

Firms' Strategies and Markets Entry

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Introduction

- ▶ Entrant's strategy: "Judo economics"
- ▶ Incumbent's strategies vis-à-vis entry
 - ▶ Entry deterred
 - ▶ Entry Accomodated

Entrant's strategy: Judo Economics

In the art of "judo", a combatant uses the weight and strenght of his opponent to his own advantage.

- ▶ *Value-based* judo strategy
- ▶ *Rule-based* judo strategy

1. Softsoap on the liquid soap market
2. Red Bull on the energy drinks market

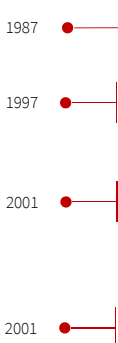
Ruled-based judo strategy

Softsoap Case

- 1970s ● Minnetonka Corporation was facing slowing sales: \$25 million.
- 1977 ● US bar soap industry had sales of \$1.5 billion. Industry dominated by 4 large firms "Armour Dial, P&G, Lever Brothers, Colgate Palmolive".
- 1980 ● Minnetonka created a new product, a liquid soap. Minnetonka launched Softsoap at \$1.49. Spent \$7 million on advertising. Sales of Softsoap reached \$39 million.
- 1983 ● P&G released a liquid soap product under the name "Rejoice". With aggressive strategies, they achieved 30% market share.
- 1985 ● Minnetonka still market leader with Softsoap in a \$100 million market.
- 1987 ● Minnetonka sold Softsoap to Colgate-Palmolive for \$61 million.

Insight: Softsoap had a novel product. Major incumbents could have imitated quickly and use their brand name to dominate the market but they were hesitant (risk of cannibalisation + risk of tarnishing their image).

Red Bull Case

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- A vertical timeline with red dots and horizontal lines indicating key events in Red Bull's history.
- 1987 • Founded in Austria by Dietrich Mateschitz. Red Bull began with sales to discos where alcohol was prohibited.
 - 1997 • Sold for a decade before entering the US. market. Carbonated soft drinks largest beverage market in the US (>\$50 billion).
US energy drinks market were not interesting yet for large players (\$75 million)
 - 2001 • Rumors of being made of bulls' testicles. 3 swedes died (because of mix with alcohol). Red Bull now looks dangerous. Red Bull had grown its sales 118% over the past year (about 2/3 of the energy drink market), while overall soft drinks grew by only 0.6% (total US energy drink market size: \$275 million).
 - 2001 • Coke launches its energy drink KMX with a marketing strategy based on secrecy and mystery.

Insight: Soft drinks don't really see it as a new product at first because it is just caffeine. Then Red Bull deliberately aligned with dangerous sporting events. Soft drinks launch their energy drinks on a different brand name to escape this image.

Judo Economics: Gelman and Salop (1983)

- ▶ Consumers have an inelastic demand of size D if $p \leq p_{max}$.
- ▶ An incumbent I has an installed capacity D and no production cost.
- ▶ An entrant E has a variable cost $c_E > 0$

The timing of the game is as follows:

1. E decides to enter or not the market. If he enters, he sets a capacity K_E and its price p_E .
2. The incumbent observes (K_E, p_E) and adapts its price denoted p_I .

If E does not enter the market

- ▶ E gets 0 and I is a monopolist.
- ▶ A monopolist I sets a price p_{max} and its profit is $p_{max}D$.

If E chooses to enter the market,

- ▶ If $p_I > p_E$ the firm E $D_E = K_E$ and $D_I = D - K_E$. Firm I can sell at p_{max} and obtain a profit

$$p_{max}(D - K_E)$$

•

- ▶ If $p_I \leq p_E$, the firm I has a demand $D_I = D$ and $D_E = 0$. The firm can also sell at $p_E - \epsilon$ and obtain $p_E D$.
- ▶ I chooses the price that maximizes its profit i.e.: p_{max} if $p_E \leq \frac{p_{max}(D - K_E)}{D}$ and p_E otherwise.

- ▶ Given the reaction of firm I , we determine the optimal decisions (K_E, p_E) of the entrant.
- ▶ The firm E can sell if and only if I chooses p_{max} . Therefore, E must set $p_E = \frac{(D-K_E)p_{max}}{D}$, that is a sufficiently low price and maximises

$$K_E \left(\frac{D - K_E}{D} p_{max} - c_E \right)$$

which gives $K_E^* = \frac{D}{2} \left(1 - \frac{c_E}{p_{max}} \right)$ and $p_E^* = \frac{p_{max} + c_E}{2}$.

