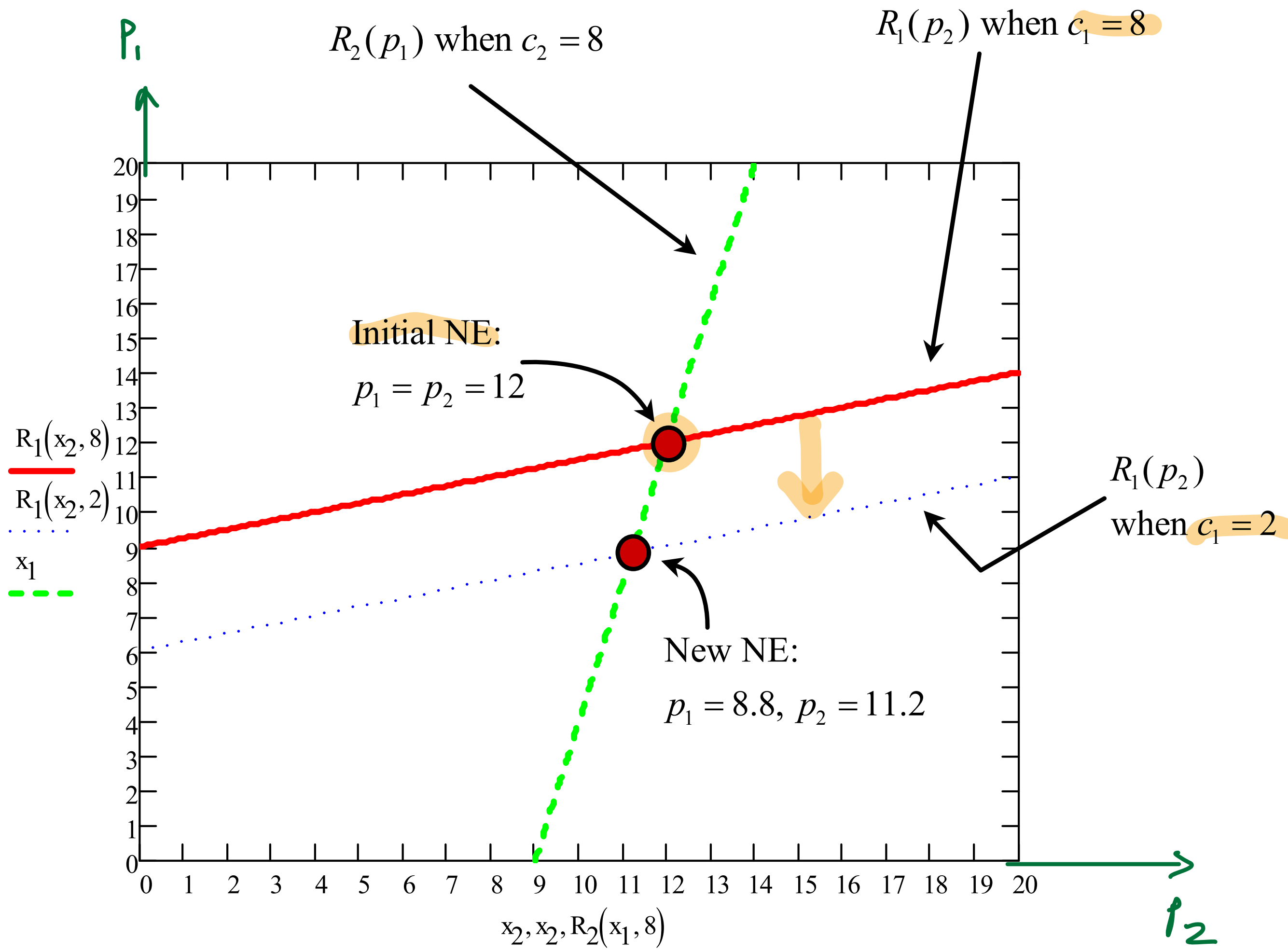
What happens to the Nash equilibrium in these situations if one of the reaction curves shifts due to a change in a parameter?

