SPECIAL FOCUS

The Impact of the War in Ukraine on Commodity Markets

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The Russian invasion of Ukraine has been a major shock to commodity markets. The war has led to significant disruptions to the production and trade of commodities for which Russia and Ukraine are key exporters. Prices have risen sharply for all energy commodities and some food commodities, including wheat and oilseeds. This, in turn, has raised energy and food security concerns, especially for the poorest households. In response to price hikes, policymakers have often sought to provide relief to consumers via subsidies or lower taxes; however, these are generally ineffective remedies and may exacerbate supply shortages. Policymakers can better mitigate the impact of higher prices on low-income households through targeted measures, including cash transfers. Past commodity price shocks induced policy and market responses that led to increased sources of supply and, for oil price shocks, greater consumption efficiency and substitution away from oil. Over time, the recent spike in prices will likely once again spur more efficient energy consumption and a faster transition away from fossil fuels, particularly if supported by appropriate policy responses. Food production, at the global level, will also respond to changes in relative prices. However, the uncertainties for food supply availability stemming from the war are high, and low-income countries may have urgent needs for international assistance for a prolonged period.

Introduction

The Russian invasion of Ukraine has caused major disruptions to the supply of commodities. Both countries are key exporters of energy and agricultural products. The disruptions have exacerbated existing stresses in commodity markets following the recovery from the COVID-19 pandemic, which saw rebounding global demand and constrained supplies after 2020. As a result, commodity price volatility has surged, with food prices reaching levels not seen since the 2007-08 price spikes. Beyond their broader impact on inflation, supply disruptions of key commodities could severely affect a wide range of industries, including food, construction, petrochemicals, and transport. Concerns about energy and food security have already prompted ad hoc policy responses to bolster national self-sufficiency and reduce energy prices for consumers; however, these policies often fall short of effectively solving the underlying problems.

Against this background, this Special Focus addresses the following questions:

- What has been the near-term impact of the war on commodity markets?
- What are the main lessons of past commodity price shocks?
- What are the key policy implications?

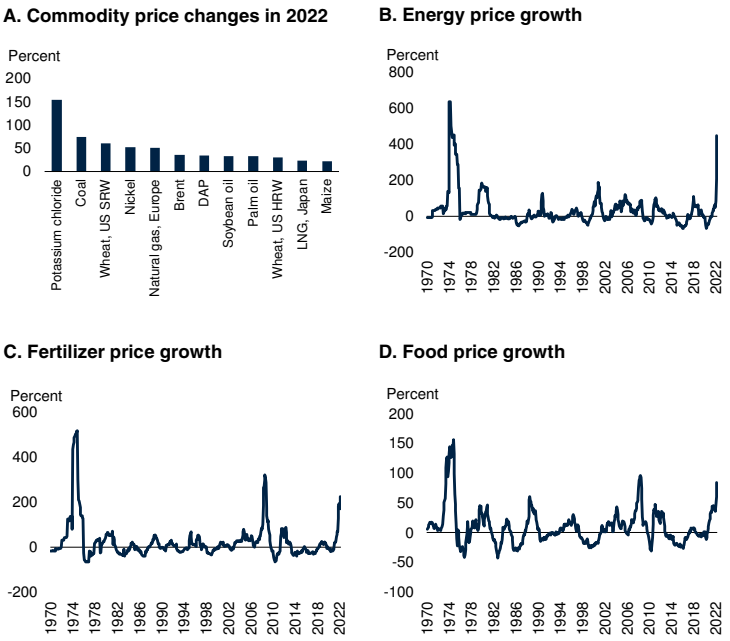
Near-term impact of the war on commodity markets

Commodity prices surged in the immediate aftermath of the war in Ukraine, particularly for commodities for which Russia and Ukraine are key exporters (figure SF.1). Commodity prices have been extremely volatile, with volatility for some commodities (e.g., coal, nickel, and wheat) reaching record highs in February and March 2022. The recent rise in prices reflects supply disruptions, higher input costs, and geopolitical risk premia. It comes on top of already tight commodity markets driven by a strong demand recovery from the pandemic, and numerous pandemic-related supply constraints. Reflecting these developments, between January 2020 and December 2021, the World Bank's energy and non-energy price indexes increased by 50 and 40 percent, respectively, while between January and March 2022 the two indexes rose an additional 34 and 13 percent.

Together, the total changes in nominal prices during the 23-month period (April 2020-March 2022) resulted in the largest increase in energy prices since the 1973 oil price spike. The recent price spike for food and fertilizers was the third-largest (after 1974 and 2008). Some commodities reached all-time highs in nominal terms (e.g., coal, European natural gas, and nickel), although only

FIGURE SF.1 Commodity price developments

Commodity prices (in nominal terms) rose sharply following the start of the war in Ukraine, particularly for commodities for which Russia and Ukraine are key exporters. Price increases from April 2020-March 2022 were the largest for any equivalent 23-month period since 1973 for energy, and since 2008 for fertilizers and food.



Sources: Bloomberg; World Bank.
A. Three-month change in commodity prices through end March 2022.
B.-D. Charts show the percent change in monthly price indexes over a 23-month period. This facilitates a comparison of the April 2020 with the most recent data (March 2022). Prior to 1979 the energy price percent change is proxied by the oil price due to data limitations.

European natural gas prices are at a record high when adjusted for inflation (figure SF.2).

The heightened volatility in commodity prices after February 2022 reflects concerns about the current and potential impact of the war on the production and trade of commodities, especially those for which Russia and Ukraine play a key role (figure SF.3). Russia is the world's largest exporter of wheat, pig iron, enriched uranium, natural gas, palladium, and nickel. It accounts for a significant share of coal, platinum, crude oil, and refined aluminum exports. Russia and Belarus are important suppliers of fertilizers, including nitrogen and potash.[1] Ukraine is a key exporter of wheat, pig iron, maize, and barley and is the world's largest exporter of sunflower seed oil.[2] Ukraine is also the largest exporter of neon gas, which is a critical input used to manufacture electronic chips.

Many countries rely on commodities from Russia and Ukraine. Europe imports a substantial share of its energy from Russia, including natural gas (35 percent), crude oil (20 percent), and coal (40 percent). In turn, Russia is similarly dependent on the European Union (EU) for its exports, with around 40 percent of its crude oil and natural gas being exported to the EU. With respect to food supplies, advanced economies (e.g., Australia, Canada, EU, the United States) are not reliant on Russia and Ukraine, being themselves major suppliers of grains and oilseeds. Large emerging market economies are also major agricultural commodity producers (e.g., Argentina, Brazil, China, India). However, many smaller emerging market and developing economies (EMDEs) depend heavily on supplies from Russia and Ukraine. More than half of wheat imports in numerous countries in Africa, developing Europe, and the Middle East, come from Russia and Ukraine.

Channels of disruption

The potential impact of the war in Ukraine on commodity markets comes through two main channels: the *physical impact* of blockades and the destruction of productive capacity, and the *impact on trade and production* following sanctions.

Physical impact. The war has significantly disrupted the transport of commodities. Almost all of Ukraine's grain exports flowed through Black Sea ports that are no longer operational (as of April 2022). Ukraine was expected to export as much as 20 million tons of wheat during the current season (ending in July 2022), corresponding to about 10 percent of global wheat exports. While some wheat may be transported through road and railway corridors to Hungary, Poland, Romania, and Slovakia, the capacity of

[1] The EU has imposed sanctions on imports of fertilizer from Belarus.

[2] Although Ukraine accounts for 46 percent of global sunflower seed oil exports, when all edible oils are considered (most of which are highly substitutable), its share is a little more than 6 percent (the shares are based on 2020-21 and 2021-22 season averages).

these facilities is limited, especially in view of the damage to infrastructure, and safety concerns. Elevated insurance rates reflecting the risks posed by the war have also increased the cost of shipping outside of blockades.

