

Working Paper

Reroute, Reduce, or Replace? How the Oil Market Might Cope with a Loss of Russian Exports After the Invasion of Ukraine

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INTRODUCTION

Russia's February 24th invasion of Ukraine provoked a global uproar, and nearly simultaneously, a robust and immediate response. Leaders of countries, organizations and firms not only condemned the death and devastation wrought by Russia on Ukraine, a neighbor that has been independent since 1991. Led by the EU and US, countries followed up with a blizzard of sanctions and boycotts on Russia, alongside diplomatic support and shipments of aid and weapons to Ukraine.

While initial state-issued sanctions avoided *direct* targeting of Russian energy exports, private sector reluctance to do business in an uncertain and rapidly-changing environment is reducing Russia's participation in global oil and gas markets in any number of ways, with repercussions occurring over the short and longer term. Despite the intention of the U.S. and EU to avoid a sanction-induced energy shock to the global economy by allowing exports of oil and natural gas sanction-free, global oil prices have risen substantially as have natural gas prices in Europe and the Far East.

Ultimately, the invasion threatens to undermine Russia's longer term position as the world's No. 2 oil producer and exporter.

With oil being by far the world's leading source of energy, Russia is a crucial cog in the global economy. It has long been understood that Russia's status as major oil and gas exporter—and a major nuclear weapons state—insulated it from serious reprisals over Moscow's aggressive foreign policy. After February 24th, however, widespread perceptions held that Moscow had gone too far. The harm caused by Russia's invasion was being weighed against the important contributions of Russian energy exports to the world economy.

Importers of Russian energy commodities appear to be resigned that trade engagement and diplomacy have not moderated Russian behavior and are now opposed to Russian use of their energy payments to fund government and military budgets. Several importers of Russian commodities signaled a willingness to undergo the long and painful process of reducing dependence on Russia.

Russia's willingness to leverage its exports to constrain importers' freedom of action in foreign policy has been demonstrated for at least the third time. The EU experienced natural gas cutoffs in 2006 and 2009, and Gazprom began withholding gas shipments from the EU again in late 2021.¹

Oil shipments, the subject of this paper, began faltering in early March 2022 largely due to reluctance by trading and shipping firms, and as of this writing are estimated to have fallen by one-third, about 2.5 million barrels per day (Mb/d). Further disruption directed by Moscow – rather than its trading partners – or of flows through war-torn Ukraine also cannot be ruled out. Nor can it be ruled out that in a world of fungible oil that a daisy chain of trades allow additional Russian oil to find its way back into the market, albeit probably at healthy discount to other crudes.

¹ Isis Almeida. "IEA Blames Russia for Gas Squeeze Hurting European Economies." Bloomberg News. Jan. 12, 2022; <https://www.bloomberg.com/news/articles/2022-01-12/iea-blames-russia-for-gas-squeeze-hurting-european-economies?sref=Q77DYrNe>

In short, the February invasion catalyzed dissatisfaction with trade dependence into action. Until the Ukraine invasion, Russian activism in the region attracted diplomatic protests and mild sanctions from the EU and its western allies. The attack on Ukraine signals a new era, whereby import ties with Russia are being re-examined to eliminate or reduce funding ties that could support the Russian military and unwind so-called “dependence” constraints on importing country foreign policy.

Opposing Russia’s war may eventually mean that policymakers seek to reduce—or even unwind—long-running ties to Russian natural resources. The sheer magnitude of Russia’s oil exports means that there can be no easy offset in the event of a full outage. Commercial inventories are below the recent historical range. In theory, spare oil producing capacity in OPEC and strategic stocks could fully offset a loss of Russian supplies. But strategic stocks would be quickly depleted, and Saudi Arabia and other countries with spare production capacity may be reluctant to tap their surplus in the face of a new geopolitical calculus. Ramping up new supplies – in the US and elsewhere – would take time especially considering the ongoing reluctance of investors to finance new investment and the massive downsizing of the service and equipment sectors during the COVID oil-price crash. Increases in investment in US shale and elsewhere around the globe could eventually come into play over time as investment responds to higher prices, which would also accelerate demand-side adjustments, but we are talking months, maybe years, not weeks to replace any large decrease in Russian oil sales.

Longer term, the damage could extend to the Russian sector itself, possibly even stranding investment into Russian oilfields and transportation infrastructure.

This paper examines the potential for disruptions and possible direction of change in Russia’s participation in the global oil market, and in the market itself. For a companion discussion of the natural gas dimensions of this issue by the Center for Energy Studies, please see “Strategic Response Options If Russia Cuts Gas Supplies to Europe” (February 2022).²

BACKGROUND: RUSSIAN OIL SECTOR

Russia is one of the world’s largest oil producers and exporters. In 2021, the International Energy Agency (IEA) reported that Russia produced 10.5 million b/d (Mb/d) of crude oil, behind only the United States.³ Including production of other petroleum liquids, Russia was the third-largest producer (10.9 Mb/d) behind the US and Saudi Arabia. Russia was also the fourth-largest oil consumer, with 2021 consumption of 3.7 Mb/d ranking behind the US, China and India (and slightly ahead of Saudi Arabia).

Total Russian exports of crude oil and refined products were about 7.4 million b/d (Mb/d) in 2020, the most recent year for which full data is available.⁴ Russia was the world’s 2nd-largest oil exporter after Saudi Arabia. Although the US is the world’s largest oil producer it continues to import large quantities

² See Gabriel Collins et al, “Strategic Response Options if Russia Cuts Gas Supplies to Europe”, Baker Institute Working Paper, February 2022, <https://www.bakerinstitute.org/research/strategic-response-options-if-russia-cuts-gas-supplies-europe/>

³ See “Oil Market Report”, International Energy Agency, February 2022, <https://www.iea.org/topics/oil-market-report> (free summary available but subscription needed for full report and data).

⁴ BP, *Statistical Review of World Energy 2021*, www.bp.com/statisticalreview. Note that BP defines Europe to include Eastern Europe as well as EU countries, but not countries of the Commonwealth of Independent States (CIS, including Ukraine).

of foreign crude that better fit US refinery configurations than domestic shale oil.⁵ Separating exports of crude oil and refined products, Russia was the 2nd-largest crude oil exporter (5.2 Mb/d) after Saudi Arabia, and the 2nd-largest refined product exporter (2.2 Mb/d) after the United States.

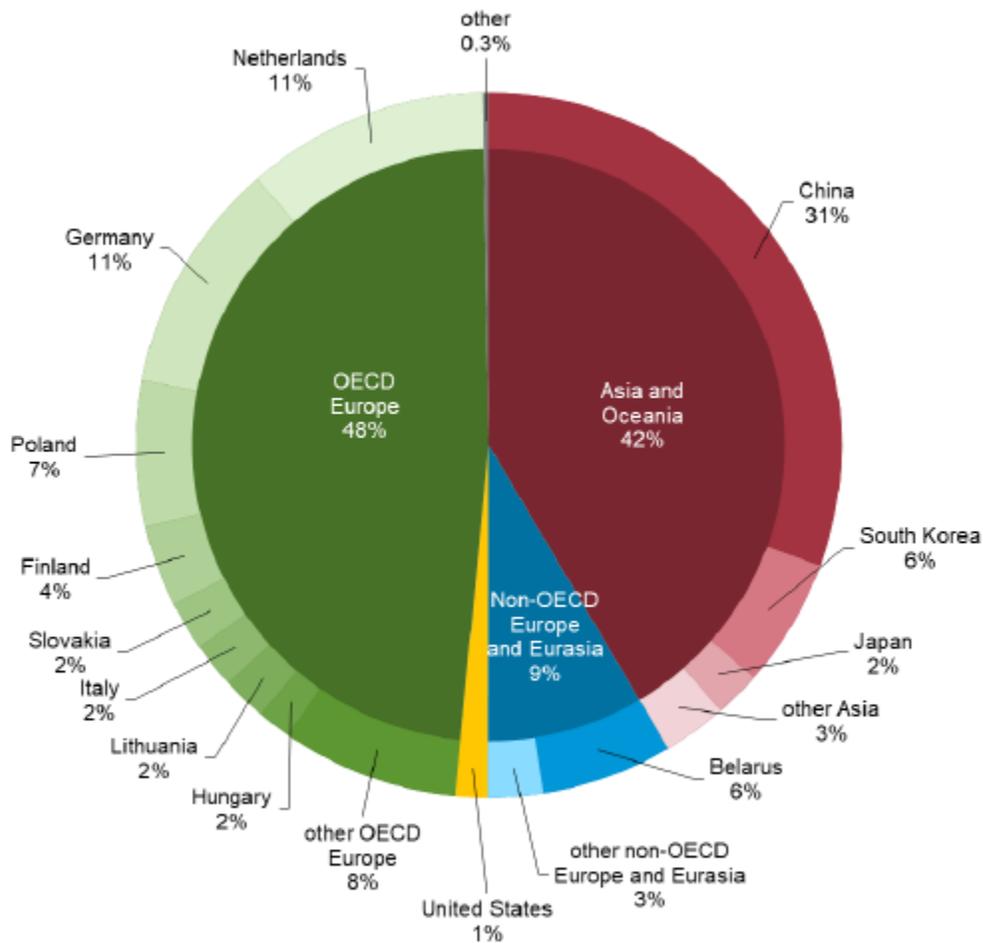
Table 1: Initial data on crude oil and refined products