The strategic complements case.

$$\begin{cases} D_1 = 40 - 4p_1 + 2p_2 \\ D_2 = 40 + 2p_1 - 4p_2 \end{cases} \qquad \begin{cases} C_1 = c_1 q_1 \\ C_2 = c_2 q_2 \end{cases} \quad \text{then} \quad \begin{cases} R_1(p_2) = 5 + \frac{1}{4}p_2 + \frac{1}{2}c_1 \\ R_2(p_1) = 5 + \frac{1}{4}p_1 + \frac{1}{2}c_2 \end{cases}$$

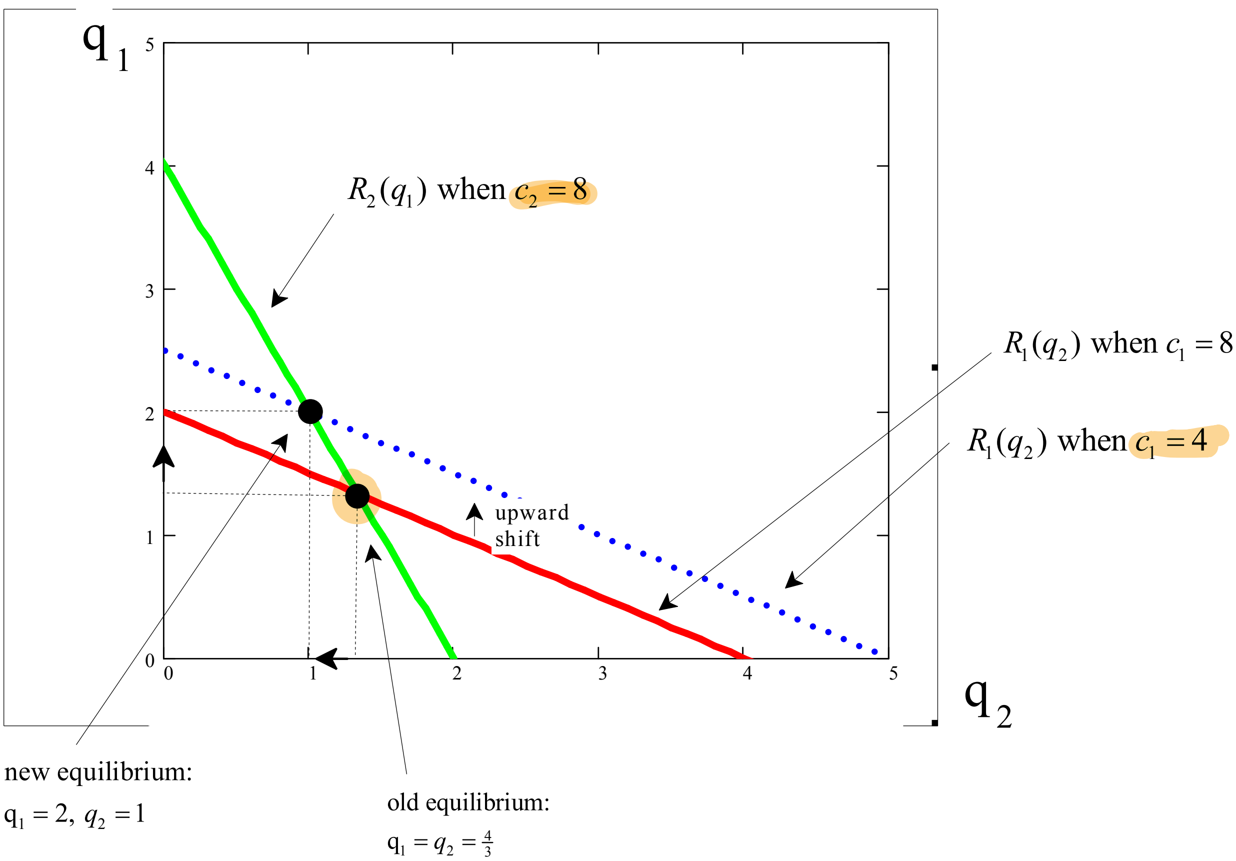
The reaction curves are upward-sloping. **If the cost of firm 1 goes down, firm 1 becomes more aggressive** (for any p_2 the profit-maximizing price for firm 1 is lower), that is, firm 1's **reaction curve shifts down.** Firm 2 will react by lowering its price too (i.e. will react aggressively) and the result is a new Nash equilibrium with lower prices.



