UNIVERSITY OF CAMBRIDGE | Energy Policy Research Group

Strategic investment and international spillovers in natural gas markets

EPRG Working Paper 1505

Cambridge Working Paper in Economics 1510

Robert A. Ritz

This paper presents a game-theoretic analysis of competition in natural gas markets, with an emphasis on the strategic interaction between pipeline-based sellers, such as Russia/Gazprom and Norway, and exporters of liquefied natural gas (LNG), such as Qatar, Australia, and Nigeria. Following the expansion of international trade in LNG over the last 10 years, pipeline gas and LNG now increasingly compete head-to-head, notably in the European market. But they are also fundamentally different. Gas pipelines are large investments with a very high degree of "asset specificity": once built, they are physically bound to a particular route, with no alternative use. LNG, on the other hand, is transported by tanker, giving exporters a *choice* of markets for any cargo. The Fukushima Daiichi accident of March 2011 highlighted the ability of flexible LNG supplies to "fill the gap" in Japan's energy mix after its nuclear shutdown. From a strategic perspective, a key question is how this difference affects the competitive playing field between these two types of exporters.

The analysis examines a simplified version of the global gas market: 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. The model is a two-stage game of investments in production capacities followed by quantity competition. Its key feature is that the LNG exporter chooses how to deploy its capacity across the two markets. This creates a supply-side link between them, and allows for an analysis of how local "shocks" spill over from one market into another—and their implications for competitive balance and consumer welfare.

The paper makes three main contributions. First, it shows that the "focused" producer (Gazprom) enjoys a competitive advantage over the "diversified" seller (Qatar) in their common market. The multimarket firm's optimal strategy equalizes "marginal revenues" across export markets. Recognizing this, Gazprom strategically over-expands its capacity and market share in the European market, thus depressing the local price, knowing that Qatar can still employ its capacity in Asia.

This result suggests that Gazprom's traditional focus on Europe may be a source of *strength*, rather than a weakness as is usually argued in policy discussions around "energy security", and also shows that this constellation *benefits* European gas buyers. The analysis also highlights a limitation to the common practice of using Herfindahl concentration indices to measure supply security in energy markets; in some cases, a *higher* Herfindahl index can be better for supply security.

Second, what were the repercussions of the Fukushima accident for European gas markets and Gazprom? The paper examines both short-term impacts—when firms' capacity levels are fixed—and longer-term effects—when firms can re-optimize capacity in light of changes in market conditions. The results suggest that, in the longer term, an Asian LNG demand boom makes Qatar a *stronger* competitor in Europe. This hurts Gazprom as well as European gas consumers, as prices rise due to less aggressive competition. Key to these results is that LNG exporters have significant pricing power in Asia, which seems consistent with market experience. This long-run response differs from Fukushima's short-term impact: For Qatar, in the short run, raising sales to Asia means cutting those to Europe. This allows Gazprom to gain further European market share in the short run—while it *loses* share over the longer term as LNG producers invest more heavily in capacity. The available empirical evidence is limited but seems broadly consistent with these “predictions”.

Third, the model is used to evaluate Russia’s evolving gas export strategy. In May 2014, Russia and China agreed on the “Power of Siberia” deal, reportedly the largest-ever gas deal, worth US$400 billion. Does this deal expose Russia to the multimarket vulnerability identified above for LNG exporters? No. Pipeline sales cannot be redirected between different end markets in the same way; in effect, the existing western-bound and the new eastern-bound pipeline are different capacities. By contrast, the subsequent “Altai” agreement of November 2014 involves pipeline gas from Western Siberia which has so far gone to European consumers, with some analysts expecting Russia to thus become the new “swing producer” between European and Asian markets. The present analysis suggest that such “flexible” diversification—whatever its benefits—also comes with a strategic cost; the Altai deal may therefore be significantly *less* attractive to Russia.

Similarly, the paper shows that it can be rational for a traditionally pipeline-based exporter to reject a seemingly profitable diversification opportunity into LNG (from the same gas fields) so as to protect market share in its existing business.

Contact rar36@cam.ac.uk
Publication February 2015
Financial Support Enel Foundation