Module 5: "Dynamic games of incomplete information"

Lecture 36: "Signaling Game: Another Practical Application - Limit Pricing Model"

The Lecture Contains:

Module 5: "Dynamic games of incomplete information"

Lecture 36: "Signaling Game: Another Practical Application - Limit Pricing Model"

Signaling Game : Another Practical Application

Limit Pricing Model : Basic Concept

- Game between two players in a pizza market
- Incumbent - Joe
- Entrant – Maria
- Joe would like to keep Maria out of market and hence may take pricing decision strategically to deter entry by Maria.
- Higher the price , the incumbent sets - more difficult will be for the entrant to enter.
- The highest price at which entry is deterred is called limit price.

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Basic Game

- Nature makes the first move
  - Deciding whether Joe's cost are high or low
  - 10% probability that Joe has high cost and 90% probability that Joe has low cost – this is in common knowledge

- In the first time period , Joe (the monopolist) observes the cost and takes the pricing decision– set high price or low price
- At the start of second period, Maria moves after observing Joe's price & output (but Not his costs) - she decides whether to enter or stay out
- If Maria decides not to enter, Joe retains his monopoly & sets his pricing decision independently
- If Maria enters , then Maria & Joe play a static cournot duopoly game
- Maria's cost is common knowledge. Maria gets to know Joe's production cost only after she chooses to enter

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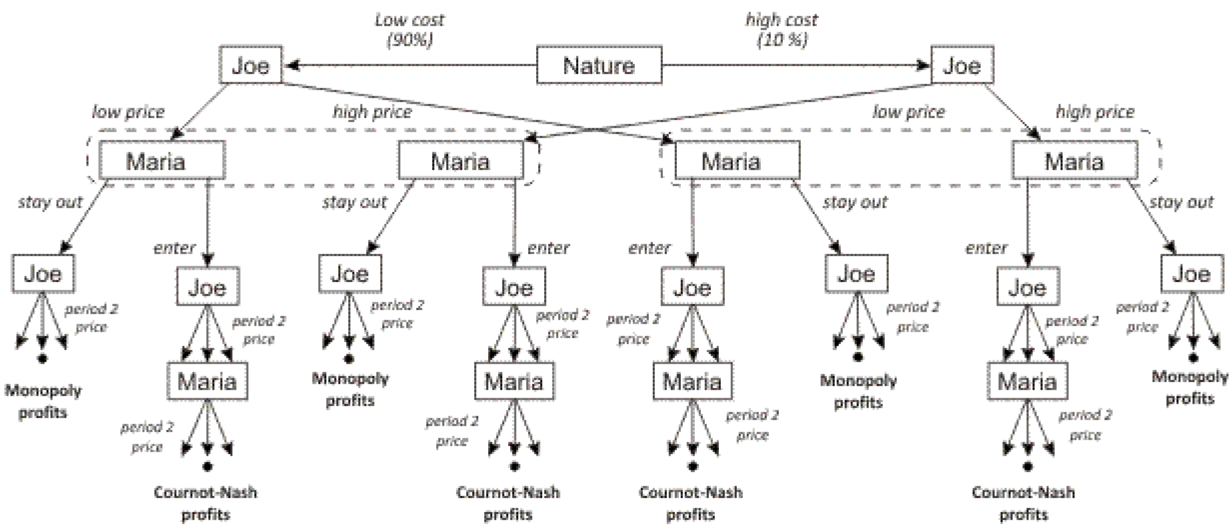
Game tree



Source: Bierman & Fernandet 2

Payoffs of players

- Demand function for pizza in town is given by,

$$P(Q_t) = \begin{cases} 16 - \frac{1}{100}.Q_t & \text{For } 0 \le Q_t \le 1600 \\ 0 & \text{otherwise} \end{cases}$$

$Q_t =$ total quantity of pizza sold

Joe’s total costs are

$C_J^L(Q_t) = 5.Q_j$ with 90% probability

Or

$C_J^H(Q_J) = 7.Q_j$ with 10% probability

Maria’s total costs are given by

$$C_M(Q_M) = 600 + 7.Q_j \quad \begin{cases} \text{if} & Q_M > 0 \\ 0 & \text{otherwise} \end{cases}$$

There is a fixed entry cost of 600 units for Maria.

All the above are in common knowledge

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Backward Induction : Second stage Game : When Maria does Not Enter

- We start at end of tree
- Look at the simple case, in which
  Maria chooses not to enter
- Joe will be the monopolist end will set profit maximizing quantity & price

$$\Rightarrow MR(Q_J) = MC(Q_J)$$

When Joe has high costs,

$$16 - \frac{1}{50}Q_J = 7$$

$$Q_J = 450 \, , P = 11.50 \implies \Pi = 2025$$

When Joe has low costs,

$$16 - \frac{1}{50}Q_J = 5 \implies Q_J = 550, \qquad P = 10.50, \qquad \Pi = 3025$$

	Joe's costs	
	High	*Low*
Joe's pizza output	450	550
Joe's pizza price	11.50	10.50
Joe's profit	2,025	3,025

Table 1: Monopoly profit of Joe in stage.

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