Partial cross ownership and tacit collusion

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Introduction

- There are many cases of passive investments in rivals:
  - Microsoft acquired 7% of the nonvoting stock of Apple in 1997 and 10% in Inprise/Borland in 1999.
  - Gillette acquired 22.9% of the nonvoting stock and 13.6% of the debt of Wilkinson Sword.
- Passive investments in rivals are often multilateral:
  - The Japanese and the U.S. automobile industries (Alley, *JIE* 1997)
  - The global airlines industry (*Airline Business*, 1998)
  - The Dutch financial sector (Dietzenbacher et al. *IJIO*, 2000)
- Often, a controlling shareholder makes a passive investment in rivals.
  - GM, National Car Rental's controller, passively held a 25% stake in Avis, while Ford, Hertz's controller, acquired 100% of the preferred nonvoting stock of Budget Rent a Car.

- Passive investments in rivals were granted a de facto exemption from antitrust liability in leading antitrust cases, and have gone unchallenged in recent antitrust cases.

- This lenient approach stems from the courts' interpretation of the exemption for stock acquisitions "solely for investment" included in Section 7 of the Clayton Act.

- In this paper:
  - We show that even completely passive investments in rivals by firms and their controllers may facilitate tacit collusion.
  - We identify the precise conditions under which such investments facilitate collusion and when they have no effect on collusion.
  - We show that investments by firms' controllers may facilitate collusion further

Related literature

- Unilateral effects of PCO: Reynolds and Snapp (*IJIO*, 1986), Bolle and Güth (*JITE*, 1992), Dietzenbacher et al (*IJIO*, 2000), Flath (*IJIO*, 1991, *MDE*, 1992), Reitman (*JIE*, 1994)
- Some papers ignore the multiplier effect of PCO
- Reitman (*JIE*, 1994) - firms may not wish to invest in rivals since noninvesting firms benefit more from such investments
- Charléty, Fagart, and Souam (Mimeo, 2002) - a controller's investment increases the target's profit at the expense of the profit of the controller's firm.
- Malueg (*IJIO*, 1992) - PCO has an ambiguous effect on collusion: firms internalize part of their rivals' losses from deviation but competition following a breakdown of collusion becomes softer.

The model

- Infinitely repeated Bertrand game with $n \geq 2$ identical firms.
- Firm i's strategy is chosen by its controller whose ownership stake is γ_i.
- The monopoly price and profit:

$$p^m \equiv \underset{p}{Argmax}\ Q(p)(p-c), \qquad \pi^m \equiv \max_{p}\ Q(p)(p-c).$$

- Absent PCO, the fully collusive outcome, where all firms charge p^m and earn π^m/n each, is sustainable if $\delta \geq \hat{\delta} \equiv 1 - 1/n$
- We will say that tacit collusion is easier if $\hat{\delta}$ is smaller.

The Accounting profits

- Firm i's profit:

$$\pi_i = \hat{\pi}_i + \sum_{j \neq i} \alpha_{ij} \pi_j.$$

- In matrix form:

$$\pi = \hat{\pi} + A\pi, \qquad A \equiv \begin{pmatrix} 0 & \alpha_{12} & \cdots & \alpha_{1n} \\ \alpha_{21} & 0 & \cdots & \alpha_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ \alpha_{n1} & \alpha_{n2} & \cdots & 0 \end{pmatrix},$$

where $\hat{\pi} = (\pi^m/n,\ldots,\pi^m/n)'$ under collusion and $\hat{\pi} = (0,\ldots,\pi^m,\ldots 0)$ under deviation by firm i.

- The vector of accounting profits is given by the Leontief system:

$$\pi(A) = B\hat{\pi} \equiv (I - A)^{-1}\hat{\pi}.$$

Example:

- 2 firms hold 25% in each other; the other 75% in each firm is held by the firm's controller. The monopoly profit is $\pi^m = 100$ => $\pi_1 = 100/2 + 0.25\pi_2$, $\pi_2 = 100/2 + 0.25\pi_1$
- Solving: $\pi_1 = \pi_2 = 66.66$ => $\pi_1 + \pi_2 = 133.33$ (inflated profits!)
- But, 0.75 x 66.66 = 50 (payoffs of individuals are not inflated).

