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The G7 Pricing Scheme, an Exercise in Monopsony Power

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About KAPSARC

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High in the Bavarian Alps, at a special security session, G7 leaders set out to devise an ambitious plan to sanction Russian energy sales. The intent was to reduce Russian profits from oil and gas sales, while minimizing the damage to developed economies caused by rising fuel prices and inflation. The proposed solution, a ceiling on the price of oil and gas, is a new, untried method, which will be carefully constructed to allow oil to continue to flow to low- and middle-income countries, while limiting the economic benefit to Russia.

While the exact details have yet to be determined, a price cap requires close collaboration between international allies. The cap would likely be set slightly above Russia's marginal production costs, so that the Federation still has an incentive to export oil. The plan aims to reduce energy costs to consumers in Europe while constraining Russia's ability to profit from sales to consuming nations. Comprehensive participation, including from the OECD, non-G7 and non-OECD nations, will support enforcement by requiring importing countries to observe the price cap in order to obtain European Union (EU) insurance and shipping services. Since EU insurers provide at least 95% of the coverage for Russian hydrocarbon exports, the constraint could indeed be binding. As a counter measure, Russia plans to ensure its oil shipments to third countries through the use of state guarantees. Indian and Chinese insurance companies are considering sovereign-backed insurance coverage. The next steps might include an EU ban on Russian oil imports by Russian companies (Mohanty et al. 2022).

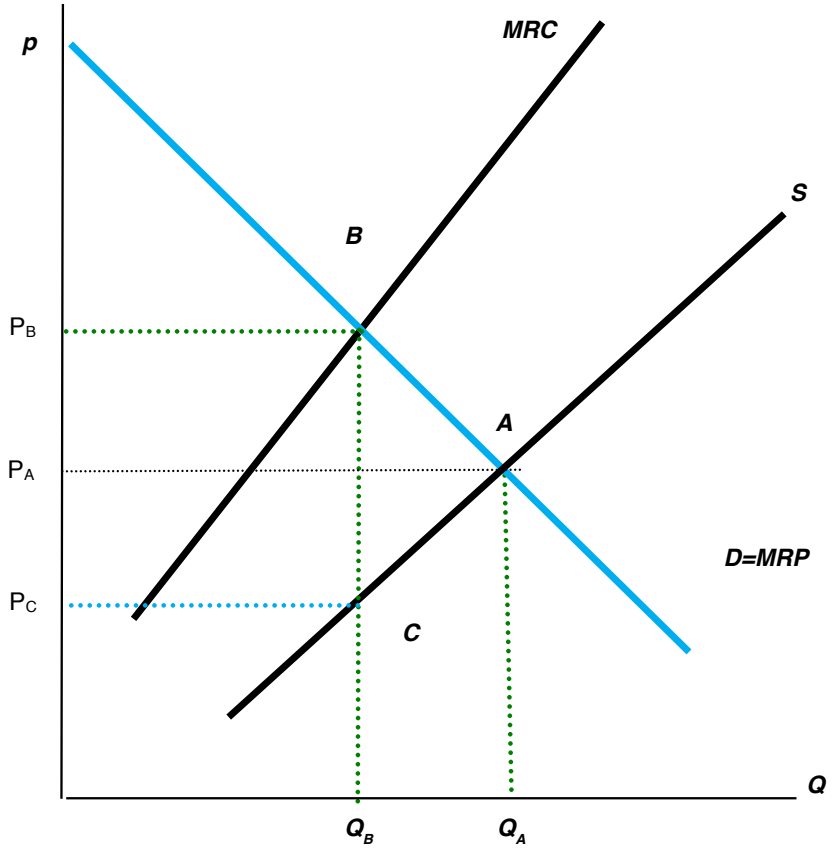
From a theoretical economics viewpoint, the plan rests on the assumption that the G7 will be able to band together, essentially creating a form of monopsony, and exercise market power over the Russian Federation. A monopsony, or a single buyer, that controls most of the market demand for a product, can benefit from its detailed knowledge of the market structure to obtain a price that is lower than that available in a competitive marketplace. Such market power can be used to forge a wedge between the price that can be obtained in the free markets and the price that is actually obtained. If it is successful, the marginal benefit to the consumer will be higher than the marginal cost of the producing country, in this case Russia.

In other words, the monopsonist(s) can exercise market power to forge a gap between the marginal benefit and marginal cost of oil and gas in the market. The size of the gap, or the level of the price cap, can be estimated by using the elasticity of supply for oil or gas and a mathematical formula called the Lerner Index (Love and Shumway 1994). The Lerner Index determines the amount that the monopsonist can lower the price from the maximum amount that European consumers would be willing to pay if they had no alternative supplier (see Appendix A). While we calculate the Lerner Index for oil and gas, we focus primarily on the natural gas industry. In short, a price cap on gas is much more likely to succeed than a price cap on oil because of its less fungible nature.

