Managing Energy Prices through Strategic Procurement

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Abstract

In response to high energy prices sustaining Russian aggression in Ukraine, there has been a growing number of calls to either tax Russian oil imports or establish a buyer's cartel that would lower prices by restricting demand. We offer a policy alternative building on the fact that the economics of oligopolistic, cartelized markets are radically different from the economics of competitive markets. In such markets strategic procurement can stabilize prices to a reasonable level without reducing demand or sacrificing environmental goals.

KEYWORDS: oligopoly, cartel, OPEC, Russia, strategic procurement, joint purchase board, advance purchase commitments.

1 Motivation

Challenges. Our work is motivated by two main challenges. The first is to address current high energy prices. These high prices help support a belligerent Putin and reduce Europe's ability to take needed action. In addition, at a time of high inflation, high energy prices contribute to discontent, social inequality, and likely heighten inflation expectations.[1]

The second challenge we are preoccupied with is that of supply network resilience: the current energy (and related food) crisis is a case study in how to mount a coordinated

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[1]Even if energy purchases are a small part of the CPI, it is a very salient component of the CPI, and may plausibly have an outsize effect of expectation formation.

response to supply challenges that avoids the pitfalls of autarky and protectionism. The strategic procurement program we develop in this context can serve as a blueprint for the regulation of other key input markets.

Our specific expertise. The specific expertise we bring to bear regards the issue of procurement in oligopolistic cartelized markets with high entry costs (Chassang and Ortner, 2019, Chassang et al., 2022, Kawai et al., 2022, Ortner et al., 2021). While supply in competitive markets is driven by marginalist considerations, this is not true in an oligopolistic cartelized setting. This informs the assessment of policy proposals that have already been made, and suggests novel policies that seek to directly change market conduct and market structure. We believe that the know-how developed by firms and governments to improve procurement in cartelized markets can be used to regulate the energy market.

The fact that energy markets are not efficient (Asker et al., 2019) also creates room for meaningful policy improvements. In particular, we seek to outline a win-win-win scenario for energy producers, energy consumers, and the environment. Crucially, our policy goal is not to exchange high and volatile prices for low and volatile prices, but instead support moderately high and stable prices. We believe that this is an attractive compromise benefiting suppliers, consumers, and environmental stakeholders.

Overview. We develop our analysis in three main steps. First, we provide a simple framework to understand cartel discipline by considering a producer's marginal decision to produce more.

Second we articulate a policy proposal based on the idea of strategic procurement, i.e. the strategic allocation of both demand commitments and acquired supply to regulate the energy market. An advantage of our proposal is that it does not operate through painful and logistically difficult demand reduction operations. Indeed, in a cartelized market, it is possible to reduce prices without reducing demand, through the use of strategic purchases.

This is a rare policy free-lunch exploiting the specific economics of oligopolistic cartelized markets.

Finally, we use our framework to inform other policies, including taxes on Russian oil (Hausman, 2022), price caps, as well as rationing and demand management.

2 Framework: The Economics of Cartelized Markets

The cartel discipline equation. Consider an oil producer currently supplying quantity Q, and let $\Delta Q > 0$ be a (positive) increase in supply.[2] Let P denote the price of oil, while ΔP denotes the change in price caused by increased supply ΔQ. Let MC denote the marginal cost of production. Finally we denote by ΔV the change in the net present value of profits caused by the change in current production: this term captures the impact of inducing a response from other strategic producers, including a possible price war.

Cartel discipline holds whenever the producer will prefer *not* to increase supply. This is the case if and only if

$$\underbrace{\Delta Q \times (P - MC)}_{\text{profit from marginal unit}} + \underbrace{\Delta P \times Q}_{\substack{\text{inframarginal} \\ \text{price impact}}} + \underbrace{\Delta V}_{\substack{\text{impact on} \\ \text{continuation values}}} \leq 0. \tag{CD}$$

Term $\Delta Q \times (P - MC)$ is the profit the producer would make from marginal production ΔQ. This term is only one involved in marginal analyses of supply with price-taking producers. Term $\Delta P \times Q$ reflects the producer's estimated loss in revenue from reducing the market value of its non-marginal units. This term matters in oligopolistic markets where producers are price-makers. Finally, term ΔV reflects sophisticated collusive play in which cartel members discipline one an other through the threat of future price wars.

The core of our policy proposal builds on an understanding of how the last two terms in

[2]For much of the paper we focus on the oil market rather than gas markets. Because gas markets are localized, the analysis of gas markets requires greater care. However, our analysis plausibly applies to European electricity markets, some of which may be affected by tacit collusion (Dohmen and Kerbusk, 2007).

(CD) affect producer behavior.

