A World Bank Report

OCTOBER 2022

Commodity Markets Outlook

Pandemic, war, recession: Drivers of aluminum and copper prices

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Many people contributed to the report. The Special Focus on "Pandemic, war, recession: Drivers of aluminum and copper prices" was authored by Christiane Baumeister, Guillermo Verduzco-Bustos, and Franziska Ohnsorge. Section authors include Peter Nagle (energy), John Baffes (agriculture), Francisco Arroyo Marioli (metals), and Wee Chian Koh (fertilizers and precious metals). Shane Streifel provided input and reviewed the report. Kaltrina Temaj provided research assistance and managed the database. Maria Hazel Macadangdang produced the forecast table. Design and production were handled by Adriana Maximiliano. Graeme Littler produced the accompanying website.

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The World Bank's *Commodity Markets Outlook* is published twice a year, in April and October. The report provides detailed market analysis for major commodity groups, including energy, agriculture, fertilizers, metals, and precious metals. Price forecasts for 46 commodities are presented. Commodity price data updates are published separately at the beginning of each month.

The report and data can be accessed at:
www.worldbank.org/commodities

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Executive Summary

A sharp global growth slowdown and concerns about an impending global recession are weighing on commodity prices. In many economies, however, prices in domestic-currency terms remain elevated because of currency depreciations. This could deepen the food and energy crises already underway in a number of countries. As the global growth slowdown intensifies, commodity prices are expected to ease in the next two years, but they will remain considerably above their average over the past five years. Energy prices are expected to fall by 11 percent in 2023 and 12 percent in 2024. Agricultural and metal prices are projected to decline 5 and 15 percent, respectively, in 2023 before stabilizing in 2024. This outlook, however, is subject to numerous risks both in the short- and medium-term. Energy markets face an array of supply concerns as worries about the availability of energy during the upcoming winter intensify in Europe. Higher-than-expected energy prices could pass through to non-energy prices, especially food, prolonging challenges associated with food insecurity. A sharper slowdown in global growth presents a key downside risk, especially for crude oil and metal prices. A Special Focus section suggests that concerns about a possible global recession have already contributed to a decline in copper prices from their peak in March 2022, and a shift in demand from aluminum has contributed to lower aluminum prices. Prices will likely remain volatile as the energy transition unfolds and demand moves from fossil fuels to renewables, which will benefit some metal producers. Metal-exporting countries can make the most of the resulting opportunities for growth over the medium-term, while limiting the impact of price volatility by ensuring they have well-designed fiscal and monetary frameworks.

Recent trends

Most commodity prices have retreated from their peaks in the aftermath of the post-pandemic demand surge and war in Ukraine as global growth slows and worries about a global recession intensify. However, individual commodities have seen divergent trends amid differences in supply conditions and their response to softening demand (figure 1.A). Moreover, currency depreciations in many countries have resulted in higher commodity prices in local currency terms compared to the price in U.S. dollars (figure 1.B).

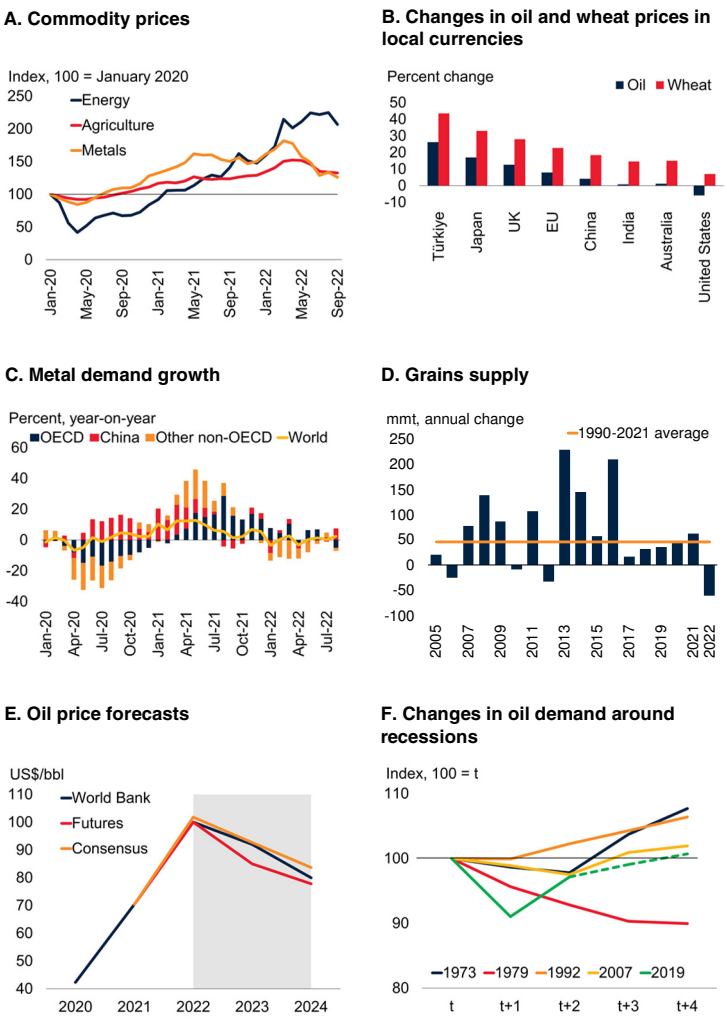
For example, from February 2022 to September 2022, the price of Brent crude oil in U.S. dollars fell nearly 6 percent. Yet, because of currency depreciations, almost 60 percent of oil-importing emerging market and developing economies saw an increase in domestic-currency oil prices during this period. Nearly 90 percent of these economies also saw a larger increase in wheat prices in local-currency terms compared to the rise in U.S. dollars. As a result, commodity-driven inflationary pressures in many countries with depreciating currencies may be more persistent than indicated by recent declines in global commodity prices. This could prolong the food and energy crises already affecting many developing economies.

Energy prices have diverged widely and have been extremely volatile since the outbreak of the war in Ukraine. *Brent crude oil prices* fell sharply during 2022Q3 (nearly one-quarter lower in September 2022 relative to its June 2022 peak) due to concerns about a global recession in 2023 and tightening financing conditions. Prices partially rebounded in October following the announcement by OPEC+ members on October 5th to reduce their production target by 2 million barrels per day (mb/d) but have been volatile since. *Natural gas prices* in Europe reached all-time highs in August 2022 due to aggressive actions by several countries to rebuild their inventories as well as reduced flows of gas from Russia. Prices have since dropped sharply as inventories reached their target levels and demand has fallen. *Coal prices* continued to increase in 2022Q3, as many countries turned to coal as a substitute for natural gas. During the past four quarters, natural gas prices in Europe and seaborne coal prices have averaged 420 and 180 percent higher, respectively, than their average over the past five years.

Non-energy prices declined 13 percent in 2022Q3 (q/q). *Metal prices* declined the most, largely reflecting weaker global growth and concerns about a slowdown in China (figure 1.C). *Precious metal prices* fell 9 percent (q/q) as global interest

FIGURE 1 Commodity price developments

Commodity prices have diverged since the start of the war in Ukraine, with energy prices remaining elevated and non-energy prices declining. In many countries, however, most commodity prices are much higher in local currency terms because of the strength of the U.S. dollar. Metal demand growth has fallen in most regions as the global economy has decelerated. The production of grains was robust in 2021-22 but is expected to decline in 2022-23. Looking ahead, oil prices are expected to ease in 2023-24, but there is much uncertainty to the outlook; a key downside risk is the possibility of a global recession.



Sources: Bloomberg; Consensus Economics; U.S. Department of Agriculture; World Bank; World Bureau of Metal Statistics.

A. Monthly data. Last observation is September 2022.

B. Percent change in prices in local currency terms between February 2022 and September 2022.

C. Year-on-year growth of metal demand. Monthly data. Last observation is August 2022.

D. Supply is the sum of beginning stocks and production. Years refer to crop seasons (for example, 2022 refers to 2022-23).

E. Consensus forecasts taken from the October 2022 survey. Futures prices average of October 3 to October 21, 2022.

F. Figure shows episodes of oil demand contractions around recessions. Year t is the peak in oil demand prior to contractions. Dashed line shows IEA forecast for 2022 and 2023 from its Oil Market Report, October 2022

rates rose sharply. *Agricultural commodity prices* fell 11 percent in 2022Q3 (q/q). Fears about food shortages earlier in the year gradually eased. Exports from Ukraine restarted and inventories of key crops remain above historical levels, thereby providing a buffer for the ongoing 2022-23 season. Notwithstanding the decline in agricultural commodity prices from their March 2022 highs, they remain nearly 9 percent higher than a year ago. Expected supply shortfalls in the current season for some key commodities, especially maize, coupled with adverse weather and high energy prices, could keep prices high during the current season (figure 1.D).

Outlook and risks

After surging by an expected 60 percent in 2022, energy prices are projected to decline 11 percent in 2023 and a further 12 percent in 2024. Key drivers of the outlook include slower global growth, weaker demand for natural gas as households and industry reduce consumption, and some supply responses, primarily for coal. However, prices will remain more than 50 percent above their five-year average through 2024. Persistently high energy prices will continue to have inflationary implications, particularly through second-round effects such as higher transport and electricity costs for businesses. Inflationary pressures stemming from commodity prices will be further exacerbated in countries that have had sizeable currency depreciations against the U.S. dollar.

Brent crude oil prices are forecast to average $92/bbl in 2023, down from a projected $100/bbl in 2022, before easing to $80/bbl in 2024 (Figure 1.E). Oil consumption is expected to continue to increase by just under 2 percent in 2023 as China gradually reopens, and as switching from natural gas to oil continues, especially in electricity generation. A sharper-than-expected slowdown in global growth and continued COVID restrictions in China are the key downside risks to oil consumption. During previous global recessions oil demand has declined by about 2 percent in the first year and 1 percent in the second, although with wide variation (figure 1.F).

Oil markets are expected to tighten over the next few months as additional sanctions restrict exports from Russia, releases of oil from strategic reserves in several countries come to an end, and as OPEC+ members cut production (even if somewhat less than the announced 2 mb/d since many of the OPEC+ members are already producing below quota). This will more than offset the effect of rising production in a few countries, primarily the United States.

The outlook is subject to numerous risks, especially on the supply side. First, production in the United States could disappoint as producers prioritize returning cash to shareholders over increasing output, and higher input costs constrain new investment. Second, the outlook for Russia's production depends on the impact of trade measures. Russia's exports next year could be as much as 2 mb/d lower, as the EU embargo on Russian oil and oil products (as well as restrictions on access to EU insurance and shipping services) comes into effect. The proposed G7 oil price cap could affect the flow of oil from Russia, but it is an untested mechanism and would need the participation of large emerging market and developing economies to achieve its objectives. Third, releases of crude oil from strategic reserves, including the U.S. are due to end this year; while these could be extended further, it would risk leaving strategic inventories at very low levels.

Amid low levels of inventories, limited spare production capacity, and ongoing geopolitical events, the oil market is susceptible to price spikes. The materialization of some of these risks could intensify challenges associated with energy security in many countries.

Natural gas and coal prices are also expected to ease in 2023 and 2024 but remain at much higher levels than their pre-pandemic averages. By 2024, Australian coal and U.S. natural gas prices are expected to be double their average over the past five years, while European natural gas prices could be four times higher. The expected easing of prices next year is due to weaker demand for natural gas as households and industries curtail their consumption and switch to substitutes, while coal production is expected to increase as China, India, and seaborne exporters boost output. The near-term outlook for natural gas and coal prices will depend heavily on the severity of the winter in Europe. As with crude oil, slower global growth is a key downside risk to the outlook for next year.

Concerns about energy shortages, particularly in Europe, will require careful policy coordination among key importers to ensure the burden of high energy prices, or future energy disruptions, is equitably shared. Recent government policy announcements to sharply increase the installation of renewable energy and reduce overall energy consumption may feed through into lower energy prices, but this will take time, and a worsening supply outlook in the winter of 2023 is possible. Furthermore, the current high inflation and high-interest rate environment will make financing investment in new energy production (both fossil fuels and renewables) more challenging, even if recent declines in metal prices provide some reduction in project costs.

In the longer term, the prospect of persistently high energy prices may require a shift in industrial models in Northern European countries that have historically relied on natural gas imports by pipeline. Indeed, high energy prices have already led to the closure of some facilities in energy-intensive industries, including fertilizer and chemical plants, as well as shifts in manufacturing patterns in others. Together, these changes should lead to reduced carbon emissions from the EU and may help accelerate its energy transition. In other countries, however, the implications for carbon emissions are less clear. A reduction in carbon intensity globally, not simply a shift in activities between countries, is needed to achieve climate change objectives.

Following an estimated decline of nearly 2 percent, metal prices are forecast to fall more than 15 percent in 2023 before stabilizing in 2024. The weakness reflects the deterioration of global growth prospects along with China's softening demand (due to its zero COVID policy and the slowdown of its real estate sector). Risks to the short-term outlook for metals are on the downside

and reflect slower-than-expected global growth and a further deterioration of China's property sector. One upside risk is higher-than-expected energy prices which could lead to increased production costs for metal refiners. In the longer term, however, metal demand is expected to increase, stimulated by recent government policies to accelerate the energy transition and boost renewables, which are metals intensive.

Agricultural prices are forecast to decline by 5 percent in 2023 before stabilizing in 2024. The projected decline in 2023 reflects a better-than-expected global wheat crop, stable supplies in the rice market, and the resumption of grain exports from Ukraine (although the maize crop is expected to contract materially during the 2022-23 season). However, there are numerous upside risks to the price forecast. First, disruptions in exports from Ukraine or Russia, both key grain exporters, could once again interrupt global supplies, as they did in the early stages of the war in Ukraine. Second, further increases in energy prices or disruptions in energy supplies (especially natural gas and coal, which are key inputs to fertilizers) could exert upward pressure on grain and edible oil prices. Third, adverse weather patterns can reduce yields; indeed, 2023 is likely to be the third La Niña year in a row, potentially reducing yields of key crops in South America and Southern Africa. On the downside, weaker-than-expected growth, especially in China, could affect the prices of certain agricultural commodities such as maize and soybeans, which are used as animal feed.

As a result of developments in food markets following the Russian invasion of Ukraine, the number of people subject to severe food insecurity is projected to exceed 200 million in 2022. Populations facing food crises are typically in countries with conflict or countries that are facing extreme weather events, especially in Sub-Saharan Africa. Materialization of the upside risks to food prices outlined above could result in even larger increases in the number of people suffering from food insecurity.

Special Focus. Pandemic, war, recession: Drivers of aluminum and copper prices

Over the past three years, the pandemic, the war in Ukraine, and concerns about an impending global recession caused large swings in prices of aluminum and copper. Record price rebounds from pandemic lows in April 2020 were followed by renewed steep declines starting in March 2022. The price rebound after the pandemic was mainly driven by the economic recovery but, in contrast to the increase in prices after the global financial crisis, supply factors also contributed about one-quarter to the rebound. Since March 2022, a steep global growth slowdown, an unwinding of supply constraints, and concerns about an imminent global recession (especially for copper) contributed to the plunge in prices.

Prices will likely remain volatile as the energy transition unfolds and as global commodity demand shifts from fossil fuels to renewables, which are metals intensive. For metal-exporting countries, the energy transition may bring windfalls, but it could also increase their exposure to price volatility. In this regard, policymakers need to design strong fiscal and monetary frameworks now—and foster an environment for diversification—to make the most of the resulting opportunities for growth while limiting the impact of price volatility.

TABLE 1 World Bank Commodity Price Forecasts

							Percent change from previous year		Differences in levels from April 2022 projections	
Commodity	**Unit**	**2020**	**2021**	**2022f**	**2023f**	**2024f**	**2022f**	**2023f**	**2022f**	**2023f**
Price indexes in nominal U.S. dollars (2010=100)										
Energy a/		52.7	95.4	151.7	134.7	118.3	59.1	-11.2	8.1	8.9
Non-Energy Commodities		84.4	112.0	123.7	113.7	113.0	10.5	-8.1	-9.8	-8.0
Agriculture		87.5	108.7	123.2	117.7	117.5	13.4	-4.5	-4.7	-0.3
Beverages		80.4	93.5	108.7	101.5	101.5	16.3	-6.6	5.2	1.8
Food		93.1	121.8	143.6	134.7	134.1	17.9	-6.2	-6.1	0.5
Oils and Meals		89.8	127.1	145.7	134.3	133.7	14.7	-7.8	-19.2	-7.6
Grains		95.3	123.8	149.3	141.0	139.8	20.6	-5.6	0.3	7.4
Other food		95.5	113.1	135.7	129.5	129.4	19.9	-4.5	5.4	4.7
Raw Materials		77.6	84.5	81.2	84.7	85.4	-4.0	4.3	-6.0	-3.1
Timber		86.4	90.4	79.8	86.4	87.6	-11.8	8.3	-6.6	-3.1
Other raw materials		67.9	78.0	82.7	82.7	82.9	5.9	0.1	-5.4	-3.2
Fertilizers		73.2	132.2	219.5	192.2	174.1	66.1	-12.4	-4.2	-6.1
Metals and Minerals b/		79.1	116.4	113.8	96.5	96.9	-2.3	-15.2	-21.0	-24.1
Base Metals c/		80.2	117.7	121.2	103.0	103.8	2.9	-15.0	-22.7	-28.9
Precious Metals		133.5	140.2	134.6	129.7	126.7	-4.0	-3.6	-9.8	-1.8
Price in nominal U.S. dollars										
Energy										
Coal, Australia	$/mt	60.8	138.1	320.0	240.0	212.3	131.8	-25.0	70.0	70.0
Crude oil, Brent	$/bbl	42.3	70.4	100.0	92.0	80.0	42.0	-8.0	0.0	0.0
Natural gas, Europe	$/mmbtu	3.2	16.1	40.0	32.0	28.0	148.2	-20.0	6.0	7.0
Natural gas, U.S.	$/mmbtu	2.0	3.9	6.6	6.2	6.0	71.4	-6.1	1.4	1.4
Liquefied natural gas, Japan	$/mmbtu	8.3	10.8	18.4	17.0	15.9	71.0	-7.6	-0.6	3.0
Non-Energy Commodities										
Agriculture										
Beverages										
Cocoa	$/kg	2.37	2.43	2.35	2.30	2.34	-3.2	-2.1	-0.10	-0.20
Coffee, Arabica	$/kg	3.32	4.51	5.90	5.50	5.41	30.8	-6.8	0.40	0.20
Coffee, Robusta	$/kg	1.52	1.98	2.35	2.10	2.11	18.6	-10.6	0.10	0.10
Tea, average	$/kg	2.70	2.69	3.10	2.80	2.82	15.3	-9.7	0.40	0.20
Food										
Oils and Meals										
Coconut oil	$/mt	1,010	1,636	1,660	1,670	1,672	1.4	0.6	-540	-230
Groundnut oil	$/mt	1,672	…	2,200	2,100	2,091	…	-4.5	-100	200
Palm oil	$/mt	752	1,131	1,275	1,050	1,054	12.8	-17.6	-375	-350
Soybean meal	$/mt	394	481	550	540	539	14.4	-1.8	-40	-10
Soybean oil	$/mt	838	1,385	1,675	1,550	1,537	20.9	-7.5	-125	150
Soybeans	$/mt	407	583	680	650	641	16.6	-4.4	-20	50
Grains										
Barley	$/mt	98	…	200	175	172	…	-12.5	35	25
Maize	$/mt	165	260	315	290	287	21.4	-7.9	5	10
Rice, Thailand, 5%	$/mt	497	458	435	435	436	-5.1	0.0	10	20
Wheat, U.S., HRW	$/mt	232	315	430	410	405	36.4	-4.7	-20	30
Other Food										
Bananas, U.S.	$/kg	1.22	1.21	1.50	1.40	1.39	24.4	-6.7	0.20	0.10
Beef	$/kg	4.67	5.39	5.90	5.80	5.82	9.5	-1.7	-0.30	0.00
Chicken	$/kg	1.63	2.26	3.35	3.10	3.07	48.5	-7.5	0.20	0.10
Oranges	$/kg	0.60	0.65	0.88	0.85	0.85	34.8	-3.4	0.10	0.10
Shrimp	$/kg	12.67	13.70	13.50	14.00	14.30	-1.5	3.7	-1.00	-0.80
Sugar, World	$/kg	0.28	0.39	0.40	0.38	0.38	2.7	-5.0	0.00	0.00

