OI: entrada e saída

Aula 3 – 1ª Parte

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Agenda

- Taxonomy of entry-related strategies
- Strategies affecting cost variables
- Strategies affecting demand variables
- Entry deterrence and multiple incumbents

Taxonomy of entry strategies (1)

- Incumbent's investment decision **anticipating** the possibility of entry depends on
  - Strategic effect of this investment
  - Type of product market competition

- Two-stage game
  - **First stage**
    - Incumbent (firm 1) chooses some irreversible investment K_1
  - **Second stage**
    - Observing K_1, entrant (firm 2) decides to enter or not
    - Product market decisions
      - ✓ If the entrant enters: duopoly
      - ✓ If not: incumbent remains in monopoly position

Taxonomy of entry strategies (2)

- If potential entrant decides to enter
  - Second-stage decisions: σ_1 and σ_2, typically either a price ($\sigma_i = p_i$) or a quantity ($\sigma_i = q_i$)
  - Profits: $\pi_1(K_1,\sigma_1,\sigma_2)$ and $\pi_2(K_1,\sigma_1,\sigma_2)$
  - Equilibrium: $\{\sigma_1^*(K_1),\sigma_2^*(K_1)\}$
- If potential entrant does not enter
  - Entrant makes zero profit
  - Incumbent obtains $\pi_1^m\left(K_1, \sigma_1^m(K_1)\right)$
    - $\sigma_1^m(K_1)$: monopoly choice in stage 2
- 2 options for the incumbent under the threat of entry
  - **Entry deterrence**: choose K_1 such that $\pi_2\left(K_1, \sigma_1^*(K_1), \sigma_2^*(K_1)\right) \leq 0$
  - **Entry accommodation**: choose K_1 to maximize

$$\pi_1\left(K_1, \sigma_1^*(K_1), \sigma_2^*(K_1)\right)$$

Taxonomy of entry strategies (3)

- **Question**: does the incumbent over- or under-invest when acting strategically?
  - Is investment level at subgame perfect equilibrium higher or lower than what would be chosen by an incumbent acting 'non strategically'?
  - We answer the question for
    - Entry deterrence
    - Entry accommodation

Entry deterrence (1)

- Incumbent chooses investment to make entry unprofitable
  - Assume: monopoly choice of K_1 is not sufficient to avoid entry (entry is not 'blockaded')

    $\rightarrow$ Incumbent must distort its investment choice
  - Distortion is costly $\rightarrow$ incumbent chooses investment such that

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

- Impact of a change in K_1 on the entrant's profit?
  - Totally differentiate π_2 with respect to K_1

$$\frac{d\pi_2}{dK_1} = \frac{\partial \pi_2}{\partial K_1} + \frac{\partial \pi_2}{\partial \sigma_1}\frac{\partial \sigma_1^*(K_1)}{\partial K_1} + \frac{\partial \pi_2}{\partial \sigma_2}\frac{\partial \sigma_2^*(K_1)}{\partial K_1}$$

Total effect ***Direct effect*** ***Strategic effect (SED)*** *= 0 (envelope theorem)*

Entry deterrence (2)

- **Direct effect**: can be of any sign
  - Negative (e.g., persuasive advertising)
  - Positive (e.g., some types of informative advertising)
  - Nul (e.g., investment in capacity)
- **Strategic effect**: by changing its ex ante decision, incumbent modifies its ex post behaviour
  $\rightarrow$ which affects firm 2's profit
- Investment makes the incumbent tough (soft) if total effect ($d\pi_2/dK_1$) is negative (positive)
- To deter entry $\rightarrow$ need to look aggressive
- So, if investment makes incumbent...
  - **Tough** $\rightarrow$ incentive to *overinvest*: **'top dog strategy'**
  - **Soft** $\rightarrow$ incentive to *underinvest*: **'lean and hungry look'**

Entry deterrence (3)

- **Lesson**
  - If investment makes incumbent **tough** (i.e., if investment entrant's profit), then incumbent must behave as a **top dog** to deter entry: he must overinvest (be strong or big) to look aggressive
  - If investment makes incumbent **soft** (i.e., if investment ↑ entrant's profit), then incumbent must adopt a **lean and hungry look** to deter entry: he must underinvest (be weak or small) to look aggressive

