A strategic perspective on competition between pipeline gas and LNG

Robert A. Ritz[1]

Executive summary

Natural gas is of significant commercial and public policy interest. It provides close to 25% of worldwide primary energy consumption, being widely used in power generation, residential heating and as a feedstock for industrial production. Following the 2015 COP- 21 Paris climate conference, many policy analysts also see an important medium-term role for gas in the transition to a low-carbon economy—notably given that it has half the CO2-emissions intensity of coal.

Competition in the international natural gas industry features two types of suppliers: traditional sellers of gas that is transported by pipeline and exporters of seaborne liquefied natural gas (LNG). With the expansion of international trade over the last decade, pipeline gas and LNG now increasingly compete head-to-head, notably in Europe. Indeed, the balance of power between Russia, the world's largest export of pipeline gas, and Qatar, the leading LNG export has played a central role for competition in global gas over the last 10 years. Yet they are also fundamentally different. Gas pipelines are large infrastructure investments with a very high degree of "asset specificity": once built, they are physically bound to a particular route, with no alternative use. They are also observable to market participants and largely irreversible, giving them substantial commitment value in business strategy. LNG, by contrast, is super-cooled and then transported by tanker, which gives exporters a choice of markets for any given cargo. Put simply: LNG is mobile, pipelines are not.

The objective of this paper is use the toolkit of game theory to understand the implications of this asymmetry for competition in global gas markets. The analysis examines a simplified version of the global gas market, with two markets and two strategic suppliers. A pipeline producer, say Russia/Gazprom, sells gas to the European market while an LNG exporter, say Qatar, sells to both European and Asian gas consumers. Each market also features competitive fringe of smaller non-strategic suppliers (such as smaller LNG or pipeline exporters). The model is a two-stage game of capacity investments followed by quantity competition, in which the LNG exporter in the 2nd stage chooses how to split its sales across the two markets.

The model delivers three sets of insights. First, the analysis shows how its commitment to serving a single market confers a competitive advantage on a pipeline supplier: it recognizes that its LNG rival has an alternative use for its capacity in Asia and can therefore be induced in the 2nd stage to cede market share of the common European market. As this raises its return on investment, the pipeline supplier aggressively "overinvests" in capacity. By contrast, the pipeline player itself has no such outside option due the specificity of its investment. This strategic effect raises the market share and profits of pipeline gas at the expense of LNG. The paper uses an illustrative calibration to global gas market data to demonstrate that the strategic effect can be quantitatively significant; it also argues that the main insights are robust to different model specifications, including the

1 Judge Business School & Energy Policy Research Group, University of Cambridge, UK. E-mail: rar36@cam.ac.uk

strategic players having "political objectives" that depart from narrow economic profit-maximization.

Second, the analysis makes clear Russia's dependence on Europe can *benefit* local gas buyers: its strategic overinvestment raises the intensity of competition, leading to higher production and a lower gas price. For the same reason, the widely-used Herfindahl index may give a misleading picture of "security of supply": in some cases, higher import concentration is good news for buyers. The model can also explain why gas-importing countries nonetheless like to diversify into LNG and how Lithuania's first LNG import terminal yielded a larger-than-expected price concession from Gazprom. Finally, it sheds light on how the strategic players optimally respond to additional entry into the European gas market (e.g., by smaller LNG exporters): at equilibrium, the pipeline player (Gazprom) more strongly "makes room" than a large LNG player (Qatar) to an expansion of the competitive fringe.

Third, the model is used to analyze Russia's evolving gas export strategy, with a focus on its "pivot to Asia". In May 2014, Russia and China agreed on the "Power of Siberia" deal, reportedly the largest-ever gas deal, reportedly worth US$400 billion over a 30-year period. At first glance, this eastward diversification of Russian gas exports may appear puzzling in light of the preceding game-theoretic analysis. In particular, it seems to turn Russia into a multimarket exporter to both Europe and Asia—and thus expose her to the same strategic vulnerability of LNG exporters. On closer inspection, however, it turns out that this conclusion does not follow. The key point is the Power of Siberia project involves natural gas in Eastern Siberia that was previously "stranded" and will become dedicated to the Chinese market. Hence the above concerns over strategic weakness do not apply. In effect, the existing western-bound pipeline (to Europe) and the new eastern- bound pipeline (to Asia) are different capacities, specific to different gas fields, with no scope for redirection into each other's markets.

Particularly interesting in this regard is that, soon thereafter, in November 2014, it was reported that Russia and China were agreeing on a further major gas deal. This "Altai" project is fundamentally different in that it involves pipeline gas from Western Siberia that has so far been going to European consumers. This led to speculation that Russia could indeed become the new "swing producer" between European and Asian markets, taking over this role from Qatari LNG. The present analysis suggests that, from a strategic viewpoint, this deal should be significantly less attractive to Russia because it risks undermining Gazprom's position in Europe. Indeed, more recent press reports suggest, for a range of economic and political considerations, the Altai project is no longer being pursued.

The paper complements the existing literature on natural gas markets, which is dominated by large-scale numerical Cournot-style models. It is well-established in this literature that the global gas market is not perfectly competitive; market power is an important driver of prices and trade flows. Such large-scale models are well-suited to policy analysis via numerical simulation of scenarios in terms of gas demand, investment volumes, etc. However, their complexity means that it can be difficult to understand what is driving the numbers. This paper instead emphasizes the microeconomic intuition and strategic interaction between key producers.

Keywords global gas markets; strategic competition; security of supply; diversification strategy