



An oil tanker is moored at the Sheskharis complex, part of Chernomortransneft JSC, a subsidiary of Transneft PJSC, in Novorossiysk, Russia, Tuesday, Oct. 11, 2022, one of the largest facilities for oil and petroleum products in southern Russia. (AP Photo, File)

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# The Price Cap on Russian Oil Exports, Explained

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If you've taken an introductory economics class, you were probably left with the strong impression that price caps are bad – they distort demand and discourage producers from supplying the market. So, why has Treasury Secretary Janet Yellen, the consummate economist, advocated so strongly for a price cap on Russian oil?

The answer is that this price cap is different from the standard cap discussed in introductory economics classes.

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A standard price cap applies to all goods traded in a market. For example, in some countries there are price caps on bread for everyone or diesel for farmers or rent controls on housing. Such caps lead to excess demand for the good and insufficient supply, leading to shortages at the capped price. If prices are constrained, other non-price mechanisms, like first-come-first-served, are required to allocate the good. All too frequently, the result is empty bakery shelves or fuel shortages or difficulties finding housing. To understand why the cap on Russian oil is different, we first need to provide background on Russian oil trade and the proposed price cap.

## Background

On February 24, 2022, Russia invaded Ukraine, in a major escalation of an ongoing war. The United States, the European Union, and their allies responded to this unprovoked and illegal aggression with a broad range of sanctions, including the freezing of Russian central bank reserves. These unprecedented actions, while damaging to Russia's economy, have not stopped the war. Russian aggression continues, causing massive loss of life and damage to civilian infrastructure.

Oil is Russia's most important source of revenue. In the nine months since it invaded Ukraine, Russia has exported oil worth over \$600 million per day.<sup>1</sup> Oil and petroleum products are also the country's single largest source of foreign exchange.<sup>2</sup> Revenues from fossil fuel exports, including crude oil, petroleum products, natural gas, and coal, funded around 45% of the Kremlin's budget before the war. Given the decline in other domestic and export sectors, fossil fuel exports – oil in particular – are now even more important to federal revenues.<sup>3</sup>

- 1 This is a conservative estimate based on multiplying 8 million barrels per day times an average "Urals discount" price of around \$80 per barrel. (Russia's main crude oil product is the Urals blend.) See also <https://energyandcleanair.org/october-update-eu-fossil-fuel-payments-to-russia-in-first-fall-below-pre-invasion-level-in-october/>, for more detailed estimates by types of fossil fuel.
- 2 Oil is expected by far to be Russia's largest potential source of foreign exchange revenue in 2023 and for the foreseeable future. In 2019, oil, petroleum products, and gas earned Russia \$240 billion, with over half of that coming from sales to the EU; the rest of Russia's exports combined (\$48.5 billion) amounted to less than the value of its gas exports (\$51 billion); oil generated \$122.2 billion and refined products accounted for \$66.9 billion; see this Bank of Finland working paper, <https://helda.helsinki.fi/bof/bitstream/handle/123456789/18304/bpb2202.pdf?sequence=1&isAllowed=y>.
- 3 Oil and natural gas "made up 45 percent of Russia's federal budget" in 2021; <https://www.iea.org/topics/russia-s-war-on-ukraine>. Russia received high short-term profits from natural gas exports in 2022, primarily through exploiting its market power in Europe. For Russian fossil fuel revenues during 2022, see <https://energyandcleanair.org/publication/financing-putins-war-fossil-fuel-exports-from-russia-in-the-first-six-months-of-the-invasion-of-ukraine/>. Russian federal government revenue is currently forecast at just over \$500 billion for 2023, <https://www.reuters.com/world/europe/russias-pm-sees-budget-deficit-2-gdp-2023-2022-09-20/>, with a budget deficit of 2% of GDP.

Every day, Russia produces about 10.5 million barrels per day (mbpd) and exports about 8 mbpd of crude oil and refined products.<sup>4</sup> In 2021, just under 5 mbpd were crude oil, with 1.5-2 mbpd flowing through pipelines to the European Union, China, and countries that were formerly part of the Soviet Union.<sup>5</sup> Before the February 2022 invasion, much of Russian crude was shipped by sea to European markets. Crude oil tankers are large and can deliver their cargo to any suitable port, so since the invasion, Russia has exported an increasing amount of crude by sea to China, and they have started exporting over 1 mbpd to India, which was not previously a significant buyer of Russian crude.

In contrast to crude, none of Russia's petroleum product exports travel by pipeline and before the invasion, most were carried in specialized short-haul tankers to European markets.<sup>6</sup> Russia has very little available on-shore storage for oil or refined products, so they can only produce what they can consume domestically or export.

## Structure of the Price Cap on Russian Oil

The price cap for Russian oil will be implemented by G7 countries and allies, a group we will refer to as “the coalition.” The coalition is best understood as a group of service providers—not a group of Russian oil importers. The cap applies to any purchase of crude oil exported by sea from Russia after December 5 providing the purchase involves maritime, financial, or other services from any entity based in a coalition member's jurisdiction. Petroleum products will fall under the cap after February 5, 2023. Crude oil exported by pipeline is exempt from the cap. Purchases that do not involve coalition services – e.g., a purchase by a Chinese trader carried on a Chinese ship to a Chinese refinery, paid in rubles through a Chinese bank, and insured by a Russian company – will not be subject to the price cap. The cap applies only until the point of the “first landed sale,” meaning that sales while the oil is still on the water must adhere to the price cap, so long as they use coalition services.<sup>7</sup> Any refined products made from Russian oil in other countries will not be subject to a price cap.