Entry accommodation (1)

- Firm 1 takes entry as given → no longer chooses K_1 to make π_2 negative but to maximize π_1
  - → Differentiate $\pi_1\left(K_1, \sigma_1^*(K_1), \sigma_2^*(K_1)\right)$ with respect to K_1

$$\frac{d\pi_1}{dK_1} = \frac{\partial \pi_1}{\partial K_1} + \frac{\partial \pi_1}{\partial \sigma_1}\frac{d\sigma_1^*(K_1)}{dK_1} + \frac{\partial \pi_1}{\partial \sigma_2}\frac{d\sigma_2^*(K_1)}{dK_1}$$

Total effect ***Direct effect*** *= 0 (envelope theorem)* ***Strategic effect (SEA)***

  - **Direct effect**: exists anyway and can be neglected
  - **Strategic effect**: influence of firm 1's investment on firm 2's second-stage behaviour
  - Incumbent should
    - **Overinvest** if strategic effect is positive
    - **Underinvest** otherwise

Entry accommodation (2)

- Sign of the strategic effect (SEA)? Depends on
  - Sign of strategic effect under entry deterrence (SED)
  - Whether 2nd-stage strategies are strategic substitutes or complements

$$sign\left(\frac{\partial \pi_1}{\partial \sigma_2}\frac{d\sigma_2^*(K_1)}{dK_1}\right) = sign\left(\frac{\partial \pi_2}{\partial \sigma_1}\frac{d\sigma_2^*(K_1)}{dK_1}\right)$$

Chain rule

Same sign if firms' choices have same nature

$$= sign\left(\frac{\partial \pi_2}{\partial \sigma_1}\frac{d\sigma_2^*}{d\sigma_1}\frac{d\sigma_1^*}{dK_1}\right) \Leftrightarrow$$

$$sign\left(\frac{\partial \pi_1}{\partial \sigma_2}\frac{d\sigma_2^*(K_1)}{dK_1}\right) = sign\left(\frac{\partial \pi_2}{\partial \sigma_1}\frac{d\sigma_1^*}{dK_1}\right) \times sign\left(\frac{d\sigma_2^*}{d\sigma_1}\right)$$

SED — **SEA** — **Slope of firm 2's reaction curve**

Entry accommodation (3)

- If 2nd-stage choices are **strategic substitutes**
  - Reaction curves are downward sloping
  - SEA has reverse sign of SED

Investment makes firm 1 tough → SED < 0 → SEA > 0 → overinvestment
Investment makes firm 1 soft → SED > 0 → SEA < 0 → underinvestment

- Same conduct for accommodation and deterrence
  - If investment makes incumbent tough, incumbent **overinvests** → **top dog strategy** → Commitment to be aggressive
    - ↓ entrant's profit (good for deterrence)
    - ↑ incumbent's profit (good for accommodation)
  - If investment makes incumbent soft , incumbent **underinvests** → **lean and hungry look** → Commitment not to be aggressive

Entry accommodation (4)

- If 2nd-stage choices are **strategic complements**
  - Reaction curves are upward sloping
  - SEA and SED have the same sign

Investment makes firm 1 tough → SED < 0 → SEA < 0 → underinvestment
Investment makes firm 1 soft → SED > 0 → SEA > 0 → overinvestment

- Different conducts for accommodation and deterrence
  - When deterrence calls for overinvestment (top dog), accommodation calls for underinvestment → **puppy dog**
  - When deterrence calls for underinvestment (lean and hungry look), accommodation calls for overinvestment → **fat cat**
  - **Intuition:** incumbent wants to look inoffensive so as to trigger a favourable response from the entrant

Entry accommodation (5)

- **Lesson**: The optimal business strategies for entry deterrence (D) and for entry accommodation (A) are as follows

	Investment makes the incumbent	
	Tough	Soft
Strategic substitutes	*(D and A)* **Top dog**	*(D and A)* **Lean and Hungry**
Strategic complements	*(D)* **Top dog** *(A)* **Puppy Dog**	*(D)* **Lean and Hungry** *(A)* **Fat Cat**