TABLE 1 World Bank Commodity Price Forecasts (*continued*)

							Percent change from previous year		Differences in levels from April 2022 projections	
Commodity	**Unit**	**2020**	**2021**	**2022f**	**2023f**	**2024f**	**2022f**	**2023f**	**2022f**	**2023f**
Price in nominal U.S. dollars										
Non-Energy Commodities										
Raw Materials										
Timber										
Logs, Africa	$/cum	399	414	365	390	395	-11.9	6.8	-25	-30
Logs, S.E. Asia	$/cum	279	271	230	250	254	-15.2	8.7	-25	-10
Sawnwood, S.E. Asia	$/cum	700	750	670	725	735	-10.7	8.2	-50	-25
Other Raw Materials										
Cotton	$/kg	1.59	2.23	2.95	2.90	2.86	32.2	-1.7	-0.10	0.00
Rubber, RSS3	$/kg	1.73	2.07	1.80	1.90	1.94	-13.1	5.6	-0.30	-0.30
Tobacco	$/mt	4,336	4,155	4,200	4,100	4,116	1.1	-2.4	0	0
Fertilizers										
DAP	$/mt	312	601	790	750	650	31.5	-5.1	-110	-50
Phosphate rock	$/mt	76	123	270	200	175	119.1	-25.9	95	40
Potassium chloride	$/mt	218	210	520	500	479	147.4	-3.8	0	30
TSP	$/mt	265	538	735	650	550	36.6	-11.6	-15	0
Urea, E. Europe	$/mt	229	483	720	650	600	49.0	-9.7	-130	-100
Metals and Minerals										
Aluminum	$/mt	1,704	2,473	2,700	2,400	2,434	9.2	-11.1	-700	-700
Copper	$/mt	6,174	9,317	8,700	7,300	7,361	-6.6	-16.1	-1,400	-2,400
Iron ore	$/dmt	108.9	161.7	120.0	100.0	98.0	-25.8	-16.7	-20	-5
Lead	$/mt	1,825	2,200	2,100	1,900	1,917	-4.6	-9.5	-200	-200
Nickel	$/mt	13,787	18,465	25,000	21,000	20,708	35.4	-16.0	-3,000	-1,000
Tin	$/mt	17,125	32,384	31,000	22,000	22,257	-4.3	-29.0	-10,000	-13,000
Zinc	$/mt	2,266	3,003	3,500	2,800	2,771	16.6	-20.0	-200	-400
Precious Metals										
Gold	$/toz	1,770	1,800	1,775	1,700	1,650	-1.4	-4.2	-105	0
Silver	$/toz	20.5	25.2	21.3	21.0	21.0	-15.6	-1.2	-2.9	-1.5
Platinum	$/toz	883	1,091	940	1,000	1,050	-13.9	6.4	-170	-180

Source: World Bank.
Note:
a/ = Energy price index includes coal (Australia), crude oil (Brent), and natural gas (Europe, Japan, U.S.).
b/ = Base metals plus iron ore.
c/ includes aluminum, copper, lead, nickel, tin, and zinc.
f = forecast.

SPECIAL FOCUS

Pandemic, war, recession: Drivers of aluminum and copper prices

Pandemic, war, recession: Drivers of aluminum and copper prices

Over the past three years, the pandemic, the war in Ukraine, and concerns about global recession buffeted global aluminum and copper markets and contributed to large swings in global prices. Record price rebounds from pandemic lows in April 2020 were followed by renewed steep declines starting in March 2022. The price rebound after the pandemic was mainly driven by the economic recovery but, in contrast to the rebound after the global financial crisis, supply-side factors also contributed about one-quarter to the rebound. Since March 2022, a steep global growth slowdown, an unwinding of supply constraints, a shutoff of energy-intensive smelters amid record high energy cost (especially for aluminum), and concerns about an imminent global recession (especially for copper) contributed to the plunge in prices. More price volatility can be expected as the energy transition unfolds and global commodity demand shifts from fossil fuels to metals. Appropriate policies can help metal exporters make the most of the resulting opportunities for growth while limiting the impact of price volatility.

Introduction

Aluminum and copper prices have undergone sizable swings in the past three years. The COVID-19 pandemic triggered a severe global recession and, in the three months from January 2020, global aluminum and copper prices suffered record declines. This episode was followed by the strongest economic rebound in eight decades and steep rebounds in prices (figures SF.1A, B). By March 2022, inflation-adjusted copper and aluminum prices had reached their highest and second-highest levels, respectively, in a decade. Since then, aluminum and copper prices have fallen again by 36 and 24 percent, respectively.

These swings were the outcome of a confluence of different shocks caused by the pandemic. Global economic activity contracted by more than 3 percent in 2020, but then rebounded by almost 6 percent in 2021 (figure SF.1C). In China, which accounts for about 60 percent of global aluminum and copper demand, growth slowed sharply from 6 percent in 2019 to 2 percent in 2020 before rebounding to 8 percent in 2021 (figure SF.1D). Since metals are heavily used in cyclical sectors, such as construction, the swings in global and Chinese growth led to a collapse and rebound in global demand for metals. As global economic activity shifted online and demand gravitated towards consumer durables, demand for copper and aluminum—heavily used in consumer electronics, household appliances, and cars—increased disproportionately (figure SF.1E). Meanwhile, COVID-19 restrictions, strikes and political tensions, trade restrictions, and rapidly rising energy prices disrupted mining, refining, or shipments of metals in Australia, Chile, China, Guinea, and Peru (figure SF.1F).

As global metal price swings buffet economies, metal exporters will need to understand the sources, features, and impacts of these swings to design appropriate policy responses. Different types of shocks may cause price swings of different magnitudes and duration. More permanent shocks may warrant economic adjustments while the impact of temporary shocks may be smoothed with countercyclical policies.

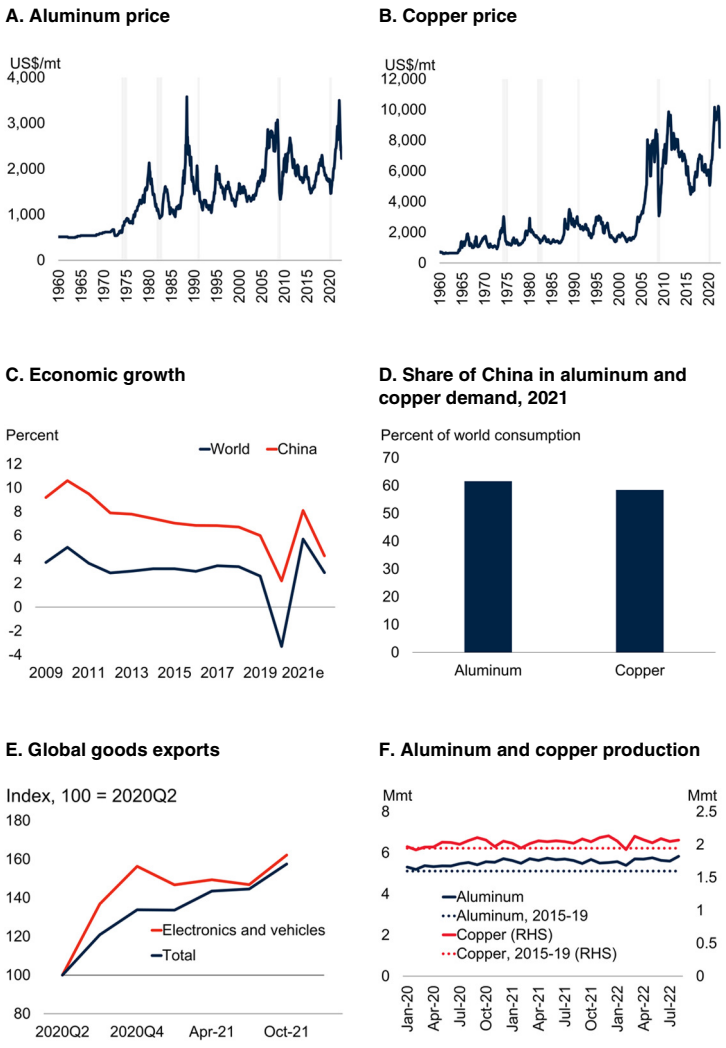
This Special Focus explores how different types of shocks affect global prices for copper and aluminum. Specifically, it addresses the following questions:

- How large and persistent is the impact of different types of shocks on copper and aluminum prices?
- Which shocks play the largest role in copper and aluminum price variations?

This Special Focus was prepared by Christiane Baumeister, Guillermo Verduzco-Bustos, and Franziska Ohnsorge. Research assistance was provided by Kaltrina Temaj. Helpful comments were provided by Alain Kabundi, Francisco Arroyo Marioli, Jeetendra Khadan, Ayhan Kose, and Peter Nagle.

FIGURE SF.1 Recent developments in global aluminum and copper markets

In early 2020, aluminum and copper prices underwent one of their steepest three-month declines in a decade, followed by one of their strongest increases in more than three decades. This in part reflected the steep global recession and subsequent economic rebound as well as a shift in demand towards goods and away from services from mid-2020.



Source: UNComtrade; World Bank *Pink Sheet Global Economic Prospects* (June 2022); World Bureau of Metal Statistics.

A.B. Grey shades show global recessions.

C. GDP-weighted average at 2010-19 average prices and exchange rates. "e" stands for estimated value.

E. Export values. Electronics and vehicles include Harmonized System categories 85 (electrical machinery and equipment and parts thereof; sound recorders and reproducers; television image and sound recorders and reproducers, and parts and accessories of such articles), 87 (vehicles; other than railway or tramway rolling stock, and parts and accessories thereof), and 90 (Optical, photographic, cinematographic, measuring, checking, medical or surgical instruments and apparatus; parts and accessories).

F. Refined aluminum and copper production. Monthly data until August 2022.

- How did the evolution of aluminum and copper prices during the pandemic-induced global recession in 2020 compare with that during the global financial crisis-induced global recession in 2009?

This Special Focus builds on a rapidly growing literature that, thus far, has focused on oil markets. Baumeister and Hamilton (2019) identified four shocks as the main drivers of oil prices—aggregate demand shocks ("economic activity shock"), commodity-specific demand shocks ("consumption demand shock"), commodity-specific supply shocks, and speculative demand shocks ("inventory demand shocks"). Their methodology is now widely used for oil prices but has not yet been applied to metal prices. A variant that identifies only a subset of these shocks has been applied to metal prices by Stuermer (2018) and Kabundi et al. (2022). Stuermer (2018) identifies only long run ("commodity demand") shocks and short run ("commodity supply") shocks without any further decomposition of short run shocks. Kabundi et al. (2022) neglect speculative demand shocks, which turn out to be an important driver of short run volatility in the analysis presented here.

This Special Focus offers the following main findings. First, inventory and consumption demand shocks cause much volatility in metal prices in the very short term, accounting for about one-third of global metal price volatility on impact. However, these shocks are small, reverse quickly, and have modest price impacts.

Second, a negative economic activity shock that reduces copper or aluminum prices by 1 percent on impact would continue to put downward pressure on prices such that three quarters later prices would be more than 5 percent below the baseline before the effect begins to dissipate.

Over a one-year horizon, economic activity shocks—which capture the global business cycle—are the single most important driver of copper and aluminum prices, accounting for 74 and 91 percent of the variance in these prices, respectively.

Third, during global recessions and their recoveries, economic activity shocks have been the

main drivers of price changes. However, in the recovery from the pandemic-induced global recession of 2020, supply shocks also contributed, on average, one-quarter to the rebound in aluminum and copper prices. This contrasts with the price swings during the financial crisis-induced global recession of 2009 when supply shocks played a negligible role in price swings.

Methodology and data

Shocks are estimated in a Bayesian vector autoregression of aluminum or copper prices, production, and inventories as well as global economic activity. Sign restrictions and estimates of elasticities from the literature are used to identify four types of shocks.

- *Economic activity shocks*—such as global recessions—imply a reduction in global economic activity, metal prices, and production but an increase in metal inventories.
- *Consumption demand shocks*—such as a shift in demand caused by substitution from one commodity to another, or an unanticipated drop in construction activity in China, the world's largest consumer of aluminum and copper—imply a reduction in metal prices and production but an increase in metal inventories and global economic activity.
- *Commodity supply shocks*—such as the opening of new mines—imply an increase in metal production, inventories and economic activity, but a reduction in metal prices.
- *Inventory demand (speculative) shocks*—such as metal sales in anticipation of slowing construction activity in China—imply a reduction in metal prices, production, and inventories but an increase in global economic activity.

The methodology corrects for the unusual nature of the pandemic as in Ng (2021) and allows for the possibility of measurement error in inventories data as in Baumeister and Hamilton (2019). Details of the methodology are presented in Baumeister et al. (forthcoming).

The Special Focus relies on monthly data from January 1995 to July 2022. This is a period when China's role in global metal markets surged such that, by 2019, China alone accounted for about one-half of global metal demand. Aluminum and copper prices are from the World Bank's *Pink Sheet*. Aluminum and copper production is from the World Bureau of Metal Statistics. Aluminum and copper inventories are registered mineral inventories as reported by the London Metal Exchange and the World Bureau of Metal Statistics. Global economic activity is proxied by the GDP-weighted average of the OECD's index of industrial production in OECD countries and industrial production in six major non-OECD economies (Brazil, China, India, Indonesia, the Russian Federation, and South Africa).

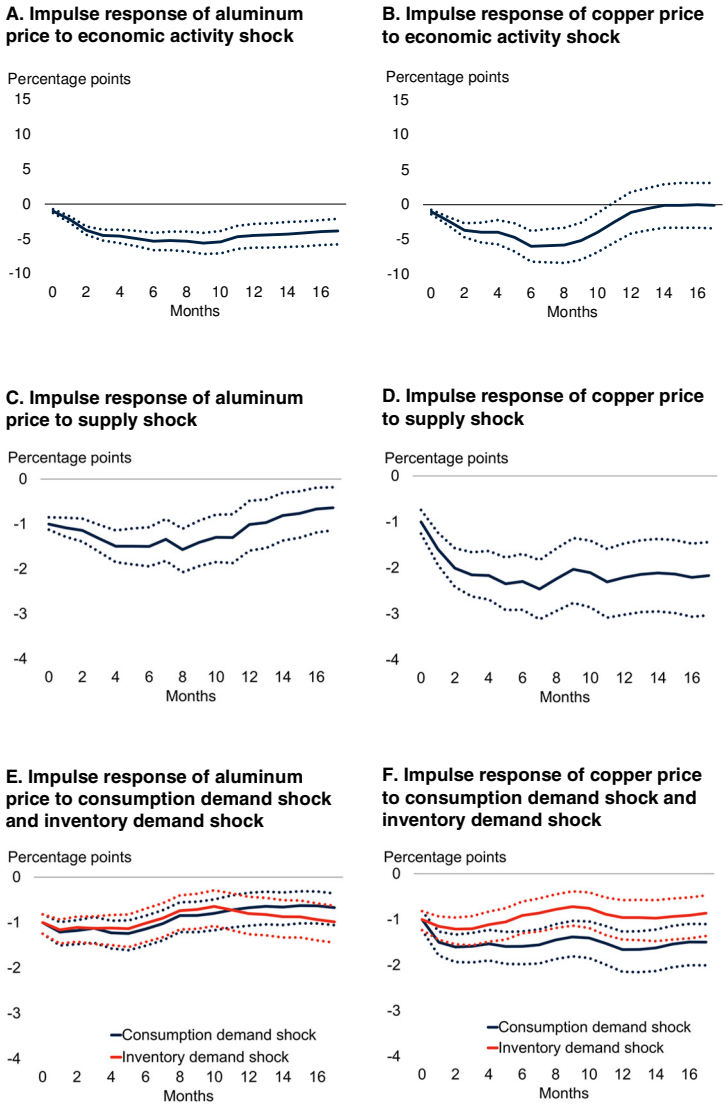
Drivers of aluminum and copper prices

Aluminum and, especially, copper prices are highly sensitive to the global business cycle (World Bank 2018). Consequently, economic activity shocks that reduced aluminum and copper prices on impact by 1 percent had a considerably larger and longer-lasting impact on prices than any of the other three types of shocks. Three quarters after such a shock, aluminum and copper prices were still more than 5 percent below the baseline (figure SF.2A,B).[1] The impact of the economic activity shock on copper prices was somewhat larger initially than on aluminum prices but dissipates sooner. For copper prices, the effect dissipated and became statistically insignificant after about a year. For aluminum prices, the effects lessened over time but continued to be statistically significant even 18 months later. The more pronounced swings in copper prices may reflect the fact that copper is used considerably more intensively than aluminum in highly cyclical infrastructure construction activity, especially in China, which now accounts for more than half of global copper and aluminum consumption

[1] A 1 percent decline in aluminum and copper prices on impact due to an economic activity shock is associated with a decline in global industrial production by 1.0 and 1.3 percent, respectively, on impact.