How this informs current producer behavior. Before turning to our policy proposal, we use (CD) to clarify why oil producers have been reluctant to calls for increased production.

For a number of reasons we believe that term ΔV is currently large and negative: the threat of a price war looms large. One reason for this is that oil producers went through a price war starting in March of 2020 following disagreements between Russia and OPEC on production targets, culminating in negative spot prices. This recent experience makes threats credible, but also means that oil exporters will be especially keen to avoid further conflict: the pain of a second price war after multiple years of depressed demand would be very high.

Importantly, the realization that OPEC has only just reached a truce with Russia clarifies why it has been difficult for OPEC to follow the pleas of the policy makers in the West and increase production. This is essentially a deviation from agreed-upon production targets which could trigger another price war. To alleviate the issue, the West may need to provide OPEC price guarantees protecting it from a future price war.

We also believe that the current price impact ΔP of additional production ΔQ is large and negative. This is because current demand appears to be inelastic.[3] As a result, as illustrated by Figure 1, a small shift in supply causes a large decrease in equilibrium price. This encourages producers to refrain from increasing production since it would also significantly reduce the value of their existing supply.

Finally, we note that these forces may well dissipate in the medium run, for instance if demand softens again. For this reason, current high prices may not be enough to induce entrants (e.g. producers active on the Marcellus shale) to pay the fixed costs needed to allow for greater production 6 months from now.

[3]One possible story is that people have been postponing travel due to the pandemic and are currently eager to travel regardless of the cost.

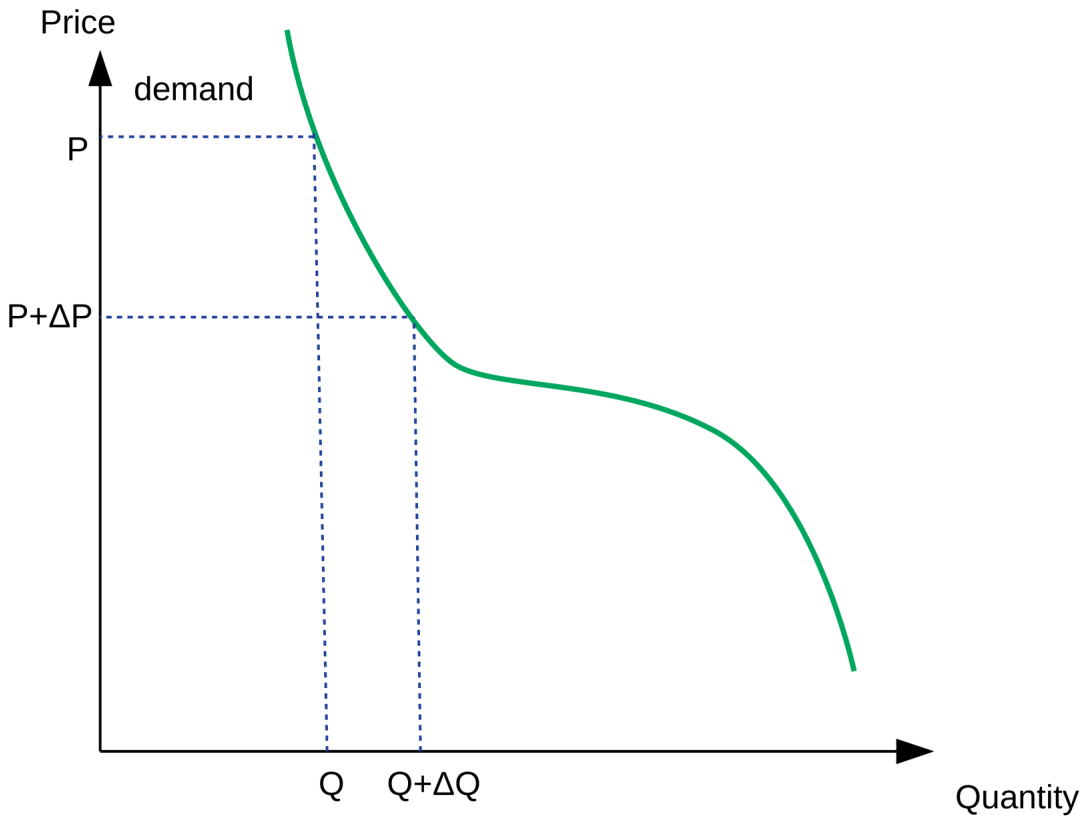

Figure 1: Inelastic demand leads to a large price impact

3 Policy Proposal

Summary. Our proposal builds on the strategic use of advance purchase commitments to directly affect industry structure and industry conduct.[4] For simplicity, we think of those purchase commitments as being managed within a single supranational entity, endowed with a purchase mandate by member countries, but they may also be managed by individual countries, coordinated by a centralized board. One possibility would be to work within the IEA infrastructure and expand the range of strategic use for required minimum oil reserves.