- Following a deviation by firm 1's controller: $\pi_1 = 100 + 0.25\pi_2$, $\pi_2 = 0.25\pi_1$
- Solving: $\pi_1 = 106.66$ and $\pi_2 = 26.66$ => $\pi_1 + \pi_2 = 133.33$
- But, 0.75 x 106.66 = 80 and 0.75 x 26.66 = 20 (controller 1 gets 80% of the profits even though his stake in firm 1 is only 75%).

Properties of the accounting profits:

$$\pi(A) \equiv B\hat{\pi}, \qquad B \equiv (I - A)^{-1} = \begin{pmatrix} 0 & b_{12} & \cdots & b_{1n} \\ b_{21} & 0 & \cdots & b_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ b_{n1} & b_{n2} & \cdots & 0 \end{pmatrix}.$$

Profits: $\pi_i(A) = \pi^m \sum_k b_{ik}/n$, $\pi_i^{di}(A) = b_{ii}\pi^m$, $\pi_i^{dj}(A) = b_{ij}\pi^m \geq 0$.

Lemma 1:

(i) B is invertible, $b_{ii} \geq 1$ for all i and $0 \leq b_{ij} < b_{ii}$ for all i and all $j \neq i$.

(ii) $b_{ij} = 0$ iff firm i has no direct or an indirect stake in firm j.

(iii) $b_{ij} > 1$ iff there exists a firm $j \neq i$ that has a direct or an indirect stake in firm i (i.e., $b_{ji} > 0$) and vice versa (i.e., $b_{ij} > 0$).

(iv) $\hat{b}_i \equiv \sum_j (1 - \sum_{k \neq j} \alpha_{kj}) b_{ji} = 1$ (the aggregate profit shares of "real" shareholders of all firms sum up to 1 - all profits end up in the hands of "real" shareholders)

Implications:

(i) $\pi_i^{di}(A) = b_{ii}\pi^m > \pi_i(A) = \pi^m\sum_k b_{ik}/n$

Deviation is more profitable than collusion

(ii) $\pi_i^{di}(A) = b_{ii}\pi^m > \pi_i^{dj}(A) = b_{ij}\pi^m \geq 0$

Deviation by i is more profitable for i than deviation by j

However, firm i can make more money when firm j deviates than it makes under collusion

□ The fully collusive scheme can be sustained provided that

$$\frac{\gamma_i \pi_i(A)}{1 - \delta} \geq \gamma_i \pi_i^{d_i}(A), \qquad i = 1,\ldots,n.$$

where,

$$\pi_i(A) = \frac{\pi^m}{n} \sum_{k=1}^{n} b_{ik}, \qquad \pi_i^{d_i}(A) = \pi^m b_{ii}.$$

Lemma 2: *The fully collusive outcome can be sustained as a subgame perfect equilibrium of the infinitely repeated game provided that*

$$\delta \;\geq\; \hat{\delta}^{po}(A) \;\equiv\; \max\left\{ 1 \;-\; \frac{\frac{1}{n}\sum_{j=1}^{n} b_{ik}}{b_{ii}} \right\}.$$

□ With PCO, firms are not necessarily identical anymore (have different PCO in rivals) and have potentially different incentives to collude. The critical firms for collusion are **industry mavericks**

□ Does PCO **always** facilitate tacit collusion?

□ Should antitrust authorities ban any type of PCO?

Theorem 1: *Starting with a PCO matrix A, suppose that firm r increases its stake in firm s by some $\omega > 0$, so the new PCO matrix, A' differs from A only with respect to the rs-th entry. Then,*

$$\hat{\delta}_i(A') \leq \hat{\delta}_i(A), \qquad i = 1,\ldots,n,$$

with equality holding iff $b_{ir} = 0$ (firm i has no direct or indirect stake in firm r) or $i = s$.

