

Relaxing competition through speculation: Committing to a negative supply slope

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The trade in commodity derivatives is widespread and trading volumes often surpass that of the underlying commodities. Commodity derivatives markets have seen a 60-fold increase in the value of trade between 1998 and 2008. In 2008 the outstanding value of commodity derivatives equaled \$13 trillion. This is twice the worldwide output of commodities, and about 21% of world GDP. Ideally derivatives markets improve market efficiency as they allow firms to manage risk and facilitate price discovery by aggregating information across market participants. However, in this paper we show that allowing for derivatives trade increases spot market volatility and harms competition, when dominant producers trade futures and options contracts and make price-contingent supply offers in the spot market. In theory, this would be the case in for instance deregulated wholesale electricity markets.

Using game theory, we show that each producer will sell a forward contract and buy a portfolio of call options with a range of strike prices. With this strategy, the net-amount of the producer's contractual obligations decrease in response to raising spot prices. Although this strategy is risky, it is profitable, as it commits the producer to a downward sloping supply function. That is, the producer will produce more when prices are low and less when prices are high. This induces its competitors to raise their prices, reducing overall competitiveness.

The anti-competitive effect of strategic derivative trade diminishes with more demand uncertainty. Hence, option contracts should be traded well-ahead of delivery. Increased demand variation has a similar effect, which can be achieved by requiring that option contracts or offers to the spot market must be valid for several subsequent delivery periods instead of just one period. For example, PJM, the largest wholesale electricity market in US, requires offers to be fixed during the whole day.

There is some empirical evidence supporting our results. First, in Nord Pool, the Nordic wholesale electricity market, a handful of producers regularly made offers that were partially downward sloping. This was allowed until October 10, 2007, when a new clearing algorithm was introduced that could no longer handle downward sloping supply functions. These irregularities are known to have been caused by option contracts, but it has not been analysed to what extent this worsened competition, and if so whether producers did it intentionally. Second, if producers would trade derivatives for hedging purposes, they would sell not only a forward contract, but also a set of call options. However, German market data suggests that producers do not sell those call options. In this way they might want to limit competitive pressure during peak hours.