The war is also likely to disrupt agricultural production in Ukraine in the upcoming season. Spring planting for crops such as maize, barley, and sunflowers typically occurs from April to May, while winter wheat is planted from September to mid-November. Shortages of labor and inputs (such as fuel and fertilizers), destruction of farming equipment, and safety concerns of growers will have a severe impact on Ukraine's 2022-23 agricultural (and especially wheat) production. Estimates on how much Ukraine's agricultural production will decline in the upcoming season vary from 25 to 50 percent (FEWS NET 2022).

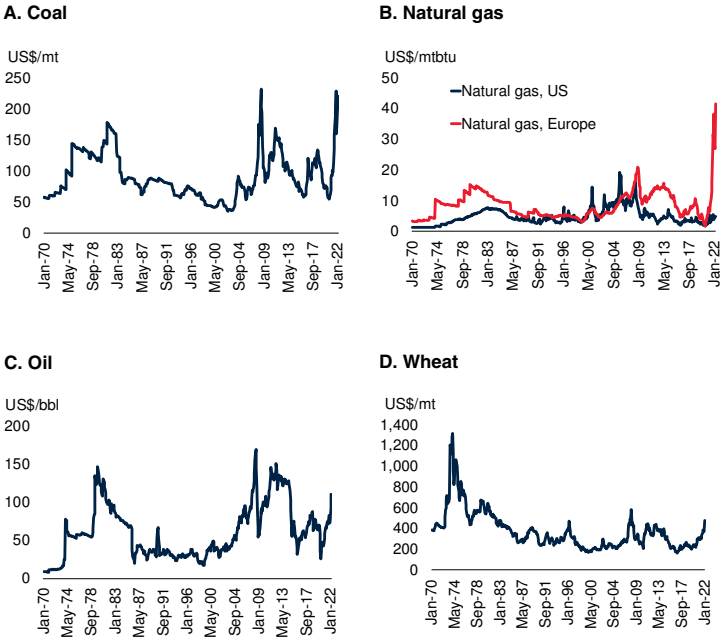
Impact on Trade. In response to the invasion of Ukraine, a wide range of sanctions have been imposed on Russia. While initial rounds of sanctions did not include energy, some countries subsequently banned or announced a phasing out of imports of Russian energy products. The European Union has announced a ban on imports of coal from Russia (starting in August 2022) and a two-thirds reduction of Russian gas imports by the end of 2022. The EU is also considering extending these measures to oil with an eventual phasing out of Russian fossil fuel imports by 2027.[3] The United States has banned imports of Russian oil, gas, and coal, though these only make up a small fraction of Russian energy exports. The United Kingdom has announced plans to phase out Russian oil imports by the end of 2022. Several large oil companies announced they would cease operations in Russia, while many traders chose to boycott Russian oil, in part reflecting difficulties and risks in making transactions or obtaining insurance on cargoes. As a result, the price of Urals (the Russian oil price benchmark) fell to more than $30/bbl below Brent oil prices in following the start of the invasion.

Russian exports of commodities by sea may also be facing disruptions as numerous shipping lines have announced they will suspend Russian bookings, and this has been exacerbated by difficulties in obtaining insurance. The reciprocal ban on Russian and European air space has disrupted trade through air cargo, pushing up transport costs as re-routing results in longer journeys, thus increasing the cost of transport for some commodities which are normally transported by air, such as palladium.

Russian production of commodities could also be affected, as the country will be less able to import machinery and equipment, including repair and

FIGURE SF.2 Real commodity prices

Coal, natural gas, and wheat prices have all reached historic highs in nominal terms. However, in real terms, only the European natural gas price has reached an all-time high, and it is substantially above its previous peak in 2008. Coal prices are close to their 2008 peak, while oil prices remain some way below. In the case of wheat, prices are far lower today compared to their peak in the 1970s, but close to their 2008 level.

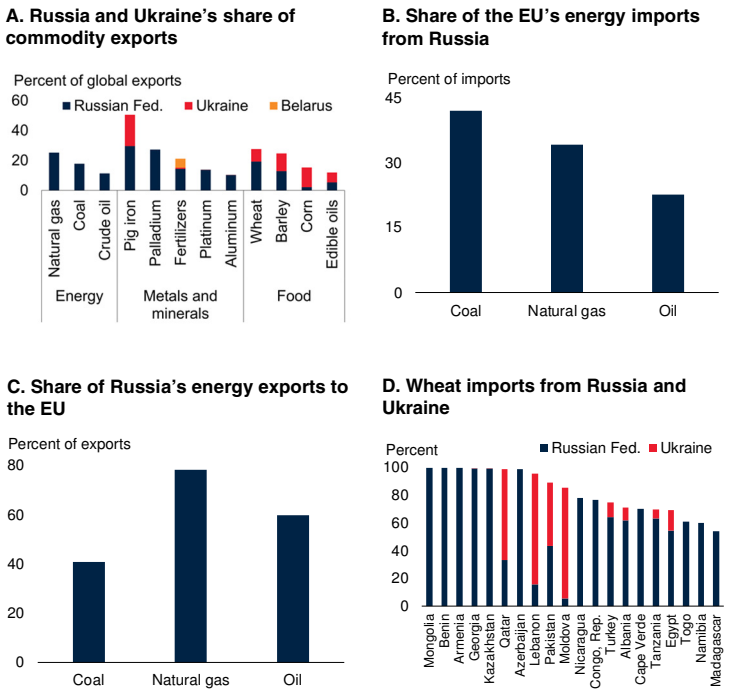


Sources: Haver Analytics; World Bank.
A.-D. Monthly data from 1970 to March 2022. Prices deflated by January 2022 Consumer Price Index (CPI). Oil refers to the Dubai benchmark. Wheat refers to the US HRW benchmark.

[3] The European Commission released a communique discussing policy options to mitigate the price impact on households and businesses, proposing the creation of a Task Force on common gas purchases to consolidate EU bargaining power, and advocating for a jointly coordinated European gas storage policy (European Commission 2022). The International Energy Agency has also released policy suggestions to reduce demand for oil, as well as for the EU to reduce its dependency on Russian natural gas (IEA 2022b, c).

FIGURE SF.3 Commodity dependence

Russia and Ukraine are major exporters of energy, metals, fertilizers, and agriculture. The European Union imports a large proportion of its energy from Russia, and, in turn, the majority of Russia's energy exports go to the European Union. Russia and Ukraine account for more than half of wheat imports in many EMDEs, especially in ECA, MNA, and SSA.



Sources: BP Statistical Review; Eurostat; UN Comtrade; U.S. Department of Agriculture; World Bank.
Note: MNA = Middle East and North Africa; SAR = South Asia; SSA = Sub-Saharan Africa.
A. Data for 2020. Data for energy and food are in trade volumes, and data for metals and minerals are in trade values. Fertilizers include phosphate rock and potash minerals, and ammonia-based non-minerals.
D. Data is for 2020.

maintenance parts and other inputs. In the case of agriculture, this includes farm machinery, chemicals, and seeds. In the case of energy, sanctions, and the exit of oil companies from Russia are likely to reduce oil and gas production. The inability to import parts for wells or pipelines may reduce supplies in the short term, while tighter financial conditions, reduced investment, and restricted access to technology are likely to have a longer-term impact. For metals, Australia's decision to ban exports of alumina to Russia will inhibit Russia's aluminum production (alumina is an input into the production of aluminum).