- ▶ If $c_E = 0$, i.e; the entrant is as efficient as the incumbent, $K_E^* = \frac{D}{2}$, the two firms share the market and the price is $\frac{p_{max}}{2}$.

$$\Pi_E = \frac{D}{p_{max}} \frac{(p_{max} - c_E)^2}{4}$$

Strategic Incumbent and entry

An incumbent can be strategic in many ways when confronted to a competitors' entry threat

- ▶ Excess capacity
- ▶ Limit price
- ▶ Reputation of being a tough competitor
- ▶ Increase of competitors costs
- ▶ Creation of switching costs
- ▶ Tying practices
- ▶ Long term contracts with customers
- ▶ ...

These strategies can either be used to deter entry or to accomodate!

Strategic Incumbent and entry

1. A taxonomy of incumbent's investments strategies
 - ▶ "Top-dog strategy": investment in capacity
 - ▶ "Lean and hungry look strategy": an innovation model
2. The chain store paradox : a reputation game
3. Exclusive dealing: a contracting strategy

A taxonomy of incumbent's investments strategies

- ▶ In stage 1, the incumbent chooses the level of some irreversible investment K_1 .
- ▶ In stage 2, after observing K_1 , E decides to enter or not. Product market decisions are taken, denoted σ_1 and σ_2 (price, quantity, investment).
- ▶ If E enters, σ_1 and σ_2 are chosen simultaneously, and profits are denoted $\pi_1(K_1, \sigma_1, \sigma_2)$ and $\pi_2(K_1, \sigma_1, \sigma_2)$.

We assume that $\pi_2(K_1, \sigma_1, \sigma_2)$ includes entry cost if any.

We assume that there exists a unique Nash equilibrium of this competition stage $(\sigma_1^*(K_1), \sigma_2^*(K_1))$ solution of:

$$\frac{\partial \pi_1(K_1, \sigma_1, \sigma_2)}{\partial \sigma_1} = 0$$

$$\frac{\partial \pi_2(K_1, \sigma_1, \sigma_2)}{\partial \sigma_2} = 0$$

- ▶ If E does not enter, the incumbent obtains sets $\sigma_1^m(K_1)$ and obtains $\pi_1^m(K_1, \sigma_1^m(K_1))$.

- ▶ Two strategies: Entry deterrence and Accomodation.

Entry deterrence

- K_1 is set at a level sufficient to deter entry i.e. such that:

$$\pi_2(K_1, \sigma_1^*(K_1), \sigma_2^*(K_1)) = 0$$

- To see how K_1 must be distorted, we totally differentiate π_2 with respect to K_1 :

$$\frac{d\pi_2}{dK_1} = \underbrace{\frac{\partial \pi_2}{\partial K_1}}_{\text{Direct Effect}} + \underbrace{\frac{\partial \pi_2}{\partial \sigma_1} \frac{\partial \sigma_1^*(K_1)}{\partial K_1}}_{\text{Strategic Effect}} + \underbrace{\frac{\partial \pi_2}{\partial \sigma_2} \frac{\partial \sigma_2^*(K_1)}{\partial K_1}}_{0 \text{ Envelop theorem}}$$

- Sign of direct effects : advertising informative ($\frac{\partial \pi_2}{\partial K_1} > 0$) or persuasive ($\frac{\partial \pi_2}{\partial K_1} < 0$), investment in capacity ($\frac{\partial \pi_2}{\partial K_1} = 0$)
- Strategic effect : given K_1 it is a commitment for the incumbent to be tough or weak in its decision of $\sigma_1(K_1)$
- If $\frac{d\pi_2}{dK_1} < 0$, investment makes the incumbent tough: "top dog"; If $\frac{d\pi_2}{dK_1} > 0$, investment makes the incumbent soft: "lean and hungry look".

Entry accomodation

- K_1 is set at its best accomodating level, i.e. :

$$\max_{K_1} \pi_1(K_1, \sigma_1^*(K_1), \sigma_2^*(K_1))$$

- To see how K_1 must be distorted, we totally differentiate π_1 with respect to K_1 :

$$\frac{d\pi_1}{dK_1} = \underbrace{\frac{\partial \pi_1}{\partial K_1}}_{\text{Direct Effect}} + \underbrace{\frac{\partial \pi_1}{\partial \sigma_1} \frac{\partial \sigma_1^*(K_1)}{\partial K_1}}_{0 \text{ Envelop theorem}} + \underbrace{\frac{\partial \pi_1}{\partial \sigma_2} \frac{\partial \sigma_2^*(K_1)}{\partial K_1}}_{\text{Strategic Effect}}$$

