APPENDIX for:
Strengthening Enforcement of the Russian Oil Price Cap
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The main text describes three channels through which the price cap can work to reduce Russian oil revenues: reducing the price paid to Russia, increasing the risk premium for shipping Russian oil, and increasing buyers' bargaining power.

The following equation, representing average Russian export earnings per barrel of oil, shows all three potential effects:

Average Russian revenue per barrel = $(cs)*(P^c – S^c(1+r)) + (1-cs)*(P^{nc} – S^{nc})$

Where:
cs = share of shipments using coalition services;
P^c = price paid for shipments of Russian oil using coalition services;[1]
P^{nc} = price paid for shipments of Russian oil not using coalition services;
S^c = transportation cost (including shipping, insurance, and financing and embedding a regular risk premium, absent sanctions) paid to coalition service providers;
S^{nc} = transportation cost paid to non-coalition service providers (embeds a regular risk premium, absent sanctions);
r = sanctions risk premium (where $r = x*Y$, where x is a service provider's assessed probability of being caught violating the cap and Y is the expected penalty if caught).

For example, if an Indian refinery can buy oil from a trader (who charters a tanker, insures the ship and cargo, and finances the transaction) at $70 per barrel ($P^c$ in the notation above) in a shipment using coalition services, and if the transportation cost (S^c including payments to the oil trader, shipping and insurance costs, etc.) is $10 per barrel – then the net price paid to Russia is $60. The attestation process is intended to ensure that Russia only receives $60 per barrel from oil traders and other intermediaries.

The Urals discount reported in the press is likely to reflect the average of prices for transactions involving coalition services and prices for transactions outside the coalition (average of ($P^c – S^c(1+r)$) and ($P^{nc} – S^{nc}$)) and prices in some reports may include the cost of transportation services (in other words, they may reflect P^c and P^{nc}). As we explain in the main text, however, the reported Urals prices are opaque and inconsistent across outlets. There is no way to know how different reports weight coalition versus shadow fleet shipments.

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[1] In oil industry parlance, P^c and P^{nc} are the prices paid by the buyer, or the delivered ex-ship (DES) prices. The prices paid to Russia are known as the free on-board (FOB) prices. The price cap applies to what Russia receives (most often a cash payment upon lifting/loading the oil, but sometimes when a previously unsold shipment already at sea is sold), which is net of transportation cost, i.e., $P^c – S^c(1+r)$ for coalition sales.

Russia has some control over the share of its oil that is shipped without coalition services (1-cs) including through its acquisition of oil tankers. It has little control over the other variables. This exposition assumes that Russia exports as much oil as physically possible, which seems to fit the data.

The first effect of the price cap, as long as it is enforced, is to keep $(P^c - S^c(1+r))$ at the cap. The second effect is to increase the risk premium, r, which was zero before the cap. The third effect is to put downward pressure on P^{nc}. Finally, as discussed in the main text, the third effect (negotiating power) interacts with the first two effects, as those influence Russia's outside option.