Figure 1 illustrates the market power that a monopsonist can exert over the marketplace. When there is perfect competition in the market, a seller can sell to several small firms or buyers. Under these conditions, given the supply (S) and demand (D) curves for crude oil, the market is said to be in equilibrium when supply is equal to demand, at point A. The equilibrium price and quantity are given by P_A and Q_A respectively.

If the small firms get together to form a monopsony, the seller has limited options, and can only sell to one collective buyer. It must accept the price that the monopsonists offer, as there are no other feasible alternative buyers (Lyndon et al. 2022). Under these conditions, given the demand curve, the buyers would be willing to pay a higher price (P_B), equal to the marginal cost of buying MRC, in order to receive a slightly lower quantity (Q_B). However, they can exercise their market power, and pay only a lower price to the supplier (P_C), instead of the competitive price(P_A), at point C.

Figure 1. Monopsony power in the oil market.



Source: KAPSARC.

The marginal cost of buying oil is given by the MRC curve. The intersection of this curve and the demand curve (point B) represents the preferred buyer's choice for the quantity Q_B which is available on the supply curve at price P_C.

Given these relationships, the elasticity of supply can be used to calculate the value of the Lerner Index (see Appendix A). If the elasticity of supply ranges between 0.26 and 0.7, then for every 1% increase in the price of natural gas, the quantity supplied will be increased by approximately 0.26 to 0.7 (Burke and Yang 2016; Gros 2022; Vivid Economics 2016). At present, the price of natural gas Dutch Title Transfer Facility

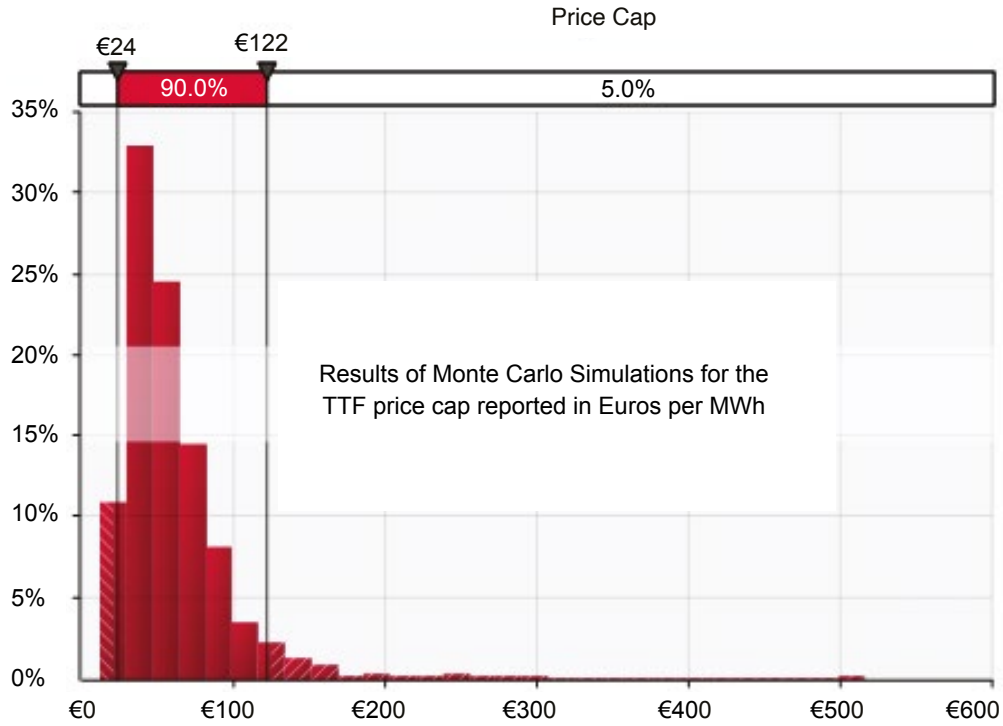
(TTF) is 139.58 euros per megawatthour (EUR/MWh). The price is high, and the quantity demanded does not respond much to changes in the price level. In other words, the price elasticity is low because the ability of alternative suppliers to reach markets has been limited by economic sanctions and pipeline and transportation constraints. The price markdown given by the Lerner Index suggests a cap of 46 EUR/MWh in the short run, when markets are tight.

Alternative energy sources and suppliers will become available in the longer term, and the price elasticity will be much higher at 0.7. In this case, with alternative supplies, available gas prices will return to normal levels, like the average price of 73 EUR/MWh seen from July to December 2021. When we apply the Lerner Index to this price, the mark down reveals a sustainable price cap of around 50 EUR/MWh.