- The direct effect is the “profit maximizing effect” with no effect on firm 2.
- The strategic effect:

$$\text{Sign}\left(\frac{\partial \pi_1}{\partial \sigma_2} \frac{\partial \sigma_2^*(K_1)}{\partial K_1}\right) = \text{Sign}\left(\frac{\partial \pi_2}{\partial \sigma_1} \frac{\partial \sigma_1^*(K_1)}{\partial K_1}\right) \times \text{Sign}\left(\frac{d\sigma_2^*}{d\sigma_1}\right)$$

Table: TAXONOMY

	$(\frac{\partial \pi_2}{\partial \sigma_1} \frac{\partial \sigma_1}{\partial K_1}) < 0$	$(\frac{\partial \pi_2}{\partial \sigma_1} \frac{\partial \sigma_1}{\partial K_1}) > 0$
Strategic substitutes $\frac{d\sigma_2^*}{d\sigma_1} < 0$	(D) Top Dog (A) Top Dog	(D) Lean & Hungry (A) Lean & Hungry
Strategic complements $\frac{d\sigma_2^*}{d\sigma_1} > 0$	(D) Top Dog (A) Puppy Dog	(D) Lean & Hungry (A) Fat Cat

- ▶ Top Dog: Overinvestment;
- ▶ Lean & Hungry: Underinvestment;
- ▶ Puppy Dog: Overinvestment for (D) and Underinvestment for (A);
- ▶ Fat Cat: Underinvestment for (D) and Overinvestment for (A).

Example

A top dog example: Investment in capacity

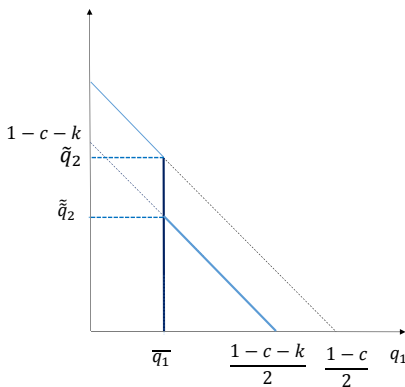
- ▶ In stage 1, an incumbent firm 1 sets its capacity \bar{q}_1 .
- ▶ In stage 2, the entrant 2 decides to enter or not. In case of entry the two firms set additional capacity $\Delta\bar{q}_1$ and $\Delta\bar{q}_2$ respectively and produce at most $\bar{q}_1 + \Delta\bar{q}_1$ for the incumbent and $\Delta\bar{q}_2$ for the entrant.
- ▶ Products are homogeneous and the inverse demand function is $P = 1 - q_1 - q_2$.
- ▶ Entry cost : e
- ▶ k is the marginal cost of capacity.
- ▶ c the marginal cost of production.

Assume that 2 has entered. The incumbent's profit is:

$$\pi_1 = (1 - q_1 - q_2 - c)q_1 - k\Delta\bar{q}_1$$

Maximizing this function with respect to q_1 it follows that the best reaction function is:

$$q_1(q_2) = \begin{cases} \frac{1}{2}(1 - q_2 - c - k) & \text{for } q_1 > \bar{q}_1, \\ \frac{1}{2}(1 - q_2 - c) & \text{for } q_1 \leq \bar{q}_1 \end{cases}$$



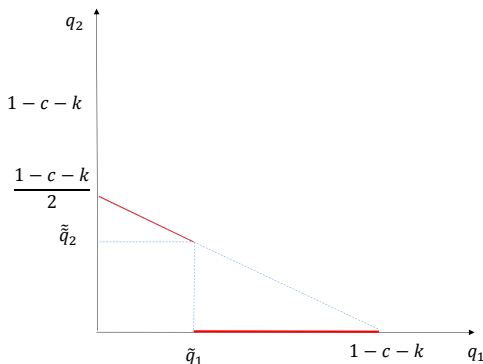
The entrant's profit is:

$$\pi_2 = (1 - q_1 - q_2 - c)q_2 - k\Delta\bar{q}_2 - e$$

Maximizing this function w.r.t. q_2 , the best reaction function is:

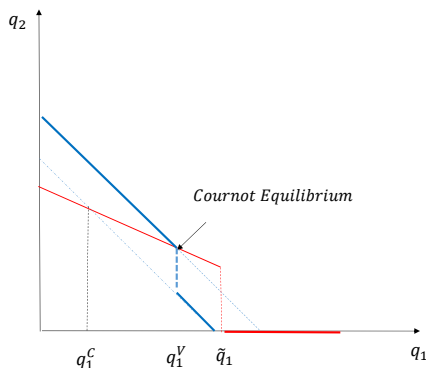
$$q_2(q_1) = \begin{cases} \frac{1}{2}(1 - q_1 - c - k) & \text{for } q_1 < \tilde{q}_1, \\ 0 & \text{for } q_1 \geq \tilde{q}_1 \end{cases}$$

$$\tilde{q}_1 = 1 - c - k - 2\sqrt{e} \Leftrightarrow \pi_2(q_2(q_1), q_1) = \frac{1}{4}(1 - q_1 - c - k)^2 - e = 0$$



