

## Chapter 12 & 13: Entry deterrence and predation

The Stackelberg quantity leadership model can be used to model entry deterrence. But another model can be used for this, namely the **model of limit pricing**. In this model the entry is limited; an incumbent firm makes choices that affect the incentives of potential new firms to enter the market.

We set a model in which firm 1 is an incumbent firm and firm 2 is a potential entrant. If a firm wants to enter the market it deals with a fixed and sunk entry cost  $e$ . We take that the inverse demand curve is:

$$p = 100 - (q_1 + q_2).$$

When a firm enters the market its profit depends on the output of the incumbent firm, firm 1.

$$\pi_2 = (p-10)q_2 = (90 - q_1 - q_2)q_2$$

After the entry the market will be a non-cooperative quantity setting duopoly. The entrant will maximize profit and therefore produces the output given by its best response function:

$$q_2 = 45 - 0.5 q_1$$

$$p - 10 = 90 - q_1 - (45 - 0.5 q_1) = 45 - 0.5 q_1$$

The discounted present value of the entrant is:

$$V_2 = 1/r (45 - 0.5 q_1)^2 - e$$

The first part of the equation represents the all profits in the future discounted at rate  $r$ . The second part represents the sunk entry cost that the entrant must pay to enter the market.

An incumbent firm can commit in advance the output it will produce. The commitment could be effective if the firm can choose a technology that makes its cost fixed and thus its marginal cost almost zero. The firm can produce at the highest possible capacity level.

The incumbent firm can choose a level that makes profits for the entrant in the new market zero to keep the entrant out of the market. This output is called the entry-detering output.

$$V_2 = 0 \diamond 1/r (45 - 0.5 q_1)^2 - e = 0 \diamond q_1 = q_L = 90 - 2\sqrt{re}$$

To determine whether entry-detering is profitable depends on the entry cost. We distinguish between two extreme cases:

- *Blocked entry*. In this case the entry is blocked and the market is a natural monopoly. Entry

cost is so large that the entry-detering output is less than the monopoly output. The incumbent firm will then produce the monopoly output and it is not profitable for the other firm to enter the market.

- *Contestable market.* In this case entry is costless and the market is a contestable market. The incumbent firm is forced to produce the output that would be produced in the long-run equilibrium of a perfectly competitive market.
- *In-between.* There is also a case between these two extremes. The incumbent firm can decide to produce slightly more than the limit output so that the entrant will stay out of the market.

$$p_L = 10 + 2\sqrt{re}$$

When entry costs increase, the entry-limiting price  $p_L$  will also increase.

$$\pi_L = (p_L - 10) q_L = 2\sqrt{re} (90 - 2\sqrt{re})$$

The discounted present value of the incumbent firm if it deters entry is:

$$V_L = \frac{2\sqrt{re} (90 - 2\sqrt{re})}{r} = 2\sqrt{\frac{e}{r}} \times (90 - 2\sqrt{re}) = 180 \sqrt{\frac{e}{r}} - 4e$$

An incumbent has another choice besides entry-detering. It could let the entrant enter the market and then compete as a Cournot duopolist.

In the previous cases we assumed that there is perfect and complete information. However it can also be that the entrant is uncertain about what kind of market it enters or which incumbent it will face in the market. In this case actions of the incumbent can deter the entrant to enter.

Suppose that  $e=8000$ ,  $r=1/10$  and that the marginal cost of the entrant is 10. The incumbent could have two kinds of marginal cost:

### 1. *High-cost incumbent*

The marginal cost of the incumbent can be 10. If the firm then enters the market, there will be a Cournot duopoly with the firms having the same marginal cost. In this case the present discounted value of the entrant when it enters is positive and therefore the firm will enter the market.

### 2. *Low-cost incumbent*

The second possibility is that the marginal cost of the incumbent is 1. If the firm then enters the market there is a Cournot duopoly but this time with unequal marginal cost. Because the marginal cost of the entrant is much higher than the cost of the incumbent, the entrant will have a negative discounted value when it enters. Thus the firm will not enter the

market.