A company based in one of the coalition countries that knowingly provides services to a transaction involving seaborne Russian oil priced above the cap will be engaging in conduct prohibited by their

4 See <https://www.bloomberg.com/news/articles/2022-11-15/iea-sees-russia-oil-output-nosediving-in-2023-on-lack-of-markets?leadSource=uverify%20wall>. Total Russia oil exports in 2021 were 7.3 million bpd in Q1 2021, rising to 7.7 million bpd in Q4; from the IEA Monthly Oil Market Report, 16 March 2022, p.5.

5 See <https://www.iea.org/reports/russian-supplies-to-global-energy-markets/oil-market-and-russian-supply-2>

6 For example, in 2021, China received 1.6-1.8 million barrels of crude per day from Russia, half via pipeline and half on ships, but no refined products (IEA, Monthly Oil Market Report, 16 March 2022, p.5).

7 This was clarified by officials in early November: <https://www.reuters.com/business/energy/g7-russian-oil-price-cap-applies-only-seaborne-crude-official-2022-11-04/>.

country's sanctions and would therefore face the appropriate national penalties.<sup>8</sup> For instance, if the transaction described above involving the Chinese refinery was insured by a UK-based entity that knew the price paid was above the cap (or should have known if the company had followed appropriate due diligence processes), then the UK insurer would be violating the UK's prohibition on providing services for oil purchases above the cap.<sup>9</sup> Coalition countries have established "safe harbor" for service providers who unknowingly provide services for oil purchased above the cap due to fraudulent or falsified information provided by their customers.

The cap will be set as a specific price level measured in dollars per barrel of oil, meaning that it will not mechanically vary with the price of world oil (e.g., the Brent benchmark price for crude oil).<sup>10</sup> The coalition may periodically reset the price cap, for example if world oil prices rise or fall dramatically – or based on Russian military actions.

The price cap has two main goals. First, it is an integral part of a broader sanctions package designed to reduce Russia's foreign exchange revenues and reduce its capacity to wage war in Ukraine. Sanctions are designed to limit government revenues and impose an appropriate degree of economic hardship on aggressor countries. Reducing the revenue from oil exports provides a key lever to reduce Russia's ability to wage war.<sup>11</sup>

The second goal of the price cap is to make it possible for Russian oil to stay on the world market in the face of the impending complete European Union (EU) embargo and services ban. In early May 2022, the EU announced that it would both ban imports of Russian seaborne oil and refined products, and ban the provision of EU-based services for shipments of Russian seaborne oil to non-EU countries.<sup>12</sup> This import ban will take effect on December 5, 2022, for crude oil and February 5, 2023, for petroleum products. Without the price cap policy, many analysts predicted that the

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8 For a more discussion regarding how the cap will be enforced, see this commentary: <https://www.engage.hoganlovells.com/knowledgeservices/news/ofac-issues-guidance-on-implementation-of-g7-price-cap-on-russian-crude-oil-and-petroleum-products>.

9 See this summary of UK legislation, from the UK Treasury: <https://www.gov.uk/government/news/uk-government-bans-services-enabling-the-transport-of-russian-oil>, which notes: "Insurance is one of the key services that enables the movement of oil by sea, particularly protection and indemnity (P&I) insurance which relates to third-party liability claims – the UK is a global leader in the provision of P&I cover, writing 60% of global cover".

10 <https://www.reuters.com/world/exclusive-g7-coalition-has-agreed-set-fixed-price-russian-oil-source-2022-11-03/>

11 There are three potential effects here: lower foreign exchange revenue will make it harder for Russia to defend its exchange rate, particularly given that most of its foreign currency reserves are frozen; less foreign cash per day will also reduce Russia's ability to buy weapons (including ammunition and drones) from other countries; and lower expected future federal government revenues will reduce the government's broader ability to finance and conduct war, including the local currency component (e.g., paying soldiers and domestic armaments suppliers).

12 This was part of the EU's sixth package of sanctions, agreed May 30-31: [https://ec.europa.eu/commission/presscorner/detail/en/IP\\_22\\_2802](https://ec.europa.eu/commission/presscorner/detail/en/IP_22_2802).

EU embargo and services ban would prevent Russia from exporting 1-2 mbpd of oil, potentially increasing oil prices significantly and, in turn, adding to global inflationary pressures.<sup>13</sup>

## How Is the Price Cap on Russian Oil Different from Standard Price Caps?

The price cap on Russian oil differs from a standard price cap in several important ways. First, it only caps the price received by one supplier – Russia. Oil markets are global, and crude oil is regularly shipped long distances, e.g., from Russia to India or from Saudi Arabia to Japan. This means that decisions by consumers or producers anywhere in the world can impact the global market price for oil. Russia is a major supplier to world consumers, accounting for about 8% of world supply, but certainly not the only one. Since the cap only applies to Russian oil, it will not dampen the incentives of firms in other countries to produce and export oil, and it will not distort the prices that consumers pay for oil on the global market.