FIGURE SF.2 Dynamics of aluminum and copper prices

Economic activity shocks that reduced aluminum and copper prices on impact by 1 percent had a considerably larger and longer lasting effect on prices than the other types of shocks: consumption demand, supply, and inventory demand. Consistent with these impulse responses, longer-term fluctuations in aluminum and copper prices were predominantly driven by economic activity shocks whereas the other shocks mostly caused short-term volatility in prices.



Source: World Bank.

Note: Solid lines represent median responses, dotted lines represent upper and lower bounds of 68 percent confidence intervals.

A.B. Impulse response of aluminum (A) and copper (B) prices to economic activity shock that lowers the price on impact by 1 percent. A 1 percent decline in aluminum and copper prices on impact due to an economic activity shock is associated with a decrease in global industrial production by 1.0 and 1.3 percent, respectively, on impact.

C.-F. Impulse response of aluminum (C, E) and copper (D, F) prices to supply shock (C, D) and consumption demand and inventory demand shocks (E, F) that lower the price on impact by 1 percent. A 1 percent decline in aluminum and copper prices on impact due to a supply shock is associated with a 1.1 percent increase in aluminum or copper production. A 1 percent decline in aluminum and copper prices on impact due to an inventory demand shock is associated with a 0.7 percent decline in aluminum inventories and 0.6 percent decline in copper inventories.

(Kabundi et al. 2022; Kabundi, Vasishtha, and Zahid 2022).

In contrast, consumption demand shocks, inventory demand shocks, or commodity supply shocks that also reduced copper or aluminum prices by 1 percent on impact had much smaller impacts (figure SF.2C-F).[2] At their peak impacts, they reduced aluminum and copper prices by 1.2 percent (for inventory demand shocks), 1.2 and 1.6 percent (consumption demand shocks), and by 1.6 and 2.5 percent (supply shocks), respectively. The effects of these shocks were persistent: estimated impulse responses are statistically significant even 18 months after the initial shocks. The impacts of consumption demand and inventory demand shocks peaked two to four months earlier than the impacts of economic activity shocks. The impact of global aluminum supply shocks remained statistically significant for two years after the shock but more than halved in magnitude, whereas those for copper supply shocks remained broadly steady. The decline in the impact of supply shocks on aluminum prices may in part reflect the larger share of China—and its proactive policies to stabilize markets—for aluminum than copper (Kabundi et al. 2022).

Consistent with these impulse responses, longer-term fluctuations in aluminum and copper prices were predominantly driven by economic activity shocks whereas inventory, consumption demand and supply shocks mostly caused short-term volatility in prices. A forecast error variance decomposition suggests that supply shocks accounted for about one-quarter of aluminum and copper price fluctuations on impact, and inventory and consumption demand together for another one-third (figure SF.3A, B). In contrast, over a one-year horizon, economic activity shocks, which capture the global business cycle, were the single most important driver of copper and

[2] A 1 percent decline in aluminum and copper prices on impact due to a supply shock is associated with a 1.1 increase in aluminum or copper production on impact. A 1 percent decline in aluminum and copper prices on impact due to an inventory demand shock is associated with a 0.7 percent decline in aluminum inventories and 0.6 percent decline in copper inventories.

aluminum prices, accounting for 74 and 91 percent of the variance in these prices, respectively.

Drivers of aluminum and copper prices during global recessions

Over the past three years, a series of shocks have buffeted global metal markets. A steep pandemic-induced global recession was followed by a sharp rebound in global economic activity, which then slowed sharply again amid policy tightening; COVID-19 restrictions closed mines and intermittently disrupted activity in China, the world's largest metals consumer; global demand initially shifted from services to goods followed by a reversal; and pandemic policies, the war in Ukraine, and the recent policy tightening to rein in inflation caused much speculation about commodity market prospects.

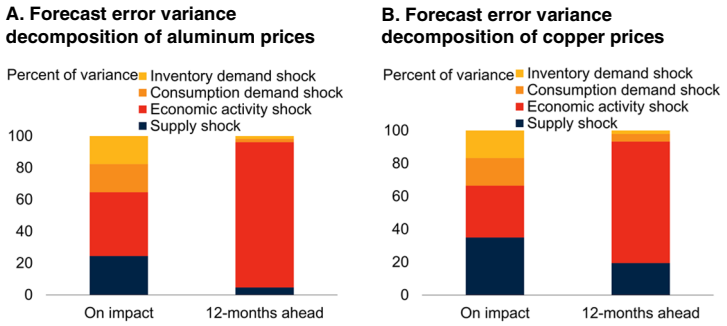
In the three months between January and April 2020, aluminum and copper prices declined by 18 percent and 16 percent, respectively, their steepest drops over a corresponding period in more than a decade. Subsequently, between April 2020 and March 2022, aluminum and copper prices more than doubled—their steepest increases over a corresponding period in more than three decades for aluminum and more than one decade for copper. Since then, within five months, one-quarter of the aluminum price gains and almost one-half of the copper price gains has been unwound again as mounting concerns about a global recession put downward pressure on commodity prices more broadly.

A historical decomposition of price movements into the four shocks identified by the methodology used here suggests that these aluminum and copper price fluctuations were largely the result of economic activity shocks (figure SF.4A,B). Between January and April 2020, economic activity shocks depressed aluminum and copper prices by 27 and 23 percent, respectively; this was only partially offset (9.7 and 4.4 percentage points, respectively) by consumption demand shocks that raised prices. These consumption shocks may reflect above-average economic growth in China during the pandemic. During this period, demand in China, which accounts for about 60 percent of aluminum and copper demand, continued to expand, although at a much reduced pace, whereas it contracted steeply elsewhere amid pandemic lockdowns (IWCC 2022; Statista 2022). In the subsequent twelve months between May 2020 and May 2021, the rebound in economic activity lifted aluminum and copper prices by 39 and 42 percent, respectively. Supply disruptions, such as mine closures, added another 11 and 17 percentage points to the increase in aluminum and copper prices, respectively.

The role of supply shocks during the pandemic differed from their role during the global financial crisis. Both the pandemic and the global financial crisis were accompanied by steep global recessions, in 2020 and 2009, respectively, that drove down prices. In contrast to the global recession of 2009, when supply shocks played a negligible role, supply shocks contributed about one-quarter to the price rebounds following the pandemic. Aluminum and copper supply disruptions are part of a broader phenomenon of severe supply bottlenecks, shipping disruptions, and global value chain dislocations over the past two years. This largely demand-driven rebound in aluminum and

FIGURE SF.3 Decomposition of aluminum and copper price volatility

Consistent with these impulse responses, longer term fluctuations in aluminum and copper prices were predominantly driven by economic activity shocks whereas inventory demand, consumption demand, and supply shocks mostly caused short-term volatility in prices.

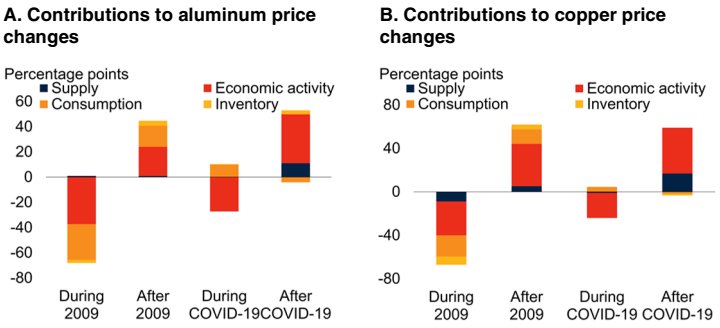


Source: World Bank.

Note: Forecast error variance decomposition of aluminum (A) and copper (B) prices on impact and at the 12-month horizon, based on a structural vector autoregression as in Baumeister and Hamilton (2019).

FIGURE SF.4 Drivers of aluminum and copper prices during global recessions

Aluminum and copper price fluctuations during and after the pandemic-induced global recession of 2020 were largely the result of economic activity shocks. Supply disruptions contributed about one-quarter to price rebounds after the pandemic-induced recession, unlike the global financial crisis-induced global recession of 2009 when supply shocks played a negligible role.



Source: World Bank.

Note: Contributions to cumulative aluminum (A) and copper (B) price changes during the specified period. "During 2009" stands for the period September 2008-March 2009; "After 2009" stands for the period April 2009-April 2010; "During COVID-19" stands for the period January-April 2020; "After COVID-19" stands for the period May 2020-May 2021.

copper prices continued through March 2022, when prices soared to near-record (aluminum) and record (copper) highs (figure SF.5A).

Since then, however, prices for both commodities have plunged. This has reflected an exceptionally steep global growth slowdown as well as the unwinding of supply disruptions. In addition, aluminum smelting, which is extremely energy intensive, has fallen sharply amid soaring energy prices. As a result, negative consumption demand shocks contributed even more to the aluminum price decline than economic activity shocks (figure 5B). Similarly, the real estate sector slowdown in China that began to intensify in April constituted a negative consumption shock for copper prices. In addition, for copper, which is often considered a bellwether for global economic developments, growing concerns about the possibility of a global recession in 2023—an example of an inventory shock—have weighed on prices.

Policy implications

The results of the analysis conducted in this Special Focus suggest that inventory and consumption demand shocks cause considerable volatility in metal prices in the very short term, accounting for about one-third of global metal price volatility on impact. However, these shocks are small, reverse quickly, and have modest price impacts.

The estimated impulse responses of aluminum and copper prices to economic activity suggest considerable downside risks to global aluminum and copper prices. There is a material risk of a global recession as a result of highly synchronous policy tightening around the world to rein in record high inflation (Guénette, Kose, and Sugawara 2022). Since industrial production tends to be more volatile than output, this could be accompanied by an even steeper slowdown in industrial production which would also be reflected in lower aluminum and copper prices.

The results point to metal price swings as an important transmission channel for the global business cycle to countries that rely heavily on copper or aluminum sectors for exports, fiscal revenues, and economic activity. More swings in aluminum and copper prices can be expected as the energy transition away from fossil fuels towards renewable fuels and battery-powered transport gathers momentum. Renewable electricity generation is considerably more metal intensive than traditional energy generation. Solar or wind-powered electricity generation, for example, uses two to three times the amount of copper per kWh than gas-powered electricity generation; the production of a battery-powered car uses more than three times the amount of copper per car than an internal combustion engine car (IEA 2022). The war in Ukraine is likely to accelerate the energy transition as countries seek to reduce reliance on fossil fuels such as oil, coal, and natural gas, where Russia accounts for 11-25 percent of global exports (Guénette, Kenworthy, and Wheeler 2022).

For now, metal exporters are on average less commodity reliant than energy exporters. For example, in the average copper-exporting emerging market and developing economy (EMDE), revenues from resource sectors accounted for 10 percent of government revenues in

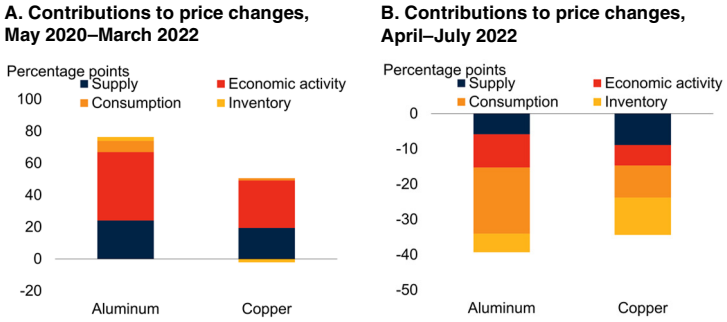
2019. This was about one-third of the share of resources sectors in government revenues in the average oil- or gas-exporting EMDE. However, the growing exposure of metal exporters to volatile global commodity prices points to two policy priorities (Kabundi et al. 2022).

First, well-designed fiscal and monetary policy frameworks can dampen the economic impact of metal price swings. This includes fiscal rules to save revenue windfalls, sovereign wealth funds, and countercyclical monetary and macroprudential policy frameworks (see World Bank 2022 for details). Almost two dozen EMDE commodity exporters have established fiscal rules or sovereign wealth funds, including Chile, the world's largest copper producer. These tend to be particularly successful at stabilizing business cycles when they operate in the context of strong institutions and resilient fiscal, monetary, exchange rate, and financial frameworks.

Second, in addition to measures to dampen the impact of global metal price swings, proactive efforts at diversification may reduce metal exporters' exposure to global shocks. This could be achieved through export diversification or a more comprehensive "national asset portfolio diversification" approach (Gill et al. 2014). The latter would aim to strengthen non-resource sectors through investment in strong institutions and governance, broad access to high-quality infrastructure, and robust measures to increase human capital. Policies would also need to address broader concerns, such as the environmental pollution that can accompany metals mining.

FIGURE SF.5 Drivers of aluminum and copper prices since their pandemic trough

Following the pandemic trough in April 2020, strong demand pressures and continued supply disruptions pushed up aluminum and copper prices to record highs in March 2022. Since then, an exceptionally steep global growth slowdown and an unwinding of supply disruptions helped to reverse some of the price increases. For aluminum, consumption demand shocks also depressed price, in part because highly energy-intensive aluminum smelters were shut off around the world as energy prices soared. For copper, often considered a bellwether of global economic activity, concerns about an incipient global recession have depressed prices, as captured by inventory shocks.



Source: World Bank.
Note: Contributions to cumulative aluminum and copper price changes during May 2020-March 2022 when prices reached record or near-record highs (A), and during April-July 2022 when prices plunged (B).

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Commodity Market Developments and Outlook

Energy

Energy prices have declined from record highs earlier in 2022 amid slowing global growth and concerns about a possible global recession. Prices have been extremely volatile, with wide divergence between individual energy commodities. Brent crude oil prices decreased from $120/bbl in June to $90/bbl in September. European natural gas prices reached an all-time high in August but have since fallen by about two-thirds, while coal prices reached an all-time high in July and have broadly plateaued. Energy prices are expected to decline over the next two years but remain well above their recent five-year average. The price of Brent crude oil is forecast to average $92/bbl in 2023, and $80/bbl in 2024. Natural gas and coal prices are expected to ease as consumption softens (natural gas) and production rises (coal). Additional bouts of pronounced energy price volatility are likely. Further supply disruptions are a key risk, particularly for crude oil and natural gas, and global spare production capacity buffers are small. The main downside risk for energy markets is a global recession, which could cause a marked reduction in energy demand and sharply lower prices.

Crude Oil

Recent oil market developments

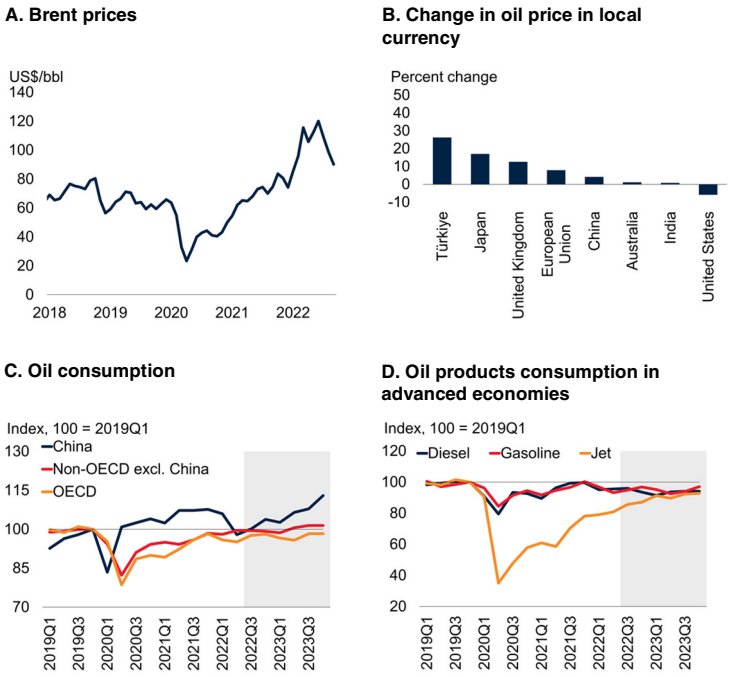
Brent crude oil prices fell sharply during 2022Q3, with prices in September 2022 averaging 25 percent below their June highs (figure 2.A). Oil prices have been particularly volatile because of significant uncertainty about oil market fundamentals. The fall in prices reflects a confluence of factors: slowing global growth and growing concerns about an impending global recession, continued pandemic restrictions in China, and substantial releases of crude oil from strategic reserves. Oil prices saw a partial rebound to $97/bbl in October as OPEC+ members agreed to cut production by 2 million barrels per day (mb/d), but this rebound proved temporary as the actual reduction may be just over half of the headline number.

Due to widespread currency depreciation the price of Brent crude oil is higher in local currency terms in many countries (figure 2.B). From February 2022 to September 2022, the price of Brent crude oil in U.S. dollars fell nearly 6 percent, but rose by 7 percent, on average, in advanced economies (excluding the United States) and by 3 percent in oil-importing EMDEs in domestic currency terms. Indeed, almost 60 percent of oil-importing EMDEs saw an increase in domestic-currency Brent oil prices during this period. The increases were largest in the South Asia region, with an average increase of 13 percent, and the largest overall increase in Sri Lanka of 67 percent.

Global crude oil consumption growth has slowed over 2022 because of COVID-19 lockdowns in China and weakening demand elsewhere,

FIGURE 2 Oil market developments

Oil prices have generally declined from their peak following the war in Ukraine, albeit with significant volatility. As a result of the sharp appreciation of the dollar, however, oil prices remain higher in many countries in local currency terms. The economic slowdown has weighed on oil consumption, particularly in China, although it has been somewhat more resilient in other EMDEs. Consumption of jet fuel has increased rapidly, although it remains below its pre-pandemic level.

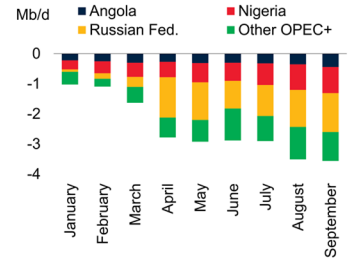


Sources: Haver Analytics; International Energy Agency; World Bank.
Note: EMDEs = emerging market and developing economies; OECD = Organisation for Economic Co-operation and Development.
A. Monthly data. Last observation is September 2022.
B. Change in price of Brent crude oil from February to September 2022 in local currencies.
C.D. Shaded area indicates IEA forecast. Last observation is 2023Q4.