Trade in commodities is also being affected by Russian countermeasures, which at the moment do not include critical energy commodities. Trade restrictions, including tighter licensing quotas on grains introduced prior to the war and export bans announced in March, have been extended to the Eurasian Economic Union.[4] Russia has recommended that fertilizer manufacturers halt exports. In addition, it has requested to be paid in rubles for its energy exports, which will cause complications as existing contracts are in different currencies.

Impact of disruptions

The impact of these disruptions on global commodity markets depends on the magnitude of the disruption, the possibilities for sanctioned exports to be diverted via other countries, the availability of inventories that can be drawn upon, the potential for increased production elsewhere, and the extent to which demand can be reduced. These factors differ in importance between commodities.

Crude oil

Prior to the war in Ukraine, Russia exported about 5 mb/d of crude oil and 3 mb/d of refined petroleum. The International Energy Agency estimates that current sanctions could reduce Russia's exports of oil by 2.5 mb/d from May onward, equivalent to about 3 percent of global supply (IEA 2022a). If the European Union reduced or banned oil imports from Russia, the disruption to Russian exports could be much larger—currently the EU imports 3.4 mb/d from Russia. This would require more diversion of trade or new, incremental sources of oil (figure SF.4).

- **Diversion of trade.** The sharp discount on Russian oil has already spurred the diversion of its exports to other countries. For example, India has increased its imports of Russian oil. In the event of deeper sanctions, additional diversion to other countries is likely. However, the actual magnitude of this channel will depend on the willingness of

[4] High global food prices, and fears of shortages, are leading to restrictions on food exports in some countries. These include export bans on some food commodities in Algeria, Egypt, Hungary, Turkey, and Serbia, as well as export taxes by Argentina and Indonesia.

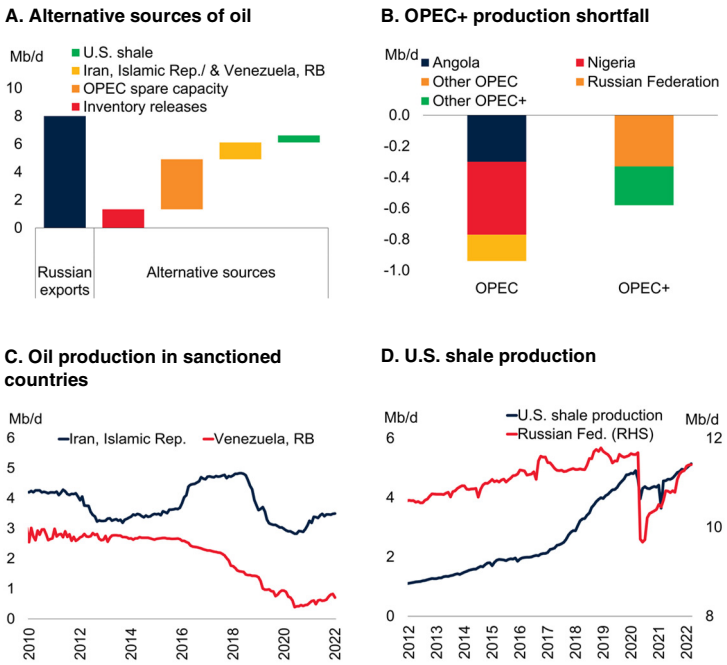
other consumers to purchase Russian oil, as well as on infrastructure constraints. For example, 9 percent of Russia's oil in 2020 was exported by pipeline to Europe, and this would be difficult to redirect elsewhere. Finding alternative sources of oil would, however, be a challenge for the European Union since its refineries are designed to process Russian oil.

- **Inventory drawdown.** Oil inventory releases from strategic national reserves is the fastest tool to respond to shortfalls in supply. Coordinated inventory releases have been used by IEA members in response to previous shocks (Kilian and Zhou 2021; World Bank 2019). On March 31, 2022, the United States announced the release of 180 million barrels from its Strategic Petroleum Reserve from April-October 2022 with other IEA members agreeing to release 60 million barrels. This represents a release of about 1.3 mb/d of oil over six months—more than 1 percent of global daily consumption. Overall, the IEA countries hold just over 4 billion barrels of oil in inventories, equivalent to 90 days of their oil consumption— 1.5 billion held in strategic government reserves and 2.5 billion held by industry. However, inventory releases are a temporary solution as they don't tackle longer-term supply and demand imbalances. Furthermore, strategic reserves most likely would be refilled in the future.

- **Potential for increased production.** Spare production capacity is considered an alternative source of oil, although it typically takes several months to become available. The majority of spare capacity is held by OPEC countries, notably Saudi Arabia (2 mb/d), the United Arab Emirates (1.1 mb/d), and Iraq (0.6 mb/d). So far OPEC+ countries have been reluctant to raise production faster than they have previously announced, and the group as a whole is producing well below their agreed target, perhaps suggesting that spare capacity among the group may be lower than estimated. Other potential sources of oil are the Islamic Republic of Iran and República Bolivariana de Venezuela, which are both currently under U.S. sanctions. A new nuclear deal with the former could potentially bring about 1 mb/d of additional oil into the global market within six months (IEA 2022a). However, in the case of the latter, the chronic deterioration of its oil industry suggests that a meaningful increase in oil production and would require significant new investment. Increasing U.S. shale output beyond the expected 1.4 mb/d growth for 2022 would be difficult (EIA 2022). The industry is facing significant capacity constraints due to a lack of skilled labor as well as shortages of physical inputs such as sand (Dallas Fed 2022). Additional production increases among other

FIGURE SF.4 Alternative sources of additional oil supply

As Russian oil supply is increasingly disrupted, alternative sources will be needed. These include inventory releases and spare capacity in other producers, including OPEC, sanctioned countries such as the Islamic Republic of Iran and República Bolivariana de Venezuela, and non-OPEC countries, notably the United States. However, additional supply from OPEC and the United States may be limited by capacity constraints



Sources: International Energy Agency (IEA); U.S. Energy Information Administration; World Bank.
A. Figure shows Russian exports of oil and oil products prior to the war in Ukraine and alternative sources of supply. Inventory releases refer to the current announced release of oil by IEA members including the United States. Estimates for production are author calculations based on the IEA's "Oil Market Report—April 2022." OPEC spare capacity refers to Iraq, Saudi Arabia, and UAE only.
B. Change in crude oil production compared to target set by OPEC countries for March 2022 based on IEA Oil Market Report April 2022. Other OPEC + includes Bahrain, Brunei Darussalam, Malaysia, South Sudan and Sudan.
D. U.S. shale production refers to Permian Basin production.

producers, such as Brazil or Canada, will take significant investment and time.

- **Demand reduction.** Higher prices will likely induce households and firms to adjust their consumption behavior. In the short run, however, demand for oil and petroleum products such as gasoline and diesel are very price inelastic (Dahl 2012).[5] This implies that demand is unlikely to fall significantly without a much larger increase in prices. While the IEA released guidelines for policy measures to reduce demand, most government policies so far have taken the form of tax cuts and fuel subsidies, especially for gasoline (IEA 2022c). Such measures actually increase demand and put further upward pressure on the prices of crude oil and other petroleum products.

Natural gas

The majority of Russia's exports of natural gas go to the European Union, and so far these have not been disrupted as much as crude oil (although Russian flows to Europe had been much lower than normal in the months preceding the war). However, the EU has announced plans to sharply reduce its reliance on Russian natural gas by two-thirds by the end of 2022. In its place, the EU will increase its imports of LNG from other countries and expand its own LNG processing capacity. It is also stepping up the use of renewable energy, increasing the generation of biomethane, and seeking to lower demand for natural gas through efficiency measures as well as changes in consumer behavior, namely lowering heating temperatures (EC 2022).

Demand for natural gas in Europe had already been affected by higher prices, with energy-intensive activities, such as fertilizer plants and aluminum and zinc refineries, curtailing production in response to higher prices.