Second, Russia is an inframarginal producer, meaning that its marginal costs of extracting and transporting oil for export are considerably below market clearing prices. This reflects both Russia's luck – the country is endowed with oil that is inexpensive to extract (although analysts suggest this inexpensive oil is dwindling) – and the fact that oil markets are far from perfectly competitive, meaning that the market price is above all suppliers' marginal costs.<sup>14</sup> OPEC+, the coalition of large oil exporters (the original members of OPEC plus Russia) and several other countries, regularly meets to orchestrate agreements among members to restrict output in order to buoy prices.<sup>15</sup>

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13 “Some 1 million barrels per day of Russian products and 1.3 million barrels per day of crude would have to find new homes due to the planned EU restrictions, according to the IEA estimates,” <https://www.bloomberg.com/news/articles/2022-08-11/iea-sees-russian-oil-output-down-20-when-eu-ban-takes-effect>.

14 According to a pre-invasion presentation by Rosneft to investors, its upstream margins were positive in early 2020, even though the onset of the COVID-19 pandemic pushed world oil prices down towards \$20 (see slide 11 in [https://www.rosneft.com/upload/site2/document\\_cons\\_report/Q42021\\_Results\\_ENG\\_final.pdf](https://www.rosneft.com/upload/site2/document_cons_report/Q42021_Results_ENG_final.pdf), which is the presentation accompanying full year financial results). Some estimates suggest a marginal cost of production for established Russian oil fields may even be under \$10 per barrel, <https://www.project-syndicate.org/commentary/case-for-punitive-tax-on-russian-oil-by-ricardo-hausmann-2022-02>.

15 OPEC currently has thirteen member countries: five on the Persian Gulf (Iran, Iraq, Kuwait, Saudi Arabia, and UAE), seven are in Africa (Algeria, Angola, Republic of the Congo, Equatorial Guinea, Gabon, Libya, and Nigeria), and one in Latin America (Venezuela); [https://www.opec.org/opec\\_web/en/](https://www.opec.org/opec_web/en/). Ten other countries, including Russia, join that group to form OPEC+: <https://www.weforum.org/agenda/2022/11/oil-opec-energy-price/>. According to the US Energy Information Agency, <https://www.eia.gov/energyexplained/oil-and-petroleum-products/where-our-oil-comes-from.php>, “Together, the OPEC members at the beginning of 2020 held about 71% of the world’s total proved crude oil reserves, and the OPEC members in 2021 accounted for about 37% of total world crude oil production.”

Because Russia is an inframarginal supplier, there is room to set a price cap above the country's marginal cost and still significantly below world prices. If the price cap level is set sufficiently above Russia's marginal costs, it has the economic incentive to sell at the cap rather than withhold oil that it cannot sell without coalition country services.<sup>16</sup>

Where will the money that used to be paid to Russia go? In practice, the answer will be up to individual countries. The immediate beneficiaries are the customers (e.g., refineries) that can import cheap Russian crude and, most likely, sell the refined products at world market prices. For example, if an Indian refinery buys oil at less than the price cap, it can sell the refined products without restriction – creating a hefty additional margin. Note that this does not require that India officially commits to the price cap (see below for more on how this would work). When the cap on petroleum products is implemented in February 2023, customers of Russian petroleum products will become beneficiaries as well.

However, oil importing countries may decide to tax away some of those economic rents or find some other way to share the benefits with ultimate consumers of fuel. We discuss this further below and in the appendix.

## Additional Benefits of the Russian Price Cap

In addition to reducing Russian export revenue while keeping oil on the market, the price cap on Russian oil will have several additional potential benefits. First, while the price cap only directly applies to purchases of Russian oil that use services from coalition countries, it also provides negotiating power to oil importers that continue to buy Russian oil above the cap without using those services. For example, if 20% of Russia's exports are at the cap (because a non-EU customer is using coalition ships, insurance, or trade finance) and 80% are outside the cap (using only non-coalition services), the price cap will only directly apply to 20% of Russia's exports. Buyers of the remaining 80%, however, gain negotiating power as they know that Russia's only other option is to sell at the cap.

Think of a refinery in India that knows it can buy Russian oil without using coalition services. The existence of the price cap gives this buyer additional leverage to drive down the price it pays to Russia, further reducing Russia's oil export revenues. This condition holds as long as not all of Russia's oil can be sold using non-coalition services.

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16 All tankers loading in Russia are tracked by various experts. Ship to ship transfers at sea are possible, but these can also be monitored. The origin of services to these shipments is also generally known. The main question for enforcement will be whether the oil in question was or will be sold at a price no greater than the cap.

