

# Entry

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18 septembre 2025

- Market power : ability to set a price above the marginal cost.
- Many strategies to increase market power :
  - Launch a new product
  - Collude
  - Merge
  - Deter entry
- IO : firms' strategies and their social impact
- This chapter : study some strategies to *deter* entry ?

# Introduction

## Outlines of the chapter

- 1 A typology of entry deterrence strategies
- 2 A paper presentation on the possible ambiguous role of fixed cost

# Introduction

Reading list for that chapter

- \*Tirole : chapter 8
- \*BP : chapter 3
- \*Presentation : "On Excessive Entry in Bayes-Cournot Oligopoly"

- An incumbent has a strategic advantage
- This section : how that strategic advantage may be used to preserve market power ?
  - The case of using capacity to deter entry : the theory and an empirical illustration
  - A general typology
  - The ambiguous role of the fixed entry cost

- The case of production capacity :
  - Many examples of firms that seem to expand their capacity to deter entry or deter competitors expansion
  - Build a model to clarify firms' strategies and/or to test entry deterrence motive
  - A model to build an empirical strategy to identify entry deterrence
  - An empirical test
- A general model of entry deterrence

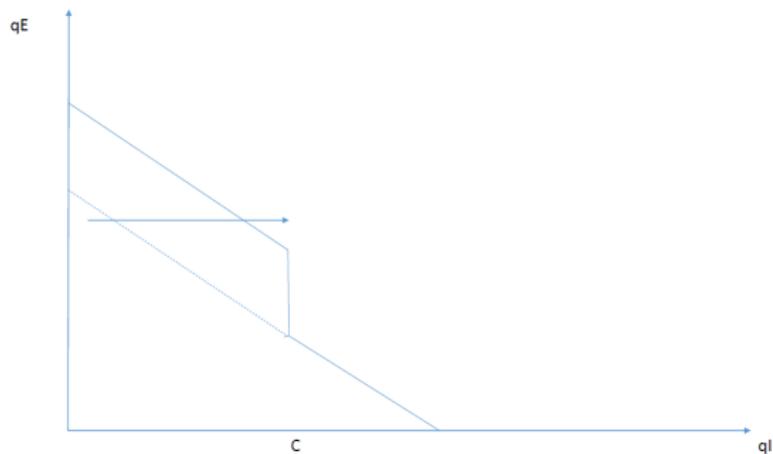
- Presentation based on Dixit (1980) "The role of investment as entry deterrence", *Econ. Journ.*
- Theoretical prediction : investment is not a monotonic function of the cost of entry
- Empirical test on the Casino industry in the US

- Cournot competition. Two firms :  $I$  and  $E$
- Demand :  $P(q^I + q^E)$ .  $P'(\cdot) < 0$  and  $P''(\cdot) \leq 0$
- Marginal revenue :  $q^i P'(Q) + P(Q)$  decreases with  $q^i$
- Marginal cost of production  $c$  and marginal cost of capacity  $k$
- Capacity :  $C$ . Output  $q \leq C$
- The game :
  - 1 :  $I$  sets its capacity  $C$
  - 2 :  $E$  : entry decision. Cost of entry :  $e$
  - 3 : Cournot competition

- Stage 3
- Total cost :
  - for  $I$  :  $cq + kC$  if  $q \leq C$  and  $cq + k(q - C) + kC$  if  $q > C$
  - for  $E$  :  $(c + k)q$
- Marginal cost :
  - for  $I$  :  $c$  if  $q \leq C$  and  $(c + k)$  if  $q > C$
  - for  $E$  :  $(c + k)$
- $C$  building : commitments to have lower marginal cost ("tough") for  $q < C$