In the event of a disruption of imports of natural gas from Russia, Europe would rely on inventory drawdowns and further increase its imports from other countries, or drastically reduce its consumption. Inventories of natural gas in Europe have risen from their recent lows, but their level in April 2020 of 32 billion cubic meters (bcm) was around one-third of their maximum theoretical storage capacity of about 100 bcm. For comparison, total natural gas consumption in the EU in 2021 was close to 400 bcm, while imports from Russia were 155 bcm. While low-season summer demand may not experience a shortfall, peak-winter demand could pose a problem. Rationing may be necessary, with Germany announcing that it may have to ration natural gas consumption if imports from Russia are shut off.

The potential for redirection of Russia's natural gas exports is much more limited than for crude oil. Seventy percent of Russia's natural gas is exported by pipeline to Europe, and Russia's capacity to increase exports elsewhere is severely limited. For Russia to increase its exports of natural gas in the form of LNG would require major investment in new processing facilities.

There is also minimal spare global production capacity in natural gas at present. Some producers have announced plans to increase production and export capacity, including Algeria and the United States, but this will take time to come onstream. As a result, increased imports of LNG by the EU would likely come at the expense of other countries. This could drive up the cost of energy globally. It may also force other countries, especially EMDEs, to turn to more polluting forms of energy, especially coal.

Coal

While Russia's exports of coal also appear to have been less affected by disruptions than crude oil, import bans by the EU and Japan are being phased in. In 2020, about one-third of Russia's coal exports went to Europe (including non-EU

[5] In an analysis of 240 studies on gasoline price elasticities, Dahl (2012) found gasoline price elasticities ranged from −0.11 to −0.33. For some countries, elasticities are estimated to be much lower. For example, in the United States, the price elasticity of gasoline is estimated to be in the range of −0.02 to −0.04 in the short term, meaning it takes a 25 to 50 percent increase in the price of gasoline to lower automobile travel by 1 percent (EIA 2014). Elasticities have also been found to have declined over time, likely reflecting the falling share of fuel in consumer expenditure.

countries) and 10 percent to Japan. In the short term, the import bans will likely lead to significant disruption in coal markets and may raise prices for all importing countries. In the medium term, there will be diversion of trade of coal as the EU and Japan seek alternative supplies from Australia, Colombia, Indonesia, South Africa, and the United States.[6] As a result, other coal importers such as China and India could reduce their imports from these countries and import more from Russia. This change in trade patterns would be costly since it would greatly increase transport distances, and coal is bulky and expensive to transport. In addition, the magnitude of the changes in trade flows may be limited by logistical issues such as capacity constraints for land and sea transport.

Fertilizers

The global fertilizer market was already under severe stress before the war. Because nitrogen-based fertilizers are produced from natural gas (or coal in the case of China), high prices of these commodities had already pushed some fertilizer prices to their highest level since 2010. The European Union imposed sanctions on Belarus in June 2021, followed by Canada, the United Kingdom, and the United States in August 2021 (World Bank 2021). Additional trade restrictions could further disrupt global fertilizer supplies, as Russia (and Belarus) are important exporters of potassium and nitrogen-based fertilizers. For example, in early March, Russia's Industry Ministry announced that it would temporarily suspend fertilizer exports. The announcement followed an earlier ban on ammonium nitrate (effective from February 2 until April 1), in order to guarantee supplies to domestic farmers. China has also suspended urea and phosphate exports until June 2022 in order to ensure adequate supplies for domestic food production. Shortages in fertilizers could lead to a reduction in their use, particularly in EMDEs, further reducing agricultural yields and production.

[6] This type of diversion of commodities is common in response to sanctions or tariffs (World Bank 2019).

Wheat

Russia and Ukraine have in recent years accounted for about one-quarter of global exports of wheat.[7] Exports from Ukraine have been halted due to closures of all Ukrainian ports on the Black Sea, which account for about 90 percent of Ukraine's wheat exports. This disruption was due to blockades and as such there is less scope for diversion. Limited quantities of wheat exports have started taking place since early March through rail and road corridors. While precise estimates of such exports are not available, perhaps as much as half of Ukraine's exportable wheat (estimated at 20 million tons, or 10 percent of global exports) could eventually be exported overland, although at a greater cost than shipping. Exports of wheat from Russia have, so far, not been affected.

Disruptions to wheat exports from Ukraine have already affected several importing countries, especially in the Middle East and North Africa, including Egypt and Lebanon. As a result, several countries have introduced (or announced) trade policy measures that either reduce or ban wheat exports. By the end of March, 53 new policy interventions affecting the trade of food commodities had been imposed. However, the trade restrictions imposed so far are not nearly as extensive as they were during the 2007-08 and 2011-12 commodity price spikes.

On current projections, global supplies of wheat for 2022 are adequate by historical standards.[8] A difficulty is that wheat inventories are heavily concentrated in China and India, which have not been important exporters. In response to the increase in wheat prices, India announced it would release wheat from its stockpiles. In terms of

[7] Despite their large share of global exports, the two countries produce only seven percent of total global production, since many countries produce wheat primarily for domestic consumption.

[8] According to the United States Department of Agriculture's latest update, released on April 9, the end of season global stocks-to-use ratio (a measure of expected supply availability relative to consumption) for the 2001-22 season stood to 35.3 percent. While lower than 40 percent in 2019-20, it much higher than the historical low of 20.9 percent in 2007-08 and above the 60-year average of 30.5 percent.

production, while planting will be reduced in Ukraine, early reports show that other wheat producers, including Argentina, Australia, Brazil (a net wheat importer, mainly from Argentina), and the United States, will increase the area allocated to wheat production, helping to partly offset the lower production in Ukraine (Colussi, Schnitkey, and Cabrini 2022).[9] Furthermore, output in Canada is likely to rebound strongly following droughts of 2021. Major caveats on the downside for global wheat harvests (and food more broadly) stem from high input prices, especially fertilizers.

Metals

Disruptions to metal markets have been less severe than in other markets, although Russia's production and exports of aluminum and nickel have been partially disrupted by sanctions, and potential further curtailments have impacted prices. The war has reduced imports of alumina, a key input into the production of aluminum. In February, Russia's state-owned Rusal had already suspended production at its alumina refinery in Ukraine, while in March, Australia imposed a ban on alumina exports to Russia. These losses amounted to two-thirds of Russia's alumina imports. The nickel market has been affected by production disruptions following sanctions imposed on Nornickel, Russia's mining giant. Russia accounts for 6 percent of global nickel supplies, but 20 percent of high-grade nickel for batteries (due to strong EV demand).

These problems have been compounded at the global level by reduced production elsewhere. For example, high energy costs across Europe forced many smelters to cut aluminum output by an estimated 17 percent of European capacity. Traders of metal commodities, as those for energy, may also choose to avoid Russian metal exports. The same is true for precious metals such as gold, palladium, and platinum, where Russia has a significant export share, especially for palladium. However, in general, metals exports are easier than energy products to divert to alternative export markets.

Lessons from past commodity price shocks

The war in Ukraine will have longer-term consequences for global commodity markets. Numerous countries, including EU members, are undertaking measures to reduce their energy imports from Russia while several countries are also restricting exports of key equipment to that country. These measures have been met with some retaliatory actions on the part of Russia. If the war is prolonged or intensified, the mutual barriers to trade may harden. To further understand the longer-term consequences of such barriers, likely market responses, and how the current situation might evolve, this section examines major shocks to commodity markets over the past 50 years.