Second, it is important to weigh the price cap relative to alternatives. In the past, oil sanctions have involved embargos, which make it illegal for anyone in one country to buy from the embargoed country. For instance, from 2017, the Trump Administration began to impose sanctions on oil exports from Venezuela. But Russia is a much larger oil exporter than Venezuela.<sup>17</sup> An all-out embargo on Russian oil would have much larger implications for world oil markets and thus for global inflation. For example, if the EU embargo prevents 2 mbpd from reaching the market, reasonable assumptions suggest that oil prices could spike by at least \$20 per barrel, more than a 20% jump from 2021 average prices.<sup>18</sup> A broader embargo would lead to much larger price spikes.<sup>19</sup>

The other problem with an embargo would be that, like many laws and rules, it is likely that it would be flouted in part, i.e., there will be “leakage” around the edges. If Russia sells some oil outside the embargo, it could make more money per barrel on the oil it can sell, since removing the regular supply of its oil from the market is likely to drive up world prices. It is even possible that Russia would make more money after an embargo than it would without an embargo.<sup>20</sup>

The price cap, by contrast, hurts Russia while providing a benefit to countries that can access lower-priced Russian oil than they could without the sanctions. This makes it less likely that there will be pressure to remove the sanctions over time. (Note that the EU and other coalition countries will not be importing Russian oil in 2023 and beyond, but they benefit from the price cap because world prices will be lower than they would be without it.)

The total windfall gain for refiners in developing countries could be large, depending on the price cap relative to world prices. For example, 5 mbpd could generate between \$50 million and several hundred million in additional profits, every day. These amounts are significant relative to the cost of oil and government budgets in many countries.<sup>21</sup> Developing countries could use the resulting

17 In 2017, before the United States imposed sanctions, Venezuela produced about 1 million barrels of crude per day; <https://www.eia.gov/international/analysis/country/VEN>. By August 2020, this had fallen to 360,000 b/d.

18 These are roughly the magnitudes discussed by market analysts; <https://www.bloomberg.com/news/articles/2022-08-11/iea-sees-russian-oil-output-down-20-when-eu-ban-takes-effect>.

19 For example, if the short-run demand elasticity is 0.1 and supply is perfectly elastic in the short run, meaning that markets clear on the demand side, a 2 mbpd reduction in Russian exports would reduce global supply by 2%. The demand elasticity assumption implies a 20% price increase is required for markets to clear.

20 Some readers may counter that clearly Russia could not make more money with an embargo or they would have reduced exports on their own. But this logic neglects that there are uncertain outcomes resulting from reduced Russian exports. In other words, it is possible that even if expected profits are higher, Russia may be risk averse and unwilling to take the risk that profits would fall. The Russian government may also be concerned about the long-run costs of shutting down and reopening oil wells; there is a range of views among experts on how difficult or costly this would be.

21 India consumes about 5 mbpd (<https://www.hindustantimes.com/business/indias-daily-petroleum-consumption-growing-faster-than-global-average-puri-101665762596340.html#:~:text=Union%20minister%20of%20petroleum%20and,growth%20rate%20of%20around%201%25>). At a world price of \$100, that is \$500 million per day. If half of this daily oil consumption comes from Russian oil in 2023 (up from about 1 mbpd from Russia currently) and if the price cap is set (hypothetically) at \$50 per barrel, that would save India \$125 million per day or \$45 billion per year. Total Indian federal government spending in 2021 was about \$360 billion.

revenue (e.g., from taxing the windfall profits of local oil refiners) to subsidize consumers who are paying higher food prices due to the Russian invasion. This would be their policy choice.

The price cap represents a novel approach to sanctions. Typically, sanctions ban the trade of a good, imposing costs on both the sanctioned and the sanctioning countries. By contrast, the price cap limits the price of a good that uses particular services. Further, the cap can be adjusted up or down as the coalition decides to tighten or loosen sanctions.

## What Will Russia Do?

There has been plenty of bluster from Russia in reaction to the price cap proposal, and some prominent western voices have also expressed skepticism. Realistically, what could go wrong either in terms of economics or more broadly?

The first line of criticism was that the United States, EU, and allies would not be able to agree to implement a price cap. This has proved ill-founded, as the cap is about to go into effect. It is true that we do not yet know how much Russian revenue will be reduced relative to a no-cap world. Once the cap is established, it should be straightforward to reduce it further, particularly if the coalition countries agree that conditions have changed or specific Russian actions require further response on this dimension.

Second, there is concern that coalition-based services will not be essential to ship Russian oil in 2023, either because entities currently based in the coalition will shift elsewhere (e.g., to the UAE) or companies in non-coalition countries will step in to provide any needed services (e.g., companies from China or Russia itself). For example, if the entire “Greek-owned” shipping fleet re-registers in Dubai, that will make it easier for Russia to make sales without coalition services – and the EU will need to think about how to treat sanctions evasion on such a scale. However, even if Russia can access ships, it would still need to procure the other services that are covered by the price cap, including financing and insurance.