Russian exports (Mb/d, 2020)	Crude	Refined products	Total
<i>Destination (below)</i>	5.2	2.2	7.4
To Europe	2.8	1.1	4.0
Share of Europe's imports	29%	39%	31%
Share of Russia's exports	53%	54%	53%
Share of world			
Trade	12%	10%	11%
Consumption			9%

Source: BP (2021)

As Table 1 and Figure 1 show, Europe is by far Russia's largest crude oil and refined product export market, accounting for just over half of Russian exports of crude oil and refined products. Russia's 2nd-largest customer for crude oil is China (accounting for about one-third of Russian crude oil exports). The US is Russia's 2nd-largest customer for refined products (accounting for about 20% of Russian refined product exports), and a small importer of Russian crude, although crude imports did more than double in 2021 (see below).

⁵ The competitiveness of US refiners also allows the country to be a significant net exporter of refined products.



 Source: Graph by the U.S. Energy Information Administration, based on Russian export statistics and partner country import statistics from Global Trade Tracker

Figure 1: Russian crude oil and condensate exports in 2020 by destination country (Source: US Energy Information Administration)

Nearly 60 percent of Russian crude oil exports were delivered by seaborne tanker ship, equivalent to roughly 3 Mb/d, according to the US Energy Information Administration (EIA).⁶ Departure ports are spread geographically from the Barents and Baltic Seas to the Black Sea and Pacific Ocean. The remaining crude exports travel via pipelines, mainly the Druzhba pipeline to Europe and the Mohe-Daqing pipeline to China.⁷ About half of Russia's refined product exports go to destinations without a land connection to Russia, implying tanker shipment, BP data show.⁸ The Caspian Pipeline Consortium

⁶ See "Country Analysis Executive Summary: Russia", US Energy Information Administration, December 13, 2021, https://www.eia.gov/international/content/analysis/countries_long/Russia/russia.pdf

⁷ See Elsie Hung, *China Energy Map (v. Apr 2021)*, Baker Institute Center for Energy Studies, <https://www.bakerinstitute.org/chinas-energy-infrastructure/>.

⁸ Additional seaborne exports of refined product to Europe are not included in this estimate. EIA (previously cited) also reports that a rail terminal allows a small amount of liquid propane gas (LPG) and propylene to be exported to China.

also crosses Russian territory, carrying roughly 1.2 Mb/d (largely Kazakh oil) to a Black Sea export terminal.⁹

Table 2. Russia's seaborne crude oil exports by port terminal, 2020

thousand barrels per day

Port terminal	Crude oil exports
Primorsk	616
Nakhodka	611
Novorossiysk	459
Ust-Luga	437
Murmansk	271
Sokol Sakhalin	265
Varandey	221
Others	127

Source: Table by the U.S. Energy Information Administration, based on data from Clipperdata

Figure 2: Seaborne shipments from various Russian terminals. (Source: US EIA Russia Country Analysis Brief Dec 13, 2021; <https://www.eia.gov/international/analysis/country/RUS>)

The main Russian crude oil export is the medium-grade, high-sulfur (or “sour”) Urals Blend which accounted for roughly 3 Mb/d of exports last year, according to SPGlobal Platts.¹⁰ The remainder is primarily East Siberian Light (primarily for Asian consumers) and Siberian Light, both low-sulfur (or “sweet”) crude blends.

Discussions of Russian energy politics tend to revolve around natural gas exports, which have been more geopolitically contentious. From the standpoint of importance to Russia’s economy, however, oil exports are far more important—responsible for about three times the revenue contribution of natural gas. Oil exports brought Russian firms nearly \$180 billion in revenues in 2021, accounting for more than a third of the country’s total export revenues. Of the proceeds from oil, roughly 60% arose from crude exports and the remainder from refined products.¹¹

⁹ See Ron Bousso and Dimitry Zhdannikov, “EXCLUSIVE Kazakh oil flows caught in Russian export problems, traders say”, Reuters, March 1, 2022, <https://www.reuters.com/business/energy/exclusive-kazakh-oil-flows-caught-russian-export-problems-traders-say-2022-03-01/>

¹⁰ See “Platts periodic table of oil”, S&P Global Platts, accessed online March 3, 2022, https://www.spglobal.com/platts/plattscontent/assets/files/downloads/crude_grades_periodic_table/crude_grades_periodic_table.html

¹¹ Official data cited by Reuters: See Vladimir Soldatkin, Darya Korsunskaya, Oksana Kobzeva and Elena Fabrichnaya, “Factbox: Russia's oil and gas revenue windfall”, January 21, 2022, <https://www.reuters.com/markets/europe/russias-oil-gas-revenue-windfall-2022-01-21/>

Oil also plays a key role in financing the Russian Federal budget, accounting for about one-third of government revenues in 2020, according to the IMF (and for about 40% in 2019, before the COVID-driven oil price collapse in 2020).¹²

Key markets for Russian exports

EUROPE: Within Europe, dependence on Russian crude oil and refined products varies greatly, with countries in Eastern Europe generally more reliant on Russia. The Soviet-era Druzhba (*Friendship*) pipeline, which first shipped oil in 1962, still supplies refineries in Germany, Poland, Hungary, Slovakia and the Czech Republic.¹³ Druzhba throughput has fallen in recent years as European refiners have diversified sources of supply: 2021 deliveries of just over 700,000 b/d were 40% below the post-Soviet peak in 2006.¹⁴ Roughly 250,000 b/d transits the southern leg of the pipeline, which flows through Ukraine, with the remainder flowing via the northern leg.¹⁵

UNITED STATES: On a net basis, the United States is self-sufficient in oil, but it is both a large gross importer and exporter of oil (including crude and refined products). Gross US oil imports in 2021 were 8.5 Mb/d (as were gross exports of oil and refined products). Of that, Russia was the No. 3 source, sending about 8 percent of gross imports, or nearly 700,000 b/d.¹⁶ Russia trailed only Canada (4.3 Mb/d) and Mexico (720,000 b/d) in the US market.

Russian exports to the US have nearly doubled since 2018, mainly substituting for lost supply of heavy crudes from Venezuela, blocked by a US import ban. More than half of Russian shipments consisted of “unfinished oils”—largely a heavy, low quality fuel oil known as *Mazut* produced by Russian refineries that lack capacity to upgrade it into more valuable gasoline and diesel, whereas US Gulf Coast refiners with sophisticated upgrading capacity process such capacity. Russia accounted for two-thirds of all US imports in this unusual category.

¹² See International Monetary Fund European Department, “Russian Federation : 2020 Article IV Consultation-Press Release; Staff Report”, February 9, 2021, <https://www.imf.org/en/Publications/CR/Issues/2021/02/08/Russian-Federation-2020-Article-IV-Consultation-Press-Release-Staff-Report-50068>

¹³ See Julian Lee, “Russia and Europe Are Vital to Each Other When It Comes to Oil”, *Bloomberg*, February 10, 2022, <https://www.bloomberg.com/news/articles/2022-02-10/russia-and-europe-are-vital-to-each-other-when-it-comes-to-oil?sref=QwrQX1nz> (subscription required).