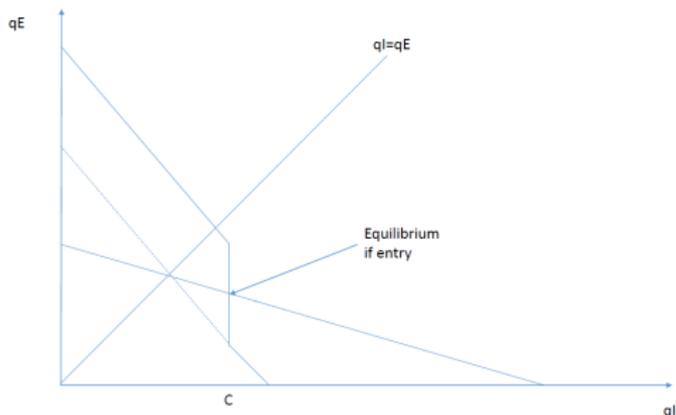
# Entry and strategic behaviour : the role of capacity

- BR of firm  $I$  :



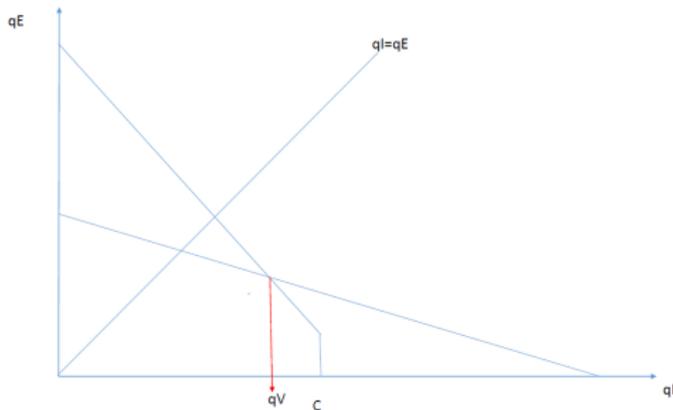
# Entry and strategic behaviour : the role of capacity

- Cournot equilibrium at stage 3 (configuration 1) :



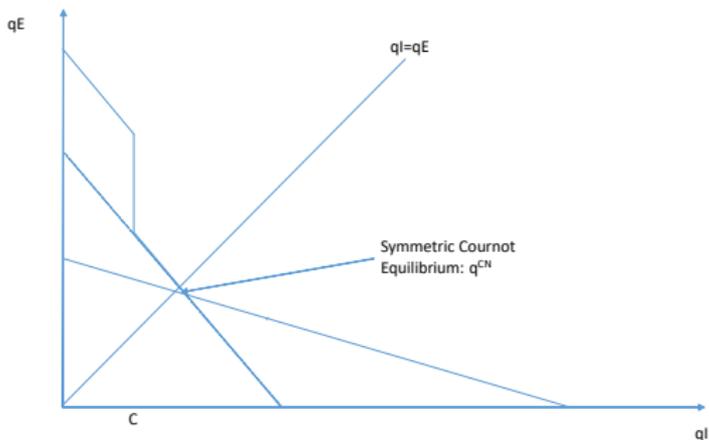
# Entry and strategic behaviour : the role of capacity

- Cournot equilibrium at stage 3 (configuration 2 : higher  $C$ )



# Entry and strategic behaviour : the role of capacity

- Cournot equilibrium at stage 3 (configuration 3 : lower  $C$ )