Russian and Chinese insurers may offer to cover all oil and product tanker owners. It is unclear whether those owners will regard such insurance as robust, especially if Russian insurance is backed by the state, which is facing sanctions, depleted revenues, and increased fiscal costs. It is also unlikely that companies in India would be comfortable accepting the risk implicit in such



insurance, particularly regarding the financial protection provided in case of a major oil spill.<sup>22</sup> Turkey has also made it clear that any tanker passing through its waters must carry insurance; it remains to be seen what kind of insurance will be regarded as acceptable.<sup>23</sup>

Another criticism ostensibly appeals to basic economic principles and argues that a price cap on Russian oil will lead to excess demand, not for oil in general but for Russian oil specifically. As with any good with excess demand, an alternative allocation mechanism will be required to determine which importers get access to the Russian oil. Critics contend that Russia will be able to recoup some of its lost oil revenues through this allocation process, for example by selling the rights to buy its inexpensive oil. A similar argument suggests that importers will have an incentive to pay a bit more than the price cap in order to convince Russia to sell them additional inexpensive oil, effectively cheating on the collective agreement to pay Russia a lower price by making side payments to Russia.

The factor that these arguments overlook is the services ban: making side payments to Russia is tantamount to violating the price cap. Companies that knowingly do this will likely be subject to enforcement measures. An importer considering paying Russia more will weigh the costs of (1) missing out on the opportunity to get inexpensive capped Russian oil and (2) incurring the costs of potential enforcement. Thus, while we cannot rule out that there may be some side payments to Russia, they will likely be minimal. In general, however, the question of who will benefit from the revenues that the price cap takes away from Russia is thus far left open.

Probably the most common critique of the price cap was that other countries would not join the coalition. But, as we explained above, the price cap coalition was not designed to include importers – it is a coalition of service providers. Companies that import Russian oil can decide on a trade-by-trade basis whether to use coalition member services and buy Russian oil at the price cap. In addition, a central design element of the price cap approach is that it increases the bargaining power of all importers of Russian oil. Of course, some companies in countries like India or China might choose not to exercise that bargaining power – this is their decision. But companies in those countries do not currently pay the world price of oil to Russia – they pay world prices minus the “Urals discount.” The price cap essentially locks in that discount.

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22 The key issue in maritime insurance discussions for oil tankers is “protection and indemnity” insurance. Most of this is currently provided or coordinated through the UK-based International Group of P&I clubs, <https://www.igpandi.org/>. Other countries may claim to offer this, but their ability and willingness to pay if there is a major oil spill (costing billions of dollars) should probably be regarded with skepticism.

23 This new Turkish requirement starts on December 1; <https://www.insurancejournal.com/news/international/2022/11/17/695489.htm>.

Russia has also threatened not to sell directly to any price cap coalition countries. That is an irrelevant threat, as those countries will also have an embargo in place. Russia's economic incentives to sell oil to non-coalition countries below the price cap depend on the level at which the price cap is set. Russia's decision involves trading off two factors: the more oil it sells at the cap, the more revenue it earns from those sales. But, keeping oil off the market could drive up prices and may increase the revenue Russia earns on its remaining non-capped sales. Note that the effect on the world price of oil in this scenario would depend on the reaction of OPEC. A decline in Russian production on the order of 1-2 mbpd of oil could be offset by OPEC, which agreed in early October to cut production quotas by about that amount.

In addition to weighing economic incentives, Russia is making a geopolitical calculus. The benefits of sales under the price cap go to countries it has historically courted, including India, China and countries in sub-Saharan Africa and Latin America. On the other hand, Putin has expressed an unwillingness to have the terms of trade for his oil influenced by the coalition. If Russia decides to cut production rather than selling under the price cap, this would involve shutting down Russian oil production and sealing up wells, which can be an expensive and risky proposition.<sup>24</sup> It would also likely amount to accepting lower government revenues from the sale of oil, which is one of the goals of the price cap.

The Russian invasion of Ukraine has greatly weakened the Russian economy and undermined local living standards. If the Russian government decides to take further steps that will exacerbate those negative economic effects, that is their decision.

In addition, given the current Kremlin rhetoric, the content of its propaganda, and its longer-term cultivation of bellicose domestic attitudes, it remains to be seen whether Russia will remain a major global oil producer. At its peak, the Soviet Union produced around 12 mbpd, but by the mid-1990s, Russia produced only around 6 million barrels.<sup>25</sup> Given that the world is seeking to invest further in renewables and reduce fossil fuel consumption, Russia may think twice before further encouraging countries to shift away from Russian oil.

Conversely, over time the EU and some other coalition countries are likely to increase their investments in non-Russia sources of energy, including renewables, liquified natural gas from elsewhere, and nuclear power. If Russia cuts production by more in 2023, that will strengthen the incentives to accelerate this energy transition. Russia's future as a major energy supplier already

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24 As discussed above, there is an expected 1-2 million barrel decline in Russia production as a result of the EU embargo. This was the market expectation before the price cap was agreed; <https://www.bloomberg.com/news/articles/2022-08-11/iea-sees-russian-oil-output-down-20-when-eu-ban-takes-effect>.

25 Kazakhstan is the largest ex-Soviet oil producer, after Russia; it currently exports about 1 mbpd. The subsequent rebound in Russian oil production was made possible largely by oil field services and technology provided by western companies.

looks bleak, but will its government really want to hasten the day when the world no longer needs what Russia produces.