4 cases to consider

1. Inevitable entry: $\tilde{q}_1 > q_1^V \Rightarrow e < e^- = \frac{1}{9}(1 - c - 2k)^2$. q_1^V corresponds to a Nash equilibrium between the entrant 2 and an unconstrained firm 1.
- ▶ if $\bar{q}_1 = q_1^V \Rightarrow \pi_1 = \frac{1}{9}(1 - c + k)(1 - c - 2k)$
- ▶ if $\bar{q}_1 = q_1^C \Rightarrow \pi_1^C = \frac{1}{9}(1 - c - k)^2$.

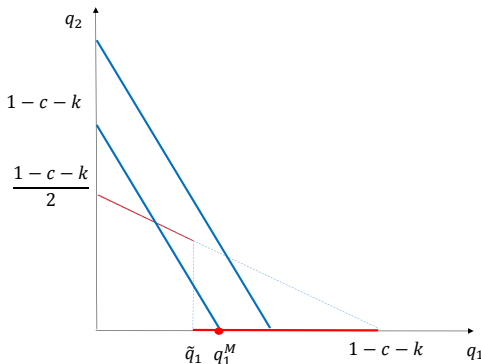


4 cases to consider

2. Blockaded entry

$$q_1^M = \frac{1}{2}(1 - c - k) \text{ and } q_1^M > \tilde{q}_1 \Rightarrow e > e^+ = \frac{1}{16}(1 - c - k)^2$$

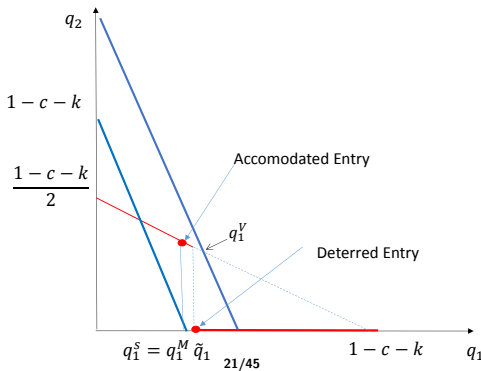
► Then $\bar{q}_1 = q_1^M \Rightarrow \pi_1^M = \frac{1}{4}(1 - c - k)^2$



4 cases to consider

If $q_1^M < \tilde{q}_1 < q_1^V \Leftrightarrow e^- < e < e^+$

3. Deterred entry $\bar{q}_1 = \tilde{q}_1$ — Commitment from 1 to be on its highest reaction function \Rightarrow credible that $q_1 = \tilde{q}_1$ and no entry.
4. Accommodated entry
 - $\bar{q}_1 = q_1^S = \frac{1}{2}(1 - c - k) = q_1^M < \tilde{q}_1$. In the competition stage, 1 is on the high reaction function only if $q_1 < q_1^M < q_1^V$.



If $q_1^M < \tilde{q}_1 < q_1^V \Leftrightarrow e^- < e < e^+$

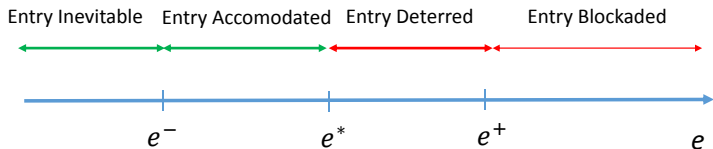
- The profit obtained in case of accomodation is:

$$\max_{q_1^S} \pi_1(q_1^S, q_2(q_1^S)) = \frac{1}{2}(1 - c - k - q_1^S)q_1^S \Rightarrow \pi_1^A = \frac{1}{8}(1 - c - k)^2$$

- To deter entry, the incumbent must install a larger capacity \tilde{q}_1 and its profit is:

$$\pi_1^D = (1 - c - k - \tilde{q}_1)\tilde{q}_1 = 2\sqrt{e}(1 - c - k - 2\sqrt{e})$$

It is possible to show that $\pi_1^D > \pi_1^A$ if $e > e^* = \frac{(2-\sqrt{2})^2(1-c-k)^2}{64}$.



Remember

This investment capacity model illustrates the TOP DOG strategy for Deterrence:

- ▶ Deterrence $\rightarrow q_1 = \tilde{q}_1$ which corresponds to a capacity expansion above the monopoly level.
- ▶ Accomodation $\rightarrow q_1^S = q_1^M$ which corresponds to a capacity expansion above the competition level ($q_1^C = \frac{1-c-k}{3}$).

