Week-9

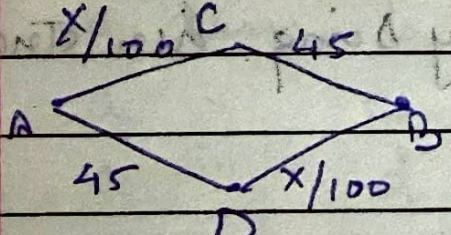
11 Game Th.-II

- Strategic envt. → players (decision maker), strategies (feasible acns), payoffs (obj.)
- rules → timing of moves, nature of conflict & interacn, informational condns, contracts
- assumpns → rationality, common knowledge.
- dominant strategy eqm → only if all players have a dominant strategy.
- Nash eqm → all players are playing the best response of what other player is playing.

	L	R
U	1,1	0,0
D	0,0	0,0

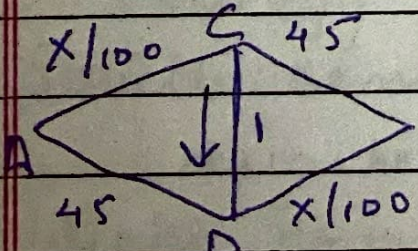
U → weakly dom. strategy
L → weakly ——
(U, L) & (D, R) are weakly dominant strategies.

Eg.



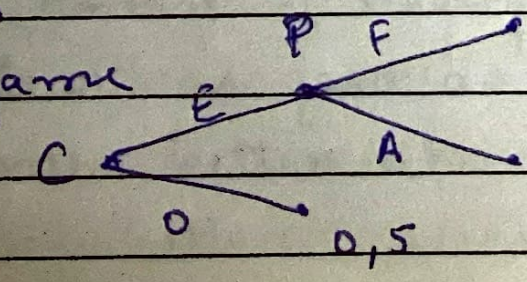
4000 motorist
2000 → ACB → 65 min
2000 → ADB → 65 min

↓ Braess' Paradox



all 4000 will take ACDB (81 min)

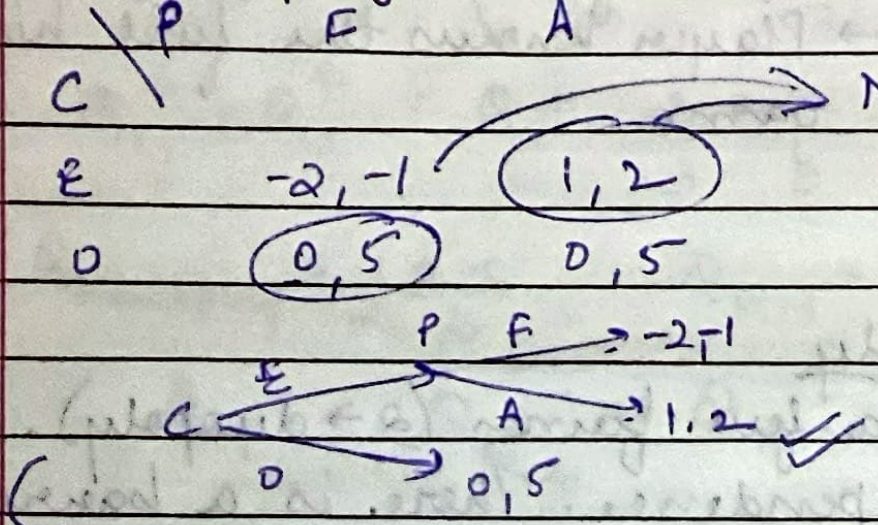
- Entry game



F → fight
A → adjust

C → coke
P → fight
O → out
E → enter

- Extensive form game → to model seq. interac^n, represented by tree, backward induc^n, sub-game perfect eq^m.
- A game tree is composed of nodes & branches. A single starting pt., no cycles, one way to proceed.
- Info. set → set of decision nodes among which the player is unable to distinguish.



- Classifica^n of games

Non-coop.	Coop.
Static	Dynamic
Perfect info.	Imperfect info.
Comp. info.	Incomp. info.
Strategic form	extensive form

- Non-coop. → detailed moves available to players.
- Coop. → abstract away from this level of details & describe the outcomes only when the players come together in diff. combinations.
- Comp. → every player knows the payoffs & strategies of all other players.
- Perfect → Player knows the full history of game.

L2 **Oligopoly**

- There a few firms (2 → duopoly). There is interdependence. There is a barrier to entry.
- **Cournot duopoly**

2 firms → 1, 2 $\quad Q_1, Q_2 \Rightarrow Q_1 + Q_2$

$P(Q_1 + Q_2)$

$\Pi_1 = P(Q_1+Q_2)Q_1 - C_1(Q_1)$

$\Pi_2 = P(Q_1+Q_2)Q_2 - C_2(Q_2)$ → interdep.

