global Commodity Insights; CME

Volatility, CBOT corn futures (trailing 52-weeks)

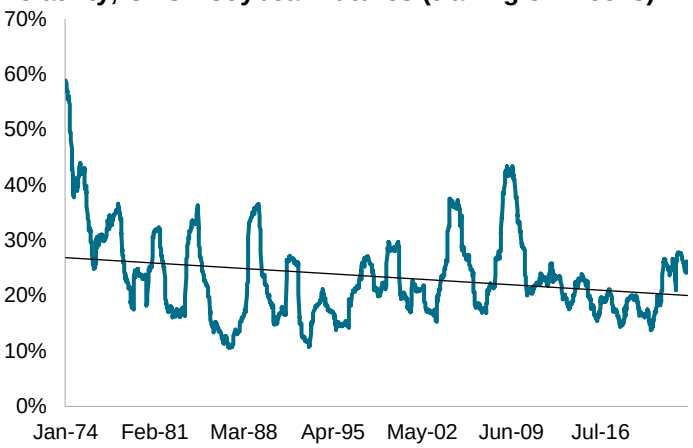


Data compiled Jun. 5, 2023.
Source: S&P Global Commodity Insights; CME

nominal soybean prices relatively higher than other commodities since the early 2000s, making price movements smaller in percentage terms.

Increased volatility in commodity prices has several implications for the global food system. It disproportionately affects food prices in lower-income countries, as seen in 2008-09, 2011-12, and over the last year. With consumers in these countries spending a larger share of their income on food, this can lead to both significant food security and geopolitical concerns, as seen during the Arab Spring.

Volatility, CBOT soybean futures (trailing 52-weeks)



Data compiled Jun. 5, 2023.
Source: S&P Global Commodity Insights; CME

But the effects are also felt in high-income countries. As noted above, relative prices see long-term shifts after inflation episodes have tempered. Higher levels of commodity prices volatility have also been associated with adverse effects in income per capita in commodity-exporting countries, according to a report from the staff at the International Monetary Fund (IMF) published in March, suggesting that volatility may be a drag on economic growth.

Recurrent episodes of price volatility also tend to be amplified, since there is limited ability to recover from the first shock and rebuild supplies. At the time of this report, food inflation continues to cool in the US and is showing preliminary signs of relief in Europe but remains high in much of the world. By historical standards, the events of the last few years (the COVID-19 pandemic, the war in Ukraine, drought in the US and Europe) appear on their face to be outliers. However, this is part of a broader trend towards an increasingly complex and increasingly volatile landscape for food and agricultural commodities.

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