More specifically the board would use its demand capacity to:

[4]Here we think of advance purchase commitments as two-sided agreements to trade at a given price in the future, i.e. a forward contract, instead of a one-sided commitment to buy at a minimum price, i.e. an option, as in some existing advance market commitment designs (Kremer et al., 2020).

(i) Encourage entry;

(ii) Weaken cartel discipline;

(iii) Encourage self-regulation by cartel by making (i) and (ii) conditional on high energy prices.

In addition, the supply sourced by the board would be allocated strategically to:

(i) Increase the elasticity of residual demand by targeting low elasticity high willingness to pay energy consumers;

(ii) Encourage early participation at scale by member countries.

We now discuss these points in more detail.

3.1 Strategic uses of demand

Encouraging entry. The first strategic use of demand is to encourage entry. The goal here is to de-risk entry for marginal suppliers.

Concretely, the board would enter long-term bilateral forward contracts at high but reasonable prices (say USD 70 and barrel for the next two years) with targeted entrants. Entrants of interest may be actors in the oil, gas, and renewable electricity markets as well as in supporting infrastructure markets (e.g. electricity grid, oil rig maintenance...). This promotes entry by reducing the price-uncertainty that entrants face, and justifying upfront fixed costs.

Importantly, the board would use bilateral contracts rather than direct operations on the futures market. Operations in the futures market would not allow the board to target marginal entrants, instead, demand posted in the open futures market is likely to be picked up by incumbents.

An important limitation of entry is that it increases future supply rather than current supply. However, since future and current prices are related via stockpiling, increasing future supply will also relax current price pressure.

Encouraging deviations from cartel discipline. A second strategic use of demand is to encourage increased production by existing cartel members. This requires insuring producers against both price impact ΔP, and future retaliation by the cartel ΔV.

Concretely, the board would enter long term bilateral contracts at high but reasonable prices with targeted producers for significant medium term increases in their supply. Long-term contracting effectively shuts down, or at least reduces, the impact of terms ΔP and ΔV on producers.

There are two advantages to increasing production by existing producers rather than entry. First, it may help increase production in the short rather than medium term. Second, production by existing producers is likely to be more efficient than production by entrants. A possible difficulty is that the scale of commitments needed to insure an existing producer against current price impact and future price wars is likely greater than the commitment needed to encourage entry.

Encouraging self regulation by producers. Finally, we propose that the bulk of the board's strategic purchase activities should only take place if energy prices are above a predetermined threshold perceived to be excessively high. This has the benefit of encouraging self-regulation by producers, and only paying the organizational costs of running a strategic procurement board if producers are unwilling or unable to self regulate.

A key point is that our goal is not to achieve low prices, but instead to support relatively high stable prices over the medium term (e.g. USD 70 a barrel). This clarifies a possible win-win-win scenario for suppliers, consumers, and environmental stake-holders. Suppliers and consumers essentially co-insure to reduce the impact of price shocks, while entrants in

the renewable energy sector benefit from stable operating conditions.

This approach has long been used successfully by best-in-class industry procurement offices (e.g. Toyota parts procurement). For critical procurement, the goal is not to get the lowest current price possible, but instead to manage a healthy and resilient supplier ecosystem providing a high quality supply. This cannot be achieved by letting suppliers compete to death: firm exit will cause supply to become fragile, concentrated, and low quality. Instead procurement offices tolerate some amount of price coordination between suppliers, provided the terms remain reasonable, and suppliers provide a high quality supply.

3.2 Strategic uses of supply

In addition to using its demand strategically, the board would also use the supply it sources for maximum strategic effect.

Softening demand. The first strategic use of sourced supply is to increase the elasticity of residual demand. The large and negative price impact ΔP of marginal production ΔQ is due to inelastic demand. By targeting the allocation of forward supply to inelastic consumers of oil, we can reduce the price impact of additional production and therefore encourage greater oil production.

We note that identifying which consumers contribute to the relevant inelastic component of demand need not be difficult. This could be done through a precise data-driven understanding of demand, or by running a side market to allocate advance purchase rights: inelastic high value consumers are likely to value guaranteed future prices more than elastic consumers.

Encourage participation early and at scale. A second strategic use of supply is to encourage member countries to participate early and at scale. One possibility is that the board would offer better supply guarantees to members that have committed to purchase

a larger shares of their demand through the board in the recent past. In other words, the board would reward early participation at scale by increasing access to the board's supply.

3.3 Precedents of interest

Before using our framework to inform other policy proposals we find it helpful to highlight precedents of interests.

