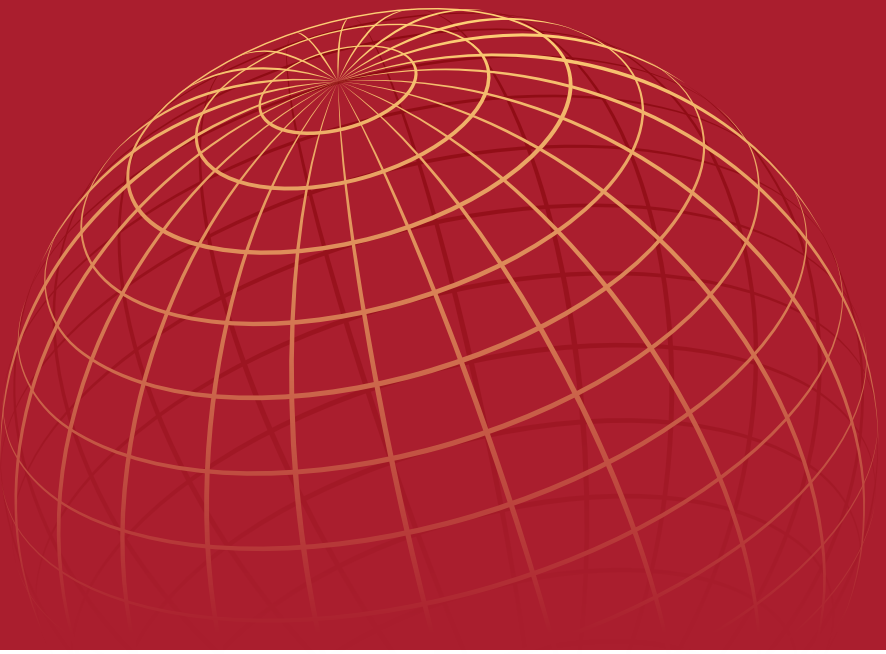


SPECIAL FOCUS 2

RUSSIA'S INVASION OF UKRAINE

Implications for Energy Markets and Activity

The Russian Federation's invasion of Ukraine has disrupted global energy markets and damaged the global economy. Compared to what took place in the 1970s, the shock has led to a surge in prices across a broader set of energy-related commodities. In energy-importing economies, higher prices will reduce real disposable incomes, raise production costs, tighten financial conditions, and constrain policy space. Some energy exporters may benefit from improved terms of trade and higher commodities production. However, on net, model-based estimates suggest that the war-driven surge in energy prices could reduce global output by 0.8 percent after two years. The experience of previous oil price shocks has shown that these shocks can provide an important catalyst for policies to encourage demand reduction, substitution to other fuels, and development of new sources of energy supply.

Introduction

Volatility in energy markets, driven by a strong demand recovery from the pandemic and numerous pandemic-related supply constraints, is being exacerbated by Russia's invasion of Ukraine. The invasion has led to significant disruptions to the trade and production of energy commodities as Russia is the world's largest exporter of natural gas and accounts for a significant share of global coal and crude oil exports (figure SF2.1.A). However, the ultimate impact of these disruptions will depend on their magnitude, the availability of inventories, the development of other supplies or a ramping up of production in other countries, and the extent to which demand can be reduced.

Already, the United States and the European Union (EU) have announced plans to ban or phase out fossil fuel imports from Russia, and Russia has cut off direct natural gas exports to Bulgaria, Finland, the Netherlands, and Poland (World Bank 2022a). The United States and other International Energy Agency members announced the release of 180 million and 60 million barrels of oil, respectively, from April to October 2022. And in any event, tighter financial conditions, reduced investment, and restricted access to technology are likely to have a longer-term impact on Russia's energy production.