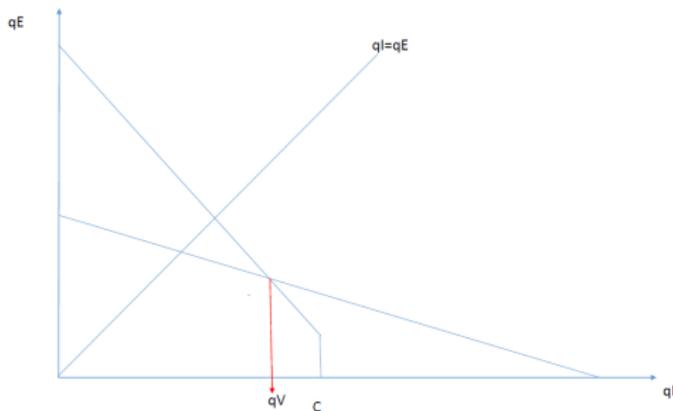


- Firm  $E$  :  $\Pi(q_I, BR_E(q_I)) > e$  iff  $q_I < \tilde{q}(e)$

- If  $q^{CN} > \tilde{q}(e)$  iff  $e > \hat{e}$ , no entry. Entry is blockaded
- Firm  $I$  :  $Max q(P(q) - c - k)$  gives  $q^m$
- First SPE ( $e > \hat{e}$ ) :
  - $I$  chooses  $C = q^m$
  - $E$  does not enter
- No entry but no strategic manipulation

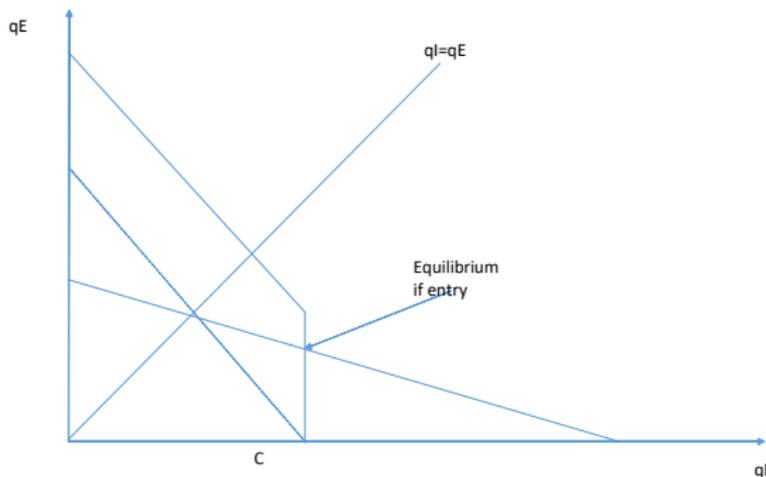
# Entry and strategic behaviour : the role of capacity

- If entry,  $I$  produces  $q \leq q^V$
- $q^V < \tilde{q}$  iff  $e < \underline{e}$ , always entry



# Entry and strategic behaviour : the role of capacity

- $C = q^m$  is the highest non "strategic investment" without entry
- If  $q^m < q^V$ ,  $C = q^m$  blockades entry iff  $q^m \geq \tilde{q}$  :

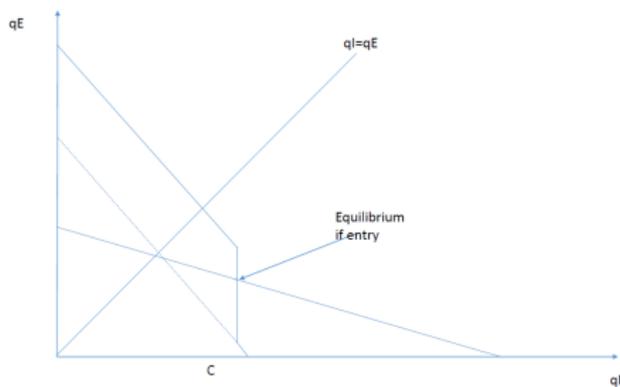


- We define  $\bar{e}$  by  $q^m = \tilde{q}(\bar{e})$  : if  $e \geq \bar{e}$ , no entry

- If entry is expected ( $e < \underline{e}$ ), which strategy for  $I$ ?