¹⁴ See Bloomberg item cited above.

¹⁵ Seaborne exports from Russia also supply refineries in Western Europe. Exports of refined products to Europe consist largely of fuel oil and especially diesel, with many Eastern Europe countries heavily dependent on Russian fuels. See “IEA closely monitoring Russia situation and its implications for energy markets”, IEA press release, 22 February 2022, <https://www.iea.org/news/iea-closely-monitoring-russia-situation-and-its-implications-for-energy-markets>

¹⁶ “US Imports by Country of Origin”, US Energy Information Administration, accessed online 23 February 2022. See https://www.eia.gov/dnav/pet/pet_move_impcus_a2_nus_ep00_im0_mbbldpd_m.htm and related pages. Regional figures are based on PADD data: East Coast (PADD 1); Gulf Coast (PADD 3); and West Coast (PADD 5). Note that in the first eleven months of 2021, the US was a small **net** oil exporter, with **gross** imports 8.4 Mb/d of crude oil and refined products offset by gross exports of 8.5 Mb/d.

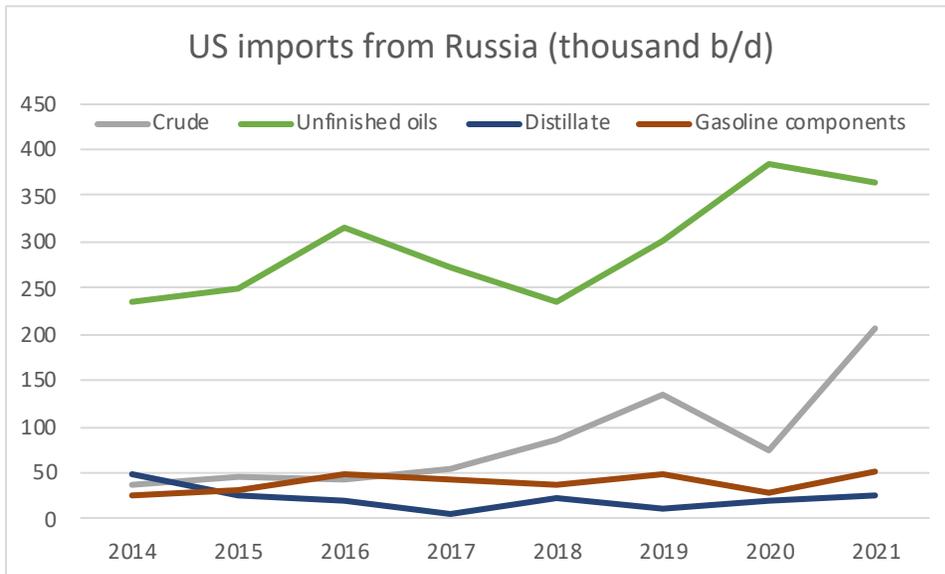


Figure 3: Source: US Energy Information Administration

Elsewhere in the US, the West Coast saw a small but noticeable increase in imports of Russian crude oil (just over 100,000 b/d, nearly 10% of the region’s total crude oil imports). Gasoline was the East Coast’s main import from Russia, amounting to about 70,000 b/d, or 10% of the region’s gasoline imports.

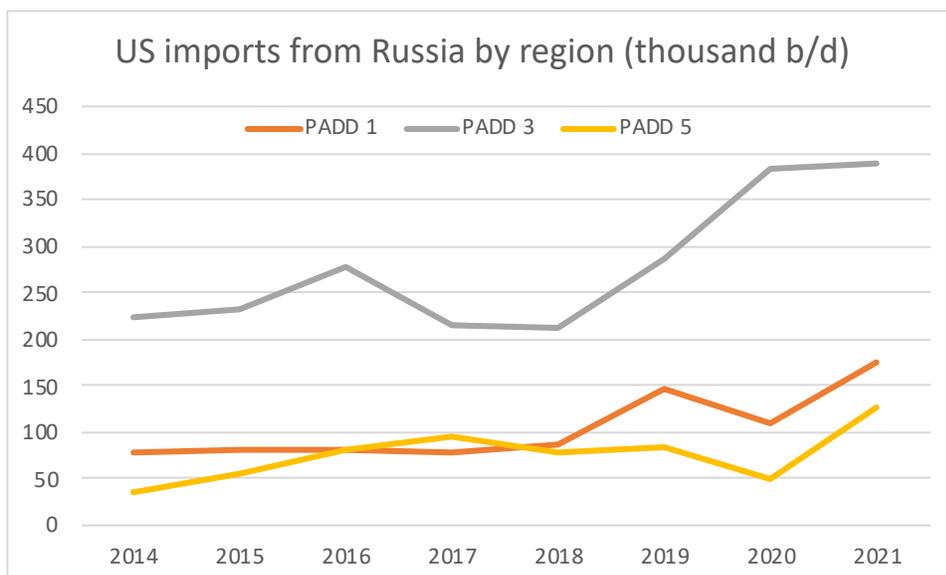


Figure 4: Source: US Energy Information Administration. PADD 1 is the US East Coast; PADD 3 the Gulf Coast; and PADD 5 the West Coast

Finally, while the annual average for US imports from Russia rose significantly in 2021, monthly data shows that imports peaked mid-year and had fallen by half by December (the most recent month for which EIA as reported data).¹⁷

CHINA: China was a much larger importer of Russian oil than the US, taking about 1.7 Mb/d of oil from Russia in 2020. Nearly all of that came in the form of crude oil. Russia accounted for about 15% of total Chinese oil imports and was China’s second largest oil supplier, just behind Saudi Arabia (which shipped 1.8 Mb/d to China, again largely in the form of crude oil).

SANCTIONS AND POTENTIAL DISRUPTION OF RUSSIAN OIL EXPORTS

At the time of writing, the West and its allies had refrained from direct sanctions on Russian exports of energy commodities—whether oil, natural gas or coal. Both President Biden and President Putin have to date stated that they did not intend to interfere with Russian energy exports. Russia’s role in global energy markets is large enough that an abrupt halt—particularly when markets are tight—would cause widespread hardship and provide another disruptive hit to a global economy already dealing with pandemic, inflation, and supply chain shortages.

However, given the importance of oil to Russia’s government and economy, sanctions on oil and natural gas cannot be ruled out. Also possible are Russian export embargoes to certain customers, in the manner of those seen in the 1973-74 Arab oil embargo, where exports to the United States and the Netherlands were halted. Other disruptions are also possible. Oil pipelines crossing Ukraine could be blocked or sabotaged given the ongoing fighting.

Russian exports could be indirectly disrupted by western sanctions on Russian banks or the SWIFT payment system, or simply by an unwillingness of tanker firms or traders to handle Russian crudes. Indeed, reluctance among shippers and trading houses to handle Russian oil is already cutting into exports – which as of this writing have fallen by an estimated one-third, or 2.5 Mb/d—and causing the Urals blend to trade at record discounts to the regional crude benchmark, Brent.¹⁸

Were oil flows disrupted, which countries might attempt continued imports of Russian oil? Which would be expected to look elsewhere for supplies? What other coping mechanisms are available for oil consumers? This section examines the oil market’s capacity for dealing with a potential disruption of Russian supplies.