The global oil market has experienced three major price increases during the past 50 years (Hamilton 2010). What has come to be known as the "first oil price shock" occurred in 1973 when several Gulf OPEC members imposed an oil embargo on exports to the United States and its allies in response to U.S. aid to Israel during the Yom Kippur War. OPEC producers subsequently cut oil production and raised prices almost five-fold (in nominal terms) from September 1973 to January 1974. The "second oil price shock" occurred in 1979 as a result of the Iranian revolution and was intensified by the Iran-Iraq war that began in September 1980, leading to a tripling in oil prices within a year. The "third shock" took place during the early 2000s in a more gradual fashion as a result of strong EMDE demand, especially in China and India (Baffes et al. 2018). At their peak, in July 2008, nominal oil prices exceeded $130/bbl (or $172/bbl in inflation-adjusted 2022 terms). The boom ended abruptly during the global financial crisis, but oil prices recovered rapidly, averaging $100/bbl until mid-2014.

Food commodity markets, especially grain markets, have experienced two major price

[9] Because of input substitutability, in response to a sharp rise in the price of one crop (wheat in the current context), farmers typically reallocate land from other crops, in turn spreading the price increase across all crops. Typically, land reallocation takes place within a season.

increases during the past half-century, both during similar time periods to the oil price shocks. The first occurred during the 1972-74 oil crisis—the World Bank's food price index increased 70 percent from 1972 to 1974 in real terms—reflecting weather-related production shortfalls in grain-producing countries, including Australia, Canada, the Soviet Union, and the United States. These shortfalls were compounded by higher input costs, including energy and fertilizers, due to the first oil price shock. Other contributing factors included earlier policies of major exporting countries to reduce stocks and idle cropland. The depreciation of the U.S. dollar following the removal of the gold standard played a role as well. The second price shock took place during the 2000s, as part of the broader commodity price boom—the real food price index gained 45 percent from 2006 to 2008.[10] As in the case of oil, food prices declined during the 2009 financial crisis but spiked again in 2011. These price increases occurred alongside adverse weather and a broad-based rise in input costs, including energy and fertilizers. Policies encouraging the use of food commodities for biofuels exacerbated the price spike (World Bank 2019).

The rest of this section examines: (i) how policies responded to these shocks and (ii) how market mechanisms responded to both policies and shocks. The section also summarizes similarities and differences between the ongoing shock and earlier episodes of price hikes.[11]

Policy responses

Energy

The oil price spikes of the 1970s triggered a number of policy responses, and both became the catalyst for demand reduction, the substitution to other fuels, and the development of new sources of energy supply (Baffes and Nagle, forthcoming). Following the first oil price shock, several OECD members set up the International Energy Agency in 1974 to safeguard oil supplies under a binding oil emergency sharing system, and to promote common policymaking and data collection and analysis. Key policy decisions included the requirement to create national oil reserves equal to 60 days of imports (later expanded to 90 days) and a ban on building new oil-fired electricity plants with a directive to switch to coal (enacted in 1977; Scott 1994).[12] Additional policies were adopted after the second oil price shock, under which member countries agreed to reduce oil demand by 5 percent, with individual policies varying by country.

Policies at the country level, while broadly similar, had some differences. The United States initially responded to high prices with a complex array of price controls for different types of oil. These policies were generally deemed to have impeded the normal functioning of markets and led to significant distortions (McNally 2017). The United States subsequently implemented numerous policy measures designed to address the underlying demand and supply imbalance with the Energy Policy and Conservation Act of 1975 (U.S. Congress 1975). On the demand side, these included energy conservation programs as well as regulations such as the prohibition of the use of

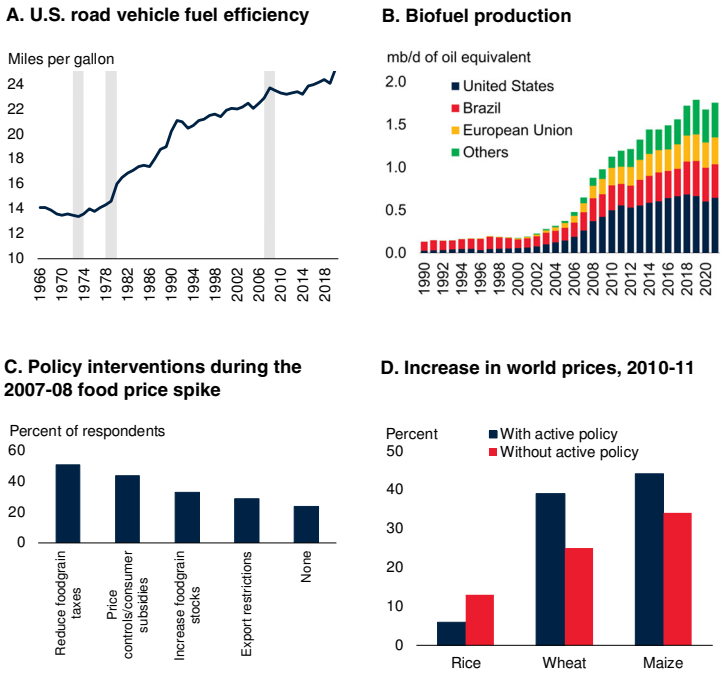
[10] A different type of shock to global food commodity markets was the breakup of the Soviet Union in the early 1990s. The objective of agricultural policies during the Soviet era was to achieve self-sufficiency and low food prices for urban consumers. However, because of inefficient production and marketing systems, neither objective was met. Consumption was rationed due to severe shortages, ultimately forcing the Soviet Union and several Eastern European countries to start importing food commodities on a large scale in the early 1970s.The transition to market economies in 1991 led to a major restructuring of agriculture, including removal of subsidies, and resulted in substantial improvements in productivity. Russia, along with Ukraine and Kazakhstan, became key exporters in the global grain market.

[11] Although policies and market responses are discussed in separate sections, it does not necessarily imply that they are independent of each other. Indeed, policies are a key driver to market responses, while the latter also affects the former.

[12] The IEA banned its member countries from building new oil-fired electricity plants. The ban, introduced under the "Principles for IEA Action on Coal" directive, was justified as follows (IEA 1979, p. 1 & 4): "The Principles are based on the conclusion that greatly increased coal use is required to meet growing energy demand in the medium and long term, and that this is both desirable and possible in light of the world's abundant coal reserves and the economic advantages which coal already has over oil in many energy markets … [T]he world is still confronted with the serious risk that within the decade of the 1980's it will not have sufficient oil and other forms of energy available at reasonable prices unless present energy policies are strengthened."

FIGURE SF.5 Policy responses to price shocks

As a result of the first oil price shock, the United States introduced legislation to increase the fuel efficiency of automobiles. During the energy price increases of the 2000s, governments mandated significant increases in biofuel production. Insulation policies undertaken during the 2010-11 episode amplified the increase of world prices and accounted for about 40 percent of the increase in the world price of wheat and one-quarter of the increase in the world price of maize.



Sources: Ag-Incentives Database; BP Statistical Review; Energy Information Administration; International Energy Agency (IEA); Ivanic and Martin (2014b); Organisation for Economic Co-operation and Development (OECD); World Bank.

A. Figure shows the fuel efficiency of U.S. vehicles in miles driven per gallon of gasoline consumed. Shaded areas refer to oil price shocks in 1973, 1979, and 2008.

C. Percent of respondents based on a survey of 80 EMDEs.

D. Estimates based on an error correction model described in Laborde, Lakatos and Martin (2019). Based on data for 82 countries, of which 26 are advanced economies, 44 are non-LIC EMDEs, and 12 are LICs for the period 2010-2011.

crude oil in electricity generation, and improved fuel efficiency standards for new automobiles and consumer appliances. The average fuel efficiency of U.S. autos rose from 13 miles per gallon (mpg) in 1973 to 20 mpg by 1990 (figure SF.5). On the supply side, measures included price incentives and production requirements to increase the supply of fossil fuels, including loan guarantees for new coal mines. The Act also mandated the creation of the Strategic Petroleum Reserve and measures to improve energy data, which led to the formation of the U.S. Energy Information Administration. In addition, in 1979, the United States announced it would remove price controls for oil (eliminated in January 1981), allowing market forces to address imbalances in supply and demand (Ilkenberry 1988).

