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Relaxing competition through speculation: Committing to a negative supply slope

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Abstract

We demonstrate how commodity producers can take strategic speculative positions in derivatives markets to soften competition in the spot market. In our game, producers first choose a portfolio of call options and then compete in supply functions. In equilibrium, producers sell forward contracts and buy call options to commit to downward sloping supply functions. Although this strategy is risky, it is profitable because it reduces the elasticity of the residual demand of competitors who respond by increasing mark-ups.

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1. Introduction

The trade in commodity derivatives is widespread and trading volumes often surpass those of the underlying commodities.[3] Ideally, derivatives markets improve market efficiency as they allow firms to manage risk and facilitate price discovery by aggregating information across market participants.[4] If derivatives markets are used to hedge risk, then they also enhance competition.[5] However, this paper demonstrates that if they are used for strategic purposes, they may generate speculation, harm competition, and increase the magnitude of price spikes. Even if financial markets are perfectly liquid and production markets are unconcentrated, producers are sometimes able to sustain monopoly prices in a non-repeated game.

In Allaz and Vila (1993) seminal work on strategic contracting, producers first sell forward contracts and then compete in a Cournot spot market; the introduction of a financial market improves competition, lowers prices and increases the total surplus.[6] We generalize this model (1) by considering a larger class of derivatives contracts, (2) by generalizing the form of spot market competition and (3) by introducing uncertainty. In our model, producers first choose a portfolio of call option contracts with a range of strike prices. Then, they compete in supply functions in a spot market with uncertain demand.[7] The results of Allaz and Vila (1993) are reversed in our more general setting as a new channel is identified through which derivatives markets affect market outcomes.

In our model, the portfolio choice is an infinite-dimensional price-contingent commitment device. Unlike previous studies, this allows producers to control not only the level of their supply function, but also its slope. We show that each producer uses derivatives to commit to a downward sloping supply function, i.e. to produce more when prices are low and less when they are high. As illustrated in Fig. 1, this commitment makes the residual demand curve for each of its competitors steeper (less price-sensitive) and induces competitors to increase mark-ups and reduce their output. This *anti-competitive effect* is partly mitigated when demand uncertainty increases. This suggests that derivatives contracts should not be traded near delivery because firms then have a good estimate of demand. Alternatively, the same derivatives contract or supply func-

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[3] Commodity derivatives markets have seen a sixty-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.

[4] The effect of derivatives trade is a point of debate in the finance literature. Some authors claim that it reduces the variance and level of spot prices and improves price information (Turnovsky, 1983; Cox, 1976; Korniotis, 2009), while others claim the opposite (Hart and Kreps, 1986; Stein, 1987; Figlewski, 1981).

[5] This has been shown for alternative settings by Allaz and Vila (1993), Von Der Fehr and Harbord (1992), Newbery (1998) and Green (1999). de Frutos and Fabra (2012) show that there are sometimes exceptions to this rule in markets where offers are required to be stepwise. The competition enhancing effect of forward hedging contracts on spot market prices has been shown empirically by Wolak (2000) and Bushnell et al. (2008).

[6] In Willems (2006), the Allaz and Vila effect becomes stronger if producers sell a portfolio of financial option contracts and then compete in quantities. Holmberg (2011) shows that contracting is weakly pro-competitive when marginal costs are constant and firms compete in supply functions in the spot market. In Newbery (1998), producers sell contracts to deter entry. Green (1999) shows that forward contracting does not influence competition in markets with linear marginal costs and linear demand if producers coordinate on linear supply function equilibria.

[7] Our spot market model generalizes Klemperer and Meyer (1989) and Green and Newbery (1992) by the addition of contracts. Anderson and Xu (2006, 2005), Anderson and Hu (2012), Aromi (2007), Chao and Wilson (2004) and Niu et al. (2005) have also analyzed how exogenously given forward or option contracts influence supply function competition, but we derive more general optimality conditions for the Nash Equilibria in the spot market so that we can address a larger range of contracting decisions and, more importantly, we contribute by endogenizing the contracting decisions.

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