Strategies affecting cost

- Specific examples for investment K_1
  - Investment in **capacity** as an entry deterrent
  - Investment as an entry deterrent reconsidered
    - Model of **R&D competition**
  - Raising rivals' **costs**

Investment in capacity (1)

- Why installing capacity **early**?
  - To convey to potential entrants that incumbent will have **low marginal costs** and thus be a tough competitor to deal with
  - May convince potential entrant that it will **not recover** its entry costs
- Incumbent may strategically **distort** its investment upward
- In practice, many investment decisions are **lumpy** and thus automatically give **commitment**
- Contracts
  - With **upstream suppliers**: long-term supply contracts that are costly to revise
  - Long-term **labour** contracts

Investment in capacity (2)

- In an entry model with capacity commitment, the incumbent's conduct depends on the cost of entry, e
  - For small entry costs ($e < e^*$), the incumbent prefers to **accommodate** entry and behaves as a Stackelberg leader
  - For intermediate entry costs ($e^* \leq e \leq e^+$), the incumbent chooses to **deter** entry by expanding its capacity
  - For large entry costs ($e > e^+$), the incumbent can behave as an unconstrained monopolist as entry is **blockaded**

Investment in R&D (1)

- A simple model of R&D competition
- K_1: investment that allows firm 1 to lower its average cost of production in the first stage
  - Cost: $\bar{c}(K_1)$ with $\bar{c}'(K_1) < 0$
  - First-period profits $\uparrow$ with K_1: $\pi^m(\bar{c}(K_1))$
- Second period
  - Incumbent and entrant compete in R&D
  - Each firm spends resources x_i
  - R&D technology is stochastic $\rightarrow$ Firm i's probability of finding the innovation is given by:

$$\mu_i(x_i) \text{ with } \mu_i'(0) = \infty,\ \mu_i' > 0, \text{ and } \mu_i'' < 0$$

Investment in R&D (2)

- If **one firm** finds the innovation
  - This firm drives the other firm out of the market (innovation is **drastic**) and obtain profits $\pi^m(c)$
- If **both firms** find the innovation
  - They produce a homogeneous good at the same cost.
  - Price competition then drives profits down to zero.
- If **no firm** finds the innovation
  - Incumbent keeps its first-period profit
- Expected profits:

$$\pi_1 = \mu_1(1-\mu_2)\pi^m(c) + (1-\mu_1)(1-\mu_2)\pi^m(\bar{c}(K_1)) - x_1$$

$$\pi_2 = \mu_2(1-\mu_1)\pi^m(c) - x_2$$

Investment in R&D (3)

- Does investment make incumbent tough or soft?
  - $K_1 \uparrow \rightarrow$ first-period marginal cost $\downarrow$
  - $\rightarrow$ $\pi^m(\bar{c}(K_1))$ $\uparrow$
  - $\rightarrow$ incumbent's fall-back position in period 2 if it fails to find the innovation improves
  - $\Rightarrow$ larger $K_1 \downarrow$ incumbent's incentive to innovate
  - $\Rightarrow$ Investment makes incumbent **soft**.
- R&D expenditures are **strategic substitutes**
  - See FOCs for profit maximization
- **Conclusion**: firm 1 wants to commit to play more aggressively $\rightarrow$ it $\uparrow$ its incentive to innovate $\rightarrow$ it $\downarrow K_1$
  - Underinvestment: **Lean and hungry look** strategy

Raising rivals' cost (1)

- Accommodation or deterrence can also be achieved by acting directly on the entrant's **cost function**
  - Incumbent could **sabotage** entrant's production facilities
  - Lobby the government to **raise taxes** on imported products so as to deter entry of foreign competitors
  - Clearly **anticompetitive**; no need for further analysis
- Some cost-raising strategies may force the incumbent to **raise his own costs** as well...
  - **Trade-off** between harm incumbent does to potential entrant and harm he does to himself

Raising rivals' cost (2)

- Such strategies = form of **overinvestment**
  - A non-strategic incumbent would not deliberately increase its own cost
- Same 2-stage model as before
  - Investment $K_1 \uparrow$ costs of both firms: $c_1(K_1)$ and $c_2(K_1)$
  - The following result holds in a wide variety of settings