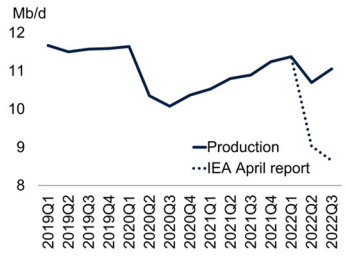
FIGURE 3 Oil production

OPEC+ continues to produce well below its production targets, despite a smaller-than-expected decrease in Russia's production following the war in Ukraine. The U.S. rig count continues to increase but at a slightly slower pace than in previous recessions. Several IEA members have released oil from strategic inventories, with the largest release from the U.S. Strategic Petroleum Reserve, which fell to its lowest level since 1984.

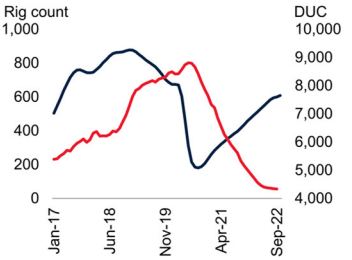
A. Shortfall in OPEC+ production from quota, 2022



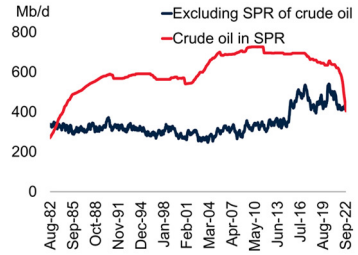
B. Oil production in Russia



C. U.S. rig count and drilled but uncompleted wells



D. U.S. oil inventories



Sources: Baker Hughes, International Energy Agency; U.S. Energy Information Administration; World Bank.

Note: IEA = International Energy Agency; OPEC = Organization of the Petroleum Exporting Countries; SPR = Strategic Petroleum Reserve.

A. Data based on the IEA Oil Market Report October 2022.

B. Oil production forecast for Russia based on IEA's "Oil Market Report October 2022" (dotted line), compared to the April 2022 report (solid line).

C. Last observation is the week of October 21, 2022 for rig count and September 2022 for DUC.

D. Last observation is October 14, 2022.

especially in advanced economies (figure 2.C). Growth in oil consumption decelerated to 1 percent (y/y) in 2022Q3, from an average of 3.7 percent in the first half of the year, and is expected to turn negative in 2022Q4. In China mobility restrictions and weaker economic activity have reduced oil demand by almost 7 percent in 2022Q3 (y/y). Oil demand has been more resilient elsewhere, in part because of government support in the form of gasoline tax cuts and the use of fuel subsidies, but it has still started to slow, particularly in advanced economies as macroeconomic activity deteriorates.

The deceleration in oil demand growth has been partially offset by power generators switching from natural gas to oil products (mainly diesel and fuel oil) in response to much higher natural gas prices. The International Energy Agency (IEA) anticipates that the use of oil products in place of natural gas in power generation and other industrial uses will increase to around 0.7 mb/d in 2022Q4, double the level from a year ago (and just under 1 percent of global consumption; IEA 2022a). Almost two-thirds of the switching will occur in Europe. Among oil products more broadly, demand for jet fuel has seen particularly rapid growth as tourism has steadily recovered, with consumption in advanced economies rising 20 percent in 2022Q3 (y/y). Jet fuel consumption remains around 14 percent below pre-pandemic levels, however (figure 2.D). Gasoline and diesel consumption have fallen slightly.

Global oil production rose by 2 percent in 2022Q3 (q/q) and has now recovered to its pre-pandemic level. Half of the increase was from OPEC and its partners (OPEC+), where production rose by just over 2 percent or 1.1 mb/d (q/q), as production targets were increased and Libya's output recovered. However, most of the OPEC+ countries subject to production quotas failed to meet their targets, and their combined output was around 3.5 mb/d below their September target (figure 3.A). In September, the largest shortfall in production compared to targets was from Russia (-1.3 mb/d), Nigeria (-0.9 mb/d) and Kazakhstan (-0.5 mb/d). The gap between targets and actual output has been widening since the beginning of the year, due to operational issues and capacity constraints.

Total oil output in Russia in 2022Q3 was around 0.3 mb/d below pre-invasion levels. This was a much smaller decline than the 2.5-3.0 mb/d anticipated by the IEA in their March Oil Market Outlook (figure 3.B). Russian production has been supported by rerouting of oil exports from G7 economies to other countries, including China, India, and Türkiye, while European Union sanctions do not begin until December 2022.

At their October meeting, OPEC+ agreed to reduce production quotas by 2 mb/d starting in

November. In practice, the decrease will be a little more than half of that, as many countries are already below their current targets.

Among non-OPEC+ producers, total oil output increased by 1 mb/d in 2022Q3 (q/q), led by the United States, Canada, and Norway. Total oil production in the United States increased by nearly 0.4 m/d in 2022Q3 (q/q) and is projected to see a similar increase in 2022Q4. U.S. total oil production has recovered to its pre-pandemic peak, although within that, *crude oil* production remains about 1 mb/d below peak, offset by higher *natural gas liquid* production. The oil rig count, a leading indicator of oil production, has been broadly stagnant since mid-June (figure 3.C). Oil producers have focused on returning cash to shareholders amid investor pressure, rather than investing in new production. In addition, the industry is facing higher input costs such as labor and equipment shortages.

Oil inventories controlled by industry in advanced economies have seen a steady decline since February and were 5 percent lower in August 2022 compared to the previous year. The decline has occurred despite the release of crude oil and oil products from IEA member countries' strategic reserves; these releases have totaled around 180 million barrels (mb) of oil from March through August, a rate of roughly 1 mb/d, or 1 percent of global consumption. The inventory release was intended to stabilize oil supplies amid expected disruptions from the invasion of Ukraine. The United States has released around 134 mb of crude oil from the Strategic Petroleum Reserve, bringing it to its lowest level since 1984 (figure 3.D). The SPR is also now smaller than the quantity of commercial inventories. The remainder of the inventory releases came from Europe and Asia in the form of crude oil and oil products.

Price forecasts and risks

Outlook. Brent crude oil prices are forecast to average $92/bbl in 2023 (close to their current level), before declining to $80/bbl in 2024; this forecast is unchanged from the April projections (figure 4.A). Despite the expected easing, prices will remain well above their recent five-year average of $60/bbl. The forecast assumes a deterioration in the macroeconomic outlook that is offset by increased switching from natural gas to oil consumption and lower production among OPEC+ (including Russia). The outlook is highly uncertain (as discussed below), and a continuation of elevated price volatility with further spikes in the short-term is likely due to low levels of spare capacity and inventories, the upcoming European Union (EU) import ban and a potential price cap, and ongoing geopolitical developments.

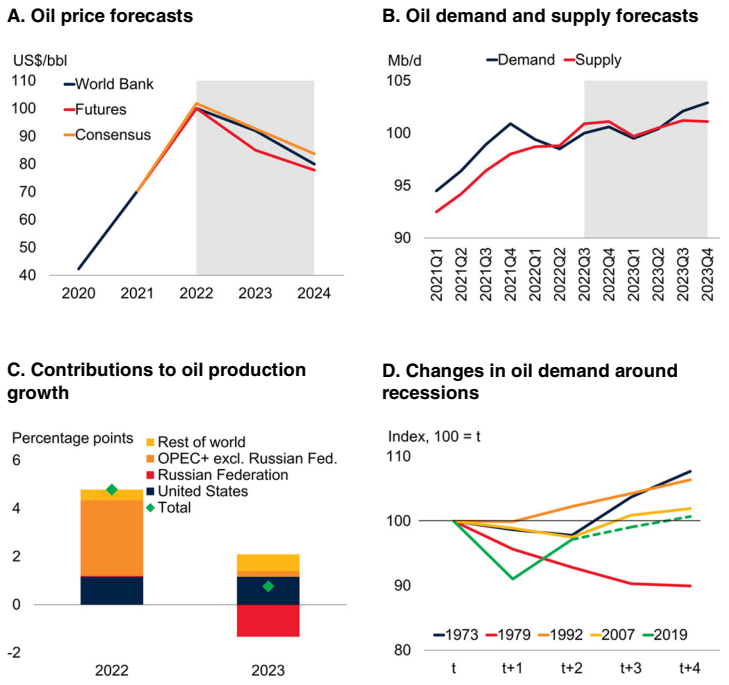
After rebounding to its pre-pandemic level by the end of 2022, oil consumption is expected to rise by 1.7 percent in 2023 to a new all-time high, according to the IEA's October assessment (figure 4.B; IEA 2022b). Oil consumption growth in 2023 is expected to be supported by a recovery in demand in China, as the country gradually reduces pandemic restrictions, and by increased switching from natural gas to oil. The IEA estimates that switching could result in 0.7mb/d of additional oil demand during winter. Outside of Asia, however, oil demand growth is expected to be negligible or slightly negative in 2023.

Oil production is expected to see an increase of less than 1 percent in 2023. Only a small number of countries are expected to see a rise in production, chiefly the United States (figure 4.C). In contrast, crude oil production among OPEC+ is expected to decrease, led by Russia. While OPEC+ announced a headline reduction in production targets of 2 mb/d, numerous countries are already well below target. As such, the actual reduction may be just over half of the headline number, and several countries may not see a reduction in production in 2023.

Production in Russia is set to fall sharply as the EU embargoes Russian crude oil (from December 5, 2022) and oil products (from February 5, 2023) and restricts access to insurance and shipping services. The IEA anticipates that Russian production could be 2 mb/d lower in 2023 as a result of sanctions. In addition, releases of oil reserves from strategic inventories are expected to stop by the end of 2022. Since March, these have been contributing about 1 mb/d of

FIGURE 4 Oil market outlook

Oil prices are expected to ease in 2023-24, with modest increases in both demand and supply, albeit weaker than previously expected. Production growth is primarily accounted for by the United States, with modest increases in a couple of other countries. A key downside risk is the possibility of a global recession, which could materially reduce oil demand growth.



Sources: BP Statistical Review of World Energy; International Energy Agency; World Bank.
Note: IEA = International Energy Agency; OPEC = Organization of the Petroleum Exporting Countries.
A. Consensus forecasts taken from the October 2022 survey. Futures prices average of October 3 to October 21, 2022.
B. Shaded area indicates IEA forecasts.
C. Figure shows IEA estimates for oil production growth from its "Oil Market Report, October 2022."
D. Figure shows episodes of oil demand contractions around recessions. Year t is the peak in oil demand prior to contractions. Dashed line shows IEA forecast for 2022 and 2023 from its "Oil Market Report, October 2022."

additional supply to the market, and in their absence the oil market would have been tighter.

The long-term oil market outlook may also be affected by the consequences of the war in Ukraine. Russian production of crude oil could be permanently lowered because of the exit of foreign companies and reduced access to capital, foreign technology, and machinery. Patterns of trade in crude oil and oil products are also likely to be altered, potentially raising transport costs. At the same time, recently announced government policy initiatives, including in the European Union and the United States, will likely accelerate the energy transition, including measures to boost the adoption of electric vehicles and boost fuel efficiency. These could lower oil consumption (and carbon emissions) in the medium term.

Risks

There are several upside and downside risks to the price outlook. The downside risks primarily arise from threats to global consumption stemming from a global recession and more prolonged COVID-19 restrictions in China. The upside risks are dominated by supply issues, including the extent to which Russia's exports are impacted by new trade measures, OPEC+ supply decisions, possible disappointments in production from the United States, and lower levels of strategic oil reserves.

The prospect of a global recession could lead to much weaker oil consumption. Global growth has decelerated and is expected to slow further in 2023, due to synchronous policy tightening, worsening financial conditions, and declining confidence. Additional negative shocks, such as higher inflation or financial stress, could push the global economy into a recession (Guenette, Kose, and Sugawara 2022). Historically, global recessions have been associated with large declines in oil consumption, although the severity of these has varied (figure 4.D). The largest decline in oil consumption occurred in the 1980s, with consumption falling for four consecutive years.

While the 1980s episode bears some similarities with the macroeconomic outlook today—high inflation, monetary tightening, and high oil prices—there are three key differences (World Bank 2022). First, part of the decline in oil demand in the 1980s reflected substitution to alternative fuels for electricity generation, notably coal and nuclear power (Baffes and Nagle 2022). However, very little oil is used in electricity generation today, and as oil is currently one of the cheapest sources of energy, its use has actually risen due to switching from natural gas. Second, governments have lowered taxes and introduced subsidies on oil, especially gasoline, which will mute the impact of higher prices on consumption. Third, the share of oil in GDP is much lower

today, especially in advanced economies, so consumers may be less responsive to higher prices than in the past.

Global oil supply will depend on the extent of disruptions to Russia's exports, OPEC+ production decisions, and the investment response by U.S. oil companies. At present, the IEA expects Russia's exports to decline by about 1.5 mb/d because of additional sanctions, but there is considerable uncertainty around these estimates. The proposed G7 oil price cap could help maintain the flow of oil from Russia, but it is untested and would need the participation of large EMDEs to achieve its objectives. Russia has also said it will not trade with countries participating in the price cap. While significant disruption to Russia's exports may occur in the short term as trade routes are disrupted, market participants may find ways to circumvent the sanctions, as has often occurred with other sanction episodes.

For OPEC+ more broadly, the group has shown a willingness to alter production targets to support prices. While the current agreement is due to last through the end of 2023, it is possible the group could cut production further in the event of weaker-than-expected demand. Several countries are already producing below their new target, and there are broader concerns about low levels of spare capacity. Spare capacity among OPEC+ remains low at about 3.5 percent of global consumption and is concentrated in Saudi Arabia (2 mb/d), UAE (0.7 mb/d), and Iraq (0.3 mb/d).

The production outlook assumes large increases in the United States. However, production could be weaker than expected if companies continue to prioritize profitability over new production. In addition, higher interest rates, higher production costs, and shortages of key inputs, will make new projects more expensive. The stock of drilled but uncompleted (DUC) wells has fallen to its lowest level on record and is down 50 percent relative to its peak in June 2020, as companies have chosen to develop these wells rather than drill new ones. Going forward, this reduces the potential for companies to increase production from this channel.

Further releases of strategic oil reserves would risk reducing supply buffers. Additional price spikes may lead to further inventory releases, but this would risk leaving strategic global inventories at very low levels. The U.S. Strategic Petroleum Reserve is currently close to 400 million barrels, down from a peak of 727 million in 2010. In addition, inventories will likely need to be refilled in the future, representing an additional source of demand. While the exact timeline is unknown, the United States has indicated it will refill the SPR at a price of between $67/bbl and $72/bbl, thereby potentially setting a temporary floor for prices.

Upside and downside risks may offset one another. Weaker-than-expected demand could be offset by lower OPEC+ production and refilling of strategic inventories, potentially limiting the extent to which prices could fall. In contrast, if demand was higher than expected as a result of stronger global growth, or supply from Russia or the U.S. was lower than expected, the gap could be met with additional releases from strategic inventories or from OPEC+ spare capacity. However, these would use up buffers and raise the risk of additional price spikes in the future.

Coal and Natural Gas

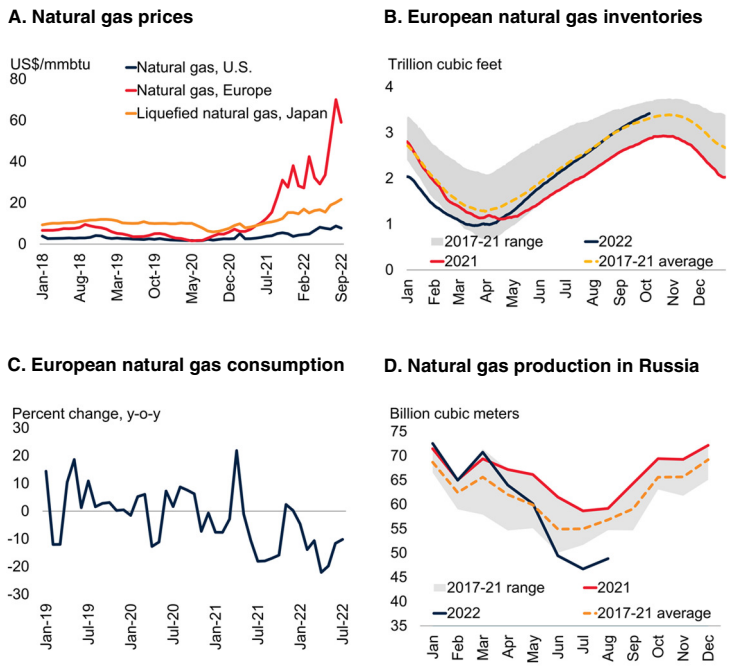
Recent developments

Natural gas market developments. Natural gas prices have been exceptionally volatile, with some benchmarks reaching all-time highs in 2022Q3 before sharply declining (figure 5.A). While the natural gas market has become increasingly global, stark price differentials remain due to differing supply dynamics. European natural gas reached an all-time high of $70/mmbtu in August 2022 due to aggressive actions by several European countries to import liquefied natural gas (LNG) to rebuild their inventories and to compensate for reduced flows of gas from Russia. (Russia cut pipeline flows to most European countries during 2022Q3.)

Prices subsequently dropped to $45/mmbtu in the first half of October as inventories filled ahead of schedule, and consumers reduced their consumption in response to higher prices and warmer-than-

FIGURE 5 Natural gas market developments

Natural gas prices have fallen from their record highs observed during 2022Q3. The fall in prices has been partly due to the rapid increase in European natural gas inventories which are now above recent average levels. The buildup in inventories has been assisted by reduced natural gas consumption in Europe as industry and households have reduced consumption and switched to alternative fuels. Natural gas production in Russia has fallen sharply due to the reduction in exports to Europe.



Sources: Bloomberg; Eurostat; Gas Infrastructure Europe (AGSI+); JODI (database); World Bank.
A. Monthly data, last observation is September 2022.
B. Sample includes 20 EU Countries and the United Kingdom. Last observation is October 5, 2022.
C. Year-on-year change of observed inland consumption. Last observation is July 2022.
D. Monthly data. Last observation is August 2022.

usual weather. Japan contract prices rose to a record high in September, albeit well below European prices. Natural gas prices in the United States rose to $8.8/mmbtu in August, their highest level since 2008, amid strong domestic demand and record exports of LNG, but subsequently declined in September and October.