# Entry and strategic behaviour : the role of capacity

- Impact of  $C$  :



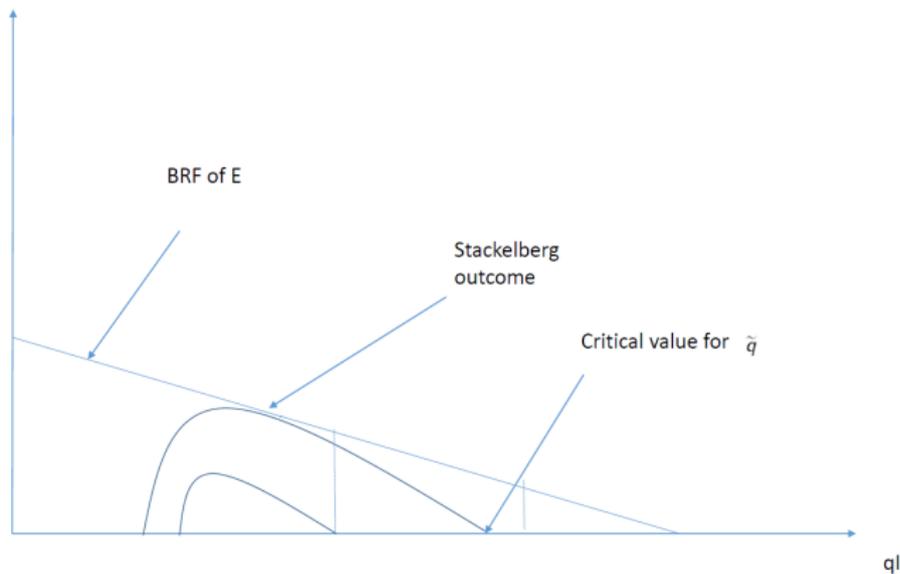
# Entry and strategic behaviour : the role of capacity

- Firm  $I$  :  $Max_{q^I} (P(q^I + BR_E(q^I)) - c - k)q^I$
- Firm behaves as a Stackelberg leader :  $q^I = q^S$

- Which strategy if  $\underline{e} < e < \bar{e}$ ?
- $q = \tilde{q}$  to deter entry or  $q = q^S$  to accommodate entry

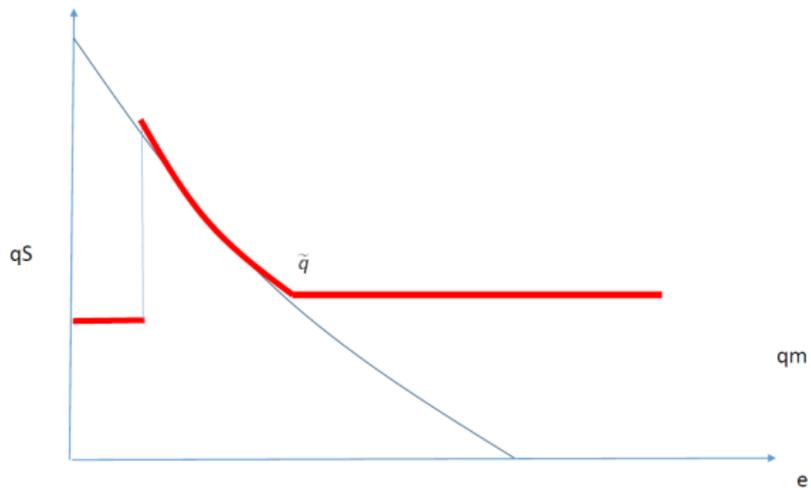
# Entry and strategic behaviour : the role of capacity

- Most profitable strategy ?



- If  $e$  increases,  $\tilde{q}$  decreases
- An increase in  $e$  first leads  $I$  to increase  $C = \tilde{q}$  to deter entry and if  $e$  is very high decreases to  $q^m$
- An increase in  $e$  (decrease in market size) leads  $I$  to increase  $C$  and then (entry blockaded) to decrease  $C$