- **Lesson**: Cost-raising strategies (i.e., strategies that raise the rival's cost but also the incumbent's) are more likely to be used to deter entry than to accommodate it

Strategies affecting demand

- **Goal**: committing to reduce the demand that is available for the entrant
- 3 specific tactics:
  - Product positioning
    - "Brand proliferation": $\uparrow$ number of varieties put on the market $\rightarrow$ fewer niches for entrant
  - Bundling
    - If incumbent controls 2 products, bundling them may make entry less profitable
  - Switching costs
    - Incentive to build an earlier base of customers

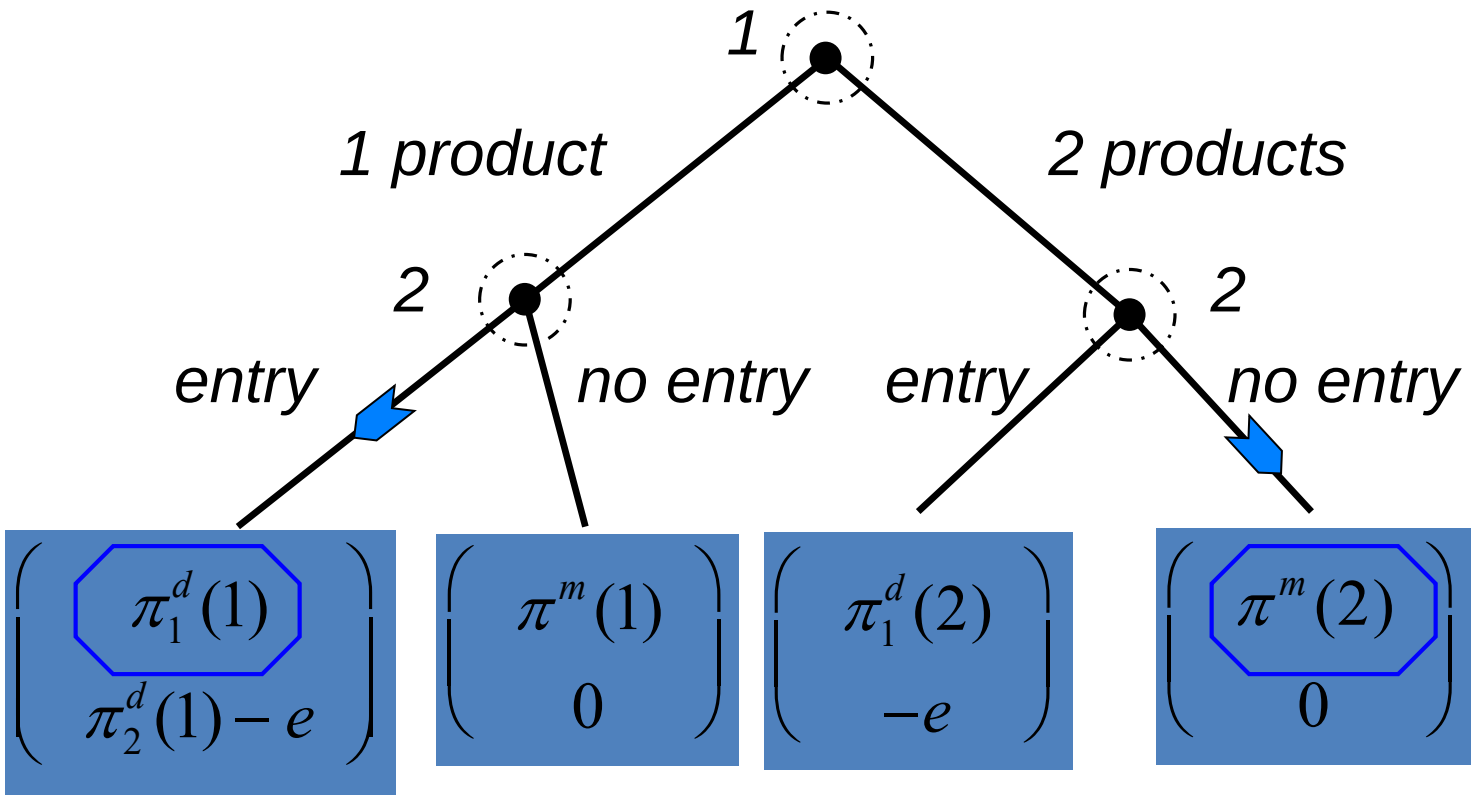
Brand proliferation model (1)