## Conclusion

The price cap on Russian oil reflects a novel approach to sanctions and the world is just beginning to understand its impacts on Russian oil revenues, geopolitical alignments, and oil trade. For example, in the months before it was implemented, reports suggested that the prospect of the price cap likely led Russia to offer crude oil at a cut-rate to importers in Indonesia. In addition, in the coming months, without a price cap, EU sanctions would likely take millions of barrels off the market daily and thereby put pressure on global prices. Oil traders, oil service providers, analysts, journalists, and sanctions officials will watch these developments carefully, but one thing is sure: economic incentives are powerful and given the large dollar volumes at play in the oil markets, it is particularly crucial to understand how they might shape decisions going forward.

# Appendix

The Appendix provides more technical details on several of the economic concepts discussed in the main text. Section A depicts the standard price cap and a price cap on Russian oil graphically. Section B considers additional policies that could constrain Russia's oil export revenues, including an embargo and a tariff, and compares them to a cap.

## A. Graphical Representation of Price Caps

**Figure A1** provides a graphical representation of a standard price cap. In a market equilibrium, the price is equal to  $P^{eq}$  and the quantity demanded is  $Q^{eq}$ : supply equals demand. If policymakers cap prices at  $P^{cap}$  the quantity producers are incentivized to provide,  $Q^{s, cap}$ , is below the quantity that consumers would like to consume at that price,  $Q^{d, cap}$ , resulting in a shortage equal to the difference between  $Q^{d, cap}$  and  $Q^{s, cap}$ . Because  $Q^{d, cap}$  is greater than  $Q^{s, cap}$ , an alternative, nonprice mechanism must be used to allocate the goods.

**Figure A2** represents the price cap on Russian oil. We assume, for simplicity, that Russian suppliers are represented by the supply curve between points A and B. Note that this implies that Russian suppliers' costs are more similar to one another's than to the costs of suppliers in other countries. The figure implies that some of the suppliers in other countries are less expensive than Russia, represented by the supply curve below point A, and some are more expensive than Russia, represented by the supply curve above point B. The figure also implies that all of Russia's supply is infra-marginal, consistent with the real world.

Since the price cap only applies to Russian oil, and assuming that the price cap does not distort the amount of oil that Russia supplies (a point we return to in the last section), the equilibrium price seen by consumers and other producers is unchanged. Russia's losses relative to a world with no price cap are depicted by the red box. Russian suppliers continue to earn some profit, depicted by the blue trapezoid.

Figure A2 also abstracts from the fact that world oil markets are not perfectly competitive, so the equilibrium price is higher than would be suggested by the intersection of demand curve and a supply curve that simply tracks producers' marginal cost. Because OPEC+'s actions drive prices above marginal costs, Russia's rents are higher, and part of the revenues that the price cap removes (red box in Figure A2) are these non-competitive rents.

