

STRATEGIC RENEGING IN SEQUENTIAL MARKETS UNDER IMPERFECT COMPETITION

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Overview

In virtually all competitive markets, some exchanges are settled through forward commitments. Those commitments often take the form of physical contracts specifying a given price for a quantity of goods to be delivered at term. A supplier is hence committed to deliver the contract's quantity but can also sell some production at the spot price. The contract price is however not directly tied to the spot market price, but relates to its expected value (Weber, 1981). Forward contracts are widely used to hedge risks associated to the spot price volatility.

The market duality created by the co-existence of the two prices - the forward and spot prices - may give room for market manipulations. A market participant who not only competes in the spot market but also holds forward commitments has both direct and indirect effects on the spot market outcomes. By renegeing on its commitments, a supplier can mechanically increase the spot market demand since some of the withdrawn output must be replaced in equilibrium. Renegeing hence shifts the firm's residual demand function in the spot market, which results in artificially inflated spot price and quantity.

This paper focuses on the opportunities to renege on prior commitments, and the channels through which they create incentives to manipulate markets. Those incentives are especially relevant to imperfect markets subject to capacity constraints and demand uncertainty, such as the energy and transportation markets, because spot prices may at times be very sensitive to unexpected supply and demand shocks.

Strategic renegeing routinely occurs in electricity markets under false claims of emergency maintenance of power plants, often referred to as "forced outages" or "production failures". An illustrative case took place in Alberta's electricity market in 2010. The regulator accused TransAlta Corporation of multiple instances of market manipulations through strategically timed forced outages of a coal-fired power plant subject to a long-term forward contract (MSA, 2015). This contract specifies that the plant's output must be sold forward at a regulated fixed price. Such contracts are widely used by regulation authorities in energy markets to reduce market concentration. The firm's manipulative scheme combined strategic renegeing, through emergency shutdown of the committed generating units, with an adjustment of its supply strategy on the spot market based on the insider's information about outage timing. Following those accusations, TransAlta agreed to pay \$56 millions in settlement.

Methods

This paper consists of two parts. First, we develop a micro-economic framework to investigate incentives for strategic renegeing in sequential market under imperfect competition. We focus on a monopolist facing a fringe in a two-period model where both the forward and spot markets are endogenous. There is a large literature on sequential markets with market power (Allaz and Villa, 1993; Coase, 1972) although not much consideration has been given to this commitment problem in the presence of uncertainty.

In the second part, we analyze the empirical behavior of TransAlta in the above case study so as to both test and illustrate our theoretical predictions. Fogelberg and Lazarczyk (2014) is the only empirical study, besides market reports, that document this form of incentives in energy markets. In addition, there are only few empirical papers studying strategic behaviors in sequential markets (Ito and Reguant, 2016). We use a rich firm-level dataset provided by the Alberta's electricity market regulator which covers the period during which the firm used this manipulative scheme. In particular, the data includes information on hourly bids and spot prices.

Results

We find that equilibrium supply strategies depend on the volume of committed output and the opportunity cost of renegeing. In particular, a strategic player may find profitable to offer its output on the spot market at higher prices because of potential renegeing opportunities for some realizations of the random demand shock. Strategic renegeing can be understood as a loss-based manipulative conduct, where the firm foregoes part of its forward profits as a tool to benefit its spot market position.

A strategic firm can benefit from renegeing on its commitments from two channels. First, the firm can weaken competition from its own output sold at forward prices as well as from its competitors by forcing them to approach their capacity limit. By doing so, the firm extends its market power and increase its profitability through higher prices and possibly higher volume of market sales. Second, the firm can alleviate demand uncertainties and relax the monotonicity constraint on its supply strategy.

We find that the profitability of renegeing depends on the volume of committed output (i.e. the forward position), its opportunity cost (i.e. the forward price and deviation penalty), and the firm's market behavior (i.e. spot market bidding strategy). We show that the ability to renege affects supply strategies in equilibrium. The firm can increase its expected profit by selling its output at higher prices on the spot market and renege on its commitments for any demand realizations above a specific threshold. This conduct has potential to increase artificially the market price, the volume of spot sales and the firm's probability to become pivotal. Under demand uncertainty, there always exists a demand threshold above which a monopolist finds profitable to renege on its commitments. An interesting corollary of this result is that equilibrium supply function strategies depend on demand uncertainty unlike in the seminal work of Klemperer and Meyer (1989).

The analytical results yield testable empirical predictions about the intent to manipulate the market. We show that TransAlta had clear financial incentives to manipulate, and benefitted from the forced outages of the coal-fired power plant during multiple events. We evaluate various counterfactual scenarios, including one where the deviation penalty is imposed based on an estimate of the firm's market position.

Conclusions

Strategic renegeing leads to higher profits for the manipulator through possibly both an inflated market-clearing price and a larger volume of market sales. On the other hand, it creates inefficiencies by allocating more costly resources to replace the capacity withdrawn through renegeing.

The firm of market manipulations considered in this paper is only one among a variety of possible extensive conducts. Yet, it allows to underline the common economic mechanism behind manipulative schemes. Our analysis yields important insights to identify potential misconducts in this context.

References

- Allaz, B. and J.-L. Vila (1993): "Cournot competition, forward markets and efficiency," *Journal of Economic Theory*, 59, 1-16.
- Coase, R. H. (1972): "Durability and monopoly," *The Journal of Law and Economics*, 15, 143-149.
- Ito, K. and M. Reguant (2016): "Sequential markets, market power, and arbitrage," *American Economic Review*, 106, 1921-57.
- Klemperer, P.D. and M. Meyer (1989): "Supply function equilibria in oligopoly under uncertainty," *Econometrica*, 57, 1253-1277.
- MSA (2015): "Market Surveillance Administrator allegations against TransAlta Corporation et al., Mr. Nathan Kaiser and Mr. Scott Connelly, Phase 1, Decision 3110-D01-2015, July 27, 2015," *Alberta Utilities Commission*.
- Weber, R.J. (1981): "Multiple-object auctions," *Northernwestern University*.