Reflecting these developments, coal and oil prices have risen sharply, European natural gas prices have reached record highs, and the World Bank's energy price index increased by 34 percent between January and March 2022, on top of a 50 percent increase between January 2020 and December 2021 (figures SF2.1.B-D). Based on current projections, energy prices are expected to rise by 50 percent in 2022, reflecting an 81 percent increase in coal prices, a 74 percent rise in natural gas prices (average of the European, Japan, and U.S. benchmarks), and a 42 percent increase in the price of oil. Relative to January projections, the prices of energy commodities are now expected to be 46 percent higher on average in 2023.[1]

Supply disruptions of key energy commodities could severely affect a wide range of industries, including food, construction, petrochemicals, transport, and firm-level effects (Lafrogne-Joussier et al. 2022). Concerns about energy security have already prompted public policies aimed at bolstering national self-sufficiency and reducing energy prices for consumers; however, lessons from previous energy price shocks show that these policies are often costly and ineffective, compared with steps to encourage consumers to reduce demand, to substitute for other forms of energy, and to develop alternative energy sources.

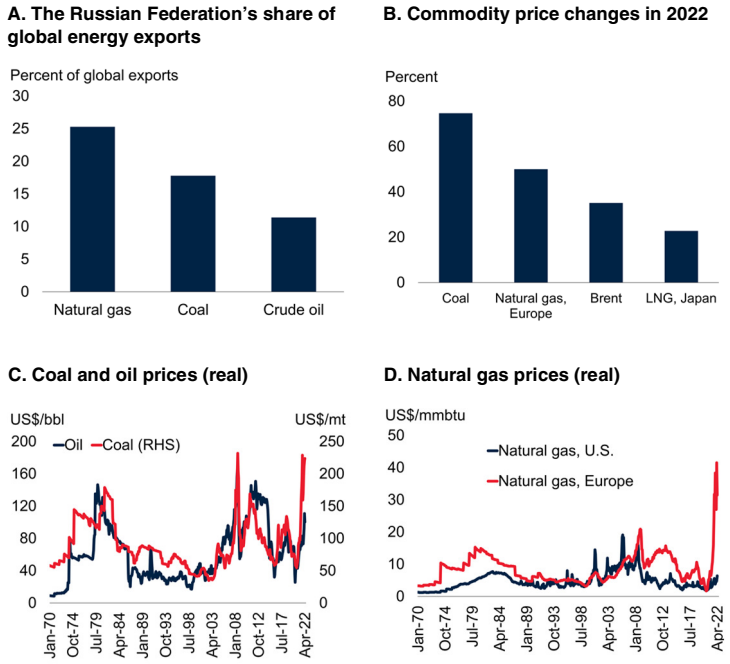
The increase in energy prices is likely to weigh on global economic activity. Higher energy prices will reduce activity in energy-importing economies by lowering real incomes, raising production costs, tightening financial conditions, and constraining macroeconomic policy. Stronger activity in some energy-exporting emerging market and developing economies—supported by more favorable terms of trade, expanded production, and stronger investment—will only provide a partial offset to the drag on global growth.

Note: This Special Focus was prepared by Justin-Damien Guénette and Jeetendra Khadan with contributions from Peter Stephen Oliver Nagle, John Baffes, and Garima Vasishtha.

[1] On average over 2022-23, oil, natural gas, and coal prices are now expected to be 87 percent, 40 percent, and 69 percent higher than in January.

FIGURE SF2.1 Commodity dependence and energy prices

The Russian Federation is a major exporter of energy commodities. All coal and natural gas prices have 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. Real coal prices are close to their 2008 peak, while real oil prices remain some distance below.



Sources: BP Statistical Review; Eurostat; Haver Analytics; Comtrade (database); World Bank.
A. Data for energy are trade volumes. Data are for 2020.
B. Three-month change in commodity prices through end-March 2022. LNG stands for liquefied natural gas.
C.-D. Monthly data from 1970 to April 2022. Prices deflated by the U.S. Consumer Price Index.

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

- How does the latest energy price shock compare with previous major shocks?
- What are the lessons from previous energy price shocks?
- What are the likely implications of the current energy price shock for global activity?

