

FTC
Conference

Joe
Harrington

Paper's
Motivation

Paper's
Contributions

Understanding
Results

Equilibrium
Issues

Future
Directions

Christian Rojas' "The Role of Information and Monitoring on Collusion"

Joe Harrington

FTC Microeconomics Conference

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- Experiments can pick up where theory ends.
- Equilibrium selection
 - When can players coordinate on a collusive equilibrium?
 - What are the properties of the equilibrium selected?
- Paper provides insight into the ability to coordinate on a collusive equilibrium under
 - imperfect monitoring
 - demand volatility

Paper's Main Results

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- Rotemberg-Saloner theory: support is solid.
 - Collusion is less frequent under the high demand state than under the low and medium demand states.
 - When collusion is made easier for the high demand state, the gap between collusion under the low/medium demand state and the high demand state shrinks.
- Green-Porter theory: support is problematic.

Paper's Main Takeaways

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- With demand volatility, pseudo-tacit collusion is feasible.
- With imperfect monitoring, pseudo-tacit collusion is difficult.
- Possible implication regarding explicit vs. tacit collusion
 - Incremental value of explicit collusion may be greater when there is imperfect monitoring.
 - Many cartels invested considerable time and effort in monitoring.
 - Need treatment allowing regular communication.

Understanding Results

Time Series on the Frequency of Collusion

- Frequency of collusion is declining over the course of the experiment.
 - End game effect?
 - Use of grim punishment and the accumulation of collapsing cartels?
- Grim trigger is the best fit for the IM treatment but is it being driven by an end game effect?

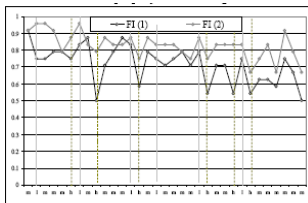


Figure 6A: Full Information Treatment

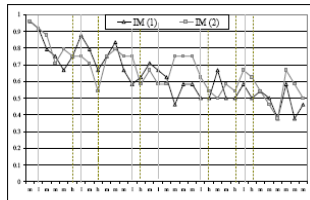


Figure 6C: Imperfect Monitoring Treatment

Understanding Results

Messages

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- Subjects are allowed to choose from a limited set of messages prior to playing the game.
- How does this impacts results?
- How did the ensuing behavior correlate with the messages sent? How did it depend on whether the messages coincided?

Equilibrium Issues

Comparing Equilibria in the FI and M treatments

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- From the paper: "contrary to conventional wisdom, ... removing demand information does not decrease (and in some cases increases) collusion."
 - This is found by comparing results when firms have demand information ex ante (FI) and ex post (M).
- If subjects are risk neutral then the M treatment is equivalent to having deterministic demand.
- Theory then predicts that collusion is *easier* with the M treatment.

Equilibrium Issues

Time Preferences

- Assumption: $\delta = 1$ for the first 30 periods, $\delta = .8$ thereafter.
- In determining equilibria, it is assumed $\delta = .8$.
- For the IM treatment (parameterization 1)
 - Claim is made that the Green-Porter strategy is not an equilibrium.
 - If a collusive equilibrium is not sustainable come period 31, then, by backward induction, it is not sustainable in any previous period.
- For the FI model (parameterization 1)
 - Claim is made that the Rotemberg-Saloner strategy only supports collusion in the low and medium demand states.
 - Can the R-S strategy support collusion in the high demand state early on when $\delta = 1$?

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- Public correlation device
 - FI treatment has a public correlation device in the level of demand.
 - Consider the IM treatment with a publicly observed signal.
 - Will this allow collusion to re-start?
 - Stochastic stationary punishment is feasible.
- Explicit vs. tacit collusion
 - Big gap between theory and antitrust practice.
 - When is it especially valuable for firms to explicitly communicate?
 - For various environments, run experimental treatments with and without messages.

Self-Serving Remarks

- Many cartels monitored the agreement by using sales, not prices.
 - Examples: carbonless paper, citric acid, graphic electrodes, lysine, plasterboard, sorbates, vitamins.
 - Source: J. Harrington, *How Do Cartels Operate?*, 2006. (*self-serving remark #1*)
- Monitoring environment
 - Green-Porter: Monitoring in price when firms' quantities are private information.
 - Harrington-Skrzypacz (*self-serving remark #2*)
 - Monitoring in firms' quantities when prices are private information.
 - Main result: Symmetric punishments are ineffective at supporting collusion.
- Experiments can shed light on the relevance of the informational setting faced by firms.

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