# Entry and strategic behaviour : the role of capacity



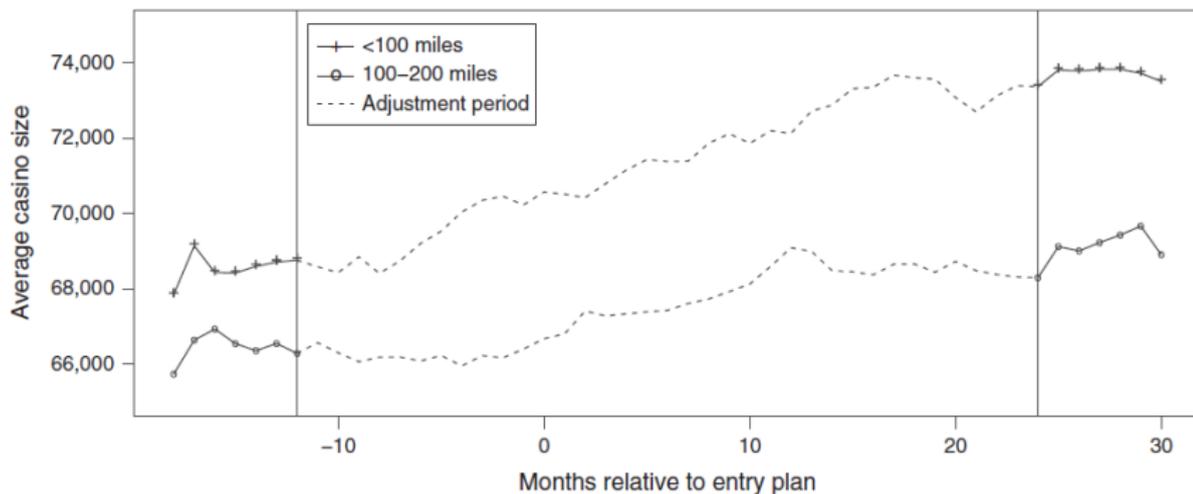
- Prediction : the threat of entry leads the incumbent to increase the capacity to deter entry
- Casino industry in the US : "Anticipated entry and entry deterrence..." (*Man. Sc*, 2018). Cookson.
- Capacity : casino floor space
- Threat of entry : entry plan
- Empirical method : diff-in-diff analysis
- Expected result : the threat of entry leads incumbents to increase their capacity

- Treated group : incumbents facing entry plans (not actual construction of the new project) from nearby competitors
- Control group : other casinos
- Estimated equation (10 months before/30 months after) :

$$\log size_{ijt} = \gamma_j + \beta_1 post_{ijt} + \beta_2 nearby_{ij} + \beta_3 post_{ijt} \cdot nearby_{ij} + X_{ijt}$$

# Entry and strategic behaviour : the role of capacity

## Parallel trends



## Control/treated characteristics

**Table 2.** Nearby vs. Faraway Incumbent Casinos: Characteristics Prior to Entry Threats

	Nearby (<100 miles)	Faraway (100 to 200 miles)	Difference
Casino size (square feet)	67,544.9	66,888.1	656.9
Bingo seats	168.2	180.9	-12.6
Poker tables	5.55	5.57	-0.03
Slot machines	1,425.7	1,323.7	102.0*
Entertainment venues	2.25	2.04	0.21*
Number of table games	46.1	39.4	6.7*
Restaurants	5.93	5.23	0.70*
Properties owned	18.5	15.0	3.5*
Distance to Las Vegas	400.7	577.9	-177.3*
Percentage of Native American casinos	29.2	39.0	-9.8