Lean and Hungry look: An innovation model

Assumptions

- ▶ **Period 1:** Firm 1 can make an investment K_1 to reduce its marginal cost $c(K_1)$ and obtain the corresponding gross profit $\pi^M(c(K_1))$ which strictly increases in K_1 in period 1.
- ▶ **Period 2** Firm 2 may enter at a fixed cost F . When firm 2 enters, 1 and 2 compete in $R\&D$:
 - ▶ To innovate with probability ρ_i costs $\rho_i^2/2$.

Innovation is drastic and leads to a marginal cost c .

Table: Gains in period2

Innovation probabilities	ρ_2	$(1 - \rho_2)$
ρ_1	$(0, 0)$	$(\pi^M(c), 0)$
$(1 - \rho_1)$	$(0, \pi^M(c))$	$(\pi^M(c(K_1)), 0)$

Period 2: Firms 1 and 2 choose their *R&D* levels ρ_1 and ρ_2 to maximize their expected profit:

$$\begin{aligned}\pi_1 &= \rho_1(1 - \rho_2)\pi^M(c) + (1 - \rho_1)(1 - \rho_2)\pi^M(c(K_1)) - \rho_1^2/2, \\ \pi_2 &= \rho_2(1 - \rho_1)\pi^M(c) - \rho_2^2/2\end{aligned}$$

FOCS are:

$$\begin{cases} (1 - \rho_2^*)(\pi^M(c) - \pi^M(c(K_1))) = \rho_1^*, \\ (1 - \rho_1^*)\pi^M(c) = \rho_2^* \end{cases}$$

The equilibrium investments ρ_1^* and ρ_2^* that solve the above system are such that $\frac{\partial \rho_1^*}{\partial K_1} < 0$ and $\frac{\partial \rho_2^*}{\partial K_1} > 0$. FOC

Deterrence

$$\frac{d\pi_2(K_1, \rho_1^*, \rho_2^*)}{dK_1} = -\rho_2^*\pi^M(c)\frac{\partial \rho_1^*}{\partial K_1} > 0$$

The deterrence strategy consists in reducing K_1 .

Accommodation

$$\begin{aligned}\frac{d\pi_1(K_1, \rho_1^*, \rho_2^*)}{dK_1} &= \frac{\pi_1(K_1, \rho_1^*, \rho_2^*)}{\partial K_1} - (\rho_1^* \pi^M(c) + (1 - \rho_1^*) \pi^M(c(K_1))) \frac{\partial \rho_2^*}{\partial K_1} \\ &< \frac{\pi_1(K_1, \rho_1^*, \rho_2^*)}{\partial K_1}\end{aligned}$$

where $\frac{\pi_1(K_1, \rho_1^*, \rho_2^*)}{\partial K_1} = (1 - \rho_1^*)(1 - \rho_2^*) \frac{\partial \pi^M(c(K_1))}{\partial K_1}$

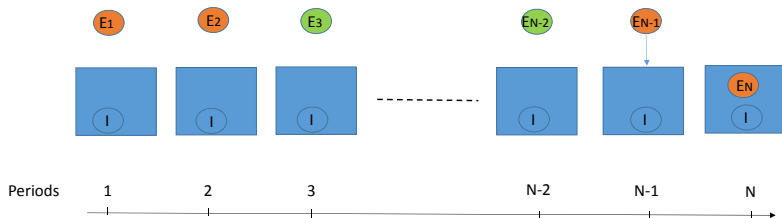
The accommodation strategy consists in reducing K_1 .

Lean and Hungry look

In period 1 firm 1 underinvests in K_1 to commit itself to being more aggressive in its *R&D* race in period 2. This is the best strategy both to deter entry or accommodate.

Why? *R&D* investments are strategic substitutes and the larger K_1 the higher $\pi^M(c(K_1))$ and therefore the lower the incumbent's incentive to invest in period 2 (Arrow replacement effect).

The chain store paradox (Selten, 1978)



- ▶ An incumbent firm I which owns stores in N markets.
- ▶ Entry takes place sequentially
 1. E_1 enters or not in period 1 on a first market.
 2. Another E_2 enters or not on a second market in period 2.
 3. ...
 4. The last E_N enters or not on market N in period N .