Figure 1 (above) details Russia’s 2020 oil customer base. The majority of Russian exports—some 57 percent—appeared at risk because they flowed to countries that have signaled support for Ukraine. Even if shippers were willing to deliver Russian crudes, these markets might become unwilling to accept those cargoes if sanctions escalate or governments pressure companies to stop imports of Russian cargoes even without an official sanction of Russian oil exports. Friendly importers such as China (31%, according to EIA) and Belarus (6%) appear most likely to retain Russian supply, given sufficient

¹⁷ See US Energy Information Administration, “US Imports by Country of Origin” (previously cited)

¹⁸ Sherry Su and Alex Longley, “Oil Trader Trafigura Offers Russia’s Crude at a Record Discount.” Bloomberg News, March 3, 2022; <https://www.bloomberg.com/news/articles/2022-03-03/oil-trader-trafigura-offers-russia-urals-at-new-record-discount?sref=Q77DYrNe>

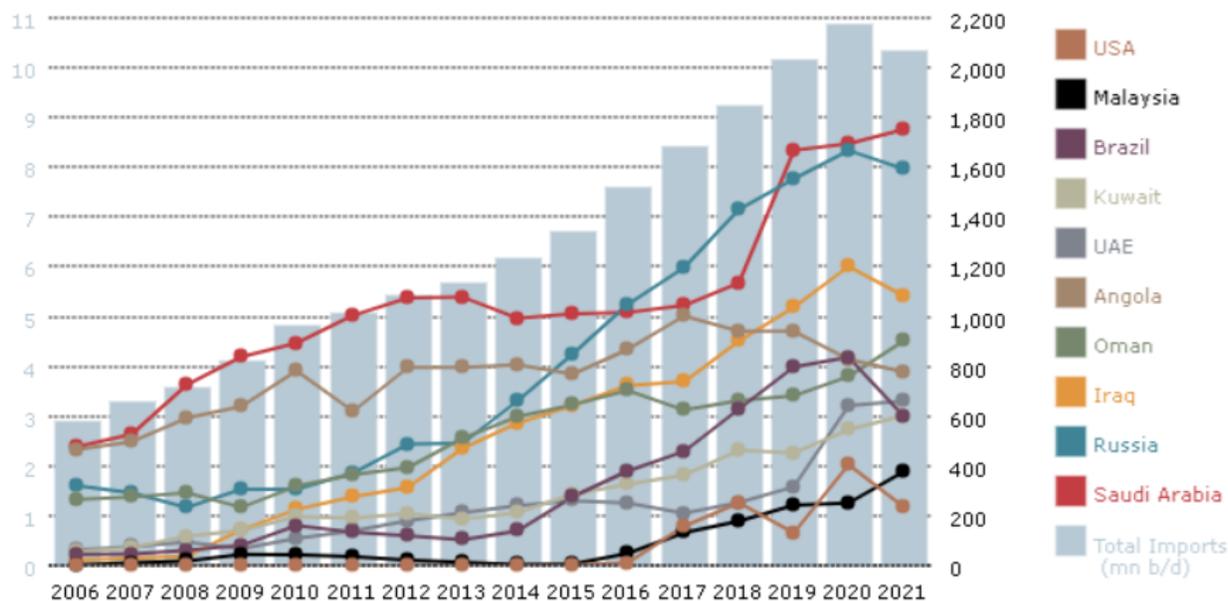
conveyance. Other likely “friendlies” include non-OECD importers in Asia and Europe, such as Myanmar, Moldova, and perhaps India, Vietnam and others.

That means restrictions on Russian oil movements could trigger a broad reshuffling of cargoes and pipeline flows across the global oil market. On the one hand, “unfriendly” importers in Europe and the OECD might reduce or eliminate imports of Russian crude and seek replacement sources, to the extent that refining and import capacity and contractual commitments allow. With most global refiners optimized to process particular crude streams, such a large disruption of global flows could cause substantial dislocations in both crude quality differentials and refining margins, and individual countries—and companies—that lack flexibility could be much more exposed than the overall global market. A further complication could be the ability of Russia to find tankers to handle shipments that previously moved to Europe via pipeline, particularly for crude oil. Transit times from Western Russia to Asia would also tie up tankers for longer than if the ocean routes were to Europe or North America.

On the other hand, “friendly” importers equipped to handle Russian crude grades would probably increase their imports—although almost certainly demanding discounts in return. China and perhaps India and other emerging markets could become more important destinations for Russia, taking cargoes that might otherwise have gone to OECD Europe and Asia.

Amid such a shift in export destinations, Russia’s magnitude as a global oil mainstay may decline slightly, and some supplies may be lost to the market. These might be due to reduced offtake from pipelines such as the 750,000 b/d [Druzhba pipeline](#), as well as reduced willingness among traders to take Russian cargoes due to sanctions exposure. A lack of access to alternative crude sources would likely pose significant risks to Central European refiners as well as regional refined product markets.

Of course, any Chinese pivot toward Russian oil would also displace cargoes from Middle Eastern exporters, currently the biggest suppliers to Asia. Data from MEES (Fig.5, below) shows that Russia was China’s No. 2 supplier last year, just behind Saudi Arabia, with Iraq at No. 3. Cargoes from the Middle East would presumably be rerouted to OECD Europe, OECD Asia as well as the United States, substituting for lost Russian supply.



TOP 10 FOR 2021. SOURCE: CHINA CUSTOMS. MEES.

Figure 5: China's top 10 oil suppliers in 2021 and their deliveries to China since 2006. (Source: MEES 2022)

In practice, an Asia-Europe crude swap would be difficult. Middle East suppliers have worked hard to build strategic relationships in Asia. Most would be reluctant to sacrifice access to the younger and more dynamic market in Asia, particularly in exchange for greater exposure to the moribund European market, which is in the process of jettisoning fossil fuels entirely.

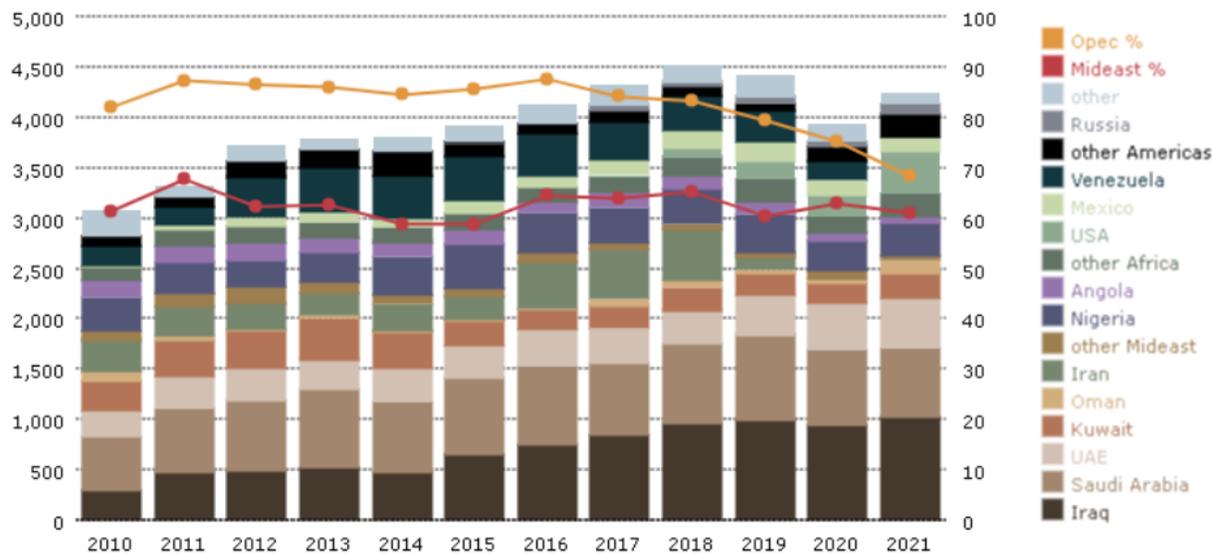
Further, China, India, Vietnam and other Asian countries have built new refineries optimized for Middle Eastern crudes. Russian crude may not be a good match.

Discounts could tilt the balance. China has already proved itself willing to buy crude oil in contravention of US sanctions. Fig. 5 (above) shows that China's imports have been growing from Oman and Malaysia, which MEES attributes to illicit transshipments of sanctioned Iranian and Venezuelan crudes. In 2021, China made no attempt to disguise a direct import of a 1.9 million barrel tanker-load of crude from Iran, MEES reports.¹⁹ Earlier analyses suggested China was taking as much as 900,000 b/d of Iranian crude in late 2020 and early 2021, disguised as imports from Oman, the UAE, Iraq, Malaysia and Indonesia.²⁰

¹⁹ MEES, "China 2021 Crude Imports: Saudi Top as Iran Volumes Rise." Volume: 65 Issue: 03, Jan. 21, 2022; <http://archives.mees.com/issues/1938/articles/60490>

²⁰ MEES, "China Crude Imports: Bumper Volumes From 'Iran Surrogate' Suppliers." Volume: 64 Issue: 12, March 26, 2021; <http://archives.mees.com/issues/1896/articles/59478>

3: INDIA CRUDE IMPORTS ('000 B/D): OPEC SHARE AT RECORD LOW DESPITE IRAQ & UAE GAINS



SOURCE: INDIA COMMERCE MINISTRY, MEES.