Given the historical prices from October 2021 to October 2022, and a distribution of natural gas own-price elasticities,[1] we perform Monte Carlo simulations on the price cap. The results are reported in Figure 2. Given these assumptions, the price markdown given by the Lerner Index suggests a mean price cap of 60 euros. The probability distribution gives a price value of at most 69.70 euros in the third quartile, a 75% probability.

In short, any price cap in the 60 EUR/MWh and 70 EUR/MWh would appear to be suitable for the G7 price cap strategy. However, the scheme could easily backfire if G7 and OECD nations do not hold sufficient market power to form a viable monopsony.

Figure 2. Probability distrubution of suitable TTF natural gas price caps.



Source: Internal CEPMLP calculations @Risk Palisade 2022.

[1] We model the price elasticity of demand as a lognormal distribution with a mean of 0.48 euros. The daily TTF prices from October 2021 to October 2022 are found estimated as Dagum(-17.8962,1.1973,3.6608,16751570.9) by means of the Kolmogrov-Smirnov test statistic.

A similar result can be derived for the oil market. If the elasticity of supply ranges between 0.27 in the short run and 0.5 over the long term, then for every 1% increase in the price of Brent crude oil, the quantity supplied will increase by approximately 0.27% to 0.5% (Baumeister and Peersman 2013; Coyle et al. 2012; Taghizadeh Hesary and Yoshino 2014; Caldara et al. 2019). The price markdown given by the Lerner Index suggests a price cap of $26 per barrel (b) for Brent in the short run when markets are tight. In the longer term, a sustainable price cap for Russian oil would be approximately $38/b. Some industry estimates place Russian production costs as low as $3/b-$4/b. Given Russia's unique tax structure, Russian firms could realize a small profit at levels as low as $25/b-$30/b (Reuters 2022).

It is important to note that the potential for the EU to form a monopsony on world oil markets is limited as there are many countries and companies supplying oil to the EU market. In addition, and perhaps more importantly, there are many more players on the demand side, including large consumers such as China and India. In a worst-case scenario, Russia might decide to cut off oil and gas supplies to Europe, exacerbating an already critical situation, which includes fuel poverty. A monopsony might be facilitated by a neutral country stepping up to offer insurance to oil shippers (Arboleda 2022).

The implications of a natural gas price cap for fuel switching in the EU are noteworthy. A price cap levied on natural gas and not crude oil could result in significant moves toward fuel switching and reduced demand for oil used for industrial purposes in the EU (Washington et al. 2021). It remains to be seen whether it will be feasible to overcome the difficult political hurdles of organizing many countries with competing and overlapping interests in order to implement a price cap at all.

Appendix A

We begin with the classical theory of monopolies. It is characterized by the equilibrium where the marginal revenue is equal to the marginal cost, which yields a markup over the marginal cost given by the usual Lerner equation on the monopoly side (Varian 1989).

Let:

R(Q) ≡ revenue (R) as a function of quantity (Q)

P(Q) ≡ price (P) as a function of quantity (Q)

ϵ_s ≡ price elasticity of supply

MC ≡ marginal cost

Then revenue is given by:

$$R(Q) * P(Q) * Q$$

The marginal revenue is:

$$\frac{dR(Q)}{dQ} = \left(\frac{dP}{dQ} * Q + P\right) + \frac{dP}{dQ} * Q * \left(\frac{P}{pP}\right) + P = P(1 - \frac{1}{\epsilon_D}) \qquad (1)$$

The marginal cost is:

$$\frac{dQ(P)}{dP} = MC(Q) \tag{2}$$

In equilibrium at which the price will be equal to the marginal cost:

$$P\left(1 - \frac{1}{\epsilon_D}\right) = MC(Q) \tag{3}$$

The markup that the monopolist can exercise over the marginal cost is given by Equation (3).

We now consider the theory of monopsony. The cost of the inputs that the monopsonist purchases, such as natural gas, is given by:

$$C(Q) = P(Q) * Q \tag{4}$$

The marginal cost of the input is given by the derivative of the cost function:

$$\text{MC}=\frac{dC(Q)}{dQ} = \left(\frac{dP}{dQ} * Q + P\right) + \frac{dP}{dQ} * Q * \left(\frac{P}{P}\right) + P = P(1 + \frac{1}{\epsilon_s}) \tag{5}$$

Equation (5) shows the markdown that the monopsonist can deploy, exploiting the notion of the elasticity of the supply function through the Lerner Index:

$$\frac{MC(Q) - P}{P} = \frac{1}{\epsilon_s} \tag{6}$$

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