Predatory pricing

A firm ("predator") sets low prices for a certain period in order for a rival ("prey") to incur losses and exit the industry.

Two main elements of predatory behaviour:

1. short-term loss for the predator (sacrifice of current profits)

2. expectation of recoupment: higher prices and profits when rival exits (existence of market power a necessary condition to raise prices)

Practical problems in identification of predation: are low prices predation (bad) or just strong competition (good)?

A phenomenon in search of a theory

McGee (1958): we should not expect predation to occur:

1. Criticism to “deep pocket” arguments: why should the prey not be able to obtain further funds?

2. Predation is inefficient (destroys industry profits): merging with rivals would be more profitable

Yamey (1972)’s counter-objections:

1. Predation discourages further entry (merging with an entrant would invite further entry)

2. Predation allows to buy rivals at lower prices (see also Saloner, 1987)

   But: lack of rigorous foundation to predation theory until the 80s.

Recent models of predation

Predation can be explained only in a context of imperfect information. The predator exploits imperfect knowledge of the entrant (or its investors) to deter entry or force exit.

Three types of models.

1. Reputation models

When an incumbent faces a stream of (successive) entrants, a price war with early entrants creates a reputation for being “strong”, and discourages entry from later entrants.

Modelling difficulties. Selten’s paradox (perfect information): predation never occurs at equilibrium.

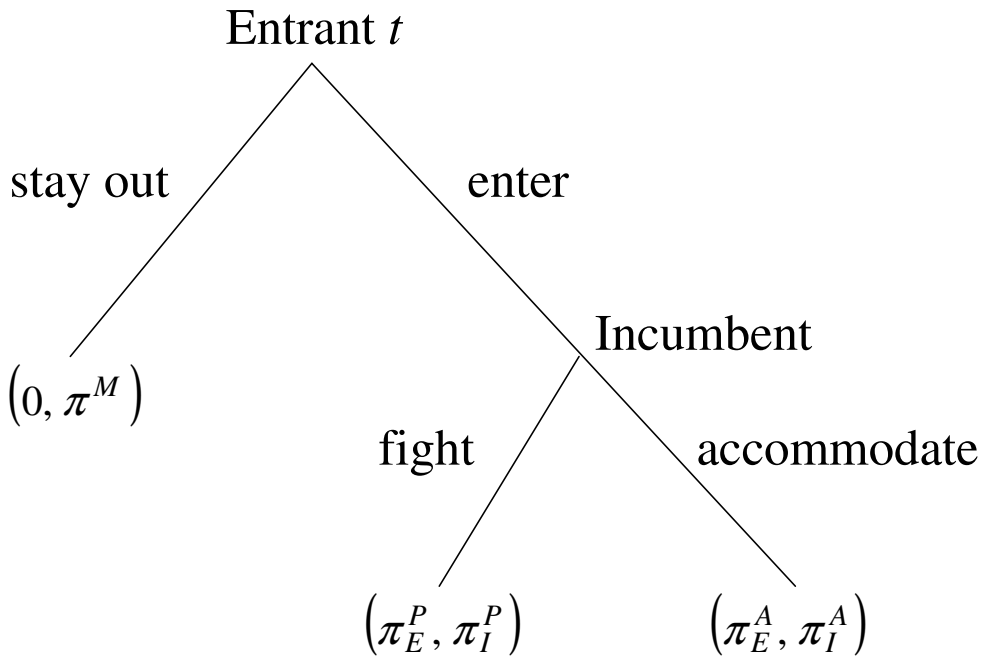

Figure 7.1. State game at time t, chain-store paradox game

1. Kreps-Wilson (1982): formalisation of the argument (incomplete information model)

2 Signaling models

Entrant does not know whether incumbent is weak (high cost) or strong (low cost). Before entering, it observes the incumbent's price.

Milgrom-Roberts (1982): two possible equilibria.

Separating equilibrium. Low cost incumbent sets a price lower than $p^m(c_L)$, and high cost chooses $p^m(c_H)$.

There is "predation": sacrifice of current profits to deter entry; however, no welfare loss with respect to perfect information world, where $p = p^m(c_L)$ in both periods.

Pooling equilibrium. Both firms set $p^m(c_L)$, and a high cost incumbent deters entry (if ex-ante probability that incumbent is low cost is high enough: the entrant does not learn from $p^m(c_L)$.)

