

## Strategic Competition: An overview

- The economics of industry – studying activities within an industry.
- Basic concepts from game theory

## Competition in the short run

- Best-response functions, best-response curves
- Strategic substitutes, strategic complements
- Quantity competition, price competition
- Price competition, homogeneous goods, constant unit costs:
  - Discontinuous profit functions
  - Unique equilibrium:  $p = MC$
  - The Bertrand paradox
- Resolving the Bertrand paradox
  - Product differentiation
  - Time horizon
  - Capacity constraints

## Price competition with capacity constraints

- Consumer rationing
  - Efficient rationing, proportional rationing
- Low capacities: equilibrium with joint price  $P$  such that
$$Q(P) = \sum_i \bar{q}_i.$$

## Capacity competition

- Stage 1: Firms choose capacities
- Stage 2: Firms choose prices
- Outcome as if one-stage competition in quantities

## Quantity competition

- The Cournot model
- $n$ -firm oligopoly
  - First: first-order condition for a typical firm
  - Then: invoke symmetry

## Prices vs. quantities

- Bertrand or Cournot?
- Cost function
  - Constant returns to scale: Bertrand
  - Sharply increasing marginal costs: Cournot

## Measuring concentration

- The Herfindahl index
- In a special case, it is proportional to total industry profits

## Dynamic competition: Tacit collusion

- Deviation from a collusive price
  - long-term loss
  - short-term gain
- Finite number of periods
  - no cooperation
- Trigger strategies
- Folk theorem
- Collusion when firms are patient enough ( $\delta$  high)
- Collusion when demand varies
  - May have collusion below monopoly price in high-demand state in order to make collusion sustainable.
  - Price war during boom?
- Infrequent interaction
- Multimarket contact
- Collusion when other firms' prices are unobservable
  - Low own demand: could be other firms' cheating, or low market demand.
  - Punishment after low demand, but not forever.

## Dynamic competition: Price rigidities

- Alternating price setting
- A discrete price grid
- Markov strategies: based on payoff relevant information
- At least two equilibria:
  - collusion: kinked demand curve
  - price war and unstable prices: Edgeworth cycle

## Product differentiation

- Horizontal differentiation
- Vertical differentiation

## Horizontal differentiation

- The Hotelling model: *which* product variants are offered in equilibrium?
  - Consumers heterogeneous with respect to preferences
  - Transportation costs in product space: a measure of product differentiation
  - Price competition: Prices are higher when transportation costs are higher
  - Prices are strategic complements
  - Equilibrium variants: two-stage game
    - Stage 1: firms choose product variants
    - Stage 2: firms choose prices
    - Quadratic transportation costs: product variants in equilibrium are maximally differentiated
    - Social optimum: differentiated, but not max.
    - Equilibrium analysis: direct effect, strategic effect.

- The circular model: *how many* product variants are offered in equilibrium?
  - Two-stage game:
    - Stage 1: firms enter and spread evenly around the circle.
    - Stage 2: price competition.
    - Entry costs
    - Equilibrium: A firm balances gross profits from having a niche in the market against entry costs
    - Social optimum: An entry saves on consumers' transportation costs but affects other firms negatively.
    - In equilibrium, too many firms enter.

## Advertising

- Informative, persuasive
- Informative advertising: firms choose both prices and advertising level.
  - More advertising: More consumers know about the firm's product
  - The more firms advertise, the tougher is price competition
  - Too much advertising in equilibrium? – Depends.

## Vertical differentiation

- Quality competition
- Consumers agree on which product variant is the best
- Consumer heterogeneity with respect to taste for quality
- Two-stage duopoly game:
  - Stage 1: Firms choose qualities
  - Stage 2: Firms choose prices
  - In equilibrium: one high-quality firm, one low-quality firm
  - Maximum differentiation again, but now in qualities

## Entry

- Strategies when confronting an entry threat
  - Blockading entry
  - Deterring entry
  - Accommodating entry
- Contestability theory
  - Prices before quantities? Hit-and-run entry.