Natural gas markets have been driven, to a large extent, by developments in Europe, and these have led to major shifts in patterns of trade. Exports of natural gas by pipeline from Russia to Europe have fallen sharply, causing Europe to turn to the LNG market as its main alternative (as well as some incremental pipeline flows from the North Sea and North Africa). LNG imports rose sharply to help refill inventories ahead of winter. Inventories had been well below their typical levels earlier in the year, but reached 90 percent capacity by October, above their average (figure 5.B). LNG imports were also needed to compensate for lower electricity production from hydroelectricity due to drought (Portugal and Spain), and nuclear power due to maintenance and water discharge issues due to heatwaves (France).

The record high price of LNG in Europe in August resulting from high demand led to LNG cargoes destined for other countries being rerouted to the more profitable European market. This led to widespread power cuts in some countries, such as Bangladesh and Pakistan, which were unable to compete with Europe to purchase LNG cargoes on the spot market. Increased use of substitutes such as oil failed to meet power needs. Other large LNG importers, including Japan and the Republic of Korea, purchase more of their LNG via long-term contracts and were less affected by the surge in spot prices. Both countries, however, sought to diversify away from natural gas, including by bringing forward planned nuclear energy restarts.

Natural gas consumption has broadly declined in 2022Q3. In Europe, demand has fallen by about 10 percent (figure 5.C). The decline is due to demand destruction—a reduction in demand due to persistently high prices—in energy-intensive industries, such as fertilizer plants, which curtailed output; the widespread switching to other fuels in power generation; and reductions in use by households in response to higher prices. Mild weather also helped reduce demand in October. The fall in demand has been helped by government policies to reduce energy consumption, particularly natural gas. Consumption has also been influenced by the weather. In Brazil, a major recovery in hydroelectricity generation from droughts in 2021 caused consumption of natural gas to fall sharply. In the United States, natural gas demand has been robust in 2022, but there has been less substitution to coal given the smaller price differential between the two fuels.

Natural gas production has sharply declined in Russia—down 17 percent in August 2022 (y/y)—as the country has few options to redirect its exports given the reliance on pipelines to Europe.

This shortfall has been partly offset by increased supplies from other countries. Production in the United States was 10 percent higher in 2022Q3 (y/y). The natural gas rig count has been increasing, and there has also been increased production associated with crude oil production. Exports of LNG from the United States reached a record high in May, with a large increase in exports to Europe, although they fell in June following an explosion at the Freeport LNG terminal. This facility accounts for about 17 percent of U.S. LNG export capacity. Production has risen slightly in other countries amid higher prices, including in Australia, Egypt, and Qatar.

Coal market developments. Coal prices continued to increase in 2022Q3, reaching an all-time high of $330/mt in July and broadly plateauing thereafter (figure 6.A). Developments in coal markets have been heavily influenced by high natural gas prices, which encouraged many countries to switch from natural gas to coal in power generation. This is a marked reversal of a broader trend to retire coal plants (figure 6.B). In addition, prices for thermal coal (mainly used in power generation) have risen well above the price of metallurgical coal (used for steel making), which has caused some lower-grade metallurgical coal to be blended in power plants.

Global consumption of coal has increased. In Europe, several countries reopened coal power plants or increased their utilization. Consumption in China also rose in 2022Q3 as increased coal generation was needed to offset very low hydroelectricity output (caused by severe droughts). In the United States, in contrast, consumption of coal declined 12 percent in 2022 Q3. This is partly due to ongoing retirements of coal plants, but also because the price differential between coal and natural gas is much smaller in the U.S. than in other countries, due to the abundance of natural gas production.

Production of coal has risen in several countries. In China, coal production was 11 percent higher in the first eight months of 2022 compared to the previous year (National Bureau of Statistics of China 2022). In India, production was 21 percent higher in the first nine months of 2022 compared to 2021 (figure 6.C; Ministry of Coal of India). As both China and India are coal importers, increased domestic production reduces their imports from other countries. Exports from Indonesia—the world's largest coal exporter—increased after the country's temporary export ban in January ended, although a new partial ban was announced in August. Australia's exports, in contrast, have fallen this year due to severe weather (Reserve Bank of Australia 2022). South African production has been hampered by rail capacity constraints and weather, although exports to Europe have surged.

The European Union ban on Russian coal imports in August altered trade flows, with Europe importing more coal from Colombia, South Africa, the United States, and even Australia (figure 6.C). Meanwhile, Russia has rerouted cargoes that would typically have gone to the European Union to other countries, including India and Türkiye. These diversions have resulted in a significant increase in transport distances and therefore higher transport costs, since coal is bulky and expensive to transport.

Outlook and risks

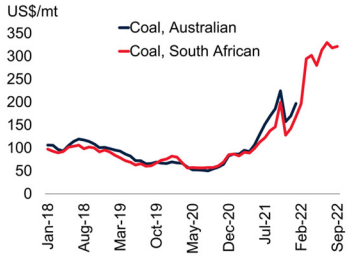
Natural gas and coal prices are expected to ease in 2023 and 2024 but remain at much higher levels than their average over 2017-21. By 2024, Australian coal and U.S. natural gas prices are still expected to be double their average over the past five years, while European natural gas prices could be four times higher. The expected easing of prices next year is due to weaker demand for natural gas as households and industries curtail their consumption and switch to substitutes, while coal production is expected to increase significantly as China, India, and major coal exporters boost output. The switching away from natural gas could put climate change objectives at risk, given alternative fossil fuels have higher carbon dioxide emissions (figure 6.D).

The outlook for natural gas will depend on the severity of the winter in Europe and the ability of consumers to reduce their demand. While current expectations are for a mild winter, a worse-than-expected outcome could still result in very low

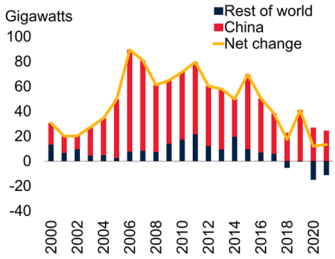
FIGURE 6 Coal market developments

Coal prices soared through 2022Q3 and remain elevated as countries turn to coal as a substitute for natural gas, a marked reversal of a broader trend toward retiring coal plants. The EU has turned to alternative suppliers of coal to reduced imports from Russia. The switch toward other fuels from natural gas could put climate objectives at risk, given greater carbon dioxide emissions from coal and fuel oil.

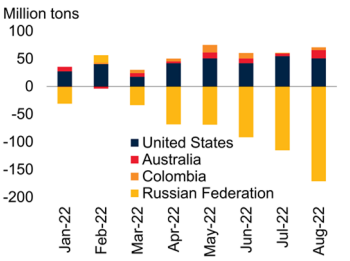
A. Coal prices



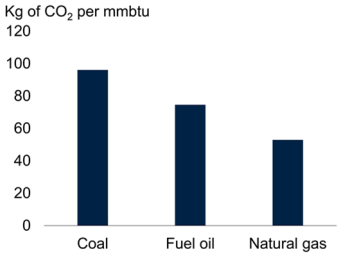
B. Net new coal plant additions



C. EU coal import growth, select countries



D. CO2 emissions, by type of fuel



Sources: BP Statistical Review; Eurostat; Energy Information Administration; Global Energy Monitor; World Bank.
A. Monthly data. Last observation is September 2022.
B. Last observation is 2021.
C. Figure shows the year-on-year change in coal imports in million tons from select countries.
D. Fuel oil is an average of distillate fuel oil and residual fuel. Figure for natural gas does not include greenhouse gas emissions arising from leaks. Mmbtu = millions of British thermal units and is a measure of energy content.

inventory levels by the end of the winter. Policy coordination among key importers will be vital to ensure an equitable burden of high energy prices or energy disruption. The European Union has announced several policies to try and address these challenges, including jointly purchasing gas, and focusing on reducing demand. A price cap on natural gas has also been discussed, however, this would need to be balanced against procuring sufficient supply.

Europe will face further challenges in replenishing inventories next summer amid the loss of Russian gas imports. The IEA forecasts that European LNG imports will increase by 60 bcm in 2023, helped by new import terminals, including floating terminals (International Energy Agency 2022c). However, that increase is more than double the expected increase in global LNG export capacity, which will keep upward pressure on prices as Europe competes with other markets, and the disruptions seen this year for some LNG importers could persist through 2023. One additional risk to natural gas is the potential for damage to critical infrastructure, as observed with the explosions that occurred on the Nordstream 1 and 2 pipelines in September. Pipelines are, by their nature, very long and therefore difficult to protect, while LNG terminals are highly concentrated.

As with crude oil, slower global growth is a key downside risk to the outlook for both natural gas and coal next year. In addition, recent government policy announcements, including in the European Union and the United States, to sharply increase renewable energy capacity and reduce overall energy consumption could further reduce natural gas and coal consumption, in both the short- and medium-term. Future growth in natural gas consumption may also be weaker than expected as the sharp volatility in prices and lack of access to LNG may prompt some countries to reevaluate its role as a reliable fuel. In part reflecting this, the IEA has reduced its forecast for natural gas consumption growth over the next five years by one-half (International Energy Agency 2022d). The impact of this change on carbon emissions will depend on the extent to which countries favor renewables or coal in place of natural gas. In addition, countries may prioritize longer-term contracts with fixed prices over purchases on the spot market.

In the longer term, the prospect of persistently high energy prices may require a shift in industrial strategies in some European countries that have historically relied on natural gas imports via pipeline from Russia. Indeed, high energy prices have already led to the closure of capacity in some energy-intensive industries, including fertilizer, chemical, and metal processing plants, and shifts in manufacturing operations among others.

Agriculture

The agricultural price index declined 11 percent in 2022Q3 (q/q), after reaching an all-time high in April, in nominal terms. The weakness reflected larger-than-expected edible and oilseed global supplies, a UN-brokered agreement that allowed Ukrainian grains to reach global markets, and deteriorating global growth prospects. Among key grains, wheat prices fell nearly 20 percent over the previous quarter (but remain 24 percent higher than a year ago), followed by maize prices (10 percent lower, q/q); rice prices have remained broadly stable. The edible oils and meals price index declined 18 percent in 2022Q3 (q/q). Beverage prices remained fairly stable during the past three quarters as a group, with a modest increase in tea and coffee prices offset by a drop in cocoa prices. Raw material prices declined nearly 11 percent in the quarter following robust supplies of cotton and natural rubber amid deteriorating global growth prospects. Following a projected increase of more than 13 percent in 2022, agricultural prices are expected to fall by nearly 5 percent in 2023, before stabilizing in 2024 as supplies of most food commodities increase due to improved yields and the ongoing Ukraine's return to the global markets. Despite the expected declines, most prices will remain high by historical norms. There are numerous risks to the price outlook. They include the likelihood of higher-than-expected input prices or energy supply disruptions; further deterioration of the global outlook (including acceleration of monetary tightening and further appreciation of the U.S. dollar); adverse weather patterns (including an emerging La Niña for a third year in a row); and restrictive trade policies.

Grains, oils, and meals

Recent developments and outlook

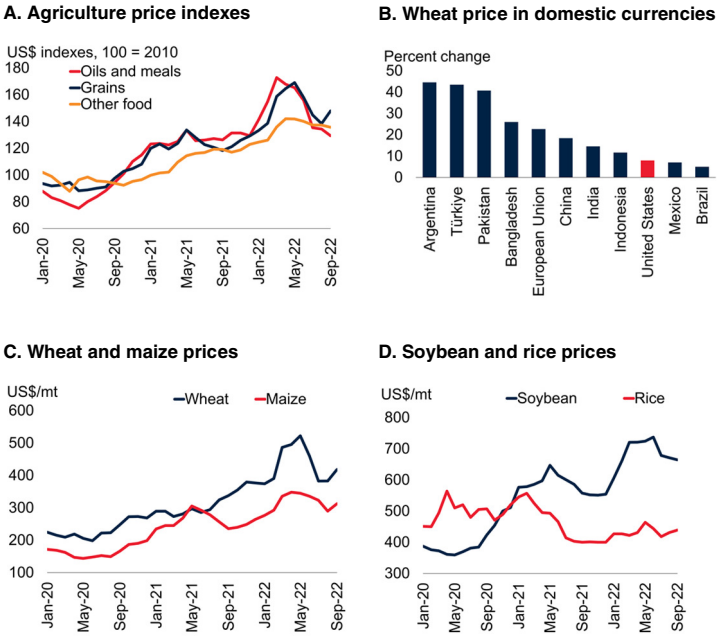
The *grain price index* declined by 12 percent in 2202Q3 (q/q) but remains almost 20 percent higher than a year ago. The broader *food price index* declined at a similar pace (figure 7). A favorable global wheat crop and a UN-brokered deal that facilitated grain exports from Ukraine have been key contributors to the easing of grain prices. Global food inventories are expected to decline marginally relative to projected demand, during the 2022-23 season, with the stocks-to-use ratio falling to 0.27 from a high 0.31 in 2017. For the three main grains—wheat, maize, and rice—the U.S. Department of Agriculture is estimating that global production will decline by 2.3 percent this season, or 57 million metric tons (mmt). By comparison, grain supplies have grown by an average of 35 mmt per year during the past three decades.

Wheat prices dropped nearly 20 percent in 2022Q3 (q/q), but they are still one-quarter higher than a year ago. Prices surged in 2022Q2, reaching $522/mt in May, following the halting of Ukrainian exports through the Black Sea. A UN-brokered deal between Ukraine and Russia, orchestrated by Türkiye, facilitated the resumption of grain exports on July 22nd. Since then, half of Ukraine's wheat inventories are thought to have found their way to global markets. Negotiations are underway to extend the deal which expires in November. On the supply side, global production of wheat during the current season (which began in August) is expected to increase marginally from last season as declines in Argentina and Ukraine (both due to lower planting area) will be offset by higher-than-expected yields in key exporters, including Australia, Canada, and the Russian Federation. Global consumption of wheat is expected to decline by 0.5 percent due to weaker-than-expected demand for animal feed. As a result, the stocks-to-use ratio will remain at 0.34, roughly unchanged from last season.

Maize prices dropped 10 percent in 2022Q3 (q/q), but are still 20 percent higher than a year ago. The resumption of grain exports through the Black Sea, along with weaker-than-expected animal feed demand in the European Union and the United States (down 8 and 4 percent, respectively) contributed to the weakness. At a global level, maize production is expected to decline by 4 percent this season, in response to weather-related lower yields in the United States and the European Union, which account for 32 and 7 percent, respectively, of global maize supplies. Given expected reductions in both production and consumption, the stocks-to-use

FIGURE 7 Agricultural price developments

Following record highs earlier in the year, prices of oils & meals and grains retreated in 2022Q3, in response to better-than-expected oilseed crop yields and the UN-brokered deal that allowed Ukrainian grain supplies to reach global markets. However, food prices in most domestic currencies are still high due to U.S. dollar appreciation.



Sources: Bloomberg; Haver Analytics; World Bank.
A.C. Monthly data. Last observation is September 2022.
B. Percent change from February to September 2022.
C. Wheat refers to the U.S. HRW benchmark.
D. Rice refers to Thai 5% benchmark.

ratio is projected to remain unchanged at 0.26, below its record 0.33 in 2016 but well above a low of 0.13 during the price spike of 2010.

Rice prices declined 4 percent in 2022Q3 (q/q), but remained 6 percent higher than a year ago. Rice prices have been broadly stable during the past five quarters since retreating from a seven-year high in 2021Q1 amid heightened pandemic-related concerns about global supplies and discussion of export restrictions, most of which did not materialize. This is in contrast to the sharper and more sustained price spike of 2010-11, which resulted from trade restrictions by key exporters (notably India and Thailand) and aggressive buying by major importers (Indonesia and the Philippines). The USDA expects global rice production to decline 2 percent in 2022-23, reflecting lower crops in China (down 1.3 percent) due to dry conditions and to lower planted area in India (down 5 percent). These shortfalls will be partly compensated by Thailand and Vietnam which are expected to raise production by 1.2 percent each; India, Thailand, and Vietnam are the world's three dominant rice exporters. As global rice consumption is expected to remain broadly unchanged, the supply shortfall will reduce the stocks-to-use ratio for rice to 0.34, marginally lower than the past two seasons but considerably higher than the low of 0.18 in 2006.

The *oils and meal price index* declined more than 18 percent in 2022Q3 (q/q), the largest drop among key food price indexes. However, the index, which reached an all-time high in March 2022, remains 5 percent higher than a year ago. The lower prices reflect better crop prospects across most edible oils and oilseeds, Indonesia's removal of its export ban on palm oil, and weakening global demand due to consumer affordability issues and faltering growth prospects. The resumption of exports from Black Sea ports also contributed to improved supply sentiment (Ukraine accounts for 30 percent of global sunflower production).

This season's global production of the eight most important edible oils—including soybean and palm oil, which together account for nearly two-thirds of global edible oil supplies—is expected to grow more than 4 percent or 9.6 mmt, much higher than long-term average growth of 5.5 mmt (figure 8). While supplies of all eight edible oils are expected to increase, most gains will come from palm, rapeseed, and soybean oils (up 4.2, 4.3, and 8.2 percent, respectively) in response to favorable growing conditions in South America (soybean oil) and East Asia (palm oil). Production of the seven major oilseeds is expected to grow even more strongly than edible oils at 4.5 percent, led by soybean and rapeseed. The supply outlook of oils and meals for 2022-23 shows improvement from last season when production of both groups grew far less than their long-term average.

Price forecasts and risks

Following a more than 20 percent increase in 2022, the *grain price index* is expected to drop 6 percent in 2023 and remain broadly flat in 2024.

The outlook reflects expectations of improved yields, continuation of Ukraine's return to the global markets, and weakening demand in response to the slowdown in the global economy. Maize prices are expected to decline 8 percent next year, following a projected increase of more than 20 percent in 2022 due to the effects of the Ukraine war and weather-related production shortfalls. Wheat prices, which are projected to increase 36 percent in 2022, are expected to decline modestly next year. Rice prices are projected to average 5 percent lower in 2022 and remain unchanged in 2023. The 2023 forecasts for all three grains represent small upward revisions since April.