## The estimated equation :

**Table 3.** Incumbent Capacity Expansion During the Planning Stage of a Nearby Rival

	(1)	(2)	(3)	(4)
<i>post</i> × <i>nearby</i>	0.072*** (0.025)	0.040*** (0.011)	0.041*** (0.011)	0.038*** (0.013)
<i>nearby</i>	0.051 (0.033)	-0.016*** (0.006)	-0.014* (0.007)	-0.071*** (0.016)
<i>post</i>	0.010 (0.051)	0.020 (0.021)	0.019 (0.021)	-0.042 (0.024)
Fixed effects and controls				
Controls ( <i>Z</i> )	x	x	x	x
Year fixed effects	x	x	x	x
Entrant fixed effects	x		x	x
Incumbent property fixed effects		x	x	x
Controls ( <i>Z</i> ) × <i>nearby</i> and <i>post</i>				x
Year fixed effects × <i>nearby</i> and <i>post</i>				x
<i>N</i>	24,419	24,419	24,419	24,419
No. of incumbents	264	264	264	264
No. of entrants	100	100	100	100
No. of dates	98	98	98	98
<i>R</i> <sup>2</sup>	0.106	0.940	0.941	0.941

*Notes.* This table presents regression results for changes incumbent capacity around the date of nearby entry plans, according to the specification

$$\log(\text{casino.size}_{ijt}) = \gamma_i + \eta_j + \beta_1 \text{post}_{ijt} + \beta_2 \text{nearby}_{ij} + \beta_3 \text{post}_{ijt} \times \text{nearby}_{ij} + X'_{ijt} \Gamma + \varepsilon_{ijt},$$

- Entry deterrence or entry accommodation ?
  - Contrast between entry plans vs construction events
- Demand expansion or entry deterrence ?
  - no higher demand nearby entry plans

# Entry and strategic behaviour : a general model

- The idea : to start from a very general point of view to identify all the possible strategic configurations
- Fudenberg and Tirole typology
- The framework :
  - Two firms :  $I$  and  $E$
  - $I$  commits at stage 1 on a variable (capacity, advertising, marketing device...) that affects the  $BR_I$
  - Both firms compete (Bertrand, Cournot)
- How does the firm  $I$  use the variable to deter/accommodate entry?

# Entry and strategic behaviour : a general model

- Firm  $I$  :  $\pi^I(x_I, x_E, k)$ . Firm  $E$  :  $\pi^E(x_I, x_E)$
- Stage 2 : Nash Equilibrium :  $x_I^N(k), x_E^N(k)$
- Stage 1 : choice of  $k$
- Effect of  $k$  on firm  $E$  :  $\frac{d\pi^E}{dk} = \frac{\partial\pi^E}{\partial x_I} \cdot \frac{dx_I^N}{dk}$ 
  - Case 1 :  $\frac{d\pi^E}{dk} < 0$  : the investment makes  $I$  tough
  - Case 2 :  $\frac{d\pi^E}{dk} > 0$  : the investment makes  $I$  soft
- Effect of  $k$  on firm  $I$  :  $\frac{d\pi^I}{dk} = \underbrace{\frac{\partial\pi^I}{\partial k}}_{\text{Direct effect}} + \underbrace{\frac{\partial\pi^I}{\partial x_E} \cdot \frac{dx_E^N}{dk}}_{\text{Strategic effect}}$
- Strategic effect :  $\frac{\partial\pi^I}{\partial x_E} \cdot \frac{dx_E^N}{dk} = \frac{\partial\pi^I}{\partial x_E} \cdot BR'_E(x_I^N) \cdot \frac{dx_I^N}{dk}$  has the sign of  $\frac{\partial\pi^E}{\partial x_I} \cdot \frac{dx_I^N}{dk} \cdot BR'_E(x_I^N)$ .