In Japan, policies focused on measures to reduce energy use, develop alternative sources of energy to oil (notably nuclear power), and stabilize the supply of oil to Japan, for example through joint ventures with other countries (Shibata 1982). The Japanese government also phased out energy-intensive industries such as aluminum and petrochemicals. European countries implemented some similar domestic policies (Ilkenberry 1988).

Steadily increasing oil prices in the 2000s again led to policies to address concerns about energy shortfalls. In the United States, the Energy Policy Act of 2005 and the Energy Independence and Security Act of 2007 included numerous provisions pertaining to demand reduction and boosting production (EPA 2007). These included improving fuel efficiency in vehicles, tax breaks for the purchase of hybrid vehicles, as well as tax breaks and incentives for investing in energy-efficient buildings, both for commercial use and housing. On the supply side, the Act mandated a sharp increase in the use of biofuels; established renewable fuel standards; provided energy-related tax incentives for fossil fuels, nuclear, and renewable energy sources; and provided loan guarantees for zero-carbon technologies. Other countries adopted similar policies. For example, the European Union introduced the Renewable Energy Directive in 2009 which mandated that 20 percent of all energy usage in the EU, including at least 10 percent of all energy in road transport fuels, be produced from renewable sources by 2020, alongside measures to increase energy efficiency (European Parliament 2009). These directives were further expanded by the European Green Deal of 2019, especially regarding competitive practices and the use of renewable energy sources. Biofuel policies were also introduced in some EMDEs such as Brazil and India.

Food

The 1970s food price spike was beneficial for food-exporting countries. In the United States, the government was able to reduce expensive support

programs that it had previously implemented (Baffes and Nagle 2022, forthcoming). Among commodity importers such as Japan, the commodity price boom of the 1970s (as well as an embargo on soybean exports by the United States) reinforced the desire for self-sufficiency in food commodities. Japan promoted international cooperation to stabilize agricultural commodity prices and guarantee reliable supplies for importers (Honma and Hayami 1988). Other East Asian countries, including the Republic of Korea, increased protection of domestic agriculture and expanded the scope of state trading agencies.

During the 2008 price increase, governments in several EMDEs were confronted with difficult policy choices. Allowing domestic prices to adjust to world food price changes would have led to higher food price inflation, thereby causing a decline in real incomes of poor households that were net food buyers (Easterly and Fischer 2001). Instead, many countries attempted to reduce the transmission of international food price shocks to domestic markets. Indeed, during the 2007-08 food price spike, close to three-quarters of EMDEs undertook policy actions to insulate their economies from the sharp increase in international food prices, especially for rice (World Bank 2009). Similar policy actions were undertaken during the spike of 2010-11 (Chapoto and Jayne 2009; Ivanic and Martin 2008, 2014).[13]

Several studies (Laborde, Lakatos, and Martin 2018; World Bank 2019) have shown that the use of such trade policy interventions compounded the volatility of world prices. In addition, when undertaken by many countries simultaneously, they may not have been effective in protecting vulnerable populations. Instead, the use of targeted safety net interventions, such as cash and food in-kind transfers can better mitigate the negative impact of food price shocks while reducing the economy-wide distortionary impacts of trade policies.

[13] According to one estimate, the 2010-11 food price spike tipped 8.3 million people globally (almost 1 percent of the world's poor) into poverty (Laborde, Lakatos, and Martin 2019).

Market responses

There are three channels through which market mechanisms respond to price shocks and associated policies: demand reduction, substitution, and supply responses. This section discusses how these channels apply to energy and food commodities. Over the medium term, the demand reduction channel is less applicable for food, except in the most severe circumstances.

Energy

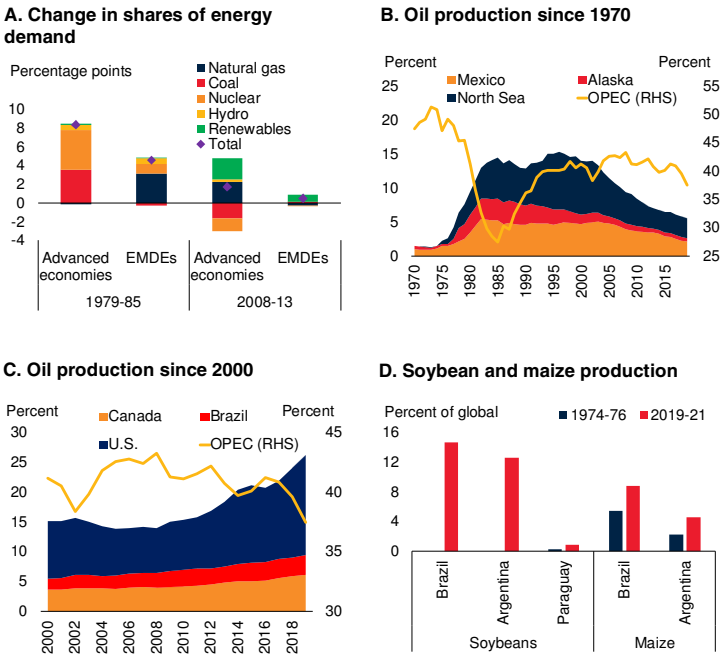
Demand reduction. Between 1979 and 1983, global oil demand fell by 11 percent, or 6 mb/d, with demand in advanced economies declining almost 20 percent. While the drop in oil demand was partly a result of the global recession in 1982, energy efficiency and substitution policies implemented by oil-importing countries caused a permanent reduction in underlying demand growth. Changes in consumer preferences in response to higher prices also played a role. For example, in the United States, there was a shift in preference away from domestically-produced and less fuel-efficient vehicles in favor of more efficient Japanese-made cars—the share of Japanese cars in U.S. auto purchases rose from 9 percent in 1976 to 21 percent in 1980 (Cole 1981).

In the 2000s, high oil prices and policy changes once again induced efficiency improvements in the use of oil, while there was less substitution to other fuels as a much smaller amount of crude oil was being used in electricity generation. After peaking in 2005, oil consumption in advanced economies steadily declined, such that by 2014 it had fallen by 14 percent from the peak. Once again, consumer preferences played a role. For example, in the United States, there was a shift toward fuel-efficient hybrid cars (supported by government policies) away from sports utility vehicles (SUVs). Indeed, in 2008, sales of SUVs began to plunge, and by mid-2008 they were down more than 25 percent from the same period a year earlier (Hamilton 2009). Among EMDEs, oil demand also decelerated in the 2010s.

Substitution. In the five years after the 1979 oil price shock, the share of crude oil in the energy

FIGURE SF.6 Market responses to price shocks

The share of non-oil energy sources rose sharply after the 1979 oil price spike, notably nuclear and coal in advanced economies, while increases were smaller during the 2008 oil price spike. The oil price increases also led to increased production from alternative sources of oil such as the North Sea and Alaska in the 1970s-80s, and U.S. shale and Canadian tar sands in the 2000s. The food price spikes of the 1970s encouraged the emergence of South American countries as major food exporters.



Sources: BP Statistical Review; Energy Information Administration (EIA); U.S. Department of Agriculture; World Bank.