Comparison with previous energy shocks

The current energy shock differs from previous oil price spikes to the extent that the current episode has had a broader impact on energy commodities, implying less opportunity for substitution toward cheaper fuels. At the same time, however, the energy intensity of GDP now is much lower than in the 1970s, so consumers may be less sensitive to relative price changes, at least in the short term. And in the current episode, policy responses have tended to focus on adjustments to fuel subsidies and taxes to mitigate the effects on consumer prices, rather than on measures to address underlying supply/demand imbalances.

Prices. Crude oil prices have increased by 350 percent (in nominal terms) from their pandemic low in April 2020 to April 2022, making it the largest increase for any equivalent two-year period since the 1970s.[2] Also, all energy prices rose sharply in 2022, in contrast to earlier episodes where oil prices rose much more sharply than those for coal and gas. In nominal terms, coal and gas prices have all reached historic highs. 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. With all energy prices elevated, there is less opportunity to substitute for cheaper fuel in the current energy shock. In addition, the increase in prices of some energy commodities is also driving up prices of other commodities. For example, higher natural gas prices have already pushed fertilizer prices to their highest level since 2010.

Smaller energy intensity of GDP. The oil intensity of GDP has fallen considerably since the 1970s. Similarly, prior to the price shock, consumer spending on energy as a share of total spending is also lower, especially in advanced economies, which means that consumers may respond less to energy price changes, at least in the short term, than in the 1970s.

Different policy focus. Many countries have responded to the current shock by prioritizing energy subsidies and tax breaks with fewer policies

[2] Another shock took place during the early 2000s in a more gradual fashion as a result of strong demand growth in emerging market and developing economies, 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).

designed to tackle the underlying imbalance between supply and demand. However, several countries have announced plans to increase production of fossil fuels (coal and LNG), while others have announced faster increases in fuel efficiency requirements to reduce energy demand.

By comparison, policy responses to previous oil price shocks were focused on establishing institutions, such as the creation of the International Energy Agency in 1974, to safeguard oil supplies and promote common policy making. 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-powered electricity plants with a directive to switch to coal (enacted in 1977; Scott 1994). Measures were also implemented to address the underlying demand and supply imbalance (Ilkenberry 1988; Shibata 1982; U.S. Congress 1975). For example, the United States adopted policies to reduce demand and boost production after the steady increase in prices in the 2000s (EPA 2007). Demand-side measures included fiscal incentives to improve energy efficiency in vehicles and housing. Supply-side measures included a mandate to sharply increase the use of biofuels; establishing renewable fuel standards; providing energy-related tax incentives for fossil fuels, nuclear, and renewable energy sources; and providing loan guarantees for zero-carbon technologies. The EU and many EMDEs adopted similar policies.

Lessons from previous energy shocks

The experience of the past 50 years suggests that there are three channels through which market mechanisms respond to energy price shocks and associated policies: demand reduction, substitution, and supply responses (Baffes and Nagle 2022).

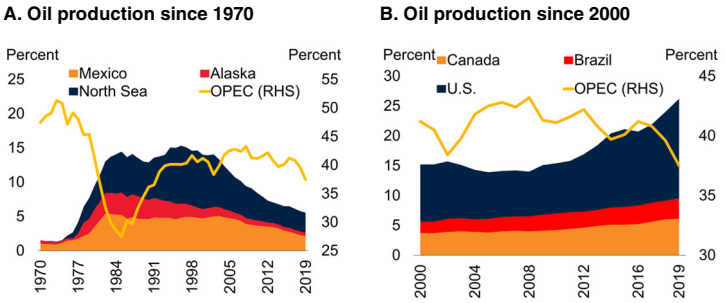
Demand reduction. Between 1979 and 1983, global oil demand fell by 11 percent, or 6 million barrels per day (mb/d). While the drop in oil demand was partly a result of the global recession in 1982, energy efficiency and policies to encourage a substitution from oil implemented by oil-importing countries contributed to a permanent reduction in underlying demand. Changes in consumer preferences in response to higher prices also played a role in reducing demand, for example, the shift toward more fuel-efficient vehicles in the United States (Cole 1981). In the 2000s, there was less substitution to other fuels as a much smaller amount of crude oil was being used in electricity generation. After reaching its peak in 2005, oil consumption in advanced economies steadily declined and was 14 percent lower by 2014. The decline in oil consumption was largely due to a shift toward more fuel-efficient automobiles, including hybrid electrics (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 mix in advanced economies fell by more than 7 percentage points, owing to the prohibition of the construction of new oil-fired power stations and their gradual replacement with nuclear and coal-powered stations. Among EMDEs, the share of oil in the energy mix fell by 4 percentage points 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, substituting other energy commodities for oil in its main current uses—transport and petrochemicals—has proved to be more difficult.