- ▶ Without entry the gain of I in each store is: a
- ▶ In case of entry, gains of firm I and E_i are:

Table: Payoffs in case of entry

Choice of I	Fight	Accomodate
Payoffs (I, E_i)	$(-1, -1)$	$(0, b)$

- ▶ We solve the game backward.
- ▶ In period N , if E_N enters, the best choice for player I is to accomodate. Long run consideration do not come in, since after period N the game is over.
- ▶ In period $N - 1$, a fight in period $N - 1$ would not deter player N to enter, therefore in $N - 1$ the best strategy for I is to accomodate.
- ▶ By induction theory, the unique sequential equilibrium is such that in each period t , E_t enters and I accomodates.
- ▶ **Selten Paradox (1978)**: Incomplete information framework, i.e. I can be of type tough or weak with a probability \Rightarrow a reputation issue!!

The chain store game with reputation

- ▶ Same framework except that I can be tough (on all markets) with probability (p) and weak with proba ($1-p$)
- ▶ Each E_i can be tough with probability (q) and weak with proba ($1-q$)
- ▶ **Tough I always fights ; Tough E_i always enters.**

Table: Payoffs in case of entry

Choice of a weak I	Fight	Accomodate
Payoffs (I, E_i)	$(-1, -1)$	$(0, b)$

- ▶ We solve the game backward.

The case $N = 1$

It is a one period game \Rightarrow **No reputation effect.**

- ▶ **A tough I fights.**
- ▶ A weak I accomodates.
- ▶ p is the probability that the incumbent is tough.
- ▶ When the expected gain of a weak E_1 is $-p + (1 - p)b > 0$, i.e. $p < \underline{p} = \frac{b}{b+1}$, E_1 enters. Otherwise, E_1 stays out.
- ▶ If $p < \underline{p} = \frac{b}{b+1}$, a weak I gains 0. If $p \geq \underline{p} = \frac{b}{b+1}$, I gains a .

The case $N = 2$

It is a two-period game \Rightarrow **A reputation effect may take place.**

- ▶ **A tough I fights.**
- ▶ What is the strategy for a weak I?
 - ▶ If I accomodates in $t = 1$, then, in $t = 2$, E_2 knows that I is weak and always enters. The expected gain of a weak I is 0.
 - ▶ If I fights in $t = 1$, and if then in $t = 2$ E_2 believes that I is tough and stays out, the expected gain of a weak I is $-1 + \delta(1 - q)a$ (with the complementary probability q , E_2 **is tough and enters**).

If $-1 + \delta(1 - q)a < 0$, there is **No reputation strategy** for a weak I.

In $t = 1$, a weak E_1 enters if $p < \underline{p} = \frac{b}{b+1}$ and stays out otherwise.

- ▶ If I is weak, he accomodates in $t = 1$, a weak or tough E_2 enters.
- ▶ If I is tough, he fights in $t = 1$, a weak E_2 stays out.

If $-1 + \delta(1 - q)a > 0$, **A reputation strategy** for a weak I may arise.

A weak I wants to fight in $t = 1$ with a positive probability β to deter entry in $t = 2$. We focus directly on the interesting case in which E_2 is a weak entrant.

- ▶ If $p > \underline{p}$,
 - ▶ If I accommodates in $t = 1$, a weak E_2 knows that I is weak and always enters. Accommodating in $t = 1$ brings 0 to I .
 - ▶ If I fights in $t = 1$, the revised probability that I is tough is $p(\text{tough}/\text{fight}) = \frac{p}{p + \beta(1-p)} > p > \underline{p}$ and a weak E_2 stays out. Bayes
 - ▶ Because fighting in $t = 1$ always deters entry of a weak E_2 in $t = 2$, the expected gain of I is $\beta(-1 + \delta(1 - q)a) + (1 - \beta) \times 0$. A weak I always fights ($\beta = 1$) in $t = 1$ and earns the profit : $-1 + \delta(1 - q)a > 0$.
 - ▶ Anticipating this, in period 1, a weak E_1 always stays out.

If $-1 + \delta(1 - q)a > 0$, a weak I wants to fight in $t = 1$ with a positive probability β to deter entry in $t = 2$.

► If $p < \underline{p}$,

► If I fights in $t = 1$, E_2 then revises its beliefs accordingly and now believes that I is tough with a probability:

$$p(\text{tough}/\text{fight}) = \frac{p}{p + \beta(1-p)} > p.$$

► In $t = 2$, still E_2 knows that a weak I accommodates and a tough I fights (last period) but he takes into account the revised probability that I is tough $p(\text{tough}/\text{fight})$. A weak E_2 prefers not entering if:
 $-\frac{p}{p + \beta(1-p)} + (1 - \frac{p}{p + \beta(1-p)})b \leq 0$, i.e. if $\beta \leq \beta^* = \frac{p}{(1-p)b}$.