The strategic substitutes case.

$$P = 24 - 4Q \qquad C_1 = c_1 q_1 \qquad C_2 = c_2 q_2. \quad \text{Then} \quad \begin{cases} R_1(q_2) = 3 - \frac{1}{2}q_2 - \frac{1}{8}c_1 \\ R_2(q_1) = 3 - \frac{1}{2}q_1 - \frac{1}{8}c_2 \end{cases}$$

If the cost of firm 1 goes down, firm 1 becomes more aggressive (for any q_2 the profit-maximizing output for firm 1 is higher), that is, firm 1's **reaction curve shifts up.** Firm 2 will react by lowering its output and the result is a new Nash equilibrium with higher output for firm 1 and lower output for firm 2.



ULTIMATUM GAME

Player 1 is given some money.

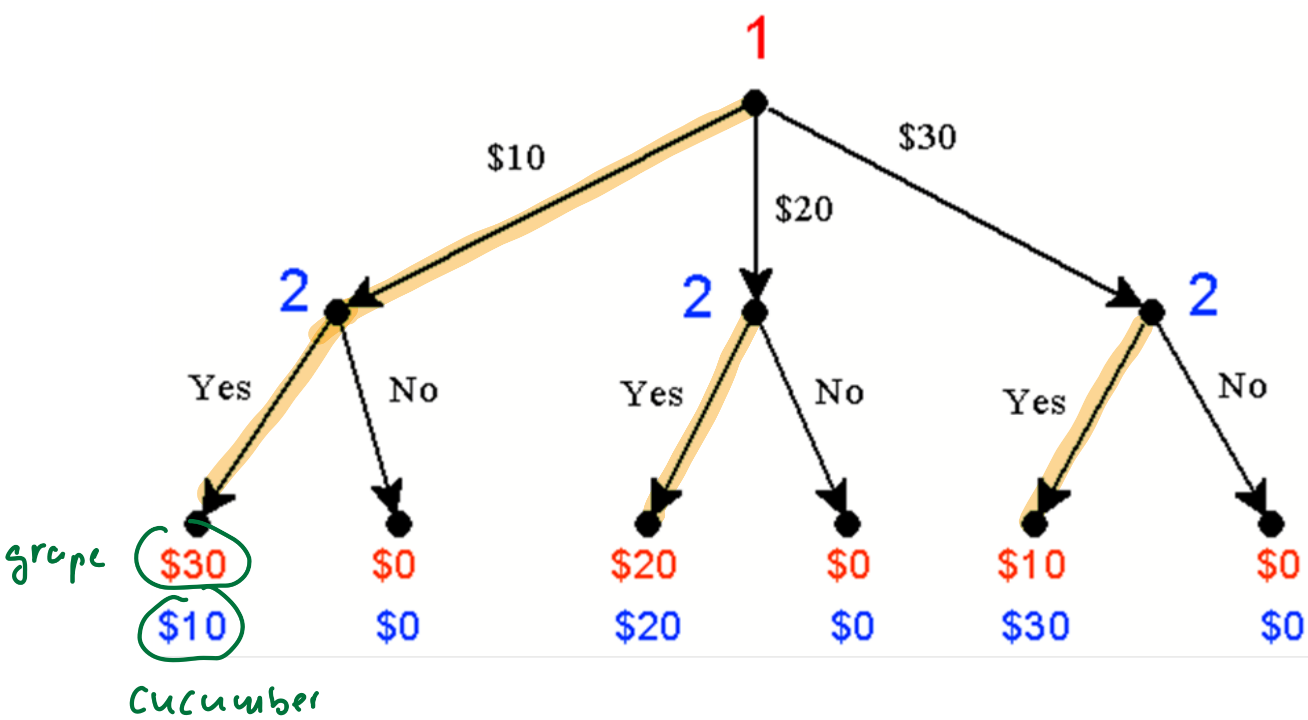
He makes an offer to Player 2.