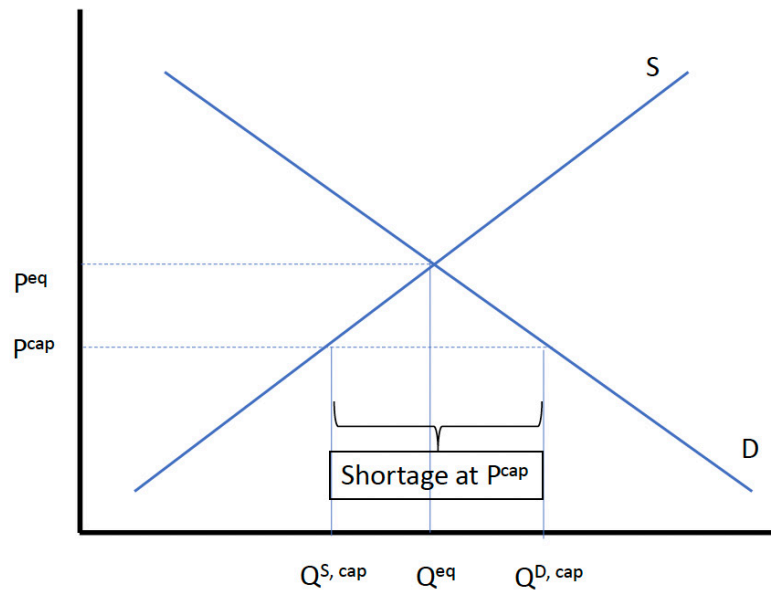


Figure A1: Econ-101 price cap and the associated quantity shortage

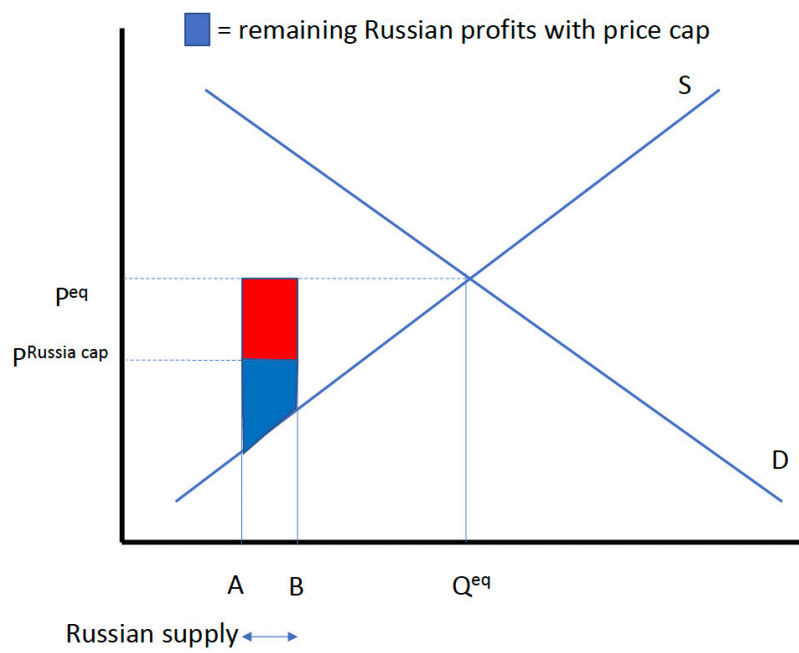


Figure A2: Price cap on the price of Russian oil

## B. Price Caps and Tariffs on Russian Oil

Economic theory suggests several ways to curtail Russia's oil revenues: most often mentioned are an embargo, a tariff, and a price cap. This appendix illustrates how these measures relate to each other; it then briefly outlines an example with a kinked supply curve, whereby Russia supplies an unaltered amount of oil to the market as long as the ongoing price that it receives allows it to make positive profits.

A tariff has several implementation advantages over a price cap. For one, importing countries could collect revenues from the tariff, which could be used to finance reconstruction in Ukraine, subsidize domestic fiscal measures necessitated by the war (such as subsidies for energy consumers) or anything else the domestic government wanted. Also, if all importers of Russian oil imposed the same tariff, the flow of Russian oil would not change. Under the current scheme, particularly with the EU embargo, ships carrying Russian oil will need to take much longer voyages to get the oil to buyers, slightly increasing the cost in global oil markets and straining shipping. With uniform tariffs, there would be no extra shipping costs.

On the other hand, the price cap has one key political economy advantage over a tariff: it does not require explicit cooperation by governments. Many governments have taken a wait-and-see approach to the price cap. They appear unwilling to commit to it given that it is a novel approach and seem to have done the calculus that it is not worth antagonizing Russia by formally agreeing to it while the G7 countries were still working through the details. If the price cap ended up not being implemented, these countries would be antagonizing Russia without gaining the benefit of low-priced Russian oil. By contrast, the price cap can be effective without formal government action. For example, the Indian government can stay silent on the cap and individual importers in India can decide whether to negotiate a price that is at or below the price cap level.

To begin the analysis, we need to specify how the tariff or price cap will be operationalized. Policymakers face several design choices. For example, either could be implemented as a fixed number (dollars per barrel) or as a percent of an existing price. We consider tariffs first, and then price caps.

A fixed %-tariff on Russian oil could mean different things, depending on what the % is applied to. Let us define three tariff types:

1. **type-x:** tariff is the % of the prevailing world price  $P^{WORLD}$
2. **type-y:** tariff is the % of the price that Russia receives  $P^{RUS}$  (note this is the way tariffs are usually specified in economics/international trade)

**3. type-z:** tariff is the % of the pre-tariff world price  $P^{NOW}$ , which is about \$87 per barrel.

The three tariffs are of course related. We first write down how the prices that Russia gets and the recipients countries pay relate to each other under the three tariffs:

$$P^{RUS} = (1 - x)P^{WORLD} \quad (1)$$

$$P^{WORLD} = P^{RUS}(1 + y) \quad (2)$$

$$P^{RUS} = P^{WORLD} - z \cdot P^{NOW}. \quad (3)$$

For example, the first equation says that Russia gets  $1-x$  percent of whatever is the prevailing oil price in the world market. Combining equations (1) and (2), and (1) and (3), we get:

$$Y = \frac{1}{1-x} \quad (4)$$

$$Z = x \cdot \frac{P^{WORLD}}{P^{NOW}} \quad (5)$$

Equation (4) shows that there is a one-to-one (non-linear) mapping between  $x$  and  $y$ . Equation (5) shows that tariff  $z$  is a scaled version of  $x$ , where the scaling factor is endogenous and depends on what happens to the price of oil in the future, relative to the price on which the  $z$  tariff is based.

**An example.** Consider the 90% tariff that Ricardo Hausman proposed.<sup>1</sup> This was the  $x$ -type tariff. The equivalent tariff calculated on the price that Russia actually receives (a  $y$ -type tariff) is  $0.9/0.1 = 900\%$ .

**What does Russia actually get?** Note that for a fixed % tariffs considered so far,  $P^{RUS}$  is endogenous and depends on what happens to the world price  $P^{WORLD}$ .

