

Cartels

Industrial Organization

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Cartels 1

Cooperation

- The “best” outcome for an oligopoly is to act as one firm
- Collusion is illegal
- Cooperating without colluding

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Strategy and Game Theory

- Princeton in the 1940’s
 - John von Neumann and Oscar Morgenstern
 - John Nash: Nash Equilibrium
- Economics and Politics
 - Thomas Schelling
 - *The Strategy of Conflict (1960), Arms and Influence (1966)*
- Business Strategy
 - Dixit and Nalebuff
 - *Thinking Strategically: The Competitive Edge in Business, Politics and Everyday Life (1991)*
 - *The Art of Strategy: A Game Theorist’s Guide to Success in Business and Life (2008)*
 - Brandenburger and Nalebuff
 - *Coopetition (1996)*

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Outline

- Why cooperation is difficult
- Achieving cooperation
 - Theoretically
 - Practically
- Examples

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The Prisoner’s Dilemma

Tchaikovsky

		Hold Out	Confess
The Conductor	Hold Out	3 3	1 25
	Confess	25 1	10 10

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The Prisoner’s dilemma

- Payoff structure:
 - If both cooperate, each gets payoff π_2
 - If both cheat, each gets π_3
 - If one cheats, it gets π_1 , the other gets π_4
 - $\pi_1 > \pi_2 > \pi_3 > \pi_4$
- Cheating is a dominant strategy: both cheat and end up worse off than if they had cooperated

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The Prisoner's Dilemma Applied to an Oligopoly

- Describes a situation in which the pursuit of narrow self interest by all parties makes them worse off

		Firm 2's Output	
		2	4
Firm 1's output	2	42 42	44 26
	4	26 44	32 32

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7

Nash-Cournot Outcome

- The equilibrium of the prisoner's dilemma game is also known as the "Nash-Cournot" outcome

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8

Getting out of the Prisoner's Dilemma

- Social pressures
- Mergers
- Repetition**
- Change payoff structure

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9

Repeated Interaction

- Example: Strategic alliance between Mercedes and Swatch. Each party can put high or low effort into collaboration. One-shot game is repeated.

		Mercedes' effort	
		High	Low
Swatch's effort	High	46 76	46 10
	Low	10 76	34 34

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10

Repeated Play

- When game is repeated, can link current moves to future moves
- Payoffs: Present discounted value of current and all future payoffs
- Strategies: Make future moves conditional on previous moves in a way which guarantees that cheaters will be punished severely enough to be discouraged from cheating

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11

The Grim Strategy

- Strategies:
 - Cooperate in first period
 - If opposing firm cheats, cheat forever after
- Christie's and Sotheby's
 - both firms charge high commission rates in both periods if each firm charged high commission rates in the past
 - both firms charge low commission rates if at any time in the past some firm has charged low commission rates
- What will outcome depend upon?

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12

Numerical Example

5,5	-3,8
8,-3	0,0

$$5 + 5\delta + 5\delta^2 + 5\delta^3 \dots > 8 + 0\delta + 0\delta^2 \dots$$

$$\frac{5}{1-\delta} > 8$$

$$\delta > \frac{3}{8}$$

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13

- If interaction is repeated and firms care enough about the future, then it is possible to achieve equilibrium co-operation in the prisoners' dilemma

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14

Carrot and Stick Routines

- Dilip Abreu showed (JET 1986) as part of his Ph.D. thesis, that carrot and stick routines also work
 - A massive price discount for one or more periods, followed by reversion to cooperation

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15

Stigler (1964)

- Collusion can take many forms
 - Mergers
 - Cartels with joint sales agencies
 - Joint determination of outputs and prices by ostensibly independent firms

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16

Mechanism of Collusion

- Colluding firms must agree on price structure (coordinating without speaking)
- All agreements whose violation would be profitable to the violator must be enforced
- Enforcement consists of DETECTION
- If enforcement is weak, can only sustain prices slightly above competitive levels, so there is less incentive to price cut.
- One way to discourage price cutting is by splitting up the market.

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17

Market Concentration

- Tacit collusion is easier to establish and sustain with a smaller number of firms
 - Bargaining theory and anecdotal evidence suggest agreements are more difficult to reach, the greater the number of interested parties
 - In an industry with n firms, the per-period and per-firm profit is Π_m/n . A large number of firms reduces the profit per firm and thus the cost of being punished for undercutting. Furthermore, profit from defection ($\Pi_m - \Pi_m/n$) is increased.

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18

Collusion with Asymmetric Firms

- Suppose firm 1 has a cost advantage over firm 2
- Maximization of joint profits says that firm 1 should set its monopoly price, firm 2 a higher price, and thus firm 2 sells zero.
- Clearly, firm 2 has an incentive to deviate. However, no punishment can detain firm two from deviating, as it makes zero profits
- Likewise, suppose both firms set the same high price. Firm 1 may now want to deviate, as firm one's gains from deviations are large, and firm 2's ability to punish is small

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19

Long Information Lags and Infrequent Interaction

- Punishment may be delayed because
 - Infrequency of Interaction
 - Counterexample: Fulton Fish Market (RAND 1993)
 - Secrecy of price agreement
 - Counterexample: Danish concrete Industry

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20

The Competition Act of 1990 (The Competition Council of Denmark)

- Article 1
- “The purpose of this Act is to promote competition and , thus, strengthen the efficiency of production and distribution of goods and services, etc., through the largest possible *transparency* of competitive conditions and through measures against restraints on the freedom of trade and other harmful aspects of anti-competitive practices.”

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21

Danish Concrete Industry

- In October of 1993, the Danish antitrust authority decided to gather and regularly publish statistics on transactions prices of individual firms for two grades of ready-mixed concrete in 3 regions of Denmark
- Following initial publication, average prices of the reported grades of concrete increased by 15-20 percent within less than a year
- Inflation at 1-2%

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22

Fluctuating Demand

- In the theoretical model, never actually see price wars
- Green and Porter (Econometrica 1984):
Suppose there are demand shocks, $P_t = \theta_t f(Q_t)$ where Q_t is market output, and θ_t is a shock with mean one, and known distribution. Firms cannot observe rivals' outputs directly: only the market price.
Trigger strategy: Firm produces x^* (collusive) until market price falls below a trigger price p : then Cournot reversion for T periods. Firm has to decide x^* , p , and T . So, in periods of low demand, cooperation may break down: in periods of high demand, cooperation more likely to be sustained.

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23

Fluctuating Demand

- Rotemberg and Saloner (AER 1986): Firms behave more competitively in periods of high demand
- In a boom, the gain from deviation is higher, so harder to sustain full collusive equilibrium.
- Firms will either
 - Engage in a price war
 - Lower the equilibrium price
- A firm that lowers its price slightly is able to capture a larger market
- Ability to punish stays roughly the same as punishments are given in the future

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24

Conclusion

- The Prisoner's Dilemma
- Conquering the Prisoner's Dilemma
- Cooperation in Theory and in Practice
- The Danish Concrete Industry
- Cooperation with Fluctuating Demand
 - Green and Porter
 - Rotemberg and Saloner

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25