- Model of treating an entry threat
  - Stage 1: Incumbent firm chooses  $K$ . Potential entrant makes entry decision.
  - Stage 2: Either incumbent firm is a monopolist, or the two firms compete by choosing  $\{x_1, x_2\}$ .
  - Analysis of stage 2: Comparative statics.
  - Stage 1: Increase in  $K$  has direct and strategic effects.
  
- Four possible strategies for the incumbent firm
  - Top Dog; Puppy Dog; Lean-and-Hungry Look; Fat Cat.
  - Depending on whether increase in  $K$  increases or decreases the incumbent's aggressivity
  - Depending on whether stage-2 variables are strategic complements or strategic substitutes
  - Depending on whether the incumbent wants to deter or accommodate entry.

### Information

- Perfect Bayesian Equilibrium
- Strategies *and* beliefs in equilibrium
- Price competition with asymmetric information
  - The uninformed behave as if confronting a virtual, expected type of the other firm

- Dynamic model: The informed firm may try to affect the uninformed firm's beliefs about its type.
  - signalling game
  - Two periods of price competition: First-period prices higher because of the signalling
  - Entry deterrence: incumbent's price low in order to signal low costs
  - Welfare effects of asymmetric information: Lower price by the incumbent.
  
- Incomplete, symmetric information about demand: Signal-jamming
  - Each firm wants the other firm to set a high price in period 2. This leads each firm to set a high price in period 1.
  
- Incomplete information in the capital market: Dominant firm competes aggressively in order to get the financially weak firm to exit the market.

## R&D

- product innovation, process innovation
  
- drastic and non-drastic innovations



- the value of an innovation
  - to society
  - to a monopolist
  - to a competitive firm
  - to a monopolist facing an entry threat
- the replacement effect vs. the efficiency effect
- patent races
- strategic timing of technology adoption
- network externalities
  - excess inertia
  - strategic compatibility decisions, standardization

### Vertical relations

- Contractual relationships producer/retailer
  - vertical integration
  - two-part tariff
  - resale price maintenance
  - Exclusive dealing, exclusive territories
- Vertical externality: double marginalization
- Horizontal externality: can be counteracted by a low wholesale price

## Vertical foreclosure

- Essential facility, bottleneck production
- The Chicago school vs. the foreclosure doctrine
  - vertical foreclosure is no problem / is a problem.
  - Chicago school: there is only one monopoly profit
- A reconciliation: the role of commitment
- The bottleneck producer cannot get hold of a monopoly profit, because of a commitment problem when contracting with downstream firms
- Vertical foreclosure is a way of getting around this commitment problem, rather than of extending monopoly power to the downstream market.
- Thus, vertical foreclosure *is* potentially harmful – if the bottleneck producer is unable to commit to contracts.

## Auctions

- Various kinds of auctions
  - Open vs. sealed bids
  - Open bids: Ascending vs. descending bids
  - Sealed bids: First price vs. second price
- *Revenue equivalence*: Expected revenue for seller is the same in all four kinds of auctions.

- Bidding behaviour in sealed bid auctions: Second price: bid = valuation. First price: bids are shaded,  $b < v$ .
- Seller's optimum reservation price: parallel story to that of monopoly.
- Discrimination in auctions: Seller should discriminate in favour of the bad group in order to get higher bids from the good group.
- Risk averse bidders bid higher than risk neutral ones.
- Correlated valuations: winner's curse.

## Mergers

- Cost savings from mergers: Oliver Williamson
- The authorities' assessment of a merger proposal
  - A proposed merger must be profitable.
  - Therefore it is welfare enhancing if the external effect is positive.
    - *External effect*: combined effect on other (non-merging) firms and consumers.
    - Effect on non-merging firms typically positive, effect on consumers typically negative.
  - In the merger-between-units-of-capital model: Effect on non-merging firms is particularly positive if non-merging firms are big.