► Going backward to $t = 1$, E_1 knows that I plays this reputation effect to deter entry in $t = 2$ and therefore anticipates that I fights with a probability $p + (1 - p)\beta^* = p\frac{(1+b)}{b}$.

► A weak E_1 prefers to stay out if $-p\frac{(1+b)}{b} + (1 - p\frac{(1+b)}{b})b < 0$, i.e. if $p > (\frac{b}{1+b})^2$ and I gains a . Otherwise if $p < (\frac{b}{1+b})^2$, a weak E_1 enters and I thus gains $\beta^*(-1 + \delta(1 - q)a) > 0$.

A lower β would reduce I 's gains and a higher β cannot block entry of E_2 .

Conclusion

Because there are at least two-periods, E_1 anticipates that I has an incentive to create a reputation of being tough in $t = 1$ to deter entry in $t = 2$, and therefore E_1 is less likely to enter also in $t = 1$.

The generalization to any N is possible

- Assuming that $N = 3$, we now find that E_1 enters if and only if $p < \left(\frac{b}{1+b}\right)^3$ and so on for $N = T$ for $p < \left(\frac{b}{1+b}\right)^T$.

Contracts to deter entry

Vertical contracts between manufacturers and retailers might be used to deter entry.

- ▶ For instance bundling or full line forcing practices (Coca-Cola case in Multiproduct pricing class)
- ▶ Exclusive dealing contracts: Mars vs HB case.
 - ▶ The case starts in Ireland in 1989. Ice-cream bars are mostly sold in gas stations.
 - ▶ HB (Unilever) has 79% of the ice-cream bar market and, in 1989, Mars enters.
 - ▶ HB freely supplies small retailers with freezers. Mars market share rises up to 42%.
 - ▶ HB requires exclusivity: "only HB ice cream bars must be stocked in my freezers". Mars' market share decreases to 20%. Mars cannot fight back by offering its own freezers because shops are too small.
 - ▶ The European Court of Justice confirms the EC's prohibition of free freezers in 2003.

Exercise 1: Aghion and Bolton (1987)

M sells a good to A who is willing to pay at most $p = 1$ for one unit.
The unit cost of M is $c_M = \frac{1}{2}$. An entrant, E can produce the same good at an unknown unit cost c_E uniformly distributed over $[0, 1]$.

- In $t = 0$, A and M sign a contract or not;
- In $t = 1$, E observes the contract, learns its unit cost c_E and chooses to enter or not.
- In $t = 2$, firms set their prices.
- In $t = 3$, A decides where to buy.

- 1 Without contract, the competition is a la Bertrand.
 - a. Determine the equilibrium and the probability ϕ of entry. Bertrand

$\Rightarrow p^* = \max\{c_E, c_M\}$. E enters only if $c_E < c_M$.

The probability of entry is $\phi = P(c < c_M) = c_M = \frac{1}{2}$.

The situation is efficient, the firm who produces is the firm with the lowest unit cost.
 - b. What are the expected profits? The expected profits are:

$$\Pi_M = \phi 0 + (1 - \phi)(1 - c_M) = \frac{1}{4},$$

$$\Pi_E = \int_0^{c_M} (c_M - c)dc + 0 = \frac{c_M^2}{2} = \frac{1}{8},$$

$$\Pi_A = \phi(1 - c_M) + (1 - \phi)0 = c_M(1 - c_M) = \frac{1}{4}.$$

$$W = \Pi_M + \Pi_E + \Pi_A = \frac{5}{8}$$

2 M offers a take-it-or-leave-it contract (P, P_0) where P is the price that A must pay if he chooses to buy the good from M and P_0 is the penalty A must pay to M if he buys from E .

a. Given (P, P_0) , under which conditions does E enter?

$\Pi_A = 1 - P_0 - P_E$ if he buys from E .

$\Pi_A = 1 - P$ if he buys from M .

Therefore A buys from E if $c_E \leq P_E \leq P - P_0$ i.e. $P - P_0 \geq c_E$ and in that case $P_E = P - P_0$.

b. What is the profit of A if he accepts a contract (P, P_0) ?

$\Pi_A = \frac{1}{4}$ without contract.

With the contract,

$\Pi_A(P, P_0) = (P - P_0)(1 - P_E - P_0) + (1 - P + P_0)(1 - P) = 1 - P$
(as $P_E = P - P_0$).

A accepts the contract only if $1 - P \geq \frac{1}{4} \Rightarrow P \leq \frac{3}{4}$.

