Competitive Strategy: Week 6

Dynamic Pricing

Simon Board

Capacity Choice

- Consider a building a stadium for the olympics.
- Demand is given by $p(q) = a - q$.
- Firm chooses capacity K.
  - Capacity costs c per unit.
  - After capacity built the marginal cost is zero
- Profit maximisation problem

$$\max_{q,K} p(q)q - cK \quad \text{s.t.} \quad q \leq K$$

- Set capacity equal to quantity, $K = q$. Hence $\max_q (p(q) - c)q$.
  - Standard monopoly problem: set $MR(q) = c$,
  - With linear demand $q = (a - c)/2$ and $p = (a + c)/2$.

Peak–Load Pricing

- Suppose there are two periods: High and Low demand
  - Demand given by $a_i - q$ where $a_i \in \{a_L, a_H\}$
- Profit maximisation problem:

$$\max_{q_1, q_2, K} (a_L - q_L)q_L + (a_H - q_H)q_H - cK \quad \text{s.t.} \quad q_L, q_H \leq K$$

- Case 1: Suppose capacity binds in high period only.
  - Solution: $q_L = a_L/2$ and $K = q_H = (a_H - c)/2$.
  - Prices: $p_L = a_L/2$ and $p_H = (a_H + c)/2$
  - Requires $q_L \leq K$, i.e. $a_H - a_L \geq c$.
- Key idea: Charge capacity when capacity constraint binds.

Peak–Load Pricing cont.

- Case 2: Suppose capacity binds in both periods.
  - Solution: $K = q_L = q_H = (a_H + a_L - c)/4$.
  - Prices: $p_L = (3a_L - a_H - c)/4$ and $p_H = (3a_H - a_L - c)/4$.
  - Requires $q_L \leq a_L/2$, i.e. $a_H - a_L \leq c$
- Examples
  - Discounted electricity prices at midnight
  - Happy hours at bars
  - \$1 baseball tickets on Wednesday
  - Cheap seaside hotel rooms in March.
  - Matinee pricing at cinemas
  - Cheap cell phone calls in the afternoon

Yield Management

- Assumptions:
  - Customers are arriving over time
  - Have capacity constraint for total number who are served.
- Examples: airlines, hotels, the superbowl, package holidays.
- Tradeoff:
  - Sell cheap seat today
  - Retain option value of seat.

Yield Management cont.

- Two types of customers
  - Some willing to pay full fare p_F
  - Some only willing to pay discounted prices p_D
- There are q seats left on the plane.
- Baseline: charge full price p_F to all customers.
  - Let s be probability plane sells out.
  - Let n be probability *next* customer is low value.
- If charge next customer p_D what happens?
  - Gain revenue p_D.
  - Lose revenue $(ns + (1 - n))p_F$.
- Each period s rises (falls) if do (do not) make sale.

Durable Goods Monopoly and Declining Prices

- Consider the problem of Xerox
- There is a demand for Xerox copiers
  - Initially sell to high valuation customers
  - Next year sell to customers with lower valuations
- Problem: Customers anticipate prices will fall
  - Customer delay purchases until price falls
  - Monopolist competes with future selves
- The Coase Conjecture
  - When the good is infinitely durable the monopolist will have no market power
  - Price instantly falls to marginal cost

Durable Goods Monopoly cont.

- Key feature
  - Used good is perfect substitute for new good
  - Hence durable goods susceptible
  - Also applies to durable services (e.g. movies)
- Solutions:
  - Renting (e.g. Xerox)
  - Most–favoured customer clauses (e.g. Chrysler)
  - Reputation (e.g. record companies)

Experimentation

- Suppose you wish to sell a unique good
  - At time t charge $p(t)$
- Each period a buyer chooses to buy or not.
  - Each buyer has the *same* value v
  - You do not know the valuation.
- Optimal policy: start price high and lower slowly.
  - Solve through backwards induction.
- What if have good each period to sell?
  - Price may go up or down.

Hold–Up

- You supply 100 crankshafts to GM.
  - A crankshaft is worth \$200 to GM
  - The cost is \$100 to you.
- Consider new investment
  - Reduce production price by \$50 per crankshaft
  - Cost is \$3000
- Should you invest?
- Problem: Hold–Up after investment is sunk

Hold–Up cont.

- Fast Food Franchises
  - A franchise costs $50–250k.
  - Company can raise price of inputs
  - Company can sell more franchises (see durable–goods, above)
- Electric Utilities
  - Electric power plants are often built next to coal mines
  - But then the coal mine can increase its prices.
- When is this a problem?
  - Whenever investment is specialised
- For whom is this a problem?
  - Supplier, buyers and complimentors

Hold–Up: Solutions

- Integration
- Long term contracts signed before investment (e.g. electric utilities)
- Reputation
- Make other firm invest (but now they get held up?)
- Second sourcing and licensing (e.g. VHS, Intel 8086)
- Exclusive contracts (e.g. GM and exclusive territories)
- Most Favoured Customer Clauses (e.g. selling franchises)