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).

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Red Bull Case

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' testicules. 3 swedes died (because of mix with alcool). 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 cafeine. Then Red Bull deliberatly 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

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

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

- In equilibrium, profits are:

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

Judo economics

A less efficient entrant can enter the market and realize a positive profit when facing an incumbent more efficient and with more capacity. The entrant chooses a relatively low capacity to make it very costly for the incumbent to go into a price war.

- The case of UK supermarket chains on the gazoline retail Case
- With personalized prices, I would sell at $p_E - \epsilon$ at population K_E but at P_{max} to other consumers and entry would be always deterred.

Strategic Incumbent and entry

An incumbent can be strategic in many ways when confronted to a competitor's 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 accommodate!

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 the system of FOCs:

$$\begin{aligned} \frac{\partial \pi_1(K_1, \sigma_1, \sigma_2)}{\partial \sigma_1} &= 0 \\ \frac{\partial \pi_2(K_1, \sigma_1, \sigma_2)}{\partial \sigma_2} &= 0 \end{aligned}$$

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

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 :

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

  - Sign of direct effects: informative ($\frac{\partial \pi_2}{\partial K_1} > 0$) or persuasive ($\frac{\partial \pi_2}{\partial K_1} < 0$) advertising, 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 accommodating 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 :

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

  - The direct effect is the "profit maximizing effect" with no effect on firm 2.
  - Strategic effects are related:

$$\underbrace{Sign(\frac{\partial \pi_1}{\partial \sigma_2}\frac{\partial \sigma_2^*(K_1)}{\partial K_1})}_{\texttt{Strategic Effect Accomodation}} = \underbrace{Sign(\frac{\partial \pi_2}{\partial \sigma_1}\frac{\partial \sigma_1^*(K_1)}{\partial K_1})}_{\texttt{Strategic Effect Deterrence}} \quad xSign(\frac{d\sigma_2^*}{d\sigma_1})$$

Table: TAXONOMY

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

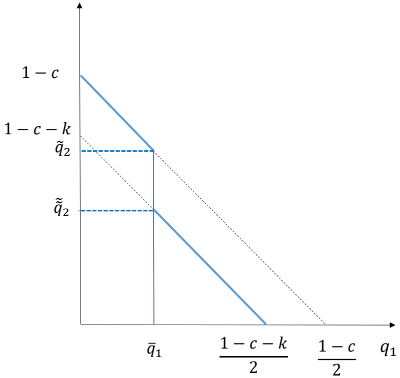
- In stage 1, an incumbent firm 1 sets its capacity $\bar{q}_1$.
- In stage 2, the entrant 2 decides to enter or not. In case of entry the two firms set additional capacity $\Delta\bar{q}_1$ and $\Delta\bar{q}_2$ respectively and produce at most $\bar{q}_1 + \Delta\bar{q}_1$ for the incumbent and $\Delta\bar{q}_2$ 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 its profit with respect to q_1, the incumbent's best reaction function is:

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



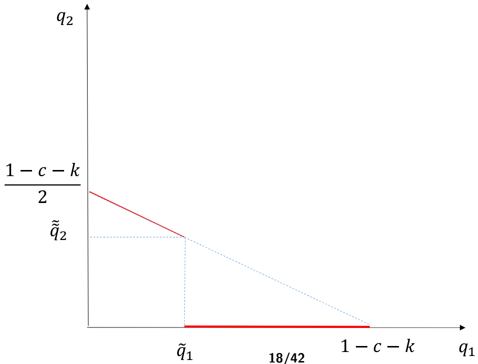
The entrant's profit is:

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

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

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

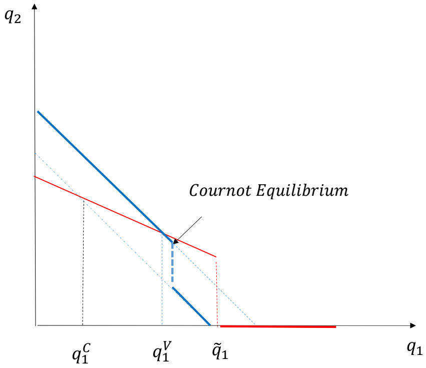
$$\tilde{q}_1 = 1 - c - k - 2\sqrt{e} \Leftrightarrow \pi_2(q_2(q_1), q_1) = \frac{1}{4}(1 - q_1 - c - k)^2 - e = 0$$



4 cases to consider

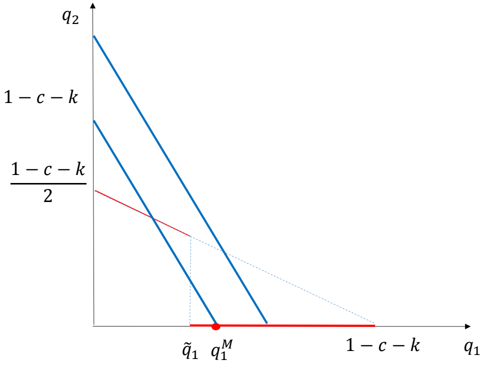
1. Inevitable entry: $\tilde{q}_1 > q_1^V \Rightarrow e < e^- = \frac{1}{9}(1-c-2k)^2$. q_1^V corresponds to a Nash equilibrium between the entrant 2 and an unconstrained firm 1.