Solution

- c. Determine the optimal contract (P, P_0) for M .

$$\Pi_M(P, P_0) = (P - P_0)P_0 + (1 - P + P_0)(P - C_M)$$

$$\frac{\partial \Pi(P, P_0)}{\partial P_0} = -2P_0 + P + P - c_M = 0$$

Replacing $c_M = \frac{1}{2}$, we obtain:

$$\Rightarrow P_0 = P - \frac{1}{4}.$$

For $P_0 = P - \frac{1}{4}$, the profit of M is $\frac{1}{4}(P - \frac{1}{4}) + \frac{3}{4}(P - \frac{1}{2}) = P - \frac{7}{16}$.

However we know that $P \geq \frac{3}{4}$ to be accepted by A .

The optimal contract is thus $P = \frac{3}{4}$, $P_0 = \frac{1}{2}$.

With the exclusive dealing contract, the probability of entry is reduced to $\frac{1}{4}$.

Solution

- d. What are the expected profits under this contract? Comment!
Expected profits are:

$$\Pi_M = (1 - \frac{1}{4})(\frac{3}{4} - c_M) + \frac{1}{4} \frac{1}{2} = \frac{5}{16} > \frac{1}{4},$$

$$\Pi_E = (1 - \frac{1}{4})0 + \int_0^{\frac{1}{4}} (\frac{1}{4} - c)dc = \frac{1}{32} < \frac{1}{8},$$

$$\Pi_A = (1 - \frac{1}{4})(1 - \frac{3}{4}) + \frac{1}{4}(1 - \frac{3}{4}) = \frac{1}{4}.$$

$$W = \frac{19}{32} < \frac{5}{8}$$

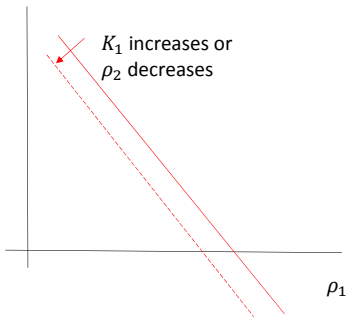
The welfare decreases because efficient entries are blockaded.

References

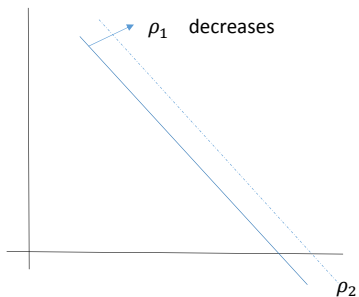
- ▶ Aghion, P. and P.Bolton. (1987). Contracts as a Barrier to Entry. *The American Economic Review*, 77(3), 388-401.
- ▶ Fudenberg, D. and J. Tirole (1991), "Game Theory", MIT Press, Chapter 9.
- ▶ Gelman, J. and S. Salop (1983), "Judo Economics: Capacity Limitation and Coupon Competition", *The Bell Journal of Economics*, 14, 2, p315-325.
- ▶ Selten, R. (1978), "The Chain Store Paradox", *Theory and Decision*, 9, p127-159.

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$$\text{FOC } f(\rho_1, \rho_2, K_1) = 0$$
$$f_{\rho_1} < 0$$



$$\text{FOC } g(\rho_1, \rho_2, K_1) = 0$$
$$g_{\rho_2} < 0$$



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Two events A and B respectively occur with probability $p(A)$ and $p(B)$.
Bayes's rule is as follows:

$$p(A/B) = \frac{p(B/A)P(A)}{p(B)}$$

where conditional probabilities:

- ▶ $p(A/B)$ is the likelihood of event A occurring given that B is true;
- ▶ $p(B/A)$ is the likelihood of event B occurring given that A is true.

Here:

$$p(\text{tough}/\text{fight}) = \frac{p(\text{fight}/\text{tough})xp(\text{tough})}{p(\text{fight})} = \frac{p}{p + \beta(1 - p)} > p$$

- ▶ This revised probability decreases with β .
- ▶ $p(\text{tough}/\text{fight}) = 1$ when $\beta = 0$ and $p(\text{tough}/\text{fight}) = p$ when $\beta = 1$.

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The Taxonomy: an Example

In 1982, Philips should decide to establish CD pressing factory and of the size of this factory. Philips fears Sony's reaction.

- ▶ Puppy Dog: Don't enter and Sony won't enter (The investment will make us tougher and Sony will react TOUGHER).
- ▶ Top Dog: Enter by building a massive factory, Sony will stay out of the market. Commitment to be TOUGH to make its rival SOFT.
- ▶ Fat Cat: Enter by building a small factory, Sony won't feel threatened. Commitment to be SOFT to also make its rival SOFT.
- ▶ Lean and Hungry Look: Stay out of the market. But the commitment to be SOFT makes me look TOUGHER.

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