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 (figure SF2.2.A). 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 0.6 mb/d in 2008 to 7.8 mb/d in 2019, resulting in a sustained expansion in total U.S. production (figure SF2.2.B).

FIGURE SF2.2 Market responses to price shocks

The oil price increases in the 1970s led to increased oil production from non-OPEC countries, notably in the North Sea and Alaska in the 1970s-80s. Similarly, high and stable prices in the 2000s induced investment in the development of alternative sources of crude oil, the most notable being U.S. shale and Canadian tar sands in the 2000s.



Sources: BP Statistical Review; International Energy Agency; World Bank.
Note: OPEC = Organization of the Petroleum Exporting Countries.

The lessons from previous energy shocks will be key to inform a long-term solution to the current price hike, especially one that could make achieving climate change goals less challenging. Measures to promote energy efficiency and changes in consumer preferences have proven to be instrumental in significantly reducing oil demand after the 1970s oil shocks. On the other hand, policies that encouraged the use of coal for electricity generation and price controls have led to environmental problems and market distortions, respectively (World Bank 2022a). These lessons would suggest that countries should focus their policies on promoting energy efficiency, investing in renewable energy sources, and pursuing policies to encourage consumers to shift toward low carbon technologies.

Implications for the global economy

Channels

Energy prices affect growth and inflation through various channels: direct effects on prices and activity for both importers and exporters; indirect effects via trade and other commodity markets; monetary and fiscal policy responses; and investment uncertainty. Through these channels, energy prices can also have immediate repercussions—even absent discretionary policy responses—on fiscal and external balances.

Shifts in national incomes and activity. Developments in global oil and energy markets are accompanied by significant real income shifts from energy-importing countries, where the propensity to spend tends to be higher, to energy-exporting countries, which tend to have higher average saving rates. This generally results in weaker global demand over the medium term. Yet, the ultimate impact of higher energy prices on individual countries depends on a wide range of factors, including the share of oil and other energy inputs in their exports or imports, their reliance on the oil sector for tax revenues, their cyclical positions, and their amount of monetary and fiscal policy room to react. While the positive impact on exporters is immediate and, in some cases, accentuated by financial market easing, the negative impact on energy importers could be more diffuse and take some time to materialize.

Higher costs. For consumers, higher energy costs decrease real disposable income and reduce consumption. This effect is particularly prominent in commodity-importing low-income countries for which fuel constitutes a large fraction of consumption (World Bank 2022b). For firms, rising energy prices often imply a sizeable increase in input costs. For energy and oil-intensive sectors, including transportation, petrochemicals, and agriculture, this would worsen conditions for investment and employment. Agriculture, for instance, is 4–5 times more energy intensive than manufacturing (Baffes et al. 2015).

Procyclical policy responses. In energy exporters, rising energy prices can trigger procyclical increases in public spending (Arezki, Hamilton, and Kazimov 2011; Frankel, Végh, and Vuletin 2013; World Bank 2022b). This procyclicality is particularly acute in commodity exporting countries, where governments have tended to raise spending in response to an increase in government revenues during booms (Frankel 2017). Fiscal policy thus often accentuates the impact of the commodity price cycle on economic growth and increases the amplitude of cycles in economic activity (Mendes and Pennings 2020; Riera Crichton, Végh, and Vuletin 2015). In contrast,

oil importing countries may see their fiscal positions deteriorate as domestic economic activity weakens and the cost of providing fuel subsidies rises.