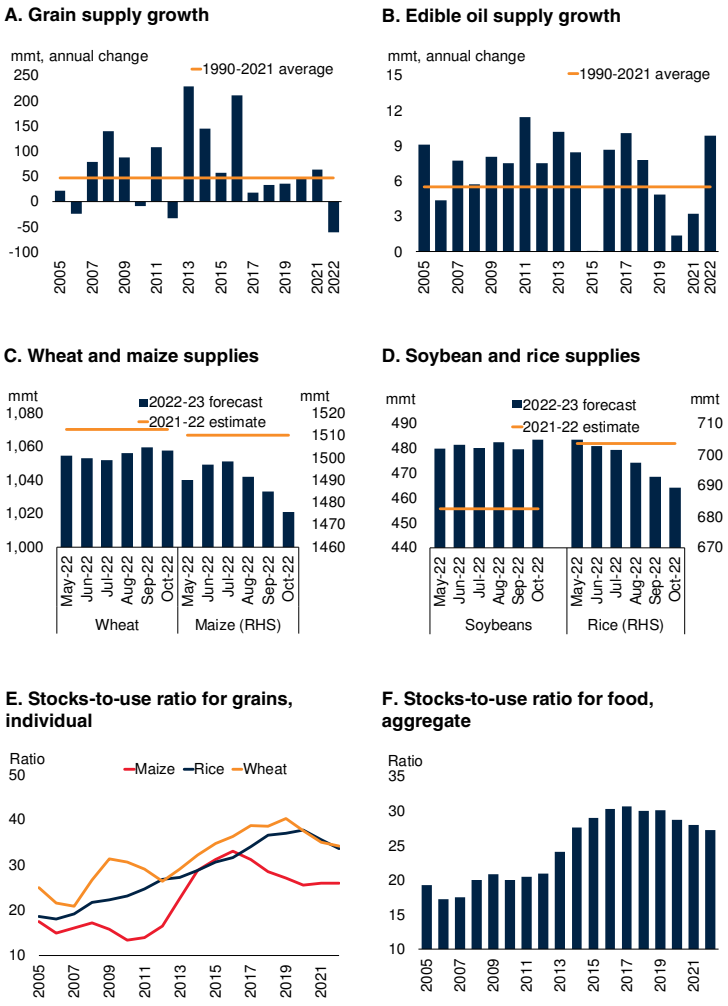
The price outlook is subject to multiple upside and downside risks in a highly uncertain environment (figure 9). They include worsening global growth prospects, including the pace of recovery in China; macroeconomic uncertainties; a prolonged and deeper conflict in Ukraine; higher input costs (especially energy and fertilizers); the ongoing La Niña weather pattern; and, in the longer term, trade and biofuels policies.

Global growth prospects. The global growth slowdown and the possibility of recession in several economies raises concerns about sharply lower household incomes. In addition, an appreciation of the U.S. dollar against most currencies has made food commodities in emerging market and developing economies more expensive, further eroding the purchasing power of households in low-income countries. Along with inflationary pressures, these would reduce affordability of, and access to, food. Low-income countries are especially vulnerable as consumers spend a large portion of their disposal income on food—in some countries exceeding 50 percent. Many of these countries have limited fiscal space to support vulnerable households after having spent considerable resources during the pandemic.

Macroeconomic uncertainties. Elevated inflation and interest rate hikes also pose risks to commodity prices. Persistently high inflation could exert further upward pressure on the cost of labor as well as on the intermediate materials used to produce, store, and transport commodities. Interest rate hikes by major central banks to combat high inflation are expected to continue in 2023 and will increase the global cost of

FIGURE 8 Global supply conditions for grains and edible oils

Global grain supplies are heading for a shortfall of nearly 50 mt in the current season that started in August, amid deteriorating prospects for the U.S. maize crop. Edible oil supplies, however, are expected to increase well above historical average growth due to a robust soybean crop from South America. Although aggregate food stocks-to-use ratio (a rough measure of supply relative to projected demand) has dropped markedly over the past four seasons (down to 27 percent from its high of 31 percent in 2017), it is still adequate by historical standards.

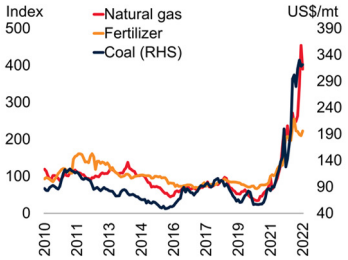


Sources: U.S. Department of Agriculture (psdonline database, October 12, 2022 update); World Bank.
Note: mmt = million metric tons.
A.B.E.F. Years represent crop season (for example, 2021 refers to 2021-22. Last observation is 2022. Supply is the sum of beginning stocks and production.
C.D. Blue bars denote revisions to the 2021-22 supply assessment (based on monthly USDA updates); orange lines denote the latest (October 12, 2022) estimate for the 2022-23 season.
E.F. Stocks-to-use ratio is the ratio of ending stocks to domestic consumption.

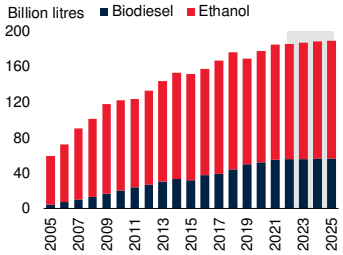
FIGURE 9 Risks to the food commodity outlook

Key risks to the food commodity outlook include high input prices, including fertilizers, coal, and natural gas; diversion of food commodities to biofuels; further U.S. dollar appreciation; restrictive trade policies; and emerging La Niña (for the third year in a row).

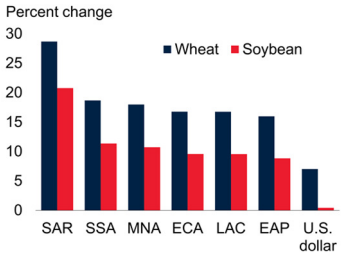
A. Coal, natural gas, and fertilizer prices



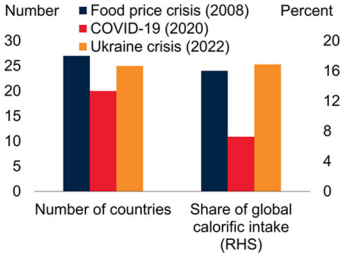
B. Biofuels production



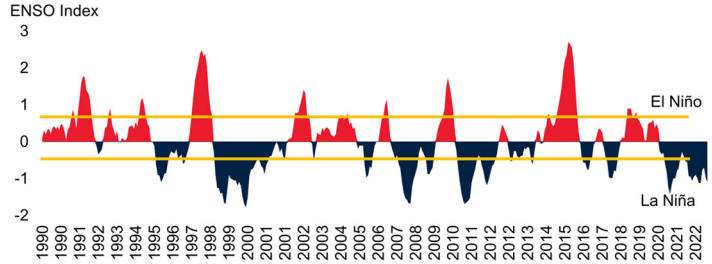
C. Change in price of wheat and soybean in local currency, by region



D. Food export restrictions



E. Oceanic Niño Index



Sources: Haver Analytics; Food Security Portal, Food and Fertilizer Export Restrictions Tracker; Organization for Economic Co-operation and Development; World Bank.

A. Monthly data. Last observation is September 2022. Coal refers to South African benchmark.

B. Shaded area indicates forecast, as noted in OECD/FAO (2022).

C. EAP = East and Asia Pacific, ECA = Europe and Central Asia, LAC = Latin America and Caribbean, MNA = Middle East and North Africa, SAR = South Asia, and SSA = Sub-Saharan Africa Percent change from February to September 2022. Sample includes 35 economies in EAP, 8 in ECA, 8 in LAC, 19 in MNA, 19 in SAR and 23 in SSA.

D. First bar shows peak number of countries implementing food export restrictions during each period. Second bar shows the percentage of global calories impacted by export restrictions during each period.

E. The ENSO (El Niño Southern Oscillation) Index represents a centered three-month mean SST (Sea Surface Temperature) anomaly for the Niño 3.4 region (that is, 5oN-5 oS, 120o -170oW). According to the National Oceanic and Atmospheric Administration, events are defined as five consecutive overlapping three-month periods at or above the +0.5o anomaly for El Niño events and at or below the -0.5 anomaly for La Niña events.

borrowing. This could constrain investment in new production of agricultural commodities, as well as in the supply chains that caused bottlenecks during the pandemic.

The war in Ukraine. Russia's invasion of Ukraine delivered a fresh blow to global commodity markets. Initially, the war led to significant disruptions to the production and trade of commodities in which Russia (energy and grains), Ukraine (grains and oilseeds), and Belarus (fertilizer) are key exporters. Although food prices have retreated from their 2022Q2 peaks, they are still high compared to the past five years. An escalation of the war could quickly reverse the expected easing of food commodity prices in 2023 and 2024. Moreover, failure to extend the UN-backed deal allowing exports of grains from the Black Sea could result in food import disruptions in low-income countries, especially in the Middle East and North Africa which depend heavily on grain imports from the Black Sea region.

Input costs. Energy is a key input to most food commodities, with both direct channels (fuel) and indirect channels (chemicals, fertilizers, electricity). Prices at the three main natural gas hubs (Europe, United States, and Asia) are projected to average 148, 71, and 71 percent higher in 2022 than in 2021. Skyrocketing energy prices have taken a toll on fertilizer markets since 2021, as fertilizers are the most energy intensive commodity group. Several companies, especially in Europe, temporarily shut production facilities due to surging input prices and/or the unavailability of feedstocks. The already tight market could be further destabilized by the continuation of restrictions on fertilizer exports from the Black Sea region, sanctions on exports from Belarus, and China's fertilizer export ban. If energy and fertilizer prices do not moderate in 2023 and 2024 as expected, food prices could be subject to significant upward pressure.

La Niña. The El Niño-Southern Oscillation (ENSO) is currently in a La Niña phase (NOAA 2022). According to the October assessment of the U.S. National Oceanic and Atmospheric Administration, La Niña conditions will likely continue into early 2023, with a 75 percent

chance during the Northern Hemisphere winter (December-February). La Niña is likely to cause droughts in the Horn of Africa and heavy rainfall and flooding in Australia and southeast Asia. However, it could improve growing conditions in other regions, including parts of North America. Historically, La Niña's impact on agriculture is milder and more mixed than that of El Niño (World Bank 2015). However, there is concern that La Niña conditions occurring for a third year in a row (a rare occurrence) could add further rainfall and flooding to already deluged areas.

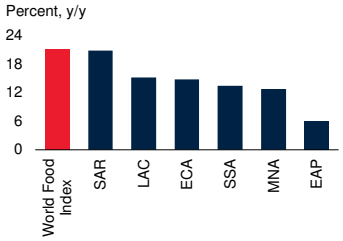
Trade policies. Trade policies have played an important role in commodity price movements during the pandemic and the war in Ukraine. Several countries have imposed export bans and other trade restrictions to keep domestic prices in check. So far, export restrictions during 2022 (both as an absolute number and as a share of calorific intake) have been comparable with restrictions imposed during the food price spike of 2008. However, because the recent restrictions have been applied to a broad set of lesser-traded commodities, they have not affected global markets as much as the 2008 restrictions (which were applied to key commodities, such as rice and wheat, by major producers and consumers). In 2008, for example, export bans and aggressive buying in the rice market caused rice prices to almost triple within a four-month period.

Biofuels. Land diversion to biofuels is projected to increase modestly during the next three years, notably for sugarcane and maize (for ethanol production) and edible oils (for biodiesel production). While advanced economies account for most biofuel production, the share from EMDEs has been growing. In view of the recent energy price surge and supply disruptions, production of biofuels could increase more than anticipated as policy makers try to address energy security concerns. Furthermore, several transport industries are actively responding to sustainability concerns. The transport sector (notably airlines) is addressing environmental, social, and governance issues by increasingly turning to biofuels as a key source for sustainable fuel. The impact of these energy security and environmental policies, however, could have important implications for food commodity markets. Currently biofuels account for 3-4 percent of global land but only 0.7 percent of global energy consumption.

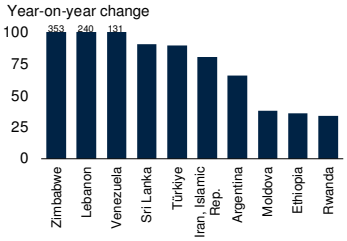
FIGURE 10 Domestic food price inflation

High food prices remain a major concern across all regions. Several countries (for example, Argentina, Iran, Sri Lanka, and Türkiye) are experiencing food price inflation in the range of 50 to 100 percent, while others (including Lebanon, Venezuela, and Zimbabwe) are experiencing triple-digit food price inflation.

A. Domestic food price inflation and world food prices, Jan-Sep 2022 average (y/y)



B. Food price inflation in selected EMDEs



Sources: World Bank; Food and Agriculture Organization of the United Nations.
Note: EMDEs = emerging markets and developing economies; EAP = East Asia and Pacific, ECA = Europe and Central Asia, LAC = Latin America and the Caribbean, MNA = Middle East and North Africa, SAR = South Asia, SSA = Sub-Saharan Africa.
A. Food inflation for each country is based on the latest month from January to September 2022 for which the food component of the Consumer Price Index (CPI) and overall CPI data are available.
B. Index measures monthly changes in international prices of a basket of food commodities.

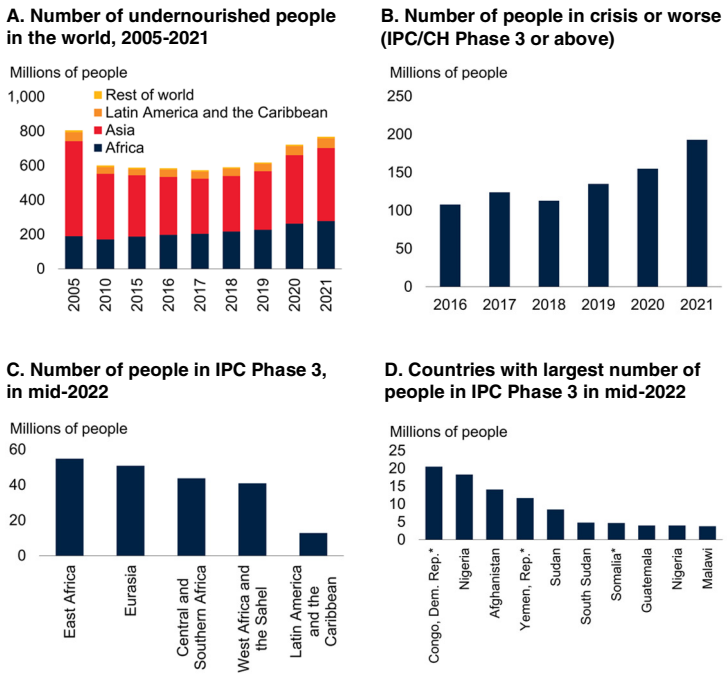
Implications for inflation and food security

Domestic food price inflation. Local food prices have surged in response to increasing energy and fertilizer prices since 2021, pandemic-induced supply chain disruptions, and disruptions resulting from the war in Ukraine (figure 10). The sharp appreciation of the U.S. dollar since the beginning of 2022 has pushed food prices in domestic currency terms even higher. For example, wheat prices, which were 7 percent higher globally in September than in February, were up more than 22 percent, on average, across the Sub-Saharan Africa and Eastern Europe and Central Asian regions. Similarly, soybean prices increased nearly 15 percent in these two regions despite broadly stable global prices from February to September.

At an aggregate level, during the first three quarters of 2022, food price inflation in South Asia averaged more than 20 percent, about the same pace as global food prices. Inflation in other regions, including Latin America and the

FIGURE 11 Food insecurity

Food insecurity has been trending higher over the past six years. An estimated 193 million people faced a severe food crisis in 2021 (up from 156 million in 2020). Sub-Saharan Africa has the world's highest share of food insecure people, followed by Eastern Europe and Central Asia, and Latin America and the Caribbean.



Sources: Food and Agriculture Organization of the United Nations; Food Security Information Network and Global Network Against Food Crises; International Fund for Agricultural Development, UNICEF; U.N. World Food Program; World Bank; World Health Organization.

A. Data from *The State of Food Security and Nutrition in the World 2022* (Table 2, page 15.)

B. Data from *Global Report on Food Crises 2022 (page 6.)*

B. International Food Security Phase Classifications (IPC) include (1) minimal/none, (2) stressed, (3) crisis, (4) emergency, and (5) catastrophe/famine. Bars represent the number of people worldwide that face stressed (IPC2) or more severe (IPC3+) food security.

C.D. Number of people in IPC/CH Phase 3 as reported in the *2022 Global Report on Food Crises 2022.*

D. Countries with asterisk (*) denote fragile and in conflict-affected states (FCS).

Caribbean, Middle East and North Africa, Sub-Saharan Africa, and Eastern Europe and Central Asia, averaged between 12 and 15 percent. East Asia and the Pacific is the only region with low food price inflation, in part due to the relative stability of rice prices, the region's key staple.

Given the long lags between global food price increases and domestic food price inflation, additional acceleration of the latter cannot be ruled out. A further spike in world food prices or further appreciation of the U.S. dollar present significant upside risks.

Food insecurity. Rising food prices have contributed to food insecurity in many EMDEs, especially in several low-income countries (figure 11). Although countries most affected by disruptions of grain imports from the Black Sea received a temporary relief following the resumption of exports (in response to the UN-backed agreement), food insecurity had already increased in response to the pandemic, adverse weather events, and numerous conflicts (for example, in Afghanistan, Ethiopia, and Somalia). According to the Food Security Information Network (FSIN), about 193 million people faced food insecurity at a crisis/emergency/catastrophe level (IPC Phase 3+) in 53 countries in 2021, up from 156 million in 2020. FSIN's group's mid-year report, released in September, is projecting that more than 200 million people in 2022 will be at IPC3 level or above, with much of the increase reflecting the initial effects of the war in Ukraine (FSIN 2022). Populations facing food crises are typically in countries with conflict or countries that are facing extreme weather events, especially droughts. Sub-Saharan Africa has the world's highest share of food insecure people (more than 100 million in 34 countries), followed by Eastern Europe and Central Asia (about 50 million in 6 countries), and Latin America and the Caribbean (nearly 13 million in 5 countries).

Beverages

The World Bank's *beverage price index* changed little in 2022Q3, as a 4 percent decline in cocoa prices helped offset a 9 percent increase in tea prices (figure 12). The index, however, remains more than 12 percent higher than a year ago. Following an estimated 16 percent increase in 2022, the index is expected to drop about 7 percent in 2023, as the global economy slows and supplies (especially coffee) increase.