There is predation, and it is welfare detrimental.

(It is a limit-pricing model: incumbent sets a low price to deter entry.)

Predation for mergers

Saloner (1987): a signaling model where:

1. Price choice by the incumbent

2. Entry (lower profits for entrant if incumbent is low cost)

3. Take-over game

In this model, low price signals that incumbent is low-cost.

Expecting lower profits, entrant will sell out at a lower price.

Deep pocket predation

Benoit (1984): a very simple (perfect information) model

1. E decides on entry; then I decides on prey/accommodate

2. E decides on stay/exit; then I decides on prey/accommodate

Assume that $A_E = -\pi^P < A_I$: entrant has less assets than incumbent (E can sustain losses for one period only).

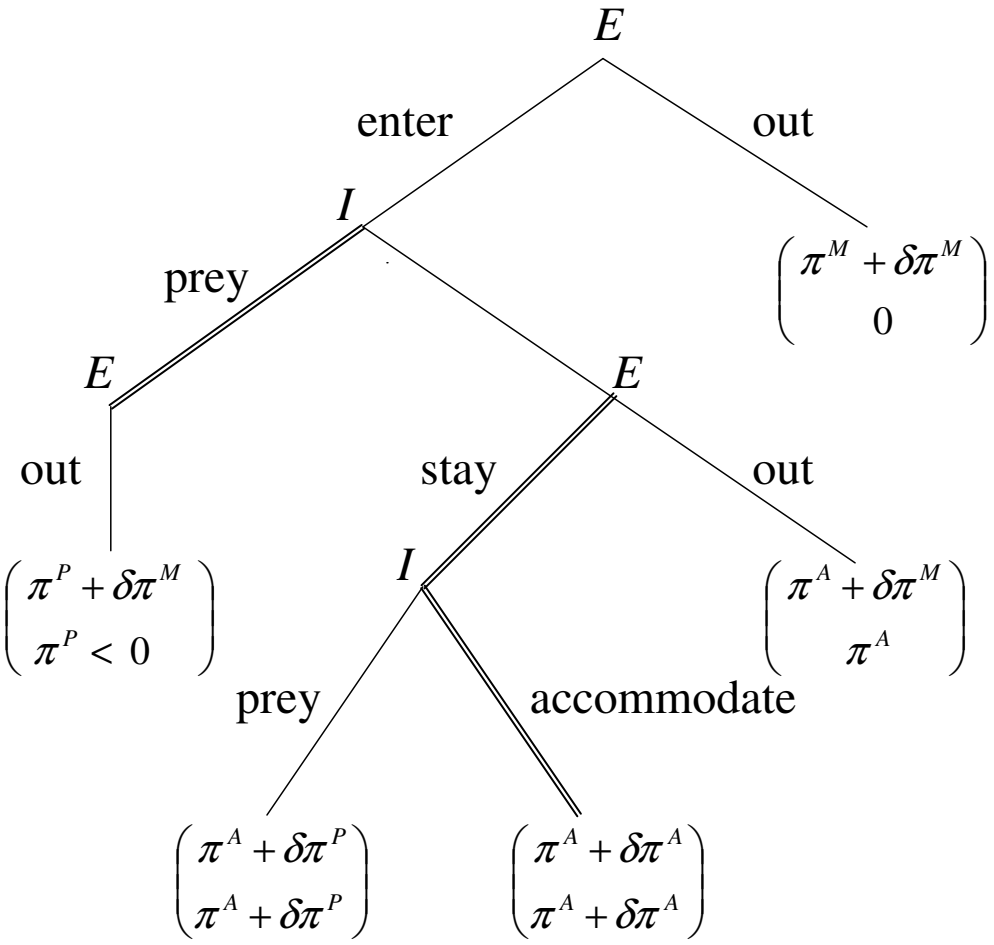

Figure 7.2. Deep pocket predation, with T = K = 1

Solution of the game: predation occurs if

$$\pi^P + \delta\pi^M > \pi^A(1+\delta).$$

Entrant anticipates that it would be fought - if (1) holds - and will stay out.

Shortcomings of the model.