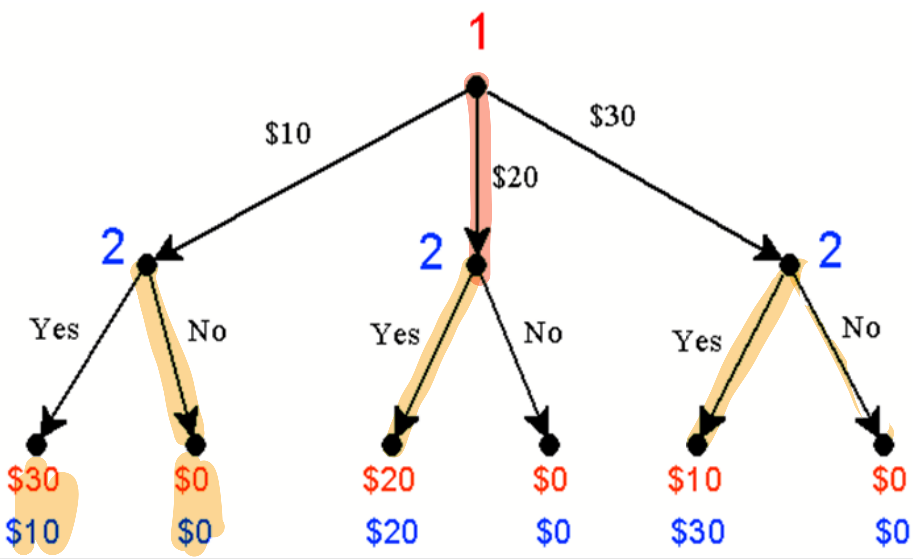
If Player 2 says Yes, then the offer is implemented.

If Player 2 says No, then both players end up with nothing.

How much should Player 1 offer to Player 2?

Player 1 is given $40.
He makes an offer to Player 2 ($10 or $20 or $30).
If Player 2 says Yes, then the offer is implemented.
If Player 2 says No, then both players end up with nothing.





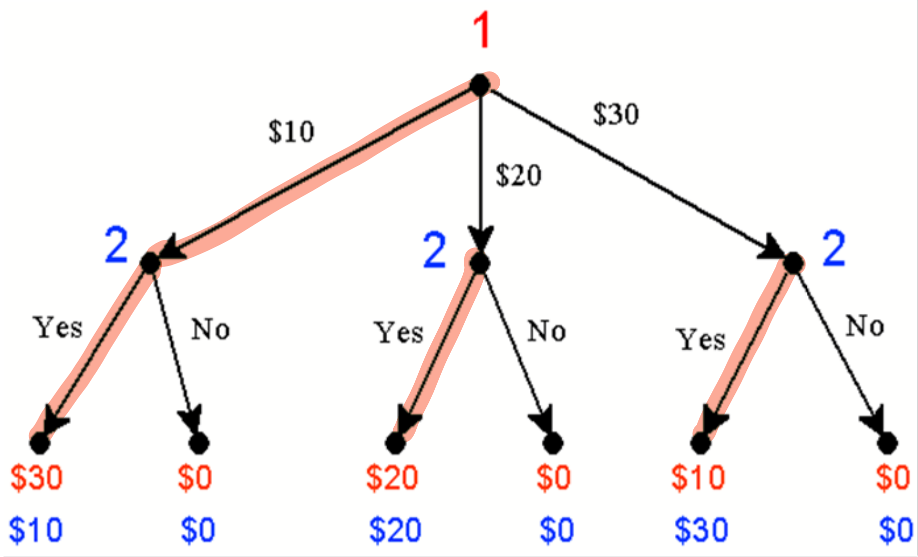
Suppose that Player 1 is selfish and greedy:

	Utility
best	\$30, \$10
	\$20, \$20
	\$10, \$30
worst	\$0, \$0

BACKWARD INDUCTION

Suppose that Player 2 is fairness-minded and averse to greed:

	Utility
best	\$20, \$20
	\$10, \$30
	\$0, \$0
worst	\$30, \$10



Suppose that Player 1 is selfish and greedy:

	Utility
best	\$30, \$10
	\$20, \$20
	\$10, \$30
worst	\$0, \$0

BACKWARD INDUCTION

selfish and greedy

Suppose that Player 2 is also ~~fairness-minded and averse to greed:~~

	Utility
best	\$10, \$30
	\$20, \$20
	\$30, \$10
worst	\$0, \$0

Centipede Game

- A referee pust $20 on the table.

