Why is Reputation Useful?

• Cooperation between competitors
  – Prices.
  – New product design, standards, market development, lobbying, advertising.

• Complementors.
  – New products.

• Suppliers
  – Reputation not to hold up suppliers.

• Buyers
  – Reputation for high quality product

• Entrants
  – Reputation for toughness to fight entry.
Tacit Cooperation over Prices

- Tacit cooperation
  - Cooperation without explicit agreements.
  - Agreements not enforceable by court.

- Key ingredients
  - Shared interest as basis for cooperation.
  - Mechanism for punishment.
  - Mechanism for recovering from mistakes.

- Warning: price fixing is illegal!
  - Cooperation on R&D or advertising is not.

Cases

- American Airlines circa 1990
  - After deregulation there were frequent price wars
  - Interpretation: AA was trying to teaching rivals how to cooperate.
  - But bankrupt rivals had no interest in playing along.

- 1955 Automobile Price War
  - 45% more cars were produced in 1955 than 1954 or 1956.

- Joint Executive Committee
  - Classic railroad cartel from 1880s
  - Involved in price war 1/3 of the time
Punishment

• Is punishment severe enough to deter defection?
  – Price war may need to be very long.
  – AA couldn’t punish bankrupt airlines sufficiently.

• Is punishment credible?
  – Punishment is costly, but must be optimal after defection.
  – Idea: get punished for not punishing.
  – Problem: must avoid renegotiation.

• When to punish?
  – Is deviation deliberate or by mistake?
  – Threshold rule: market share cannot rise above 20%.
  – Ambiguous rule: prob of price war rises with market share.

Recovery

• How do you recover from mistakes?

• Could punish for fixed time

• Make punishment fit the crime
  – Deeper and longer price war for larger transgression.
A Mathematical Example

- Market
  - Two firms $A$ and $B$
  - Costs zero
  - Demand $p = a - q$.

- Bertrand competition
  - Prices $p_A = p_B = 0$ and profits $\pi_A = \pi_B = 0$.

- Joint profit maximisation
  - Prices $p_A = p_B = a/2$ and both industry profits $\pi_M = a^2/4$.

Example II

- Suppose both firms agree to set $p_A = p_B = a/2$.
  - Problem: incentive to deviate.

- Punishment
  - If cheat then we revert to Bertrand competition.

- Grim strategy for $i \in \{A, B\}$
  - If no-one has ever defected $\rightarrow$ set $p_i = a/2$.
  - If someone has defected $\rightarrow$ set $p_i = 0$.

- Is this a subgame perfect equilibrium? Will any firm defect?
Example III

- Game
  - Each round firms choose $p_i$
  - Discount rate $\delta$.
- Suppose no-one has defected.
  - If don’t defect get $\pi_M/2$ forever.
  - If defect get $\pi_M$ today, but get punished for rest of time.
  - Hence defect if
    \[
    \pi_M > \frac{\pi_M}{2} + \delta \frac{\pi_M}{2} + \delta^2 \frac{\pi_M}{2} + \delta^3 \frac{\pi_M}{2} + \ldots
    \]
    \[
    = \frac{1}{1 - \delta} \frac{\pi_M}{2}
    \]
  - Defect if $\delta < 1/2$.

Example IV: Some Questions

- What are the shared interests of firms A and B?
- When do firms enter punishment phase?
- How is defection punished?
- Is “Nash reversion” punishment credible?
- Can firms recover from punishment phase?
- What if firms could renegotiate in punishment phase? Would this increase payoffs?
Problems with Tacit Collusion

• Lots of firms
  – More reason to deviate.
  – If there are $N$ firms in Bertrand model, need $\delta \geq (N - 1)/N$.
  – Harder to detect defection.
  – Harder to coordinate punishment.

• Small or failing firms
  – If firms differ they may have different incentives to defect.
  – Design punishments to stop those most likely to deviate.
  – Or ignore these firms.

• Entry
  – Successful cooperation promotes entry and free-riding.

Problems cont.