- Incumbent can produce a **base** product
- It may want to produce also an imperfect **substitute**
- Corresponding **monopoly** profits:
  - $\pi^m(1)$ and $\pi^m(2)$, with $\pi^m(1) > \pi^m(2)$
    $\rightarrow$ optimal to produce 1 product in protected monopoly
- 3-stage game
  - **Incumbent chooses** to produce 1 or 2 products
  - **Entrant decides** to enter or not; if entry (cost: e), entrant's product competes directly with incumbent's 2nd product
  - Active firms **simultaneously** set prices

Brand proliferation model (2)

- **Equilibrium** profits at stage 3 following entry: $\pi_i^d(k)$
  - i: firm's identity; k: number of products offered by incumbent
- Entrant's profits at stage 2 if incumbent has...
  - **1 product**: $\pi_2^d(1) - e$ (assume it is positive)
  - **2 products**: $\pi_2^d(2) - e = 0 - e \rightarrow$ entry not profitable
- Stage 1
  - Incumbent can **deter** entry by offering 2 products
  - Deterrence profitable if $\pi^m(2) > \pi_1^d(1)$
  - If so, unique subgame perfect equilibrium with brand proliferation used as an entry deterrent

Brand proliferation model (3)



- **Lesson**: An incumbent may use brand proliferation to deter entry

Bundling and market power (1)

- Suppose that an incumbent firm
  - is a **monopolist** in the market for product A
  - faces **potential** competition for product B

- By bundling products A and B, incumbent may
  - $\downarrow$ demand addressed to rival firm producing B
  - $\rightarrow$ Make **entry unprofitable** (or induce exit from the industry)

Bundling and market power (2)

- Longer-term analysis
  - Monopoly position of firm 1 in market A is at **risk** if a competitor establishes itself **successfully** in market B
    - Firm 1 may forego short-term profit goals
    - The use of technological bundling may allow firm 1 to induce exit of firm 2 in market B
  - If being successful in market B is prerequisite for entry in market A, firm 1's successful attempt to induce exit in market B **protects** its monopoly position in market A in the long term
  - Important considerations in the Microsoft case

Switching costs (1)

- Incumbent's product exhibits switching costs
- To deter entry, what should the incumbent do?
  - **expand** its base of customers (i.e., overinvest) OR
  - **contract** its base of customers (i.e., underinvest)
- 2 **opposite** forces when expanding customer base:
  - More costly for entrant to **attract** customers
    - Profitability of large-scale entry $\downarrow \rightarrow$ entry deterrence calls for overinvestment: **top dog strategy**
  - Small-scale entry may become more profitable if incumbent cannot **price discriminate** between old and new buyers
    - Incumbent sets large price to 'skim' locked-in customers, but large price also for new buyers; so, entry is easier $\rightarrow$ entry deterrence calls for underinvestment: **lean and hungry look strategy**

Switching costs (2)

- **Lesson**: Switching cost affect entry conditions in 2 opposing ways:
  - they hamper large-scale entry that seeks to attract existing customers of the incumbent
  - they induce the incumbent to harvest its base of consumers with high prices, thereby relaxing price competition for unattached consumers and making entry easier on that segment

Multiple incumbents

- Possibility of **free riding** in entry deterrence
  - If entry can be successfully deterred by proper **subset** of incumbents, those outside that subset freely benefit from the other firm's investments
  - Incumbents acting in a **noncooperative** way may invest less in entry deterrence than they would do if they could coordinate their actions
- **Number** of entrants is critical for the underinvestment result to be observed
- **Lesson**: Multiple incumbents may not be able to deter entry if they do not coordinate their investment decisions

Referências

- BELLEFLAMME, P.; PEITZ, M. Industrial Organization: Markets and Strategies, 2 ed. Cambridge (UK): Cambridge University, 2015.
- TIROLE, J. The Theory of Industrial Organization. Cambridge (MA): MIT, 1988.