Selling to a cartel of retailers: a model of hub and spoke collusion

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Recent interest in hub and spoke collusion

- Competition authorities have investigated alleged agreements between retailers that involved their suppliers
  - Belgium (chocolate and bodycare in supermarkets)
  - United States (Interstate Circuit, 1939)
  - United Kingdom (replica kit, dairy, tobacco)
  - Germany (Ciba Vision)
  - Poland (paints and DIY)
- EU Guidelines on horizontal cooperation agreements dedicates a section to information exchanges and note "data can be shared indirectly ...through the companies’ suppliers or retailers.
- E-books
What is an hub and spoke agreement?

- A mix between vertical and horizontal agreements
- Usual argument: the supplier helps retailers to collude
- Main question: why would the supplier participate in such agreement?
- Horizontal arrangements reduce the margins available to suppliers
- Chicago School-type of argument "there is only one monopoly profit to be shared between supplier and retailers"
Horizontal and vertical relations

- Incentives of spokes differ from incentives of the hub.
- Interactions between spokes are of a horizontal nature, while the interaction between the hub and the spokes are vertical.
- The difference between horizontal and vertical interactions derives from the multiproduct pricing problem by a monopoly:
  - if they are substitutable, a monopoly increases the price of both products.
  - if products are complementary, a monopolist sets a lower price.
- Competition vs double marginalization.
- What is the nature of hub and spoke collusion?
- In this paper, we try to describe a collusive agreement that involves retailers and a common supplier.
Model of sub-optimal collusion (Rotemberg and Saloner 1986)

- Two retailers (and one supplier)
- Marginal cost normalized to 0
- Bertrand competition between retailers
- Infinitely repeated game
- Demand is stochastic

\[ Q_t = (1 + \varepsilon_t) (1 - p_t) \]

- \( \varepsilon_t \) can take two values 0 and 1 with probability \( \lambda \) and \( 1 - \lambda \)
Collusion between retailers

- Passive supplier sets up wholesale price \( w \)
- Collusion is more difficult to sustain in high state of demand
- Incentive constraint:

\[
\Pi_H \leq \frac{\delta}{1 - \delta} (\lambda \Pi_L + (1 - \lambda) \Pi_H)
\]

\[
\Pi_H \leq \frac{\delta}{\left(1 - \frac{\delta}{1 - \delta} (1 - \lambda)\right)} \Pi_L = k \Pi_L
\]

When \( k < 2 \), perfect collusion is not sustainable.
- Retailers set \( p_L = (1 + w) / 2 \) and \( p_H^{\text{max}} \) such that

\[
(1 - p_H^{\text{max}}) (p_H^{\text{max}} - w) = k \Pi_L
\]
First Best for the vertical chain

- Retail prices: $p = 1/2$ in both states of demand.
- Quantities: $q_L = 1/2$ when demand is low and $q_H = 1$ when demand is high.
- Profits of vertical chain: $\Pi_{FB}^L = 1/2$, $\Pi_{FB}^H = 1$.
- Implementation of first best faces three issues
  - sustainability of collusion
  - incentive to communicate information
  - double marginalization
Giving a role to the supplier

- The state of demand is revealed to retailers.
- Retailers can decide to truthfully reveal the state of demand to the supplier. (hard information)
- The supplier sets the wholesale price $w$, potentially as a function of information revealed.
- Retailers set final prices.
- Demand and profits are realized.
- We consider an agreement where wholesale prices are set as a function of information transmitted to supplier.
- Agreement is bargained upon before start of the game.
Hub and Spoke Agreement

- Supplier sets wholesale prices $w_L$, $w_H$ to maximize:
  \[
  \max_{w_L, w_H} \{ \lambda w_L q_L + (1 - \lambda) w_H q_H^{\max} \}.
  \]

- Since $w_H$ does not influence $w_L$, supplier solves
  \[
  \max_{w_H} \{ q_H w_H \}
  \]
  \[
  \text{st} \quad \Pi_H = q_H (1 - q_H / 2 - w_H) = k \Pi_L.
  \]

- Solution $q_H = 1$

- Supplier chooses $w_H$ so that retailers collude on monopoly quantity in the high-demand state
Incentives to participate

- The retailers accept to participate if their profit is as high as in the equilibrium with no information sharing.
- It is enough that the supplier keeps the same $w_L$.
- Hub and spoke agreement creates surplus for supply chain.
- Decrease $w_L$ leads to sharing the surplus.
- Hub and spoke agreement:
  - improves collusion between retailers
  - limits the extent of double marginalization
  - allows information exchanges
Welfare analysis and bargaining power

- What is the impact of hub and spoke agreements on consumers?
- Comparison between equilibria with and without information sharing
- Importance of bargaining power $\alpha$ in the chain
- No hub and spoke agreement: $w(a) = \alpha/2$
- Hub and spoke: wholesale price in low state of demand is lowered the more buyer power
- Consumer welfare can increase or decrease
- If supplier has bargaining power, hub and spoke looks a vertical agreement
- If retailers have bargaining power; hub and spoke looks a like horizontal collusion
Interpretation, literature and future work

- Information exchange between retailers not useful in this model
  - vast literature in static games, more complicated in repeated game framework
  - but would be useful to be more in line with policy debate
  - model where one of the two retailers get the info for sure may work

- Type of contracts: two-part tariff, other vertical restraints, relational contracts
  - Two-part tariffs: should work
  - other not clear in a repeated game environment
  - relational contracts (Buehler and Gartner AER 2013)

- Manufacturer managing the collusion of retailers
  - Snyder (RJE 1996): reverse logic
Conclusions and implications for competition policy

- A model of hub and spoke collusion where all parties benefit from agreement
- Implications in terms of welfare depend on bargaining power upstream and downstream
- A mix of vertical restraints and horizontal collusion
- Implications for policy: current legal test is based on intentions of hub and spokes
- Maybe not severe enough
- Possible extensions to other model of inefficient collusion and to more complex contracts