• Competition on other dimensions
  – If cooperate on advertising, then price competition may increase.

• Demand Variation
  – When demand unusually high, have large incentive to deviate.
  – Could increase punishments.
  – Could create exemptions and not risk price war.

• Differentiated Products
  – Makes price comparisons harder.
  – Also changes nature of competition.

• Reaction Time
  – Long reaction time like low $\delta$, so cooperation harder to sustain.
Problems cont.

- Environmental Randomness
  - Suppose market price of oil falls.
  - Is this random, or did OPEC country defect?
- Communications problems
  - How specify exactly what type of adverts are allowed?
- Need infinite period game.
  - Suppose game lasts for 10 periods.
  - Then cheat in period 10 for sure.
  - Thus cheat in period 9 for sure.
  - Thus cooperation cannot be sustained!
- When fixing prices: Confessions

Problem: Allocating Production in a Cartel

- Two firms $A$ and $B$ with costs $c_A(q) = 0$ and $c_B(q) = 1$.
  - Linear demand, $q(p) = a - p$, where $a \geq 2$
- Bertrand production
  - $A$ prices at $p_A = 1$. Profits: $\pi_A = (a - 1)$ and $\pi_B = 0$.
- Joint profit maximising problem
  - $A$ prices at $p_A = a/2$. Profits: $\pi_A = a^2/4$ and $\pi_B = 0$.
- If transfers are possible
  - Nash bargaining: $A$ pays $B$ half of gain from cooperation.
  - Problem: Firm may misrepresent costs.
- If transfers not possible
  - $B$ gets some production, although this is inefficient.
Aiding Tacit Cooperation

• Industry associations
  – Lobby government, help advertising, provide information to consumers.

• Published price lists
  – Makes pricing more transparent.
  – Example: General Electric’s electric turbines.

• Most–Favoured Customer clauses
  – Commit not to make secret price cut to an individual.

• Exclusive territories
  – Make market sharing rule transparent.

Aiding Tacit Cooperation cont.

• Preannouncing future price increases
  – Reduces lag time.
  – Example: because of fuel prices, prices will rise by 10%

• Incremental Steps
  – If don’t trust rivals take small steps.

• Multi-market contact
  – Easy to trust if interact in many markets: more possibilities for punishment.

• Unused capacity
  – Increases threat of punishment.
Reputation for Quality

- A firm chooses quality $q \in \{q_L, q_H\}$ at cost $\{c_L, c_H\}$.
  - Utility of buyer equals $q - p$.
  - Buyer only sees quality after they purchase good.

- One shot game
  - Firm produces $q = q_L$ and charge price $p = q_L$.

- Repeated game.
  - Buyer: pays $q_H$ if firm chosen $q_H$ in past, else pays $q_L$.
  - Firm chooses high quality if
    \[
    \frac{1}{1 - \delta} (q_H - c_H) \geq (q_H - c_L) + \frac{\delta}{1 - \delta} (q_L - c_L)
    \]

Reputation to Fight Entry

- Entry Game
  1. Entrant $E$ chooses to enter or not.
  2. If $E$ enters, incumbent $I$ chooses to fight or not.
    \[
    (u_I, u_E) = (200, 0) \quad \text{if } E \text{ doesn't enter}
    \]
    \[
    = (75, 75) \quad \text{if } E \text{ enters and } I \text{ acquiesces}
    \]
    \[
    = (-50, -50) \quad \text{if } E \text{ enters and } I \text{ fights}
    \]

- One period game: $E$ enters and $I$ acquiesces.

- Repeated game ("chain store game")
  - $E$'s strategy: enter if $I$ has ever acquiesced.
  - $I$ can credibly fight if
    \[
    -50 + 200 \frac{\delta}{1 - \delta} \geq \frac{75}{1 - \delta}
    \]
Assignment

• Read “The Real Lesson of Enron’s Implosion” by McAfee (on website).

• Why is Enron’s collapse puzzling?

• What was Enron’s role in the gas market?

• Why is trust important in this market?

• Can you think of other firms in the trust business?