# Entry and strategic behaviour : a general model

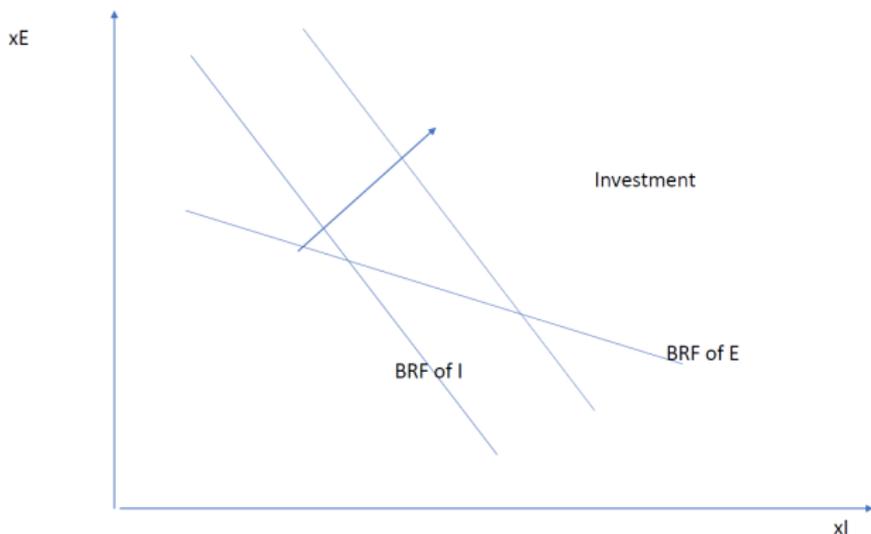
- Sign of the strategic effect of  $k$  on firm  $I$  :

$$\left[ \frac{\partial \pi^E}{\partial x_I} \cdot \frac{dx_I^N}{dk} \right] \cdot BR'_E(x_I^N)$$

- Strategic choice of  $k$  :
  - to deter entry : case 1 : to be tough ("Top Dog") and case 2 : to be "lean and hungry" (Cat)
  - to accommodate entry :
    - case 1 : strategic substitutes : "Top dog" ; strategic complements : "Puppy dog"
    - case 2 : strategic substitutes : "Lean and hungry" ; strategic complements : "Fat cat"

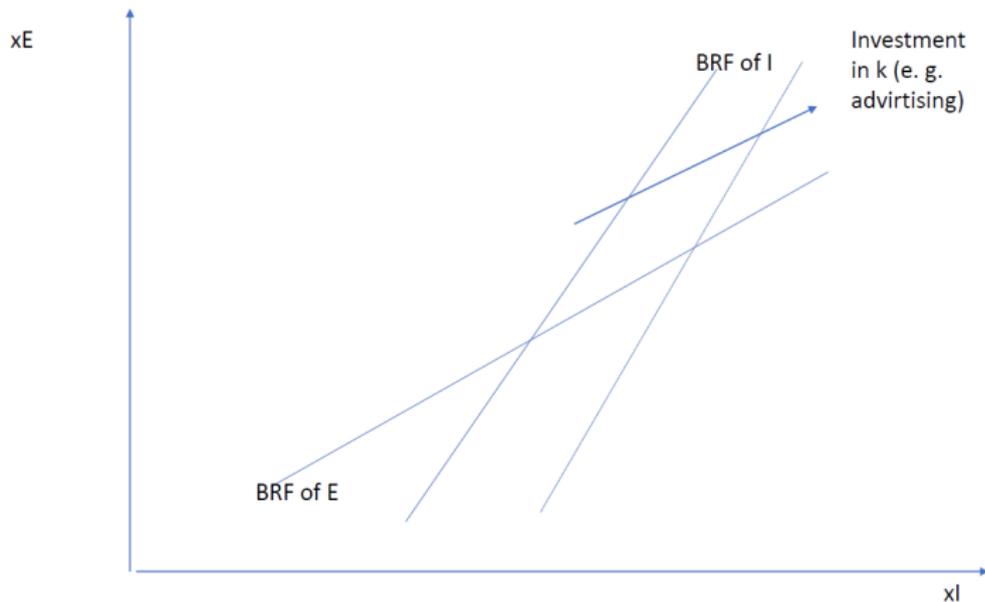
# Entry and strategic behaviour : a general model

- case 1 (capacity) and strategic substitutes :



# Entry and strategic behaviour : a general model

- case 2 and strategic complements :



- A quite general typology
- Other main entry deterrence strategy : predatory pricing