Procyclical financial flows. The economic impact of rising energy prices can also be magnified by the financial channel. In energy exporters, higher energy prices can trigger increases in domestic credit creation and compression of country risk premia, leading to large capital inflows and currency appreciation (World Bank 2022b). A surge in capital inflows can be particularly problematic if not properly invested, as evidenced by the Latin American debt crises of the 1980s (Eberhardt and Presbitero 2021; Kose et al. 2021; Reinhart, Reinhart, and Trebesch 2016). In contrast, energy importers may experience a tightening of domestic financial conditions, including as a result of lenders pulling back in the face of weaker credit quality. This may be further exacerbated if monetary policy is tightened to resist inflation pressures (Baffes et al. 2015).

Uncertainty. Abrupt changes in energy prices, by increasing uncertainty, can also have an outsized adverse impact on investment and durable goods consumption. For instance, uncertainty generated by sharp movements in oil prices can hinder the consumption of durable goods (Kilian 2014). Rising uncertainty of future oil prices can also lead to more precautionary demand of crude oil, with second-order impacts on activity (Anzuini, Patrizio and Pisani 2014).

Impact on global activity

Impact of higher oil prices

Global economy. Oil price movements driven by supply shocks in oil markets are often associated with significant changes in global output and income shifts between oil exporters and importers (Cashin, Mohaddes, and Raissi 2014; Kilian 2009; Peersman and Van Robays 2012). Recent studies using large-scale macroeconomic models indicate that a supply-driven increase in oil prices averaging about 40 percent over two years—the size of the upward revision to World Bank projections—would lower global activity by about 0.2-0.6 percent after two years (figure SF2.3.A; Andrle et al. 2015; Blagrave et al. 2020; Dieppe et al. 2017).[3]

The results of these previous studies are confirmed here using simulations of a global semi-structural model, which suggest that global output would decline by a cumulative 0.3 percent in the second year of the shock (figure SF2.3.B).[4] The impact on the global economy could be even bigger as oil price increases generally appear to have larger output effects on oil importing economies than oil price decreases (Hoffman 2012; Jimenez-Rodriguez and Sanchez 2005). This asymmetry could be caused by uncertainty, frictions such as wage rigidities, and varying monetary policy responses to different types of movements in oil prices (Bachmeier and Keen 2018; Kilian and Lewis 2011; Rahman and Serletis 2011).

Oil importers. Activity in oil importers should deteriorate in response to higher oil prices since these reduce household and corporate real incomes. Past research suggests that a 40 percent increase in oil prices could lower growth in oil-importing economies by some 0.4–2.0 percentage points, depending on the share of oil imports in GDP (Rasmussen and Roitman 2011; World Bank 2013). Broadly in line with these estimates from the literature, simulations of the global model suggest that this shock would lower output growth in oil-importing advanced economies and EMDEs by 0.25 percentage point in the first year.

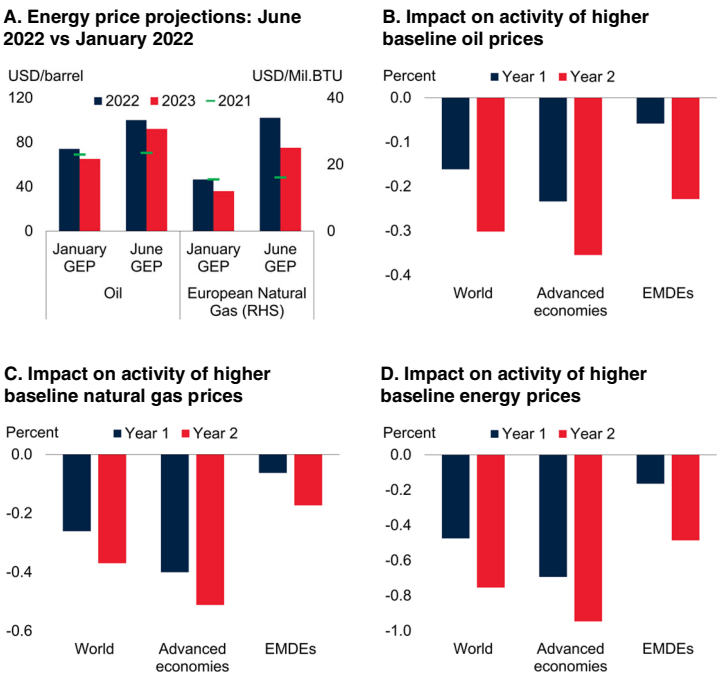
Oil exporters. In addition to an expansion of the oil sector, rising oil prices can have a number of indirect effects on oil-exporting economies. In many, government finances rely heavily on taxing