1. Strong information requirements

2. At equilibrium, no price war will be observed

3. Exogenous assumption that E unable to raise more funds –> need for an endogenous explanation

3. Predation in imperfect financial markets

Main idea:

1. Asymmetric information (lenders have little knowledge of the industry) makes capital markets imperfect.

2. If capital markets are imperfect, a firm's assets (e.g., cash and retained earnings) determine its ability to raise external funds.

3. By behaving aggressively, the incumbent reduces the prey's assets, limits its ability to raise capital, and obliges it to exit.

Financing investments in an imperfect capital market

Focus on 2. (abstract from competition): Holmström and Tirole (1997)

A risk-neutral entrepreneur needs to pay a fixed cost F to enter the industry (or to do a project).

Own assets are A: it needs to borrow from a risk-neutral bank $D = F - A > 0$.

If financed, entrepreneur can: work diligently (high effort) on the project or shirk (low effort).

If diligent, project succeeds with prob. p (revenue R); fails with prob. $1 - p$ (revenue 0).

If shirking, project fails with prob.1, but private benefit B.

Effort is not observable (or not verifiable): impossible to write a contract on it –$>$ information asymmetry (with moral hazard) between bank and entrepreneur (capital market imperfection).

Ass.: if no information asymmetry, investment would be made:

$$pR > F.$$

The bank's problem

Bank lends only if it will elicit diligent work. Otherwise, it will lose D.

Consider this contract: bank lends D to the firm; if project successful, bank receives $R - S$, and firm S.

Entrepreneur's net expected utility: $U = pS$ if high effort; $U = B$ if low effort. Therefore, S must satisfy the IC:

$$pS \geq B.$$

To elicit high effort, $S \geq B/p$.

Bank will finance project iff its expected value (subject to condition (3) is higher than its cost:

$$p(R - S) \geq F - A,$$

that is, if:

$$p(R - \frac{B}{p}) \geq F - A.$$

The bank's lending decision depends on firm's assets: the larger A the more likely the project is financed: (5) can be re-written as:

$$A \geq B - (pR - F) \equiv \overline{A},$$

A project with positive NPV is not financed (firm is

credit constrained) if firm's assets below $\overline{A}$.

Insight from deep pocket models of predation: If a price war reduces its assets, less likely the firm gets financing.

A long purse model of predation

Two firms: I (incumbent), and E (a recent entrant). They differ only in assets: I has a long purse, E has limited assets.

Assume that both have incurred fixed cost F for period 1, but not yet for period 2.

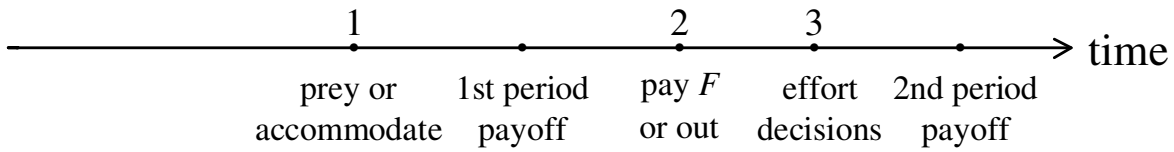

Figure 7.3. Time line: a (financial) long purse model of predation

Stage 1, I preys or accommodates entry. If preys, both get π^P; if not, they get $\pi^A > \pi^P > 0$.

Stage 2, each firm either pays F or goes out of business.

Stage 3, effort decisions. If high effort (and both paid F), both earn π^A with prob. p; if only one paid F, $\pi^M > 2\pi^A$ with prob. p.

Assume $p\pi^A > F$, and that I has own assets $A_I > F$, (always able to finance the investment), whereas E's assets in the first period are $A_E = 0$ –> its second period assets equal first period retained earnings. Assume:

$$F - \pi^A < p(\pi^A - \frac{B}{p}) < F - \pi^P.$$

Solution. Since I always invests and makes high effort, from stage 2 on, the game is as the financing model above, where: π^A replaces R and assets A are equal to either π^A (if accommodation) or π^P (if predation).

–> (7) says that E will be financed only if I does not prey.

But, does firm I have an incentive to predate? Yes, if:

$$p\pi^M + \pi^P > p\pi^A + \pi^A.$$

Therefore, predation will occur if the future prospect of higher profits, $p(\pi^M - \pi^A)$, outweighs the current losses from predation, $\pi^A - \pi^P$.