Figure 6: Crude imports to India by country, since 2010 (Source: MEES 2022)

Indian imports of Russia oil were small but rising. India imported just over 100,000 b/d of Russian crude in 2021, a small amount but nearly double increase over the average 54,000 b/d of the prior four years, MEES data show. Indian supplies are currently dominated by Iraq, Saudi Arabia and the UAE.

SANCTIONS: THEN AND NOW

While energy has so far been exempted, the latest round of economic sanctions being levied on Russia are far more robust and disruptive than those imposed in the wake of Russia's 2014 invasion of Crimea and support for Russian separatists in eastern Ukraine.

In 2014, the Obama administration enacted three rounds of sanctions on a narrow range of Russian individuals and companies involved in the invasion of Crimea and the backing of pro-Moscow separatists inside Ukraine. The 2014 penalties on Russia were far less onerous than those Washington imposed on North Korea, Iran and Venezuela.

Sanctions targets included 14 Russian defense companies and individuals in Putin's inner circle; suspension of some financing for six Russian banks and four energy firms; suspension of export credit finance for US exports to and development projects in Russia. The final round of 2014 sanctions prohibited other countries from re-exporting US technology, goods and some services to Russia, including in oil and gas exploration and production.²¹

²¹ US Department of State, "Ukraine and Russia Sanctions." (Undated); <https://2009-2017.state.gov/e/eb/tfs/spi/ukrainerrussia/index.htm>

Negative effects were clear but limited to pushing Russia into a two-year recession and undercutting a modest measure public support for Putin. Public opposition was largely attributed to the ruble's devaluation and loss of purchasing power, rather than opposition to Russian interference in Ukraine.²²

The 2022 sanctions, by contrast, have already wreaked far more damage to Russia's economy and society than those eight years earlier. This time, the US was joined by the EU, as well as the UK, Japan, Canada, Australia, New Zealand, Taiwan, Switzerland and other countries. The combined measures broadly targeted Russia's financial system including its central bank, even preventing some Russian banks from accessing the SWIFT system. Other sanctions halted the opening of the giant Nordstream 2 Russian gas pipeline to Germany; closure of airspace to Russian flights; ban on exports of computer equipment, aircraft parts and dual-use goods and software; blacklisting and asset seizures of hundreds of prominent Russian individuals and companies; and the closure of Russian banking operations in the United States and Britain.²³

The deep intensity of such measures was felt nearly immediately, resulting in devastated valuations of the Russian ruble and shares on the Russian stock exchange, as well as in bond ratings. Within days, financial advisers were describing Russia as "uninvestable," with foreign funds blocked from making an exit due to Russia's emergency currency controls.²⁴

Further escalatory measures under discussion included direct curbs on energy exports and a full disconnection of Russia from the Belgium-based SWIFT interbank communication system. Either action would cut deeply into oil exports, since disconnection from the SWIFT system would temporarily prevent Russian exporters from receiving payment. Both options were described as too potentially damaging for EU countries already undergoing energy shortages.

SPARE PRODUCTION CAPACITY

The oil market has a long history of volatility. As a result, the global marketplace has built in shock-absorbers that provide flexibility to deal with unexpected fluctuations in supply or demand. Commercial storage of oil is a key asset in this regard. The IEA estimates that commercial inventories among its member countries at year-end 2021 stood at 2.7 billion barrels, sufficient to meet nearly 60 days of members' consumption. That figure sounds substantial but actually lies below the five-year average.²⁵

Large disruptions typically trigger action by oil producing countries to start up any spare production capacity held in reserve. Historically, most of this was held in OPEC member countries in the Middle East. For instance, when Iraqi and Kuwait supplies were disrupted in 1990, Saudi Arabia tapped spare production capacity to raise output by over 2.5 million b/d within two months.²⁶ A reduction of Russian

²² David Leonhardt, "Can Sanctions Work?" New York Times, Feb 23, 2022;

<https://www.nytimes.com/2022/02/23/briefing/sanctions-russia-us-europe.html>

²³ "Factbox: Russia hit with sanctions from around the world after Ukraine invasion." Reuters, March 2, 2022;

<https://www.reuters.com/markets/europe/russia-hit-with-sanctions-around-world-after-ukraine-invasion-2022-03-02/>

²⁴ Ishika Mookerjee and Srinivasan Sivabalan, "Russian Markets Are Becoming Uninvestable as Sanctions Bite.

Bloomberg News, Feb. 28, 2022; <https://www.bloomberg.com/news/articles/2022-03-01/russian-markets-start-to-look-uninvestable-as-sanctions-bite?sref=Q77DYrNe>

²⁵ See "Oil Market Report", International Energy Agency, February 2022, <https://www.iea.org/reports/oil-market-report-february-2022>

²⁶ See McNally, Robert, "Crude Volatility", Columbia University Press (2017), p157.

oil exports is exactly the sort of event that spotlights OPEC and particularly Saudi Arabia, the cartel’s de facto leader and the world’s primary holder of spare production capacity.

There is little doubt the Saudis could help calm oil markets. EIA estimates that OPEC held about 4 million barrels per day of spare oil production capacity as of February 2022.²⁷ Most of that, just over 2 Mb/d, was in Saudi Arabia. That’s insufficient to replace any loss of Russian exports—not even Russian oil exports to Europe—but enough to cover partial losses or assuage the current “risk premium” in oil markets.

Based on the current OPEC+ schedule of production increases to fully unwind the earlier COVID-related cuts, the cartel plans to add modest 400,000 b/d in monthly increments for a total of 2.8 Mb/d in additional production between February and September, at which point the COVID-related production cuts instituted in 2020 would be fully removed.²⁸ OPEC reaffirmed that plan on March 2. Roughly one-fourth of that increase was to have come from Russia, which may now be in question.

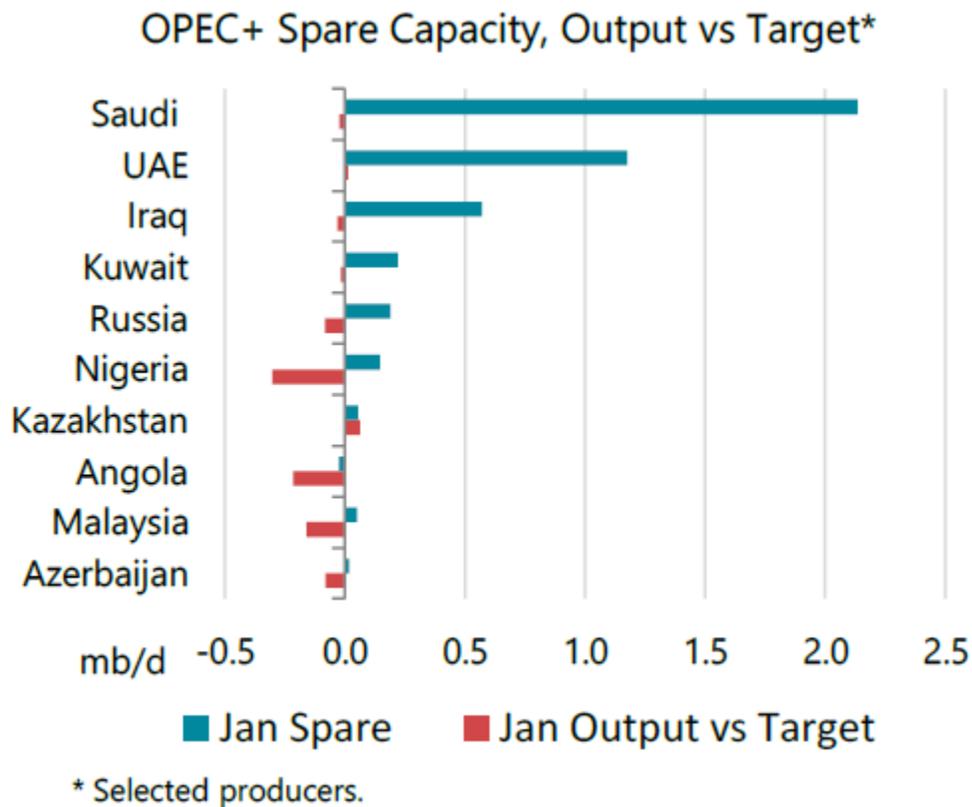


Figure 7: Spare production capacity among OPEC members not under US sanctions. (Source: Reuters <https://www.reuters.com/business/energy/saudi-arabia-uae-could-ease-oil-market-volatility-iea-says-2022-02-11>)