- Player 1 can take it and end the game or Pass.

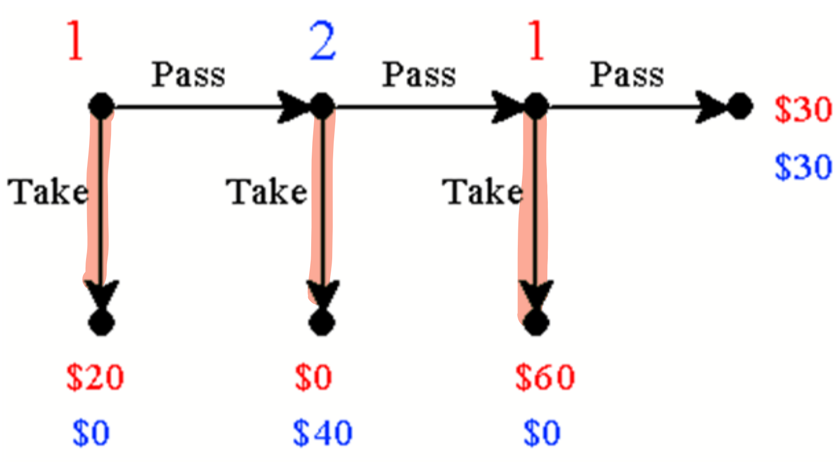
- If Player 1 passes, the referee adds $20 to the pot and Player 2 can take it and end the game or Pass.

- If Player 2 passes then the referee adds another $20 to the pot and Player 1 can take it and end the game or Pass.

... and so on.

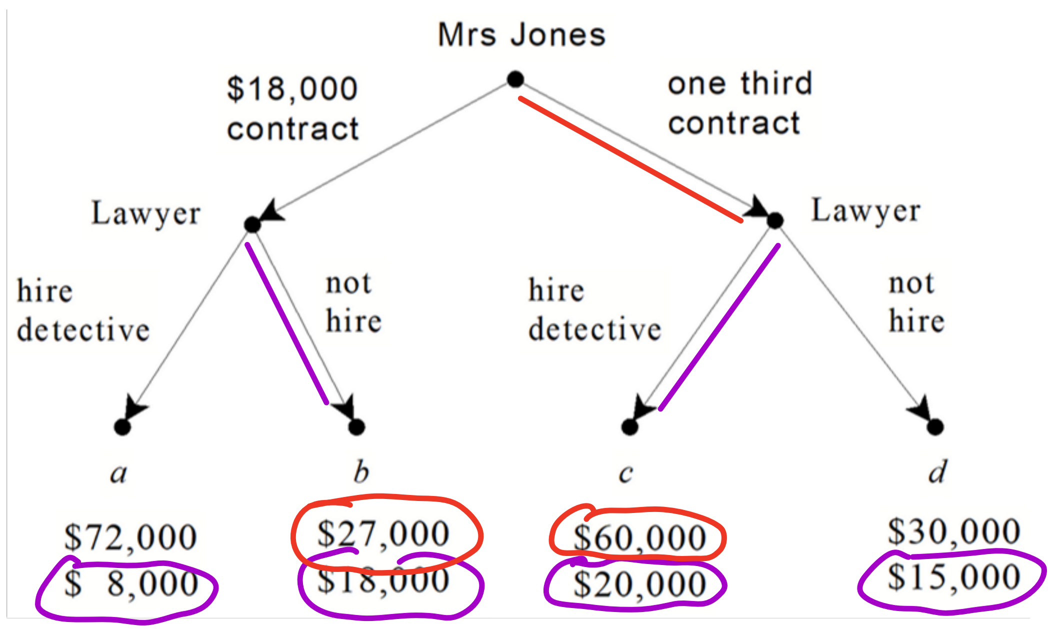
- At the last move the active player can take the pot for herself or can Pass, in which case the pot is divided equally between the two players.

