

SHALE PRODUCERS' EROSION OF OPEC MARKET POWER: CAPTURED IN AN EMPIRICAL DOMINANT FIRM MODEL

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Overview

Since the tight oil revolution in the United States, crude oil prices have fallen to levels at which many OPEC member states' oil revenues no longer support government expenditures. Economists and analysts hypothesize such drastic drops of price levels may have resulted from a shift in OPEC strategy from controlling supply to flooding the market to drive shale producers bankrupt. However, this analysis ignores the impact of the competitive fringe's new-found ability to respond to price changes, and the resultant erosion of OPEC market power. A careful modelling of underlying fundamentals within a dominant producer (Stackelberg leader) framework can explain OPEC's recent production levels as strategically consistent responses to changing elasticity of fringe supply (and the resultant effect on OPEC market power). We use monthly data from 2006 to 2016 to build a structural system of nonlinear equations which model OPEC's supply decision as a function of global demand and fringe supply as well as their costs. By allowing the slope of fringe supply to change with increased efficiency, we capture the diminished residual demand OPEC faces. Using oil supply and pricing data as well as instruments including Chinese economic health indicators, inputs costs to American fringe producers and well production rates, we estimate the reduced forms of those structural equations using a nonlinear solver for systems of seemingly unrelated equations.

Methods

Following Golombek, et al. 2014 I use a 3SLS model allowing fringe supply slope to change over time with drilling efficiency and global demand slope to change with fuel use efficiency.

Results

Fringe supply pre-shale revolution is initially estimated to be relatively inelastic and becomes increasingly elastic over the ten years studied. Using the dominant firm framework, we can then demonstrate how the residual demand left over for OPEC results in severely decreasing market power. Non-linear R-squared values are above .99 for OPEC and fringe supply and above .96 for price.

Conclusions

As fringe supply, OPEC supply and oil prices can all be accounted for within the dominant producer framework, OPEC's recent moves need not be interpreted as attempts to undercut fringe producers but rather the continuation of their previous strategies as applied to shifting underlying fundamentals. Ultimately, this means that with or without Russian collusion with the cartel, they will have decreasingly little ability to affect oil prices going forward. As oil prices today are significantly below levels required by many OPEC member nations to balance their state budgets, this could spell disaster for some of those nations, resulting in another drastic reshaping of underlying oil supply fundamentals.

References

Golombek, R., A. Irarrazabal and L. Ma (2014): "OPEC's market power: An Empirical Dominant Firm Model for the Oil Market," Norges Bank Working Paper 2014, 03.