Econ 476: Industrial Organization

Collusion and Antitrust

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Lecture 07

Antitrust

- Sherman Antitrust Act (1890)

Section 1:

> *"Every contract, combination in the form of a trust or otherwise, or conspiracy, in restraint of trade or commerce among the several States, or with foreign nations, is declared to be illegal"*

- cartels illegal
- treble damages

Antitrust

Section 2:

> *"Every person who shall monopolize, or attempt to monopolize, or combine or conspire with any other person or persons, to monopolize any part of the trade or commerce among the several States, or with foreign nations, shall be deemed guilty of a felony [. . .]"*

Antitrust

How to determine illegal activities

1. define the product
2. define the geographic market
3. calculate market share
4. consider barriers to entry, substitutes, ability to raise prices

Basically, if the firm has the ability to raise prices *without attracting competition*, then the market is well defined.

Collusion - one-shot

Consider a one-shot Cournot game:

- 2 firms
- $P = 1 - Q$ where $Q = q_1 + q_2$
- production is costless
- Solve for $R_i(q_j)$, q_i^*, P^* and $\pi_i^*(q_i^*)$.

Collusion - one-shot

- $R_1(q_2) = \frac{1-q_2}{2}$; $R_2(q_1) = \frac{1-q_1}{2}$
- $q_1^* = \frac{1}{3} = q_2^*$
- $P^* = \frac{1}{3}$
- $\pi_1^* = \frac{1}{9} = \pi_2^*$
- [graphs]

Collusion - normal form

		Firm 2					
		$q_2 = L = \frac{1}{4}$		$q_2 = M = \frac{1}{3}$		$q_2 = H = \frac{3}{8}$	
Firm 1	$q_1 = L = \frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{5}{48}$	$\frac{5}{36}$	$\frac{3}{32}$	$\frac{9}{64}$
	$q_1 = M = \frac{1}{3}$	$\frac{5}{36}$	$\frac{5}{48}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{7}{72}$	$\frac{7}{64}$
	$q_1 = H = \frac{3}{8}$	$\frac{9}{64}$	$\frac{3}{32}$	$\frac{7}{64}$	$\frac{7}{72}$	$\frac{3}{32}$	$\frac{3}{32}$

Collusion

- Now suppose this game is infinitely repeated
- Let $0 < \delta < 1$ be the discount factor.
  - $\delta = \frac{1}{1+r}$
- Total profits are $\Pi_i = \sum_{t=1}^{\infty} \delta^{t-1} \pi_i(t)$

Trigger strategy

- Definition: Player i is said to be playing a trigger strategy if for every period τ, where $\tau = 1, 2, \ldots,$

$$q_i(\tau) = \begin{cases} q_{collusion} & \text{if } q_{it} = q_{\neg it} \text{ for all } t = 1, 2, \ldots, \tau - 1 \\ q_{one-shot} & \text{otherwise} \end{cases}$$

Collusion - infinitely repeated

- The best collusive output would be to split the monopoly output.
- Both firms will collude if the profit from colluding forever is $>$ than the profit of deviating in one period and playing the one-shot game forever after.

- For which values of δ is collusion self-sustaining?

Collusion - infinitely repeated

- $1+\delta+\delta^2+\cdots=\sum_{t=0}^{\infty}\delta^t=\frac{1}{1-\delta}$
- $\delta+\delta^2+\cdots=\sum_{t=1}^{\infty}\delta^t=\frac{\delta}{1-\delta}$
- Proof

Collusion - infinitely repeated

Solution

- Deviation: $\Pi_d = \frac{9}{64} + \frac{\delta}{1-\delta}\frac{1}{9}$
- Collusion: $\Pi_c = \frac{1}{1-\delta}\frac{1}{8}$
- Collude if $\delta > \frac{9}{17}$

Cartel

- Definition: A cartel is a group of formally independent producers whose goal is to increase their collective profits by means of price fixing, limiting supply, or other restrictive practices.
- Examples:
  - OPEC
  - accountants or medical doctors
  - state bar associations
  - etc ...

Cartel

- Goal is to maximize *cartel* profits

Method:

> *The cartel's profit-maximizing output produced by each firm is found by equating the marginal revenue function (derived from the market demand curve, **evaluated** at the aggregate cartel-output level) to the marginal cost-function of each firm.*

Cartel - general case

- Inverse demand: $P(Q) = a - bQ$ where $Q = q_1 + q_2 + \cdots + q_N = \sum_{i=1}^{N} q_i$
- Cost: $TC(q_i) = F + cq_i^2$ where $i = 1, 2, \ldots, N$
- Goal is to maximize cartel profits

$$\begin{aligned}
\max_{q_1, q_2, \ldots, q_N} \Pi(q_1, q_2, \ldots, q_N) &= \sum_{i=1}^{N} \pi_i(q_i) \\
&= \left[a - b\sum_{i=1}^{N} q_i\right] \left(\sum_{i=1}^{N} q_i\right) - \sum_{i=1}^{N} TC_i(q_i) \\
&= [a - bQ]\, Q - \sum_{i=1}^{N} TC_i(q_i)
\end{aligned}$$

Cartel - general case

Solution:

- $q^* = \frac{a}{2(bN+c)}$
- $Q = Nq = \frac{Na}{2(bN+c)}$
- $P^* = \frac{a(bN+2c)}{2(bN+c)}$
- $\pi^* = \frac{a^2}{4(bN+c)} - F$
- $\Pi^* = \frac{Na^2}{4(bN+c)} - NF$
- As N increases, both q and P decrease, but Q increases.