²⁷ See US Energy Information Administration, Short-term Energy Outlook, Table 3.c, “OPEC Crude Oil (excluding condensates) Production, accessed March 6, 2022 https://www.eia.gov/outlooks/steo/data/browser/#/?v=7&f=M&s=&start=201701&end=202312&id=&maptype=0&ctype=linechart&linechart=COPR_AG

²⁸ See OPEC press release, July 18, 2021, https://www.opec.org/opec_web/en/press_room/6512.htm

In addition, Saudi Arabia has historically maintained an additional increment of spare production capacity beyond normal production needs as a security buffer. National oil company Saudi Aramco describes its maximum sustainable capacity at 12 Mb/d.²⁹

However, many analysts doubt OPEC holds that much spare capacity since many member countries were already struggling to meet increasing production quotas in 2022. (Fig. 7 below) Some believe that the current OPEC+ plan to increase output would deplete most spare capacity by late 2022.³⁰

Another significant source of unused oil production capacity that could come onstream quickly is held by Iran, currently being blocked by US sanctions. A return of the United States to the nuclear agreement with Iran known as the Joint Comprehensive Plan of Action or JCPOA could trigger a significant return of Iranian supply.

Iranian crude production already increased by 500,000 b/d in 2021, bringing February 2022 output to some 2.5 Mb/d. A full removal of sanctions could see another 1 Mb/d or more of additional Iranian supply flowing to market, based on Iran's pre-sanctions production of about 3.8 Mb/d and assuming that shut-in capacity has been maintained. Moreover, Iran has stored large quantities of oil on tankers in anticipation of the removal of sanctions—an additional increment that could come to market relatively quickly.³¹ Finally, Venezuela may have capacity to deliver a small increase in oil production as well if sanctions were lifted, although a lack of investment and maintenance make it difficult to assess with confidence.

If estimates of OPEC spare capacity are accurate and OPEC members were willing to fully utilize it—see further discussion below—adding the potential for Iranian supply means an additional 5 Mb/d of oil production could plausibly be brought onstream to replace lost Russian capacity.

Other emergency measures

A third source of emergency oil also exists in the so-called strategic stockpiles. Members of the IEA have developed emergency plans for dealing with an oil supply disruption around a cooperative framework involving a combination of strategic oil stockpiles, fuel switching, demand restraint and policy measures.

The most prominent (and most frequently employed) dimension of this program are strategic stocks. In IEA member countries, these amount to roughly 1.5 billion barrels, with the US and Japan holding by far

²⁹ See “Ministry of Energy directed Saudi Aramco to raise maximum capacity”, Saudi Arabian Oil Company press release, March 11, 2020, <https://www.aramco.com/en/news-media/news/2020/aramco-to-raise-maximum-capacity>

³⁰ See Ashitha Shivaprasad, “JP Morgan sees OPEC spare capacity falling through 2022”, Reuters, January 12, 2022, <https://www.reuters.com/business/jp-morgan-sees-opec-spare-capacity-falling-through-2022-2022-01-12/>

³¹ See Bozorgmehr Sharafedin, “FACTBOX-Iran stores more oil on tankers as nuclear talks with US enter final stage”, Reuters, February 7, 2022, <https://www.reuters.com/article/iran-oil-storage/factbox-iran-stores-more-oil-on-tankers-as-nuclear-talks-with-us-enter-final-stage-idUKL1N2UIONG>

the largest stockpiles (585 million and 490 million barrels, respectively).³² The US Strategic Petroleum Reserve (SPR) holds a third of the IEA stocks. IEA member countries in March announced plans to tap 60 million barrels from strategic stockpiles to address market concerns about supply vulnerability, with half the increment coming from the US SPR.

Outside the IEA, strategic stocks are also held by China and India. China does not report the size of its strategic stockpile, but previous statements indicated that the national objective was to have a capacity of 500 million barrels; India's reported stockpile is much smaller, about 35 million barrels.³³

The US SPR homepage says that, once a decision is made to release strategic stocks, deliveries can begin in as few as 13 days, and that oil can be pumped from the reserve at a maximum rate of 4.4 Mb/d for "up to 90 days, then the drawdown rate begins to decline as storage caverns are emptied."³⁴

This maximum withdrawal rate, however, has never been utilized. Some analysts doubt that such a large withdrawal is realistic. Many countries have proved unwilling to release strategic stocks aggressively in a crisis, fearing a depletion of emergency reserves should events deteriorate further.

IEA protocols call for strategic stockpiles to be released in a coordinated fashion to minimize the problem of "free riders." Examples of coordinated actions include the Gulf War in 1991, the aftermath of hurricanes Katrina and Rita in 2005, and the Libyan civil war in 2011.³⁵ In late 2021, the US led a release of strategic stocks by countries including Japan, Korea but also non-IEA members China and India, and outside the IEA protocols in response to rising oil prices.

Beyond strategic stocks, IEA member countries have developed programs for emergency fuel switching, conservation (or "demand restraint") and policy relief. **Fuel switching** measures include the potential to

³² For Japan, see Aaron Sheldrick and Chang-Ran Kim, "Japan PM confirms oil reserve release in response to U.S. request", Reuters, November 24, 2021, <https://www.reuters.com/markets/commodities/japan-pm-confirms-oil-reserve-release-response-us-request-2021-11-23/>

³³ Data on China's strategic stockpile is not publicly available; Chinese officials have previously stated an intention to build capacity of 500 million barrels, and in 2016-17 stated that state reserves approached 300 million barrels. China was widely seen as adding to strategic stocks when oil prices fell in 2020. See for example Michael Lelyveld, "China Sells Strategic Oil As Prices Surge", Radio Free Asia, October 18, 2021, https://www.rfa.org/english/commentaries/energy_watch/oil-10082021100712.html. For India, see Utpal Bhaskar, "India to leverage low prices to fill strategic crude oil reserves, Mint, March 17, 2020, <https://www.livemint.com/news/india/india-to-leverage-low-prices-to-fill-strategic-crude-oil-reserves-11584431985105.html>

³⁴ "Frequently asked questions", US Department of Energy Office of Fossil Energy and Carbon Management Strategic Petroleum Reserve, (accessed March 3, 2022, <https://www.energy.gov/fecm/strategic-petroleum-reserve-3>

³⁵ Last year, however, the United States announced a coordinated release of strategic stocks with several countries including non-IEA countries China and India, but without the IEA's involvement. See "President Biden Announces Release from the Strategic Petroleum Reserve As Part of Ongoing Efforts to Lower Prices and Address Lack of Supply Around the World", White House statement, November 23, 2021, <https://www.whitehouse.gov/briefing-room/statements-releases/2021/11/23/president-biden-announces-release-from-the-strategic-petroleum-reserve-as-part-of-ongoing-efforts-to-lower-prices-and-address-lack-of-supply-around-the-world/> and <https://www.iea.org/news/iea-statement-on-us-announcement-of-oil-release>

replace oil with other fuels—such as using natural gas instead of oil for electricity generation.³⁶ **Demand restraint** measures can range from public information campaigns (for example, to ensure vehicle tires are properly inflated to improve efficiency³⁷) to rationing – a practice that has not been widely used in the US since the oil shocks of the 1970s. Finally, **policy** relief can include measures such as the temporary relaxation of environmental regulations.³⁸

The short-term impact of such measures is difficult to quantify because they are generally employed amid higher oil prices, which also incentivize fuel switching and conservation.