Arabica and Robusta coffee prices changed little in 2022Q3 but stand 23 and 9 percent higher, respectively, from a year earlier. The coffee market is still feeling the aftershocks of last year's sharp output decline due to Brazil's weather-induced shortfall, when global coffee production fell more than 8 percent in 2021-22 from a year earlier. An expected increase this year will partly compensate

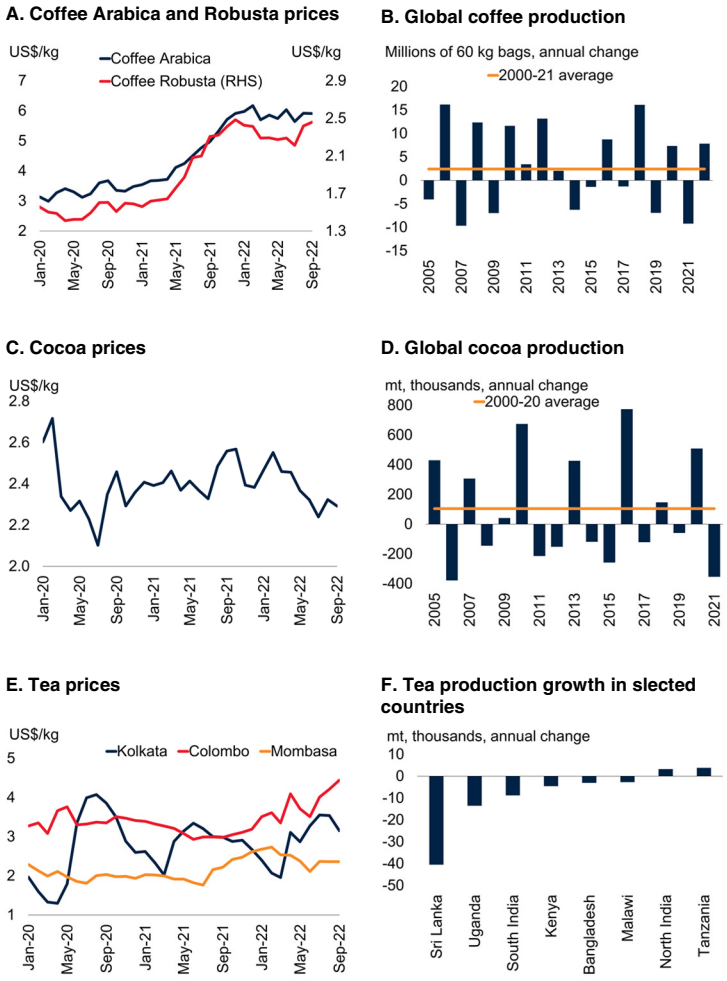
for last year's losses. However, the ongoing La Niña effect (the third in a row) presents a key risk to South America coffee production, as Brazil and Colombia account for a combined 45 percent of global coffee supplies and 55 percent of Arabica supplies. The coffee market could also face headwinds from lower consumption due to the worsening global economic outlook, with demand for 2022-23 expected to contract by 1 percent. Following strong gains in 2022, Arabica and Robusta prices are expected to decline 7 and 11 percent, respectively, as supplies are replenished. Intensification of La Niña and a more severe downturn of the global economy present key upside and downside price risks, respectively.

Cocoa prices continued to slide in 2022Q3, falling 4 percent (q/q), and are 7 percent lower than a year ago. Robust global supplies during the present and prior season, especially from Côte d'Ivoire, the world's largest supplier, have kept prices between $2.30 and $2.60/kg during the past two years. The 2022-23 season's global crop is also expected to be robust, estimated at more than 5 mmt, up from last season's 4.9 mmt. In view of adequate global supplies and a slowdown in demand, cocoa prices are expected to decline about 2 percent in 2023, following a projected drop of 3 percent this year. Barring adverse weather in West Africa (world's key cocoa supply region), price risks are tilted to the downside, reflecting headwinds to global growth.

Tea prices gained almost 9 percent in 2022Q3 (q/q), reflecting large increases at the Colombo and Kolkata auctions (12 and 11 percent, respectively); prices at Mombasa have been fairly stable. The *tea price index* stands 23 percent higher than in 2021Q3. The price strength reflects declining global tea supplies by major producers and exporters. Sri Lanka's tea output dropped nearly 20 percent in the first half of 2022 (or 35 mmt), reflecting unavailability and affordability of inputs (including an import ban of fertilizers), linked to the country's domestic economic and political challenges. Supplies declined in India (-6.2 percent) due to floods and sharp wage increases. Drought conditions affected production in several East African countries, including Kenya (-1.4 percent), Malawi (-7.2percent), and Uganda (-25.9 percent). Following a projected 15 percent increase in 2022, tea prices (three-auction average) are expected to decline almost 10 percent in 2023, as a reduction in consumption accelerates in several Eastern Europe and Central Asia countries.

FIGURE 12 Beverage commodity market developments

Both Arabica and Robusta prices have been broadly stable for most of the year, following last year's surge due to the weather-related short fall in Brazil. Cocoa prices weakened considerably in response to weak demand. Tea prices strengthened in response to declining global tea supplies by key suppliers including Sri Lanka (due to domestic economic and political challenges) as well as India, Kenya, Malawi, and Uganda (due to severe weather).



Sources: African Tea Brokers Limited; Bloomberg; International Cocoa Organization; International Tea Committee; Tea Board India; Tea Exporters Association Sri Lanka; U.S. Department of Agriculture; World Bank.

A.C.E. Monthly data, last observation is September 2022.

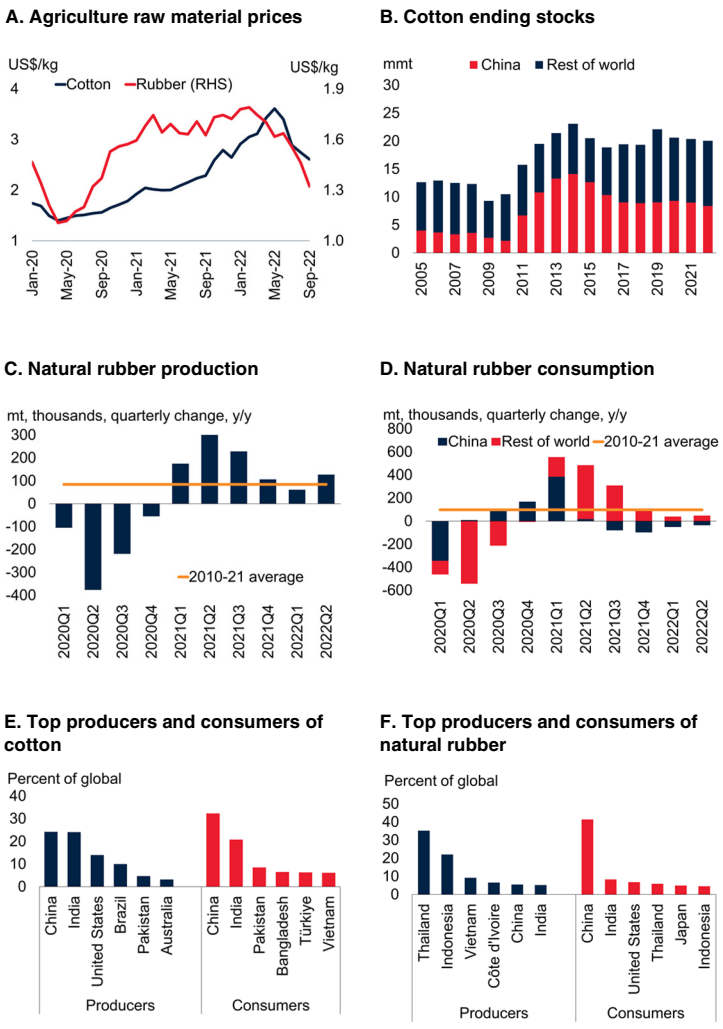
B. Years refer to crop season (for example, 2021 refers to 2021-21). Data updated as of October 12, 2022.

D. mt = metric ton. Data for 2021/2022 is ICCO forecast.

F. January to August monthly production, annual change. The period ends in June (Tanzania), July (Kenya, Uganda), and August (Bangladesh, Sri Lanka, India, Malawi).

FIGURE 13 Agricultural raw materials market developments

Cotton and natural rubber prices declined markedly during 2022Q2 and Q3 in response to robust supplies. Demand is facing headwinds due to deteriorating global growth prospects.



Sources: Bloomberg; International Cotton Advisory Committee; International Rubber Study Group; U.S. Department of Agriculture; World Bank.
Note: mmt = million metric tons; mt = metric tons.
A. Monthly data, last observation is September 2022.
B. Ending stocks, based on International Cotton Advisory Committee projection for 2022/2023. Years represent crop season (for example, 2020 refers to 2020-21 crop season).
C.D. Last observation is 2022Q2.
E.F. Global shares of top producers and consumers based on 2020/2021 data.

Raw materials

The World Bank's *raw material price index* fell nearly 11 percent in the third quarter (q/q), down 7 percent from last year. Both cotton and natural rubber, key components of the index, declined (figure 13). Robust supplies along with sluggish demand (especially for natural rubber) have been the key causes of the decline. The index is expected to increase 4 percent in 2023 (mostly in response to gains in natural rubber and timber), reversing a similar decline this year.

Cotton prices plunged 21 percent in 2022Q3 (q/q) but are still 23 percent higher than a year ago. The drop reflects a large decline in this crop season's global consumption to an estimated 25.3 mmt (considerably below the five-year average), down from last season's 26.1 mmt. Global output is expected to drop marginally this season in response to weather-related declines in India and Pakistan (due to floods) and from less plantings in the U.S. in favor of food crops. Cotton prices, which are projected to increase 32 percent this year, are expected to decline marginally next year. Similar to other raw materials, price risks are tilted to the downside, reflecting headwinds from slowing global growth.

Natural rubber prices dropped more than 21 percent in 2022Q3 (q/q) and were more than 12 percent lower than a year earlier. Prices fell below $1.50/kg in September, a 26-month low. The plunge reflects weak demand from slowing global activity, especially because of constraints in auto production. Robust rubber output and exports also played a role. During the first three quarters of 2022, global production increased more than 2 percent compared to the same period of 2021. The increase reflected favorable weather in some countries, including Thailand and Côte d'Ivoire where production surged 7.8 and 13.1 percent, respectively. The two countries account for more than 40 percent of global natural rubber supplies.

Natural rubber prices are projected to decline 13 percent in 2022, followed by a modest increase in 2023. Risks are tilted to the downside and depend on whether tire demand recovers, especially in

China. The country accounts for one-third of global tire manufacturing, and its sales were down 7 percent in the first half of 2022.

Fertilizers

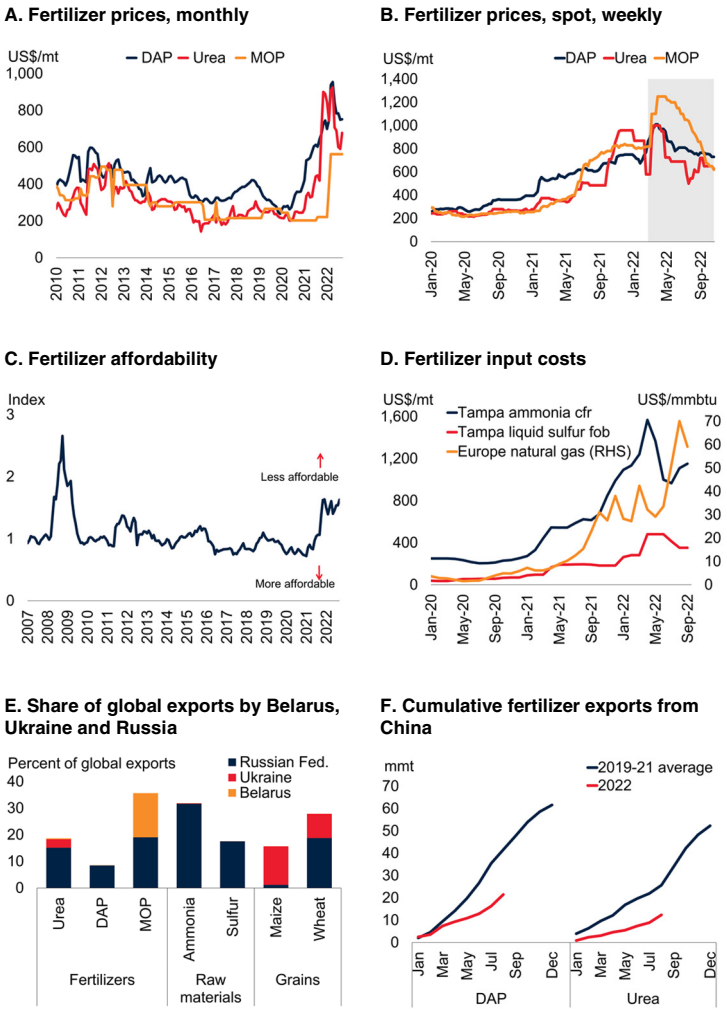
The World Bank's fertilizer price index fell nearly 8 percent in 2022Q3 (q/q), but remains at a historically elevated level, in part due to reduced supplies following Russia's invasion of Ukraine. The recent pullback in prices reflects weak demand as farmers cut back fertilizer field applications due to problems associated with affordability and availability. Following an expected 66 percent increase in 2022, the index is projected to fall by 12 percent in 2023 as supply disruptions gradually ease. Upside risks to the outlook include higher input costs, additional sanctions on Belarus and Russia, and extended export restrictions by China.

Nitrogen (urea) prices declined 20 percent in 2022Q3, after reaching an all-time nominal high in April (figure 14). Demand has softened considerably as buyers reassessed fertilizer affordability amid record-high natural gas prices in Europe. Steep increases in the cost of inputs (especially ammonia) and rising production costs have reduced European nitrogen production capacity by at least half. China has also extended export restrictions of urea fertilizers until the end of 2022 to ensure it has sufficient supply for domestic consumption, leading its urea exports to fall nearly 60 percent (y/y) during the first eight months of 2022.

However, significant new capacity outside Europe and Russia is expected to come online within the next two years, eventually restoring global supplies. Some fertilizer plants were brought into commission earlier this year but have yet to ramp up to full capacity. Facilities include Brunei Fertilizer Industries, with capacity of 1.4 million metric tons (mmt) per year (the largest in Southeast Asia), and Dangote Fertilizer in Nigeria, with capacity of 3 mmt per year (the second largest in the world). Six new plants in India (each 1.3 mmt) are expected to become operational between 2023-25. Following an expected 50 percent increase in 2022, urea prices are projected

FIGURE 14 Fertilizer market developments

Fertilizer prices fell in the third quarter of 2022, after some reached all-time or near-record highs in April. The price decline largely reflected demand rationalization as farmers either cut back or opted to forego fertilizer application amid historically elevated prices. However, fertilizer supply remains tight due to persistent supply disruptions and uncertainty arising from sanctions on Belarus and Russia, as well as Chinese export restrictions.



Sources: Bloomberg; Food and Agriculture Organization; General Administration of Customs of the People's Republic of China; International Fertilizer Association; U.S. Department of Agriculture; World Bank.

Note: cfr = cost and freight; DAP = diammonium phosphate; fob = free on board; MOP = muriate of potash; mmt = millions of metric tons; mt = metric ton.

A.C.D. Last observation is September 2022.

B. MOP is Brazil regular, Urea is Middle East Granular and MOP is U.S. Gulf NOLA prices. NOLA refers to New Orleans, Louisiana. Shaded area represents the period after Russia's invasion of Ukraine. Last observation is the week of October 3, 2022.

C. Ratio of World Bank's fertilizer price index to food price index. A higher ratio represents lower fertilizer affordability, and vice versa.

E. Data for 2020.

F. Cumulative exports, averaged over months for 2019, 2020, 2021 (blue line). Cumulative exports for 2022 (red line).

to fall 10 percent in 2023 and a further 8 percent in 2024 as new capacity comes online.

DAP (diammonium phosphate) prices fell by 11 percent in 2022Q3 after recording large gains earlier in the year. DAP prices have been supported by rising input costs—particularly ammonia—due to surging natural gas prices. Some countries have also experienced strong phosphate demand, including Brazil (due to record soybean acreage) and India (in response to very low inventories). The near-record high prices could begin to weigh on global demand since farmers are likely to reduce application of phosphate-based fertilizers, as they did in 2008. Ukraine, a key wheat supplier, experienced a substantial reduction in area planted. On the policy side, export restrictions by China, which accounts for 30 percent of global trade in DAP, has had a material effect on supply; China's DAP exports fell 55 percent (y/y) during the first eight months of this year. Following an expected 32 percent increase in 2022, DAP prices are projected to fall modestly in 2023 and 2024.

MOP (muriate of potash, or potassium chloride) contract benchmark prices remained unchanged in 2022Q3, following a large jump in contract prices between producers and Chinese and Indian buyers in February. Meanwhile, spot prices retreated from their April highs due to lackluster demand, notably in North America. However, the market remains tight due to reduced supply from Belarus and Russia, which together account for about two-fifths of global potash exports, as a result of sanctions related to the war in Ukraine. Belarusian fertilizer exports are blocked from global markets, as sea and rail transit through EU countries have been denied. The flow of exports from Russian ports has been limited as well due to logistical issues, even though the Russian fertilizer industry has not been subject to sanctions. Because MOP production is highly concentrated—Belarus, Canada, China, Israel, and Russia account for 85 percent of global production—supplies from smaller markets are not likely to make up for the shortfall, at least in the short term. Thus, potash prices are expected to remain at high levels in 2023 and 2024, following an estimated increase of 150 percent in 2022.

Metals and Minerals

The World Bank's metals and minerals price index fell 20 percent in 2022Q3 (q/q), and were 31 percent lower in September than their March peak. The decline primarily reflected deteriorating global economic activity and concerns about a possible global recession. Global industrial commodity demand continued to weaken following its post-pandemic surge, while in China, the world's largest metal consumer, demand remained weak amid COVID-19-related restrictions and property sector stress. Metal prices are expected to fall by 15 percent in 2023, following a marginal decline in 2022. Risks to the outlook are skewed to the downside and include a global recession as well as prolonged lockdowns and further deterioration in the real estate sector in China. Upside price risks include the possibility of further closures of energy-intensive smelting activity if energy prices increase more than anticipated. Aluminum and zinc are especially vulnerable to fluctuations in energy prices as they are the most energy intensive metals to process. China's recently announced infrastructure investment plan could also support prices. In the longer term, the energy transition could benefit several metals, especially aluminum, copper, and nickel, given their numerous applications in electric vehicles (EVs), batteries, and charging and grid infrastructure.