[3] The literature offers a range of estimates of the impact of a sustained, supply-driven oil price increase (Baffes et al. 2015; IMF 2014; OECD 2014). More recent studies report smaller estimates primarily because of the recent expansion of oil production in the United States which has reduced the economy's overall sensitivity to oil prices (Gervais 2019).

[4] These simulations are conducted using the Oxford Economics Global Economic Model (OEM). The OEM is a global semi-structural macro projection model which includes 81 individual country blocks, most of which are available at a quarterly frequency, with behavioral equations governing domestic economic activity, monetary and fiscal policy, global trade, and energy prices (Oxford Economics 2019). The simulations assume that agents have adaptive expectations, monetary policy is endogenous, and fiscal policy is largely exogenous.

FIGURE SF2.3 Implications for global economic activity

The World Bank has significantly increased its projections for oil and natural gas prices over the near term. According to a large-scale global macroeconomic model, the upward revision to oil prices included in baseline forecasts, if driven by supply shocks, would lower global output by about 0.3 percent after two years. The much larger upward revision to baseline natural gas price forecasts over 2022 and 2023 would be expected to lower global output by a similar magnitude. Combined, supply-driven upward revisions to the prices of oil, natural gas, and coal could lower global output by a cumulative 0.8 percent in 2023.



Sources: Oxford Economics; JP Morgan; World Bank.

Note: BTU = British Thermal Unit; EMDEs = emerging market and developing economies; Mil. = million; USD = U.S. dollar.

A. GEP refers to the *Global Economic Prospects* report. Oil price is the simple average of Brent, Dubai, and West Texas Intermediate prices.

B.D. These scenarios are produced using the Oxford Economics Global Economic Model.

B. Simulation is for supply-driven increases in Brent oil prices averaging 40 percent above baseline for two years.

C. Simulation is for supply-driven increases in natural gas prices averaging 70 percent above baseline for two years.

D. Chart combines the impacts on global output of the supply-driven increases in Brent oil prices, natural gas prices, and coal prices. Coal price shock is a supply driven increase in coal prices averaging 87 percent above baseline for two years.

the oil sector, so that higher oil prices tend to boost revenues and may trigger a fiscal expansion. In addition, an increase in oil prices generally improves their current account and precipitates currency appreciation. Previous research suggests that output in oil-exporting countries could increase by about 0.6–4.8 percent in the year following a 40 percent rise in the annual average oil price (Feldkircher and Korhonen 2012; World Bank 2013). A similar shock in the global model would raise the aggregate output of oil-exporting EMDEs by about 1 percent over the same time horizon.

Impact of higher natural gas prices

In addition to the drag from elevated oil prices, several countries are likely to face significant headwinds from sharply higher natural gas prices, and to a lesser extent, higher coal prices. Simulations of the global model indicate that a supply-driven 70 percent increase in natural gas prices—equivalent to the average upward revision to World Bank forecasts over 2022-23—would lower global output by 0.4 percent after two years (figure SF2.3.C).[5] The impact of the gas supply shock would be greatest for continental Europe owing to its outsized dependence on Russian supplies (Bachmann et al. 2022). The larger incidence on global output of the natural gas price shock compared to that of oil is a function of the size of the shock—the projected revision to natural gas prices is nearly double that for oil.