- if $\bar{q}_1 = q_1^V \Rightarrow \pi_1 = \frac{1}{9}(1-c+k)^2$
- if $\bar{q}_1 = q_1^C \Rightarrow \pi_1^C = \frac{1}{9}(1-c-k)^2$.



4 cases to consider

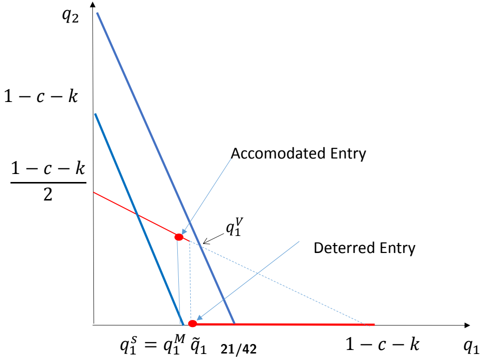
2. Blockaded entry
   $q_1^M = \frac{1}{2}(1 - c - k)$ and $q_1^M > \tilde{q}_1 \Rightarrow e > e^+ = \frac{1}{16}(1 - c - k)^2$
   - Then $\bar{q}_1 = q_1^M \Rightarrow \pi_1^M = \frac{1}{4}(1 - c - k)^2$



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. Accomodated 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 $q_1 \leq q_1^M < q_1^V$.



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

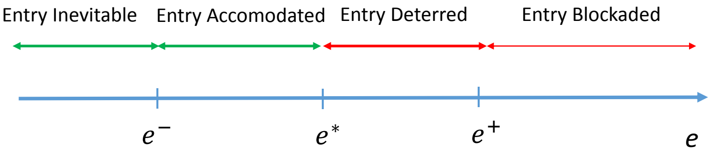
- The profit obtained in case of accomodation is:

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

- 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.

Accomodation

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

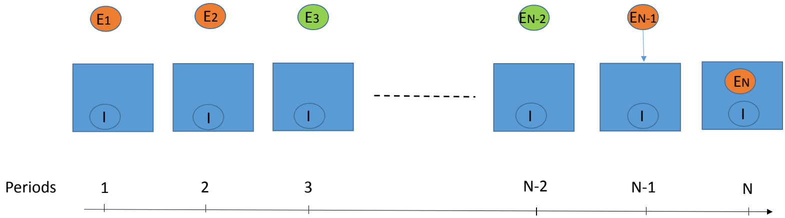
where $\frac{\pi_1(K_1,\rho_1^*,\rho_2^*)}{\partial K_1} = (1-\rho_1^*)(1-\rho_2^*)\frac{\partial \pi^M(c(K_1))}{\partial K_1}$
The accomodation strategy consists in reducing K_1.

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 accomodate.

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 => a reputation issue!!

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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 accomodates in $t=1$, a weak E_2 knows that I is weak and always enters. Accomodating in $t=1$ brings 0 to I.
  - If I fights in $t=1$, the revised probability that I is tough is $p(tough/fight)=\frac{p}{p+\beta(1-p)}>p>\underline{p}$ 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 $\beta(-1+\delta(1-q)a)+(1-\beta)x0$. 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: $p(tough/fight)=\frac{p}{p+\beta(1-p)}>p$.
  - In $t=2$, still E_2 knows that a weak I accomodates and a tough I fights (last period) but he takes into account the revised probability that I is tough $p(tough/fight)$. 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 $p < (\frac{b}{1+b})^3$ and so on for $N = T$ for $p < (\frac{b}{1+b})^T$.

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.

Exercice 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.
   b. What are the expected profits?
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?
   b. What is the profit of A if he accepts a contract (P, P_0) ?
   c. Determine the optimal contract (P, P_0) for M.
   d. What are the expected profits under this contract? Comment!

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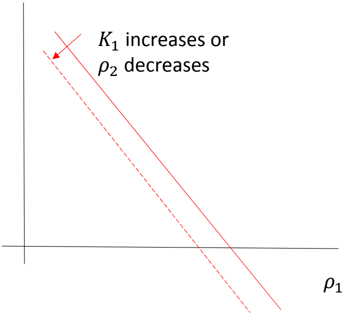
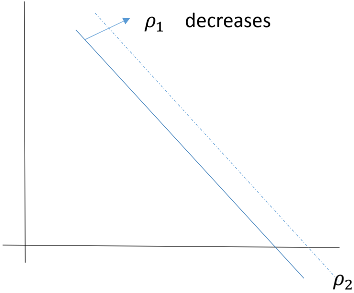
FOC $f(\rho_1, \rho_2, K_1) = 0$
$f_{\rho_1} < 0$



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



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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:

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

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

UK petrol price war

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1980s	3 types of companies hold retail gasoline stations in UK: Vertically integrated oil companies (Shell, ESSO, British Petroleum,...), supermarkets, independent retailers.
1990	Supermarkets' market share rose from 1% in 1980 to 6% in 1990. ESSO the largest player with 21% market share hesitates to launch a price war...
1995	Supermarkets have reached 20% market share while the market share of Esso dropped to 16%. ESSO launch "Price Watch" in north east of England and Scotland: ESSO will match the lowest supermarket price in 3 miles around the station.
1996	Extension of Price Watch to all its gas station and immediate price war in response by BP and Shell.

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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