A. Chart shows the change in the composition of energy consumption in advanced economies and EMDEs in the five years after the oil price shocks of 1979 and 2008. The total change reflects the equivalent decrease in oil consumption.

mix in advanced economies fell by more than 7 percent (figure SF.6). This shift was chiefly due to the prohibition of the construction of oil-powered electricity power stations—which were replaced by nuclear and coal-powered stations. The shift to nuclear power, which had started in the late 1960s, was particularly pronounced in France and Japan, where its share in total energy consumption reached 23 and 8 percent, respectively, by 1984.[14] Among EMDEs, the share of oil fell by 4 percent and was largely replaced by natural gas.

In the years following the 2008 oil price increase, the share of natural gas and renewables in the energy mix rose, reflecting the U.S. shale boom for natural gas, as well as mandates and technological improvements for renewables. However, since oil was no longer used widely in electricity generation, the decline in its share was of marginal significance. Moreover, substituting other energy commodities for oil in its main current uses—transport and petrochemicals—is much harder. As a result of mandates, the share of biofuels—ethanol and biodiesel—rose from about 0.15 percent of total oil consumption in 2005 to 1.7 percent in 2019, a large overall increase although still a very small share of overall oil consumption.

New sources of production. High oil prices in the 1970s induced investment in oil production by non-OPEC countries, particularly for reserves with a higher cost of production. These included Prudhoe Bay in Alaska, the North Sea offshore fields of the United Kingdom and Norway, the Cantarell offshore field of Mexico, and oil sands in Canada. High and stable prices in the 2000s also facilitated the development of alternative sources of crude oil. The most notable of these was the development of U.S. shale oil deposits, output from which rose from 5 mb/d in 2008 to 9 mb/d in 2014. In addition, Canadian oil sand production and Brazilian deep-water production also rose rapidly.

Food

Substitution. Most of the substitution in food commodities takes place on the input side since different crops can be grown with much the same inputs of land, labor, machinery, and fertilizers. This flexibility allows shifts in crop patterns from one season to another, in turn preventing sustained price gaps among commodities. For example, the price spikes of the 1970s and 2000s were mostly focused in one commodity and subsequently spread to the prices of other crops. Indeed, despite the large increase in maize and edible oil demand due to biofuels and for animal feed over the past two decades, the prices of these commodities moved in tandem with other grains and oilseeds. For example, global demand for maize doubled during 2000-20, compared to the 26-28 percent increase in global demand for rice and wheat (in line with world's population growth of 27 percent over this period).

[14] By the turn of this century the share of electricity from nuclear power in France had reached 70 percent.

Some agricultural commodities are also highly substitutable in terms of consumption. Most edible oils (including palm, soybean, and rapeseed oil) can be substituted for each other. Such substitutability explains the high comovement in edible oil prices. Substitutability also takes place in animal feed, especially between maize and soybean meal. Other food commodities, however, are less substitutable as they depend mostly on cultural factors (e.g., Asia is mostly a rice-consuming region while Europe and the Americas are mostly wheat-consuming regions).

New sources of supply. The food price increases in the 1970s induced a supply response from some South American countries, including Argentina and Brazil. Today, these two countries account for 17 and 50 percent of global soybean production, respectively, whereas they produced virtually no soybeans in the 1970s. Over the same period, their share of global maize production has almost doubled, to about 8 and 4 percent, respectively. High food commodity prices in 2008 and 2011, however, did not bring any major new producers into the global food markets. Indeed, some of the factors behind the spikes reversed (including the decline in energy prices and removal of restrictive trade policies), thus replenishing stocks of most grains and oilseeds. In the current context, if high food prices persist, an alternative source of food supplies could be the easing biofuel mandates, which today account for as much as 4 percent of global arable land.

Comparison of the current episode with earlier commodity price shocks

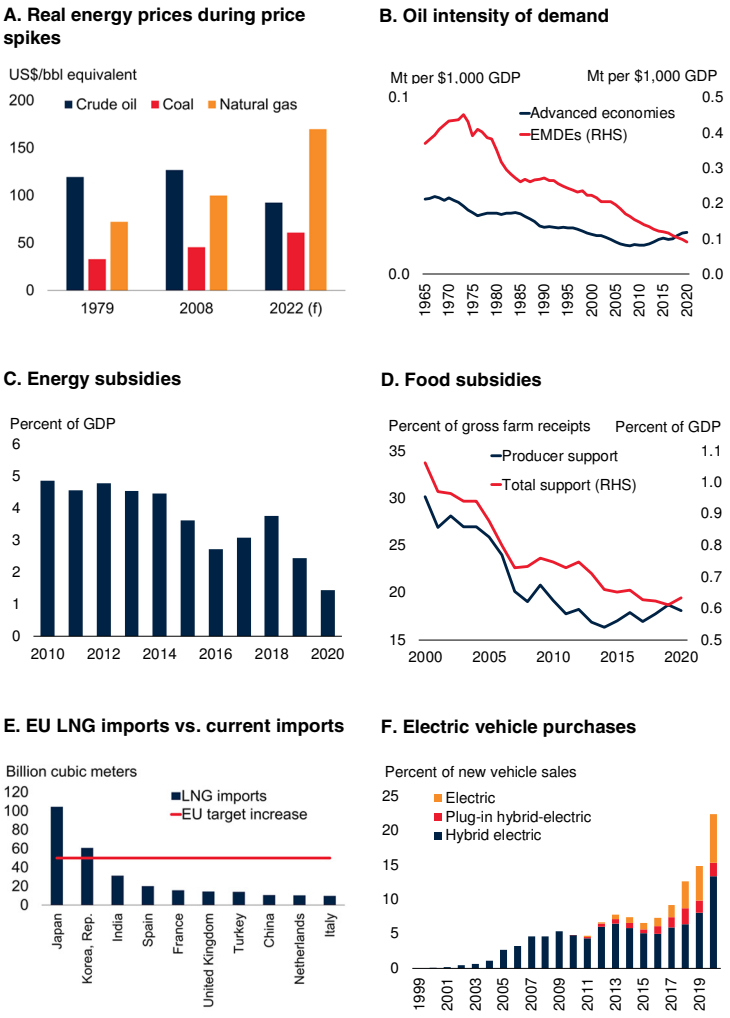
Energy

The previous two oil price spikes bear some similarities to the current situation, but there are three key differences:

- **Prices.** All energy prices have seen significant increases, particularly natural gas and coal (figure SF.7). In the earlier episodes, oil prices rose much more sharply than those for coal and gas. The price of oil in real terms is currently 35 percent below its 2008 peak, while the price of European natural gas has reached a historical high. With all energy prices elevated, there is less opportunity to substitute for cheaper fuel. In fact, as oil is now relatively cheap, there has been some substitution for it from natural gas for electricity generation (World Bank 2021). In

FIGURE SF.7 Energy and food markets during the current price spike

The spike in energy prices today is broad-based, whereas earlier price spikes primarily affected oil. The oil intensity of demand has fallen sharply since the 1970s as efficiency has improved, and the global economy has shifted toward less-energy-intensive services. Energy subsidies have been falling globally. Food subsidies declined through 2015, but governments have increased support to producers since then. The EU has mandated a sharp increase in LNG imports to diversify its sources of natural gas. In the longer term, the energy price spike may accelerate the adoption of electric vehicles.



Sources: BP Statistical Review; European Commission; International Energy Agency (EIA); Organisation for Economic Co-operation and Development; World Bank.
A. Chart shows the annual price of coal, Brent crude oil, and European natural gas, deflated using U.S. CPI.
B. Oil intensity of demand is calculated as oil consumption in metric tonnes per unit of GDP.

addition, high prices of some commodities (such as energy) are pushing up the production cost of other commodities (such as fertilizers, foods, and metals). While renewables—mainly solar and wind power—offer an alternative source of energy, their cost has also risen recently as a result of sharply higher prices for the metals used in their construction, including aluminum and nickel.