The trade-off between moral hazard and deterring predation

If the bank committed to give funds no matter what, predation would not occur. However, two problems with a contract guaranteeing unconditional funding:

1. Credibility of committment (and impossibility of renegotiation)
2. Wrong incentives to the firm (moral hazard): Bolton and Scharfstein (1990).

Extension of the model: after contract is signed but before first period market realisation firm E's entrepreneur should decide on high/low effort.

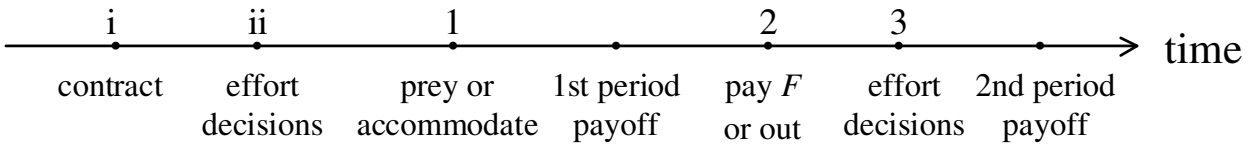

Figure 7.4. Time line: Bolton-Scharfstein's model

Stage i, bank and firm E sign a long-term contract.

Stage ii, effort decisions: success with prob. q. First-period shirking gives private benefit b (with $b < qB$).

Rest as above.

Recall that E can borrow if at the beginning of the second period $A_E = \pi^A$. But long term contract: bank will finance F with prob. $x < 1$ if firm E's second period assets are $A_E = \pi^P$, in exchange of a repayment $\pi^A - B/p$.

Optimal contract: x that maximises the value of firm E subject to: the incumbent does not prey (IC$_{I,NP}$); E's entrepreneur makes high effort in the first period (IC$_{E,1}$):

$$\max_x V = q\pi^A + [q + (1-q)x]\,(p\pi^A - F), \text{ subject to:}$$

$$\text{IC}_{I,NP}\text{: } q\pi^A + [q + (1-q)x]\,p\pi^A +$$

$$(1-q)(1-x)p\pi^M \geq q\pi^P + xp\pi^A + (1-x)p\pi^M, \tag{10}$$

$$\text{IC}_{E,1}\text{: } [q + (1-q)x]\,p(B/p) \geq xp(B/p) + b.$$

After re-arranging, the two ICs become:

$$x \geq \frac{p\pi^M + \pi^P - \pi^A(1+p)}{p\pi^M} \equiv x_{I,NP},$$

where numerator positive by (8), and

$$x \leq 1 - \frac{b}{qB} \equiv x_{E,0}.$$

Predation deterred at the cost of reducing incentive to exert effort (if $x = 1$, $\text{IC}_{E,1}$ is always violated).

The two ICs are simultaneously satisfied only if $x_{I,NP} \leq x_{E,0}$, that is:

$$\frac{b}{qB} \geq \frac{\pi^A(1+p) - \pi^P}{p\pi^M}.$$

If (14) holds, the optimal probability of refinancing is $x^* = x_{E,0}$ (the higher x the larger the present value of the firm)..

But if (14) is violated, predation can only be deterred at the cost of having low effort in the first period.

Predation: Practice

Problem: how to distinguish predatory pricing (bad) from fierce price competition (good) ?

Two main ingredients for predation:

1. Sacrifice of profits in the short-run
2. Ability to recoup in the long-run

Proposed rule: two-tier approach

1. Is there enough market power for recoupment?

   If predator is dominant, go to 2.

   Else, dismiss the case.

2. Is there sacrifice of profits?

   P$>$AverageTotalCost (ATC): always lawful

   P$<$AverageVariableCost (AVC): presumed unlawful (burden of proof on defendant)

   AVC$<$P$<$ATC: presumed lawful (burden of proof on plaintiff)

Predation Practice: Remarks

Low predation standards decrease incentives to compete for non-dominant firms

Many possible reasons for P$<$AVC (introductory price offers, switching costs, learning, network effects):

- a prohibition of below-cost pricing (laws in many EU countries) makes no sense;
- but not applicable defence for dominant firms

Intent relevant if confirms existence of predatory scheme

No need to prove ex-post damage to consumers

Meeting rivals' prices: not acceptable defence if P$<$AVC