CAUGHT IN THE MIDDLE: SAUDI ARABIA AND THE UAE

While the oil market has a plethora of impressive backstops—particularly OPEC’s spare production capacity—geopolitical complications have begun to interfere.

An important one is the onset of strategic cooperation between Russia and Saudi Arabia. The onetime rival producers have steadily ramped up oil market cooperation since 2016. That cooperation appears to have rendered Saudi Arabia more cautious about taking sides against Russia, even after the Russian invasion. In the event of a decline in Russian exports, the Saudis would be cautious about timing and rationale for an offsetting increase so as not to face accusations of “stealing” Russian market share. The United Arab Emirates, another big producer with spare capacity, is also increasingly close to Russia.

Both Saudi Arabia and the UAE have demonstrated a new reluctance to join anti-Russia condemnation. The UAE, a rotating member of the UN Security Council, abstained from a vote demanding Russia stop its attack on Ukraine. The UAE’s abstention came alongside those of China and India.³⁹ A week later, the UAE reversed itself at the UN General Assembly and voted to condemn Russia’s invasion.

The voting debacle illustrates the tension in which the UAE and Saudi Arabia find themselves. Both governments need to retain strong ties with the US and EU on one side, and China and Russia on the other. Riyadh and Abu Dhabi also seek to preserve the cooperation of the Russia-led OPEC+ countries that help balance the oil market.

This is a new dynamic. Saudi foreign relations were never a problem for US intervention in the past. At one time or another, Saudi has stepped up to replace lost exports from Iraq, Kuwait, Libya, Venezuela and Iran.

³⁶ However, structural changes in oil markets in recent decades mean that very little oil is used for power generation—less than 1 Mb/d among IEA member countries, much of which is in remote areas with no other options for power generation. The potential for switching away from oil may be greater in non-IEA countries, where a greater volume of oil is used in power generation.

³⁷ For example, see “Keeping your vehicle in shape”, US Department of Energy, <https://www.fueleconomy.gov/feg/maintain.jsp> and “Saving oil in a hurry”, *Insights Series 2018*, International Energy Agency, 2018, https://iea.blob.core.windows.net/assets/194d57e4-9126-425f-a1b3-7a25e097b677/Insights_Series_2018_Saving_Oil_in_a_Hurry.pdf

³⁸ For example, see “Fuel Waivers”, US Environmental Protection Agency, accessed online March 3, 2022, <https://www.epa.gov/enforcement/fuel-waivers>

³⁹ “Russia blocks Security Council action on Ukraine.” UN News, Feb. 26, 2022; <https://news.un.org/en/story/2022/02/1112802>

It's even safe to say that prior US sanctions on Russia would have been supported by the Saudis. Riyadh and Moscow were vehement ideological foes during the Cold War, when Washington and Riyadh engaged in lock-step opposition to what was then the Soviet Union.

Since the onset of US shale oil production—after the demise of the Soviet Union—Saudi Arabia and OPEC have found common cause with Moscow. The US crude oil flooding the global oil market since 2010 undercut OPEC's ability to balance global markets. The Saudis needed help to regain influence over prices. With Iran under sanctions, Venezuela in social collapse, and the US seeking to pivot its strategic relationships away from the Middle East, [Riyadh turned to Russia](#).

Moreover, both countries have been shaken by a lack of US support in recent years. After Iran attacked Saudi oil facilities including the critical processing junction at Abqaiq, the Saudis were unnerved by President Trump's refusal to enforce longstanding US policy (the so-called Carter Doctrine) calling for a military response to such attacks. Emirati officials have been upset with the Biden Administration's refusal to label Yemen's Houthis a terrorist group after attacks on Abu Dhabi and Dubai.

Cooperation with Russia has also been fruitful. With Russia's help, Saudi-led OPEC has successfully managed oil markets through unprecedented turbulence, including the [2019 attacks](#) on Saudi oil infrastructure—credibly attributed to Iran—and the COVID pandemic. It wasn't always smooth. A disagreement led to a brief price war in 2019 that sent [US oil futures to -\\$37](#) for a day. But by and large, Saudi-Russian production cuts were a stabilizing force.

There are limits to this rapprochement. Saudi Arabia still sees itself as the oil market's central banker. If a loss of Russian supplies threatened world economic growth via sharply higher oil prices, Saudi Arabia could be expected to lead OPEC to increase production from its buffer of spare capacity. Maintaining global economic stability remains the paramount concern. As of early March, the oil market had not yet reached this threshold in the eyes of Saudi leaders.

Despite all this recent change, Riyadh and Washington retain longstanding strategic ties—diplomatically and militarily. Relations have cooled since the Saudi murder of Jamal Khashoggi and the election of President Biden, but the US continues to spend \$100 bn appears to adhere to the [Carter Doctrine](#) of 1980, which says that Washington will respond militarily to a threat to the Persian Gulf.

From the US perspective, current tensions with the Saudis and Emiratis reflect ongoing efforts across several Administrations to strategically “pivot” away from the region, both in terms of military/strategic engagement as well as energy. For the Trump Administration, a particular focus on US energy dominance; for the Biden Administration, the intent was to raise the profile of climate issues and de-emphasize fossil fuels. Yet both narratives have stumbled on the reality that oil remains the largest energy input for the US (and global) economy, and that prices ‘at the pump’, driven by global market developments, remain a bell-weather of national well-being—even though the US is now self-sufficient, and a major producer of renewable energy.

CONCLUSION: Can global oil markets cope without Russia?

Bringing together the world's spare oil production capacity with withdrawals from strategic stocks and imposing emergency measures could *in theory* temporarily offset a complete cessation of Russian oil

exports. But the system has never been tested to such an extreme. Moreover, human behavior in a crisis frequently complicates the market and policy response in a crisis, as consumers are tempted to hoard fuel—which further exacerbates the shortage.

Given today's starting point of a tight global oil market balance, any disruption – or perceived risk of disruption – would trigger big price increases, even with large production increases expected this year in the US and elsewhere. (See Appendix) Global fuel delivery supply chains are messy and imperfect, and complicated by human nature and the global extent of the market.

Oil remains the world's single-largest source of energy and is especially vital in key sectors including transportation and petrochemicals. The risk of sharply higher oil prices continues to pose a threat to economic growth and political stability.

Policymakers hold tools for dealing with a potential disruption of Russian supplies, including spare production capacity and strategic stockpiles. But the elaborate system of energy security that has been built up over many years has never been tested to such an extreme degree as would be the case with a total disruption of Russian exports.

Given that global economic stability is at stake, policymakers should proceed with caution when it comes to short-run policies that would banish Russian oil from world markets without fully examining the capacity of policy levers including spare capacity and strategic stockpiles. In the longer term, policies to reduce exposure to Russia—and to oil in general—make sense.

Oil markets are still sorting through a series of shocks, whether related to the outbreak of COVID and crashing prices, or climate action and the flurry of net zero pledges. The Russian invasion of Ukraine has added to that instability. Since oil remains the world's largest energy source and a critical component to a healthy economy, further perturbances should be evaluated cautiously.

Appendix: OIL MARKET FUNDAMENTALS TODAY

The oil market reaction to a potential disruption of Russian oil supplies, and consideration of policy response options, depends critically on the underlying state of the world oil market.

Oil prices have increased steadily in recent months, with Dated Brent briefly exceeding \$100 per barrel in mid-February, reaching their highest levels since 2014. (As of this writing, Brent has increased further and now stands above \$110.) Here in the US, retail gasoline prices (which generally follow crude oil price moves with a lag of several weeks) have also reached multi-year highs.

The principal driver of higher prices before the onset of the crisis was a continuing tightening in global supply/demand balances, reflected in ongoing declines in weekly US oil inventory data. Since the beginning of the year, total US inventories (including crude oil and refined product) have fallen by over 40 million barrels—falling by roughly 1 million b/d (Mb/d) over this period. Indeed, in terms of days' of consumption, US oil inventories are the lowest since 2008.