One prominent precedent is the European Steel and Coal Community (ESCC, 1951-2002), which was primarily setup to prevent France and Germany from going to war again. The account of Monnet (1978) clarifies that the ESCC operated successfully as a buyers' cartel. Given limited funds available from the Marshall plan to rebuild war-torn Europe, it sought to avoid raising commodity prices. A specific mission of the ESCC, reflecting US priorities at the time, was to undermine and ultimately break apart the powerful German steel and coal producers' cartel.

Following the 1973 and 1979 oil crises, a coalition of oil buyers setup the International Energy Agency to improve the stability and transparency of energy markets. Besides providing improved access to data and analysis, the IEA requires member countries to hold oil reserves corresponding to roughly 90 days of imports. These supplies are strategically released in a coordinated way to address shocks to supply.

Finally, advance purchase commitments of various sorts are often used by governments to direct medical research and improve both access and favorable pricing from pharmaceutical companies. One recent example is provided by Operation Warp Speed, which managed to successfully source large supplies of a Covid 19 vaccine that was inexistant at the time of contracting.

4 Connections to Other Policies

We now discuss other policies suggested over the last few months, and how the cartel view informs them.

Taxing Russian oil. It has been suggested that Europe and the US should heavily tax Russian oil (Hausman, 2022). The hope is that Russian rather than consumers would pay the bulk of the cost associated with taxes, the argument being that Russia has low marginal costs of production, and that there are many suppliers that consumers can turn to as substitutes.

There are standard concerns with this suggestion. First taxes on energy have distributional issues and complex political implications. Furthermore, although oil is not a large part of the CPI, it is a salient component of consumers' budgets, and hence may have a large impact on individuals' inflation expectations.

The cartel view further qualifies the likely impact of targeted taxes proposal. First Russia is a strategic player, and hence, it might shutdown its supply even if net price is greater than marginal cost. Second, given that OPEC only recently reached a truce with Russia, it is not evident that it would increase production even in the face of increased demand. Hence, it is plausible that taxing Russian oil – especially short-term taxes – would simply result in higher oil prices and little trading of Russian oil. A much more painful outcome than predicted by marginal analysis.

Price caps. An alternative policy is to set caps on the price of energy. Price caps are often decried as politically expedient but economically misguided, as they shutdown important price signals. However, this is not the case in a cartelized oligopolistic market. Indeed, in the presence of a cartel, procurement essentially becomes a bilateral bargaining relationship. In this environment, it is optimal to set a price cap for the same reason it is optimal to set a reserve price in an auction: it improves terms of trade against a strategic player.

We note that price caps do have some significant drawbacks. They reduce incentives to

enter the market, they may lead to rationing, and they require policing side purchases.

The cartel view suggests that price caps may be usefully complemented by price floors, i.e. minimum price to be paid for the procured good. Such price floors are used frequently in procurement, and have been shown (Chassang and Ortner, 2019) to help increase entry, and weaken cartel discipline by reducing both the price impact ΔP of additional production, and alleviating the threat of future price war ΔV. In addition, price floors support the goal of building a cooperative relationship with producers, and the win-win-win outcome of maintaining reasonably high stable energy prices in the medium run.

Demand management. The standard intuitive approach to reducing prices through a cartel of buyers is to reduce demand. This is a difficult challenge when purchasing decisions and budgets are highly decentralized. In addition, this is a relatively painful way to address high prices since it requires rationing supply.

Realistically, we believe that different strategies should be used to manage demand by industry and demand by retail consumers. Industry demand could plausibly be regulate via a system of purchase permits based on past consumption. In addition, inelastic industry consumers of oil may be required to source their consumption through the board in order to increase the elasticity of residual demand.

On the retail side, rationing seems politically difficult. One difficulty is that gas prices tend to be contracted on over the medium term, so that real time household-level gas consumption data is not available from existing metering technology. One possibility would be to regulate demand for gas via the electricity market. Indeed, demand for gas is in large part driven by the need to provide a flexible, fast-to-ramp-up, source of electricity. Furthermore, smart meters for electricity have been broadly adopted ($\simeq$ 70% adoption in the US and East Asia, $\simeq$ 50% adoption in Western Europe). This would allow policymakers to setup a reward system for reducing electricity consumption during peak hours. Reductions in peak electricity consumption would directly reduce gas consumption.

5 Takeaways

Our proposal has two main takeaways:

(i) The economics of cartelized markets are different from the economics of competitive markets. This changes the pros and cons of existing policy proposals and suggests novel solutions to regulating the price of energy. In particular, through the strategic use of demand, it may be possible to reduce prices without reducing overall demand.

(ii) A win-win-win scenario attractive to suppliers, producers, and environmental stakeholders seems possible: the goal is not to achieve low prices, but reasonably high stable prices for the medium run.

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