

## Entry Deterrence and Predatory Strategies II

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## Outline

- Limit Pricing
- Signalling and Limit Pricing
- Evidence on Entry Deterrence
  - Lieberman
- Examples

## Limit Pricing

- Limit pricing occurs when a firm holds price down now to limit entry and subsequently make higher profits
- Bain/Sylos model: Firm chooses a low price such that  $\pi_d(p) < 0$  and  $\pi_m(p) > \pi_d(p)$ 
  - Problems in antitrust: To condemn a firm for charging too low a price seems paradoxical
  - Important problem: How can a low price deter entry? (Easy to change price after entry) threat is non-credible

## Signalling Model (Milgrom and Roberts – CP page 356)

- 2 periods, 2 firms
- Firm 1 is a monopoly at date 1 and chooses a first period price  $p_1$
- Firm 2, the entrant, then decides to enter or stay out. If he enters, duopolistic competition occurs, otherwise firm 1 remains a monopoly.
- How can predation occur?

- Asymmetric information!
  - Firm 1 is high cost with probability  $x$  and low cost with probability  $1-x$
  - Firm 1 knows its cost from the start
  - Firm 2 (the entrant) does not know firm 1's cost but learns it immediately after it decides to enter

## Two equilibria

- Separating equilibrium: the incumbent does not pick the same first-period price when his cost is low as when it is high. The first-period price fully reveals the cost to the entrant.
- Pooling equilibrium: The first-period price is independent of the cost level. The entrant then learns nothing about costs.

## Separating Equilibria (Optional Slide)

- The low-cost type does not want to pick the high-cost type's equilibrium price and vice-versa.

High cost type's price induces entry. Might as well charge first period optimum (monopoly) price,  $p_m^H$ . Discounted profits are  $M_1^H + \delta D_1^H$ . If the high cost type were to pretend to be a low-cost type and instead charge  $p_1^L$  profits would be  $M_1^H(p_1^L) + \delta M_1^H$ .

Thus, a necessary condition for a separating equilibrium is

$$M_1^H + \delta D_1^H \geq M_1^H(p_1^L) + \delta M_1^H \rightarrow$$

$$M_1^H - M_1^H(p_1^L) \geq \delta(M_1^H - D_1^H)$$

Similarly, the low-cost type must be maximizing his profit by choosing  $p_1^L$ .

The worst the firm 1 could do if it were a low cost type is to charge his monopoly price in the first period, induce entry, and get  $M_1^L + \delta D_1^L$ . In a separating equilibrium, if he were to charge  $p_1^{L*}$  he would get  $M_1^L(p_1^{L*}) + \delta M_1^L$ , must have

$$M_1^L(p_1^{L*}) + \delta M_1^L \geq M_1^L + \delta D_1^L \rightarrow$$

$$M_1^L - M_1^L(p_1^{L*}) \leq \delta(M_1^L - D_1^L)$$

Just to make things interesting, assume that there is no separating equilibrium in which each type behaves as in a full-information context. i.e., the high-cost type would wish to pool if  $p_1^{L*}$  were equal to  $p_m^L$ :

$$M_1^H(p_m^L) + \delta M_1^H > M_1^H + \delta D_1^H \rightarrow$$

$$M_1^H - M_1^H(p_m^L) < \delta(M_1^H - D_1^H)$$

- To separate, the low-cost type must charge a price sufficiently below his monopoly price so as to make pooling very costly to the high-cost type.
  - Entrant learns incumbent's cost perfectly, and entry occurs exactly when it would have occurred under symmetric information
  - Incumbent engages in limit-pricing: the low-cost type would be mistaken for the high-cost type if it did not sacrifice short-run profits to signal its type
  - Social welfare is higher than under symmetric information. First period welfare is generally increased because the low-cost type reduces its price. Second period welfare is identical to the case of symmetric information.

## Pooling equilibrium

- Suppose that a priori, without any knowledge of what type the incumbent actually is, the entrant expects to make negative profits upon entry. Is he going to enter if he still can't distinguish what type the incumbent actually is based on the first period prices? No. So, if the incumbent is low cost, he certainly isn't going to bother to charge a price below his monopoly price just to separate. Now, it is true that it might be more profitable for the high cost incumbent to just charge his monopoly price, and then allow entry, but if that is not the case, then you will have both firms charging the same price in the first period, and you won't be able to distinguish between high cost and low cost firms.

## Pooling Equilibria (optional slide)

A pooling equilibrium can only exist if expected profits for the entrant are less than zero ( $x D_2^L + (1-x) D_2^H < 0$ ).

Proof: Suppose at the pooling price, firm 2 makes strictly positive expected profit if it enters. This means that entry is not deterred, so that the two types cannot do better than to choose their static monopoly prices.

Assume a pooling price deters entry.

Must have

$$(1) M_1^H + \delta(D_1^H) \leq M_1^H(p_1) + \delta M_1^H$$

- Consider the pooling equilibrium in which both firms charge the low-cost monopoly price.
  - The incumbent manipulates its price in a way that does not reveal cost information. There is less entry than under symmetric information (entry is always deterred, and not only with probability  $x$ ).
  - The low-cost type charges its monopoly price. The high-cost type engages in limit pricing to deter entry
  - Welfare consequences are ambiguous. First-period welfare is, in general, increased, because the high-cost type lowers its price. There is, however, less entry, which in general lowers second-period welfare.

## Capacity as a Barrier to Entry

- Lieberman (1987)
  - Study of US chemical industry: 38 homogeneous product lines, concentrated markets, and high fixed costs: data on capacity and investment in new plants by incumbents and entrants over a 20 year period
- Questions
  - Does excess capacity deter entry?
  - If so, under what conditions is it in the interest of incumbent firms to maintain excess capacity for entry deterrence?

- Results:
  - Excess capacity used as entry deterrence is not very common in practice
  - Most excess capacity was maintained to accommodate demand variability and investment lumpiness
    - New plants were constructed during periods of higher than average growth;
    - Higher growth rates were required in sectors with lumpier plants
    - Capacity utilization threshold for investment higher for incumbents than for entrants—incumbents only build when capacity constraints are more severe
    - No apparent difference between investment equations for incumbents and entrants
  - Industries where excess capacity did appear to be used to deter entry had slow market growth, high producer concentration, and high capital intensity

## Conclusion

- BTE
- Entry Deterrence
  - Contestable Markets
  - Strategic Deterrence and Accommodation
- Case study of the Titanium Dioxide industry
- Limit Pricing
- Signalling and Limit Pricing
- Lieberman