Consider now a price cap policy, and assume that this policy fixes the price Russia gets as some level:  $P^{RUS} = \hat{P}$ . From equations (1) - (3), such a price cap can be implemented through – or is equivalent to – all of the three tariff types as follows:<sup>2</sup>

1 [www.project-syndicate.org/commentary/case-for-punitive-tax-on-russian-oil-by-ricardo-hausmann-2022-02](http://www.project-syndicate.org/commentary/case-for-punitive-tax-on-russian-oil-by-ricardo-hausmann-2022-02)

2 An alternative would be to implement the price cap via rationing. Since this is an inefficient strategy, we do not consider it here.

$$\hat{x} = 1 - \frac{\hat{P}}{P^{WORLD}} \quad (6)$$

$$\hat{y} = \frac{P^{WORLD}}{\hat{P}} - 1 \quad (7)$$

$$\hat{z} = \frac{P^{WORLD} - \hat{P}}{P^{NOW}} . \quad (8)$$

Note that all three tariffs that implement the price cap are variable: fluctuations in  $P^{WORLD}(t)$  will translate into fluctuations in  $\hat{x}(t)$ ,  $\hat{y}(t)$ ,  $\hat{z}(t)$ : fixing the price results in a variable tariff; fixing a tariff results in a variable price.

**An embargo.** A full embargo can be thought of as an extreme version of a tariff (or equivalently, a price cap). Suppose that Russia will leave the oil in the ground if the price is equal to or lower than  $\bar{P}$ . Then the embargo can be implemented with the following tariffs:

$$\bar{x} \geq 1 - \frac{\bar{P}}{P^{WORLD}}$$

$$\bar{y} \geq \frac{P^{WORLD}}{\bar{P}} - 1$$

$$\bar{z} \geq \frac{P^{WORLD} - \bar{P}}{P^{NOW}} .$$

**An example: the case with vertical-and-kinked Russian supply.** A useful benchmark case that may also be quite realistic is that Russia's supply curve is kinked: it is completely inelastic up to  $\bar{P}$ , and supply drops to zero at or below  $\bar{P}$  (Figure B1).<sup>3</sup> We only consider a simple two-country setup here. The analysis in Appendix A above instead considers a global market.

3 Why is this realistic? In early 2020, when the average price of oil fell to \$20 per barrel, Russia was happy to supply essentially as much oil as it did when the price averaged \$110. This is because the cost of producing and distributing Russian oil is low. Russia's onshore storage options are limited, so any export reduction would mean oil wells need to be shut down. In some older oil fields, this would lead to immediate and permanent decline in productive capacity, particularly as Russia is cut off from advanced drilling technology for the foreseeable future.



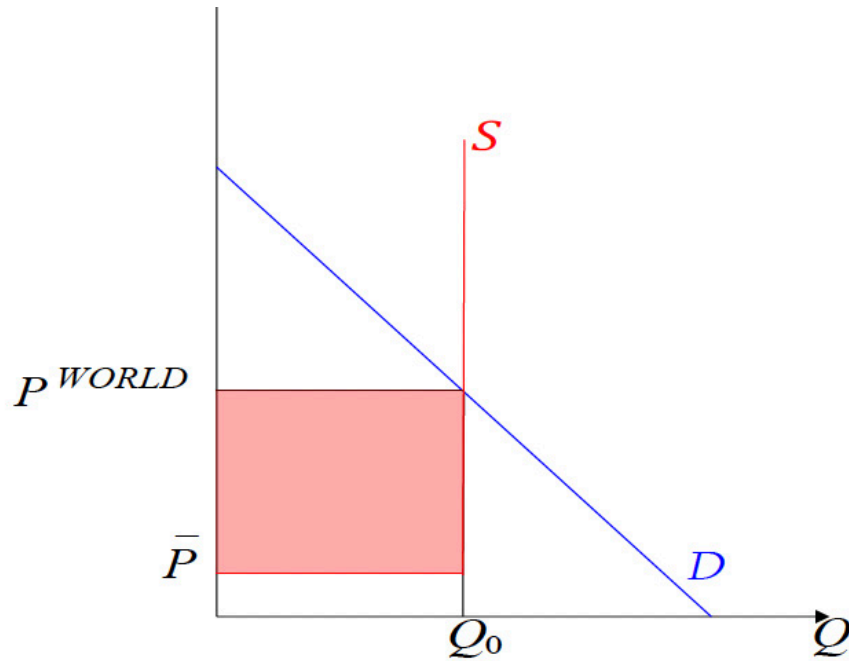


Figure B1: The price cap when Russian supply is kinked.  
*(Note: Current price and quantity normalized to 1.)*

For concreteness, suppose Russia’s supply will be roughly unchanged as long as the price which it sells at is \$40 or higher. Today’s world price is around \$87 per barrel, although Russian oil already trades at a significant discount.<sup>4</sup> Consider a policy of capping the price of oil that Russia gets at  $\hat{P} = \$40$ . Under our assumptions, at such a price Russia will supply unchanged quantity of oil to the market. This price cap is then equivalent to the following tariffs, calculated under the assumption that the world price of oil remains roughly constant at \$87 per barrel:

$$\hat{x} = 1 - \frac{40}{87} = 54\% \quad (9)$$

$$\hat{y} = \frac{87}{40} - 1 = 117\% \quad (10)$$

$$\hat{z} = 1 - \frac{40}{87} = 54\%. \quad (11)$$

4 To be binding, the price cap must be set below the price that Russia currently receives. It should be noted that the spread that we see in the data (see <https://www.neste.com/investors/market-data/urals-brent-price-difference>) is an imperfect measure of what Russia receives, not least because prices for many trades with Asian countries are agreed bilaterally and are not widely reported..



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