Impact of combined energy price shocks

On net, model simulations suggest that the upward revisions to energy prices, including to oil, natural gas and coal, could reduce global growth by 0.5 percentage point in 2022 and a further 0.3 percentage point in 2023, lowering global output by a cumulative 0.8 percent by 2023 (figure SF2.3.D).[6] The estimated impact on global growth for the first year is in line with the results of a similar exercise conducted by the OECD (OECD 2022). Advanced economies would experience a cumulative reduction in output of 0.9 percent by 2023 compared to a 0.6 percent output reduction in oil-importing EMDEs. The outsized impact on advanced economies would reflect a particularly

[5] The impact of the natural gas price shock, which is not well explored in the literature, is nonetheless broadly in line with model-based estimates for a gas-importing advanced economy (Millard 2011).

[6] OEM simulations suggest that an 87 percent rise in global coal prices—equivalent to the average upward revision to World Bank forecasts over 2022-23—would only reduce global activity by about 0.1 percent cumulatively after two years. This negligible impact may reflect the peripheral role of coal in the current version of the model. Historically, adverse coal supply shocks are estimated to have caused marked but short-lived declines in output (van de Ven and Fouquet 2017).

large drag in Europe from surging natural gas prices as a result of Russia's invasion of Ukraine (Federle et al, 2022; Guénette, Kenworthy and Wheeler 2022). This is broadly in line with other model-based studies (Ferrara, Mogliani and Sahuc 2022; Mahlstein et al. 2022).[7] The adverse impact on EMDEs would be blunted by the positive impact on EMDE oil exporters, who would see their level of output rise by a net 0.5 percent in 2023.[8]

These model-based estimates could, however, underestimate the combined drag of higher oil, natural gas, and coal prices on global growth. For instance, the model may underestimate the drag on global activity caused by a near doubling of global coal prices. It could also fail to appreciate how elevated prices for all hydrocarbon energy sources could limit the ability of countries to substitute for lower-cost energy sources in the near term.

Lastly, an even more severe scenario for energy prices could be envisioned, such as a Russian embargo on energy exports to the EU and the imposition by the EU and the U.S. of sanctions targeting shipping companies or third parties purchasing Russian oil, possibilities that are explored in the risk section of chapter 1. This scenario would include further unanticipated shocks to energy markets and a material deterioration of confidence in the euro area, resulting in an additional drag on global growth of 0.4 percentage point in 2022 and 0.8 percentage point in 2023. Thus, when combined, energy supply-related shocks in the baseline and in the energy price spike scenario could reduce global output growth by 0.9 percentage point in 2022 and 1.1 percentage points in 2023, resulting in a 2 percent reduction in global output by 2023.

Policy implications

Policy responses to previous energy shocks have shown that some polices can be highly effective and beneficial (such as increasing energy efficiency and renewable energy mandates), while others can lead to market distortions and environmental problems (such as price controls and the promotion of coal use for electricity generation in the 1970s). Given these lessons, policy makers today can prioritize policies that encourage greater energy efficiency and accelerate the transition towards low-carbon energy sources. To cushion the adverse effects of households, temporary targeted support to vulnerable groups can be prioritized over energy subsidies, which in the current context, could delay the transition to a zero-carbon economy (World Bank 2022a).

[7] Several other studies have quantified the global growth impacts of scenarios related to a worsening of disruptions to Russia's energy exports. IMF (2022) finds that more severe disruptions to European imports of Russian energy, combined with global supply disruptions and adverse confidence shocks would lower global output by about 0.5 percent in 2022 and 1 percent in 2023—over and above downward revisions to the baseline outlook. Similarly, McFee (2022) presents an alternative baseline featuring a worsening of the war in Ukraine accompanied by sharply higher oil and natural gas prices. In this scenario, global output would be lower by 0.6 percent in 2022 and 1.1 percent in 2023.

[8] Growth in oil-exporting EMDEs would be 0.8 percentage point higher in 2022 and 0.3 percentage point lower in 2023 as a result of the upward revision to oil prices.

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