Suppose the marginal cost of the incumbent is 10 but there is imperfect information so the entrant does not know this. The incumbent is a monopolist in the pre-entry period and will produce the monopoly output. After this period the cost of the incumbent is revealed and so the entrant knows what the cost is. Because the cost of the incumbent is the same as of the entrant, the entrant will enter the market and the market will become a Cournot duopoly.

Another case is that the incumbent still has marginal cost of 10 but in the first period it produces as if it has a marginal cost of 1. He produces as a monopolist at cost of 1. The entrant does not gain any information in this case because it is still not totally clear what the cost of the incumbent is. The entrant's uncertainty about the kind of cost the incumbent has makes it profitable for the incumbent to expand output and to deter entry.

A dominant firm that follows a **predatory pricing strategy** cuts price below rivals' average cost to drive rivals from the market. Both firms will make a loss; the loss of the dominant firm is even higher than the loss of the following firm. This action of the dominant firm is called a **predatory campaign**. When a firm does not survive a predatory campaign usually the consumer will become the victim.

Once rivals go out of business, the predator raises price and collects enough economic profit to more than balance out any short-term losses. This strategy is especially helpful if it gives the dominant firm a reputation that it is tough and always fights entry.

Predation is a strategy that is used after entry has occurred – but it can also serve to deter future entry. For this to occur, we need that the predator has more financial resources to survive a price war than the prey (*long pocket*).

When a firm does not want to deal whether there will be predation or not it has three options. It can choose for collusion, for the purchase of a rival or for a third alternative. This third option is to impose higher costs on the rival which lowers the price and lowers the cost of the dominant firm. This theory is called the theory of **raising rival's costs (RRC)**. As a result of the higher cost, the rival will probably lower output. If the cost is high enough it can even shut down the firm entirely. The dominant firm will quickly expand output or raise its price to gain from the cost rise of the rival.

It may even be profitable for the dominant firm to accept some increase in its own cost, if this can result in an even larger cost increase on smaller rivals.

We can put the possible scenarios of entry deterrence in a pay-off matrix. If the entrant stays out of the market it would earn an alternative investment of 1 and the incumbent a profit of 5. If the entrant enters the market, and both firms would cooperate they both earn 2. However, if both firms start a fight for the market they end up with nothing.

Pay-off matrix	Entrant in	Entrant out
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Firms cooperate	2,2	5,1
Firms fight	0,0	5,1

This matrix shows the Selton paradox. Selton's *chain-store paradox* argues that predation does not work in a market with perfect and complete information. It is a paradox because any incumbent firm would start threatening each possible entrant for a fight. This would scare off most entrants, and the incumbent would keep a high profit for any future periods.

However, according to Selton, in the final period there would be no reason for the incumbent to fight and have zero pay-off. This way the last period would be cooperative if an entrant would show up. Accordingly, the incumbent would have no incentive to fight for the period before the last one. Using this way of thinking, the incumbent would not threaten the entrant, moreover, it would cooperate, since the entrant probably also knows this process. The difference between theory and practice makes this process a paradox.

Kreps and Wilson continued this game and introduced the distinction between a weak and strong incumbent. Where a weak incumbent will often be prepared to cooperate, a strong incumbent can benefit more often from predation.

A firm can use two kinds of strategies that include investment timing tactic to deter entry:

- *Preemption*. This is the right of purchasing before others. This right is given away by the government.
- *Bundling*. Bundling is a marketing strategy that joins products or services together in order to sell them as a single unit. When the incumbent firm decides to bundle can be profitable when it keeps out new entrants.

Predation raises antitrust policy. It is very difficult to distinguish between very aggressive pricing strategies and predatory strategies. Some antitrust enforcement are now protecting competitors instead of competition.