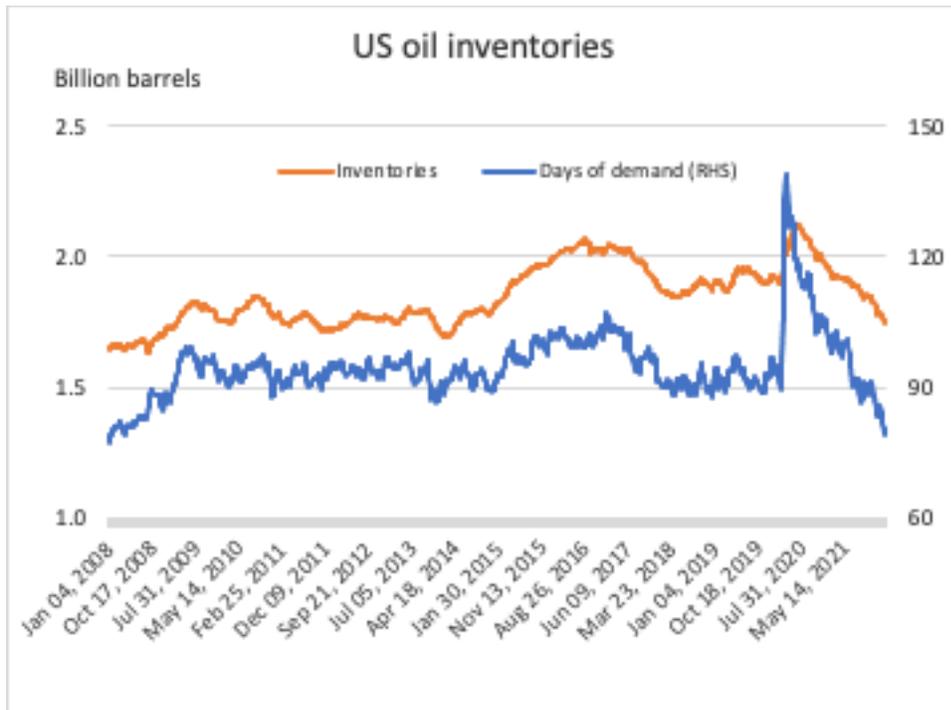


Figure 8 (Source: US Energy Information Administration, author calculations)

The tightness stems from to a combination of strong demand and weak supply. After the COVID-19 pandemic drove a record decline of 8.5 Mb/d in global oil demand in 2020, last year saw a record increase of 5.5 Mb/d as economic growth and mobility recovered. At the same time, global oil supply grew by a tepid 1.5 Mb/d, as the so-called OPEC+ group maintained production discipline and US shale investors remained cautious.⁴⁰ After a year of massive surplus in 2020 that saw large inventory increases and sharply lower prices, 2021 saw the opposite: large inventory withdrawals and one of the largest oil price increases on record.

⁴⁰ For a discussion of OPEC discipline, see Jim Krane and Mark Finley, “When Saudi Arabia Says ‘Jump!’ OPEC Responds ‘How High?’”, Forbes blog, July 13, 2020, <http://blog.bakerinstitute.org/2020/07/14/when-saudi-arabia-says-jump-pec-responds-how-high/>. For a discussion of shale investors, see Mark Finley, “Crude for Thought: Are More Prisoners and More Guards Setting Up the Next Oil Price Cycle?”, Forbes blog, June 28, 2021, <https://blog.bakerinstitute.org/2021/06/28/crude-for-thought-are-more-prisoners-and-more-guards-setting-up-the-next-oil-price-cycle/>.

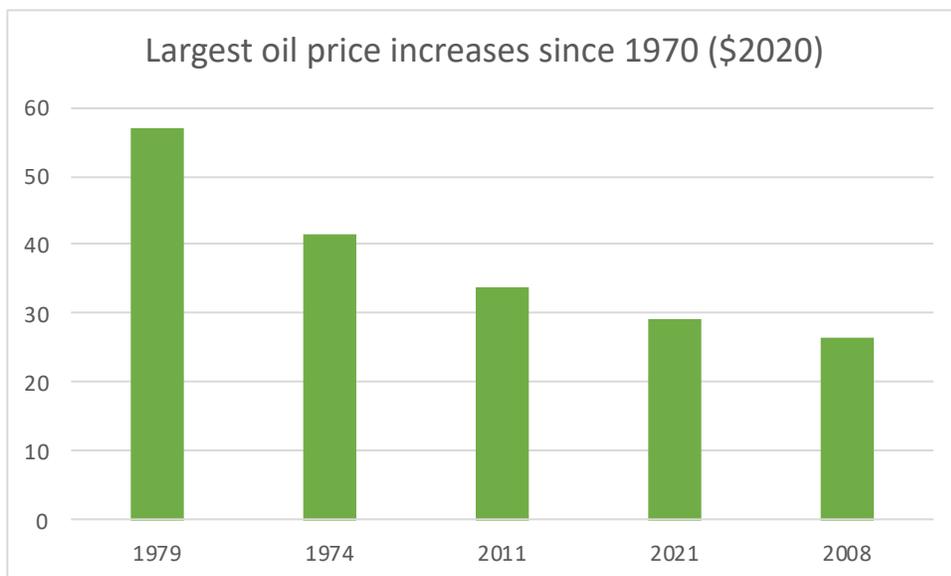


Figure 9: Source: BP (2021) and author calculations

And what's in store for this year?

Before the Russian invasion of Ukraine, expectations for the oil market in 2022 varied widely, with some analysts projecting triple-digit oil prices (annual average) and others seeing crude below \$70. The bulls believed the market had exhausted effective spare capacity; the bears believed supply growth would surge.

In addition to the OPEC+ production increases discussed in the main body of this paper, analysts also expect a large increase in production from key non-OPEC producers including the US, Canada, Guyana and Brazil—the IEA currently predicts that these four countries will add nearly 1.7 Mb/d of new supply this year, with the US accounting for about three-quarters of that increment as continued high prices allow domestic producers to both increase drilling and return cash to investors.

Even before the Russian invasion of Ukraine and the subsequent spike in oil prices, US production had been expected to increase substantially this year. In its most recent short-term outlook EIA forecast that US crude oil production in 2022 would increase by nearly 800,000 b/d, and that production of natural gas liquids would grow by an additional 500,000 b/d.⁴¹ With higher prices and renewed focus on energy security since the Russian invasion, analysts are asking whether domestic industry has capacity to accelerate investment plans, to grow production even more rapidly. After earlier calling without success on the OPEC+ group to accelerate planned production increases, the Biden Administration has begun to half-heartedly encourage industry to invest more rapidly, but without offering additional policy

⁴¹ See US Energy Information Administration, Short-term Energy Outlook, Table 4.a, “U.S. Petroleum and Other Liquids Supply, Consumption, and Inventories”, accessed 6 March 2022 <https://www.eia.gov/outlooks/steo/data/browser/#/?v=9>

incentives.⁴² However, industry executives have insisted that pressure from reluctant investors and regulatory pressures mean investment is likely to remain disciplined even in the face of sharply higher prices.⁴³

Meanwhile, global oil demand is expected to register another strong increase this year, projected by the IEA to rise by 3.2 Mb/d. Even with high prices, strong economic growth and the ongoing recovery of transportation activity should drive global demand to exceed pre-pandemic levels this year.

In summary, the oil market outlook for the remainder of this year was unusually uncertain even before the Russian invasion of Ukraine:

- Would economic growth and travel continue to rebound?
- Would US shale investors' caution slow the recovery in domestic supply?
- Would OPEC+ members continue to increase targets each month—and will they be able to deliver on promised increases?
- Would Iranian production return to mid-2018 levels?

The ability of the market to deal with any potential disruption of Russian production and exports will be significantly impacted by the answers to these questions.

⁴² See Julianne Geiger, “White House Quietly Calls On U.S. Oil Companies To Increase Production”, oilprice.com, March 1, 2022, <https://oilprice.com/Energy/Crude-Oil/White-House-Quietly-Calls-On-US-Oil-Companies-To-Increase-Production.html>

⁴³ See Kevin Crowley and David Wethe, “Not Even \$200 a Barrel: Shale Giants Swear They Won’t Drill More”, Bloomberg, February 17, 2022 (subscription required), <https://www.bloomberg.com/news/articles/2022-02-18/shale-wildcatters-send-bullish-oil-price-signal-with-output-restraint>