Eg $P = a - bQ = a - b(Q_1+Q_2)$ $\quad MC_1 = MC_2 = c$

$$\max_{Q_1} \; a - b(Q_1+Q_2)Q_1 - cQ_1$$

$$\max_{Q_2} \; a - b(Q_1+Q_2)Q_2 - cQ_2$$

C2 → Cournot duopoly

$$\max_{q_1} \left[(a-c) - b(q_1+q_2) \right] q_1$$

$$\frac{d\pi_1 = 0}{dq_1} \Rightarrow \boxed{q_1^* = \frac{a-c}{2b} - \frac{q_2}{2}}$$

similarly, $\boxed{q_2^* = \frac{a-c}{2b} - \frac{q_1}{2}}$

(q_1^*, q_2^*) → nash eq$^{\text{e}}$

↳ $= \left(\frac{a-c}{3b}, \frac{a-c}{3b} \right)$

$$q_1^* + q_2^* = Q = \frac{2}{3} \frac{a-c}{b}$$

$$Q_{\text{monopoly}} = \frac{1}{2} \frac{a-c}{b} \qquad Q_{PCM} = \frac{a-c}{b}$$

$$Q_M < Q_{C_2} < Q_{PCM}$$

← Prices

If there are n firms, $q_1 \dots q_n$

$$Q = \frac{a-c}{b(n+1)} \Rightarrow \boxed{Q = \frac{n}{n+1} \frac{a-c}{b}}$$

- Bertrand Comp.

$P_1 > P_2$ ⇒ firm 2 will have entire market

$P_2 > P_1$ ⇒ " 1 " " " "

$P_1 = P_2$ ⇒ they will split market

(c, c) → NE

- Stackelberg Comp.

$$Q_1^* = \frac{a-c}{2b}, \quad Q_2^* = \frac{a-c}{4b}$$

↳ firm 1 has first mover adv.

$$Q = Q_1^* + Q_2^* = \frac{3}{4}\frac{a-c}{b}$$

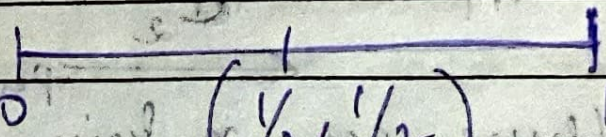
$$Q_M < Q_{C_2} < Q_S < Q_{PCM}$$

- Collusion & Cartels

(Q_1^*, Q_2^*) → how much to produce, just like monopoly & then divide the profit

- Hotelling's Locⁿ Model

2 firms

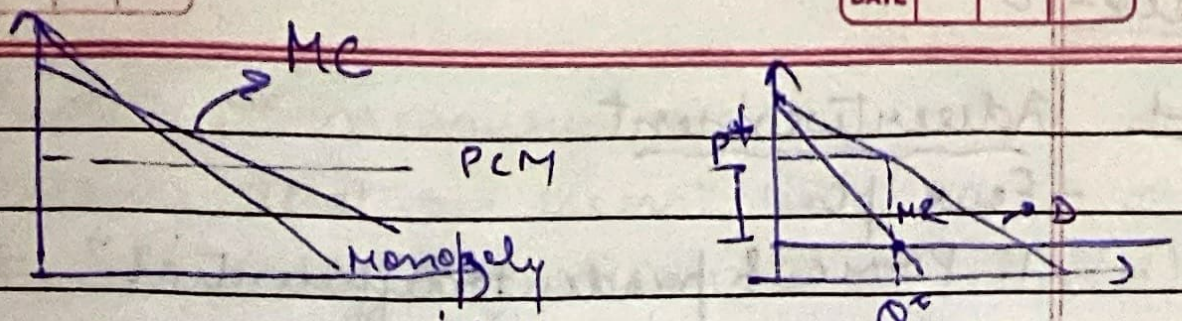


→ NE

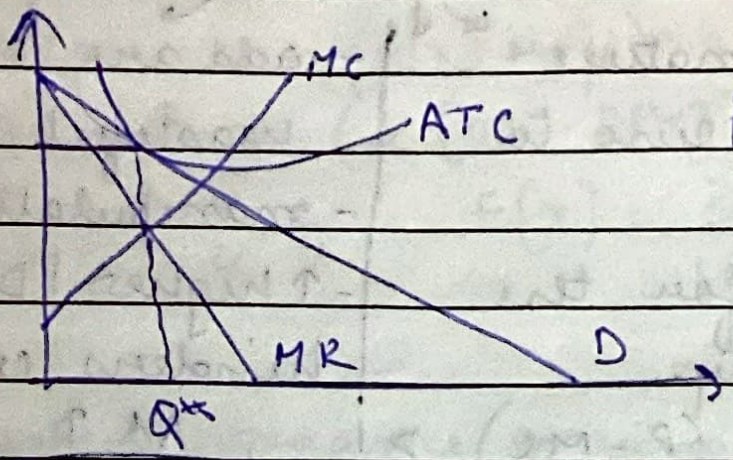
L3

Monopolistic Comp.

- many sellers (but less than PCM), diff. products (unlike PCM), free entry & exit
- a downward sloping demand



- in long run, if there is profit, more firms will enter the market



ATC = p* Profit = 0

- MC vs PCM less efficient, markup pricing

- $\pi = 0$