Implications:

(i) $\alpha_{rs} \uparrow$ never hinders tacit collusion.

(ii) Only multilateral PCO matter (if firm i does not invest in rivals, then $b_{ir} = 0$ and $\hat{\delta}_i = 1 - 1/n$).

(iii) $\alpha_{rs} \uparrow$ surely facilitates collusion, unless each industry maverick has no direct or indirect stake in firm r or firm s is an industry maverick.

- The fact that $\alpha_{rs} \uparrow$ does not affect collusion when firm s is an industry maverick means that there is an important difference between passive investments in rivals and horizontal mergers:

- "Acquisition of a maverick firm is one way in which a merger may make coordinated interaction more likely" (the 1992 *Horizontal Mergers Guidelines*).

- With PCO, investment in an industry maverick has no anticompetitive effects!

The symmetric PCO case

☐ To get further insights, let's consider the case where $\alpha_i^j = \bar{\alpha}$ for all i and all $j \neq i$.

Proposition 1: *Holding $\bar{\alpha}$ fixed, n ↑ hinders collusion if $(n-1)\bar{\alpha} < 1/2$ (the aggregate stake of rivals in each firm is less than 50%) and facilitates collusion otherwise.*

Implication: In the presence of PCO it is no longer true that an increase in n makes collusion harder.

Intuition: Holding $\bar{\alpha}$ fixed, an increase in n implies that each firm receives a larger fraction of its profits from rivals; hence the firm is more reluctant to undercut its rivals.

Proposition 2: *Suppose that firm 1 changes its aggregate stake in rivals by ω.*

(i) *If $\omega > 0$, tacit collusion is unaffected if ω is concentrated in only one rival, but is facilitate otherwise. The incentive to collude is strongest if ω is spread evenly among all rivals.*

(ii) *If $\omega < 0$, tacit collusion is hindered. Now only the size of ω matters but not how it is spread among rivals.*

Intuition:

- ☐ When $\omega > 0$, the industry maverick is the firm in which firm 1 has invested the most (this firm has a large indirect share in itself via its stake in firm 1).
- ☐ When ω is concentrated in only one firm, the situation is like an investment in a maverick firm which has no effect on tacit collusion.
- ☐ When $\omega < 0$, firm 1 becomes the maverick.

Buying additional shares in a rival firm from another rival:

- ☐ Luxembourg based Arcelor's, the world largest steelmaker at the time, has recently increased its stake in Brazilian steelmaker CST by buying shares from Acesita, another Brazilian steelmaker.

Proposition 3: *If firm 1 buys a fraction* ω *of firm 2's stake in firm 3 (*$\alpha_{13}\uparrow$ *by* ω *and* $\alpha_{23}\downarrow$ *by* ω*), then tacit collusion is hindered and more so when* $\omega\uparrow$.

Intuition: Firm 2 becomes the industry maverick (lowest stake in rivals)

PCO by controllers

- The fully collusive scheme can be sustained provided that

$$\frac{\gamma_i \pi_i(A) + \sum_{k \neq i} \gamma_{ik} \pi_k(A)}{1 - \delta} \geq \gamma_i \pi_i^{d_i}(A) + \sum_{k \neq i} \gamma_{ik} \pi_k^{d_i}(A), \qquad i = 1,...,n.$$

Theorem 2: *PCO by controllers facilitate tacit collusion in the sense that* $\hat{\delta}_i^c(A) \leq \hat{\delta}_i(A)$ *for all i with strict inequality whenever* $\gamma_i^j > 0$ *for some* $j \neq i$*. Moreover,* $\hat{\delta}_i(A)-\hat{\delta}_i^c(A)$ *increases as* γ_i *falls: PCO by firm i's controller is more effective in strengthening the controller's incentive to collude the smaller is the controller's stake in his own firm.*

Implication: Dilution of the controller's stake in his own firm (subject to retaining control) can be anticompetitive.