- **Intensity**. The oil intensity of GDP has fallen considerably since the 1970s. Similarly, consumer spending on energy as a share of total spending has also fallen, especially in advanced economies (although it will increase significantly this year). As a result, consumers may respond less to energy price changes, at least in the short term, than in the 1970s. The price elasticity of demand in energy-intensive industries may be higher than that of consumers, however, and so more adjustment may take place in industry. For example, in Europe high natural gas and electricity prices have already led to reduced production of fertilizer and aluminum.

- **Policies**. Policy responses to high energy prices in many countries have focused on reducing fuel taxes or introducing fuel subsidies—a marked reversal of a broader trend of declining subsidies over the past few years. These policies are also in sharp contrast to recent policy announcements to combat climate change (such as during COP26), which included promises to phase out fossil fuel subsidies. Although these policies may somewhat alleviate the immediate impact of price spikes, they do not provide large benefits to vulnerable groups, and by increasing energy demand, they tend to prolong the imbalance of demand and supply. They are also very costly at a time when government debt levels have already soared during the COVID-19 pandemic.

The current energy supply disruptions have the potential to present a major setback to the energy transition. Several countries have announced plans to increase production of fossil fuels. China intends to increase its coal production by 300 million tons (an amount equal to its current imports), and an increase of nearly 8 percent from its current production. Canada has authorized a new offshore oil project which could increase production by 0.2mb/d. The EU has also announced plans to increase imports of LNG to reduce its reliance on Russian natural gas. It is not clear, however, how much will come from new sources of natural gas in the near term or simply greater competition with other countries for a relatively fixed supply of natural gas. While increasing the supply of fossil fuels will help alleviate current energy shortages, it will make achieving climate change goals more challenging. Although some countries have announced intentions to boost energy production from renewable sources or to revive or extend nuclear power plants, it will take time before such projects materialize.

Some countries have announced plans to reduce energy demand, but these will take time to be implemented. For example, the United States announced a faster increase in fuel efficiency requirement for car manufacturers, with fuel efficiency now required to increase to 49 mpg by 2026, an increase of about one-quarter relative to 2021. The EU announced plans to encourage the installation of heat pumps, which are a more energy-efficient method of heating homes. In addition, high fossil fuel prices will likely encourage consumers to shift to low carbon technologies such as electric vehicles. Even before the most recent increase in oil prices, such a shift had been underway.

Food

A key similarity between the Ukraine war and the earlier food price shocks is the role of high energy (and fertilizer) prices in driving the food price increases. However, the extent and breadth of price increases differed markedly across the three spikes. Whereas the 1970s food price increases were among the largest of the past 100 years, the more recent increases have been much smaller in magnitude. While the 1970s price boom was broad-based, in 2008-09 it was led by rice, and the current price spike has been lead by wheat (with increases in maize and oilseeds as well).

Substitution has also played an important role in recent developments and explains differences in prices movement following the Ukraine war. While the prices of agricultural commodities where Ukraine is a major exporter rose, increases were smaller for sunflower oil compared with wheat. That is because sunflower oil can be substituted by soybean and palm oil (the prices of all edible oils rose following the war, reflecting this substitutability). The larger price spike for wheat reflects the fact that it is less easily substituted by other commodities. Substitution of wheat will instead come from land reallocation, which takes place from one season to the next.

On the policy front, exports bans and other trade restrictions so far have been less common today compared to the previous spike. However, if the reductions in grain supplies from Ukraine (and possibly from Russia) become much larger, it could lead to increased use of restrictive policies. Such supply reductions combined with restrictive policy measures could introduce enormous uncertainty for future food supplies and prices.

The recent food price increases have nonetheless accelerated domestic food price inflation and increased food insecurity in most EMDEs. Even before the Ukraine war, the pandemic had already taken a toll on food insecurity. According to the Global Report on Food Crises, an estimated 161 million people were facing crisis or worse. This is up from 147 and 115 million in 2020 and 2019, respectively. Populations facing a crisis, which are typically in countries with some type of conflict, include DRC (26 million), Afghanistan (23 million), Nigeria (23 million), Ethiopia (16 million), and Yemen (16 million).

The war-driven disruptions in food trade, higher food price inflation, and higher cost of assistance are likely to make more people food insecure. The U.S. Agency for International Developments estimated that between 2.5 and 5 million people in Ukraine (around 5 to 10 percent of its population) will likely need humanitarian assistance to prevent food consumption gaps and protect livelihoods in the near term (FEWS NET 2022).

Conclusions and policy implications

The war in Ukraine has delivered a major shock to energy and food commodity markets. This shock comes on top of pandemic-related supply chain disruptions and a stronger-than-expected rebound in demand. Food shortages and inflation are negatively impacting the poor and may worsen inequality (World Bank 2022). Higher food prices will exacerbate food insecurity in many countries, with particularly severe impacts on the poorest households (Gill and Nagle 2022; Ha, Kose, and Ohnsorge 2019). Over the next year, many low-income countries in Northern Africa, Asia, and the Near East face a risk of widespread hunger and malnutrition as a result of reduced supply from Ukraine and Russia (FAO 2022; WFP 2022). Ukraine itself will have localized problems of food adequacy because of destruction of farming assets, losses of labor to refugee displacement and defense, and deprivation of employment income.

In advanced economies (and EMDEs), rapidly rising energy and food prices will weigh on growth and materially increase inflation, further complicating policy decisions facing central banks. Higher interest rates are forecast, and tighter global financial conditions have historically had strong negative effects on EMDEs, particularly on those with large foreign financing requirements.

A comparison of the current energy price shock with previous episodes suggests that the current crisis has three key features that could make addressing the energy shortfall more difficult. First, there is less room today than in the past to substitute away from the most-affected energy commodities—gas and coal—as price increases have been broad-based across all fuels. Higher prices of some commodities such as energy have also increased the production costs of other commodities. Second, the energy intensity of GDP has fallen sharply since the 1970s, and so consumers may be less sensitive to relative price changes, at least in the short term. It may also be more difficult for countries to reduce energy use (i.e., less "low hanging fruit" available). Third,

policy responses in many countries have prioritized energy subsidies and tax breaks, aggravating the situation, with fewer policies designed to tackle the underlying imbalance between supply and demand.

Policy responses will be key to providing a long-term solution to the current price hike. The comparison with earlier shocks highlights how some policies have been highly effective and beneficial, while others have provided short-term fixes but at the expense of market distortions or new problems. Increased efficiency standards for automobiles, incentives for more efficient home appliances, and renewable energy mandates (except biofuels) have all generated long-term benefits. Similarly, setting up institutions to improve market transparency, coordinate policy responses, improve data quality, and facilitate policy dialog, have also been beneficial. These institutions include the International Energy Agency (set up by the OECD after the first oil price shock) and more recently the Agricultural Marketing Information System (set up by the G-20 in response to the 20007-08 prices spike).

In the past, some policies that provided short-term respite to higher prices exacerbated problems in the medium-term or led to new problems. For example, price controls in the United States after the first oil price shock in 1973 distorted markets and may have increased oil demand. The promotion of coal use for electricity generation in the late 1970s reduced reliance on oil; however, it created environmental problems, including air pollution and the acceleration of climate change. Similarly, the introduction of biofuels provided an alternative to crude oil and may have increased the share of renewable energy, but its overall effectiveness has been questioned because biofuel production requires large amounts of energy and fertilizers and leads to upward pressure on food prices. Export bans on food commodities during the 2007-08 and 2010-11 price increases, while temporarily softening the impact of food price inflation on some poorer households, also induced high volatility in world prices as well as reciprocal policy responses by other countries. In the current context, well-intentioned energy subsidies could delay the transition to a zero-carbon economy.

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