Iron ore prices dropped 23 percent in 2022Q3 (q/q) and were 35 percent lower in September than their March peak (figure 15). The decline reflects reduced steel production owing to the slowdown in global industrial and construction activity, as iron ore is a key input to steel production. Steel production in China has been constrained by lockdowns and a weak property sector. Outside China, slowing construction activity and higher energy costs have forced steel manufacturers to cut production as well. The iron ore market is oversupplied despite falls in exports from Russia and Ukraine, and lower exports from India due to an increase in export tariffs. Iron ore prices are expected to fall by 17 percent in 2023, following an estimated decline of 26 percent in 2022. Longer term supply and demand projections point to persistent downward pressures on iron ore prices. On the supply side, Australian and

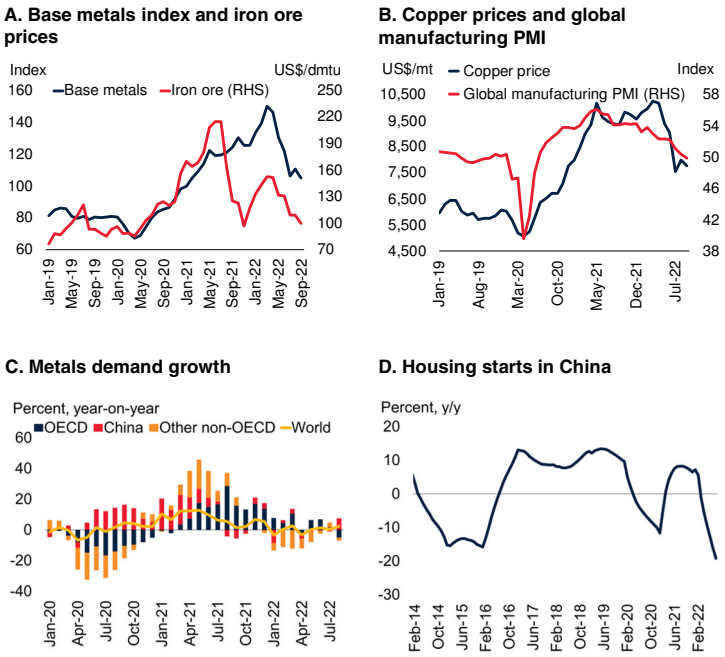
Brazilian mining companies (including BHP, Fortescue, Rio Tinto, and Vale) are expected to add capacity, new projects are expected elsewhere (for example, Guinea), and rising steel recycling could bring more supplies into the global market. On the demand side, China's decarbonization programs could limit steel output and iron ore consumption. This could be partly offset by increased demand due to the energy transition, as some renewable energy sources are steel-intensive (for example, wind turbines).

Aluminum prices declined 18 percent in 2022Q3 (q/q) and were one-third lower in September than their March peak. Aluminum demand has weakened markedly due to a slowdown in global manufacturing activity, including COVID-19-related restrictions and a weak property market in China, amid rising concerns about global recession, especially in Europe. On the supply side, production in Europe is falling due to higher energy prices as producers have announced cuts of about one fourth of overall capacity. Production remained robust in China, as cuts due to power shortages earlier in the year were offset by the restart of idled capacity and commissioning of new smelters. By the end of 2022, China is expected to have 42 mmt of aluminum capacity, near the government's target of 45 mmt. Sanctions on Russian aluminum exports have had less of an impact than originally expected. Following a projected increase of 9 percent in 2022, aluminum prices are expected to fall 11 percent in 2023. Risks to the outlook include lower production due to power rationing, especially in Europe. On the policy side, the U.S. announced its intention to impose further sanctions on Russian aluminum exports, which could lead to higher prices. In the longer term the energy transition could boost aluminum use, especially in EVs, solar, and long-distance transmission lines.

Copper prices declined 19 percent in 2022Q3 (q/q) and were one-quarter lower in September than their March peak. Demand for copper has been subjected to similar headwinds as other metals, including weak growth, especially in China. Since copper is particularly sensitive to global economic activity, concerns about the possibility of a global recession have weighed on prices (Special Focus).

FIGURE 15 Metals and minerals market developments

Metals prices drop on weak demand, and concerns about deteriorating industrial output. China demand has slowed due to COVID-19 lockdowns and a weak property sector.



Sources: Haver Analytics; National Bureau of Statistics China; World Bank; World Bureau of Metal Statistics.

A. Monthly data, last observation is September 2022.

B. PMI (purchasing managers' index) readings above (below) 50 indicate an expansion (contraction). Last observation is September 2022.

B. Year-on-year percent change in metals consumption since January 2020.

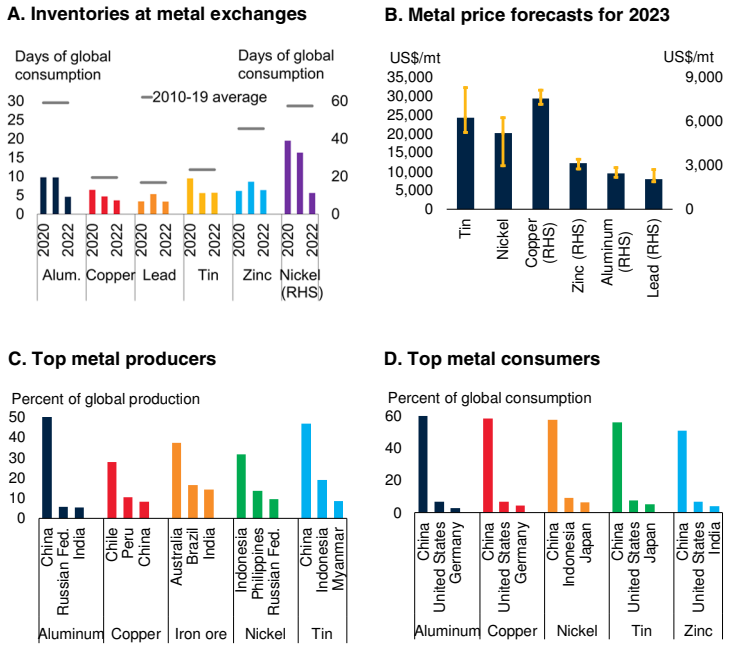
C. OECD = Organization for Economic Co-operation and Development. Year-on-year percent change in metal consumption since January 2020.

D. 12-month-rolling average of China housing starts, which refers to the entire floor space of real estate development during reference times. Last observation is August 2022.

Copper has seen some supply disruptions (for example, Chile and Peru), and reduced production due to power shortages in some of China's metal refining regions (including Hubei, Anhui, Zhejiang, and Jiangsu). However, there have been no smelter cuts in Europe to date, as copper smelting and refining has a power intensity of less than one-fifth that of aluminum and one-half that of zinc, the two most energy-intensive metals. Copper prices are expected to fall 16 percent in 2023, following an estimated decline of 7 percent in 2022. In the longer term, copper is set to benefit from the expanding manufacture of EVs (which use 2.5 to 4 times as much copper as gasoline powered vehicles), renewable power generation (more copper-intensive than conven-

FIGURE 16 Metals and minerals market—supply structure and price forecasts

Despite weak demand, inventories remain low by historical standards. Uncertainty for nickel and tin is relatively higher regarding 2023 prices. The price outlook depend on developments in China, which dominates consumption of most metals.



Sources: Bloomberg; World Bank; World Bureau of Metal Statistics.
A. Average of combined daily inventories at Commodity Exchange Inc., London Metal Exchange, and Shanghai Futures Exchange. Last observation is October 14, 2022.
B. The blue bars indicate 2023 forecasts. Yellow whiskers show results for the most optimistic to pessimistic models as presented in Arroyo Marioli et al. (2022).
C. Mine production data for 2020 except Aluminum which is refined aluminum production. Data for iron ore for 2019.
D. Refined consumption in 2020 for metals.

tional plants), as well as wiring for related grid and recharging infrastructure.

Lead prices fell 10 percent in 2022Q3 (q/q) and were 22 percent lower in September than their April peak. Lead demand is facing headwinds due to weakness in the auto industry. Lead is primarily used in batteries, of which two-thirds are for vehicles (and mostly for replacement batteries). Production has not been subject to the disruptions facing other metals as lead refining has low energy intensity, and neither Russia nor Ukraine are major producers. Lead prices are expected to fall 5 percent in 2022 and an additional 10 percent in 2023. Global lead demand is expected to rise in the medium term, due to steady new vehicle production, replacement battery use, and utilization of lead batteries in EVs for auxiliary functions.

Nickel prices fell 24 percent in 2022Q3 (q/q) and were one-third lower in September than their unprecedented March highs when a short squeeze halted LME trading for a week. Falling demand from the stainless-steel sector and strong production growth in Indonesia both contributed to the price fall. Stainless steel production, which accounts for more than two-thirds of refined nickel use, has slowed markedly from the surge in 2021 amid weak demand for consumer durables, high energy prices, and power shortages. Nickel use in batteries has slowed as well, especially in China. The supply of nickel, however, grew considerably, especially from Indonesia, which has been rapidly expanding production of nickel pig iron to produce nickel both for stainless steel and battery use. Following a projected increase of 35 percent in 2022, nickel prices are expected to decline 16 percent in 2023 (figure 16). A longer term risk is that nickel demand (and prices) could ease as non-nickel alternatives for batteries are developed, such as lithium-iron-phosphate (LPF), which have been increasingly dominating the EV market in China. Other battery makers are also exploring LFP or other technologies, such as sodium-ion.

Tin prices plunged 35 percent in 2022Q3 (q/q) and were 52 percent lower in September than their March peak. The bearish sentiment reflects weak demand from the consumer electronics sector. Production has also risen considerably, especially in the first half of the year following increased exports from Indonesia's small-scale producers. In response to concerns about the tin export boom and its negative effect on prices, Indonesian authorities are undertaking a number of measures to constrain exports, including revoking 300 tin mining permits, considering a tin export ban to encourage domestic value-added in processing, and planning to increase export royalties. After a modest decline this year, tin prices are expected to tumble 29 percent in 2023. In the longer term, tin demand stands to benefit from the energy transition and green technologies, particularly in solar panels and EVs.

Zinc prices declined 16 percent in 2022Q3 (q/q) and were nearly 30 percent lower than their April peak. Weak demand more than offset production cuts. The slowdown in construction (50 percent of zinc demand) may see global demand contract this year. High energy prices and coke shortages resulted in production curtailments in several smelters in Europe, while power rationing in China also reduced output. Global demand is expected to grow moderately next year on China's recent infrastructure investment plan. Mine supply is set to grow in the next few years with increases expected from Australia, China, and Peru, thus keeping the market well supplied. Zinc prices are expected to rise by 17 percent in 2022 and fall by 20 percent in 2023. Although zinc is less exposed to the energy transition, it may benefit from galvanized structures for offshore wind and large-scale solar.

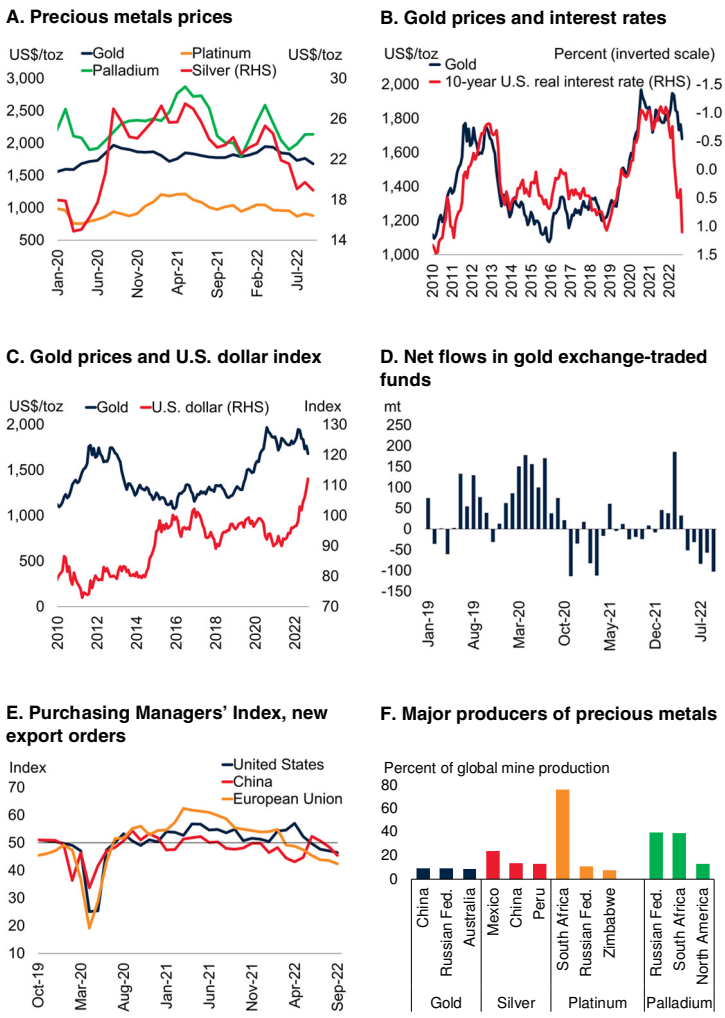
Precious metals

The World Bank's precious metals index fell 9 percent in the third quarter of 2022 (q/q), driven by weak investment and physical demand owing to the strength of the U.S. dollar and higher interest rate yields. These factors have outweighed the positive impact of safe-haven demand related to the war in Ukraine and rising inflation. Silver prices declined sharply (by 15 percent) due to the slump in industrial demand, while gold and platinum prices both fell 8 percent. Following an expected decrease of 4 percent in 2022, the index is projected to fall by 4 percent in 2023 on expectations of historically high interest rates and concerns about the possibility of a global recession that would weigh on industrial activity.

Gold prices fell 8 percent in 2022Q3 (q/q), as the increase in interest rates and appreciation of the U.S. dollar outweighed concerns about rising inflation and geopolitical risks (figure 17). The U.S. Federal Reserve has raised policy rates five times this year by a combined 3 percentage points, which has led to the U.S. dollar index increasing 16 percent to a 20-year high. Meanwhile, the yield on 10-year Treasury Inflation-Protected Securities (TIPS) reached its highest level since February 2011, raising the opportunity cost of investing in zero-yield assets. As a result, holdings in exchange-traded funds of gold have fallen for five con-

FIGURE 17 Precious metals market developments

Precious metal prices declined in 2022Q3, reflecting a rapidly appreciating U.S. dollar and the draw of higher interest rate yields for some other assets. These considerations more than offset concerns about rising inflation and uncertainty from the war in Ukraine. Gold prices were weighed down by exchange-traded fund outflows and weak jewelry demand, despite continued central bank purchases. Silver and platinum prices slumped on waning industrial demand, while concerns around Russian and South African supply supported platinum and palladium prices.



Sources: Bloomberg; Federal Reserve Bank of St. Louis; Haver Analytics; Intercontinental Exchange; International Monetary Fund; Johnson Matthey PLC; Silver Institute; World Bank; World Gold Council; World Platinum Investment Council.

A.-E. Last observation is September 2022.

B. Interest rate is the 10-year U.S. Treasury inflation-indexed security with constant maturity (not seasonally adjusted); inverted scale.

C. U.S. dollar index is a measure of the value of the United States dollar relative to a basket of foreign currencies. A higher index represents an appreciation of the dollar.

D. Monthly changes in gold-backed exchange-traded funds (ETFs).

E. PMI = purchasing managers' index. Index above (below) 50 indicates expansion (contraction).

F. Production in 2021.

secutive months. Physical demand for gold picked up slightly but remains weak by historical standards. Jewelry demand from China revived slightly in recent months following an easing of pandemic-related restrictions, while imports in India increased ahead of an import duty hike from 7.5 percent to 12.5 percent. Central banks have also continued to accumulate gold. However, physical purchases are unlikely to be sufficient to offset the monetary headwinds facing investment demand. As interest rate hikes are likely to continue well into next year, gold prices are projected to fall by 4 percent in 2023.

Silver prices plunged 15 percent in 2022Q3 (q/q), driven by sluggish industrial demand as well as the same monetary policy and broader macroeconomic factors that affect gold. More than half of silver's global demand comes from industrial applications. Although photovoltaic demand continues to grow, consumer electronics demand has weakened considerably, with global electronics production falling for the fifth consecutive month in September. New export orders of manufactured goods have also fallen markedly in both advanced economies and emerging market and developing economies. Lackluster physical and investment demand are expected to keep silver prices under downward pressure. Silver prices are expected to be lower by 16 percent in 2022 and remain soft in 2023. In the longer term, silver stands to benefit from the energy transition, particularly for its use in solar photovoltaic cells.

Platinum prices fell nearly 8 percent in 2022Q3 (q/q), weighed down by the same monetary and macroeconomic factors affecting other metals, notably high interest rates and weak industrial and jewelry demand amid a global economic slowdown. Automotive demand—where platinum is used in catalytic converters—is recovering, but it is still below pre-pandemic levels. There is risk of component shortages supplied by Russia and Ukraine. Platinum demand may also be supported by substitution away from palladium, where Russian supply is at risk (Russia accounts for 40 percent of global palladium supply). On the supply side, prices have been supported by production disruptions in South Africa due to electricity outages and project delays, as well as outages in North America from flooding. Looking ahead, platinum prices are projected to be firm in 2023 due to limited mine supply. Platinum faces headwinds from the energy transition, with increasing penetration of EVs (which do not require catalytic converters). In the longer term, platinum could benefit from a hydrogen economy and its use in fuel cells.

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A sharp global growth slowdown and concerns about an impending global recession are weighing on commodity prices. Some energy prices remain elevated, however, amid geopolitical tensions and persistent supply disruptions. Brent crude oil prices are forecast to average $92/bbl in 2023 and ease to $80/bbl in 2024. Agricultural and metal prices are projected to decline 5 and 15 percent, respectively, in 2023 before stabilizing in 2024. The outlook is subject to multiple risks in a highly uncertain environment. They include worsening global growth prospects, including the pace of recovery in China; macroeconomic uncertainties; a prolonged and deeper conflict in Ukraine; and, in the case of food commodities, the ongoing La Niña weather pattern along with trade policies.

A Special Focus section investigates the drivers of aluminum and copper prices. It finds that the price rebound after the pandemic was mainly driven by the economic recovery, but supply factors also contributed about one-quarter to the rebound. Since March 2022, a steep global growth slowdown, an unwinding of supply constraints, and concerns about an imminent global recession contributed to the plunge in metal prices. It concludes that for metal exporters, the energy transition may bring windfalls, but it could also increase their exposure to price volatility.

The World Bank's *Commodity Markets Outlook* is published twice a year, in April and October. The report provides detailed market analysis for major commodity groups, including energy, metals, agriculture, precious metals, and fertilizers. Price forecasts for 46 commodities are also presented together with historical price data. Commodity price data updates are published separately at the beginning of each month.

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