Example: Shortly after it acquired a passive stake in Budget, Ford diluted its controlling stake in Hertz from 55% to 49%.

- To the best of our knowledge, the anticompetitive effect of a controller's dilution of his stake in his own firm has been overlooked in antitrust cases involving PCO by controllers.

TCI - Time Warner

- The FTC approved TCI’s passive 9% stake in Time Warner and even allowed this stake to increase to 14.99% in the future.

- TCI controlled movie networks Starz and Encore (with an 80% stake) while Time Warner wholly owned rival movie networks HBO and Cinemax.

- Theorem 2 suggests that in the consent decree approving TCI’s stake in Time Warner, the FTC should have stipulated that TCI should not dilute its stake in Starz and Encore in the future.

Telecom Italia - Telcom Brazil

- The Brazilian antitrust authorities allowed Telecom Italia (TI) to raise its stake in Telecom Brazil (TB) from 19% to 37.3% provided that TI would be a passive investor.

- TI holds a 56% controlling stake in Telecom Italia Mobile (TIM), Brazil’s second largest cellular provider while TB had acquired a cellular license and will compete with TIM in Brazilian cellular markets.

- Theorem 2 suggests that stipulating that TI will be a passive investor in TB was not enough to alleviate anticompetitive concerns in the Brazilian cellular market, and moreover, the fact TI’s controlling stake in TB is merely 56% (rather than 100%) exacerbates these concerns.

Does Theorem 1 continue to hold when controllers hold stakes directly in rival firms?

Example

- 2 firms hold stake in each other: α_{12} and α_{21}
- The controllers hold stakes in rivals: γ_{12} and γ_{21}.
- The critical discount factor:

$$\hat{\delta}_1^c(A) \equiv \frac{1}{2} - \frac{\gamma_{11}\alpha_{12} + \gamma_{12}}{2\left(\gamma_{11} + \gamma_{12}\alpha_{21}\right)}.$$

- $\hat{\delta}_1^c(A) \downarrow$ when $\alpha_{12} \uparrow$
- $\hat{\delta}_1^c(A) \uparrow$ when $\alpha_{21} \uparrow$ so long as $\gamma_{12} > 0$ (investment of firm 2 in firm 1 weakens controller 1's incentive to collude if $\gamma_{12} > 0$).

Proposition 4: *Starting with a PCO matrix A, suppose that firm r increases its stake in firm s by some* $\omega > 0$*, so the new PCO matrix, A', differs from A only in the rs-th entry. Then,*

(i) $\hat{\delta}_s^c(A') \geq \hat{\delta}_s^c(A)$ *with equality holding only if* $\gamma_s b_{sr} + \sum_k \gamma_{sk} b_{kr} = 0$ *(firm s's controller has no direct or indirect stake in firm r).*

(ii) $\hat{\delta}_i^c(A') = \hat{\delta}_i^c(A)$ *for each firm i such that* $\gamma_i b_{ir} + \sum_k \gamma_{ik} b_{kr} = 0$ *(firm i's controller has no direct or indirect stake in firm r).*

Implications: $\alpha_{rs} \uparrow$ will weaken firm s's incentive to collude if firm s's controller has a direct or indirect stake in firm r.

- Had Budget made a passive investment in Hertz, Hertz's incentive to collude would have become weaker given that Hertz's controller, Ford, already held a passive stake in Budget.
- Firms should not acquire stakes in rivals when their controllers hold stakes in those rivals.

Conclusion

- The lenient approach of antitrust courts and agencies toward passive investment may be misguided.
- PCO affects collusion in a complex manner.
- When firms are equally efficient, these concerns exist only when investments are **multilateral** and investments are **not in mavericks**.
- Direct investments by firms' controllers in rivals may either substitute investments by the firms themselves or may facilitate collusion further.
- Such investments particularly facilitate tacit collusion when the controllers have small stakes in their own firms.