The case of 3 moves:



A divorce

Mrs. Jones is seeking a divorce from Mr. Jones. Under the terms of her prenuptial agreement, her settlement will be **$90,000** if she can prove that Mr. Jones had an affair, but **$45,000** otherwise. Her lawyer, acting as her agent, can indeed prove the affair but only if he hires a private detective for **$10,000, which he will have to pay out of his own pocket**. The lawyer has offered Mrs. Jones a choice of two contracts. One contract involves a **flat payment to the lawyer of $18,000**, regardless of the outcome. The other contract involves a fee equal to **one third of the settlement**. What contract should Mrs. Jones choose?



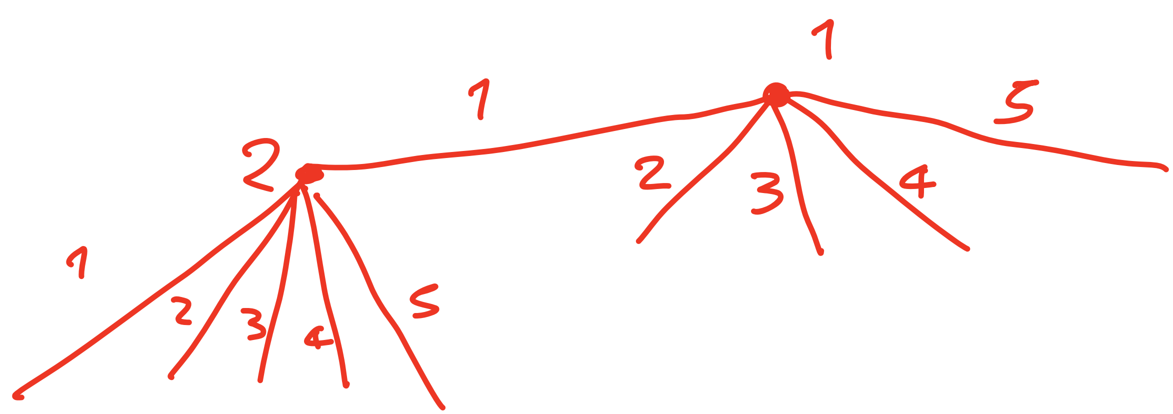
If the lawyer is selfish and greedy

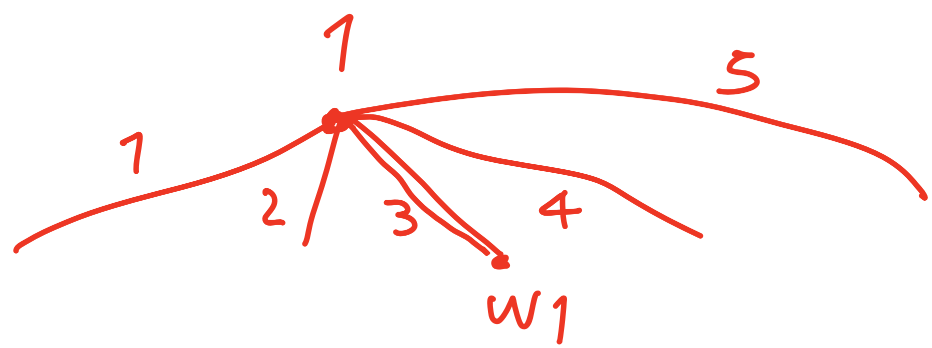
If Ms Jones is also selfish and greedy

Backward-induction solution

The race to 38. Players 1 and 2 take turns choosing a number from the set {1,2,3,4,5}. The first player to bring the total sum of the chosen numbers to 38 wins.

Two outcomes: 1 wins (W1), 2 wins (W2)





Possibility 1:

1 has a winning strategy

The race to 38. Players 1 and 2 take turns choosing a number from the set {1,2,3,4,5}. The first player to bring the total sum of the chosen numbers to 38 wins.

L	L	W	W	W	W	W
26	32	33	34	35	36	37

L	L	L	L
2	8	14	20

15 16 17 18 19

Player 1 has a winning strategy: first pick 2 then at every stage if no opponent picked n, you pick 6−n

26 32 38

1 2 1 3 2 5 4 $\boxed{3}$

2 5 3 4 1 2 3

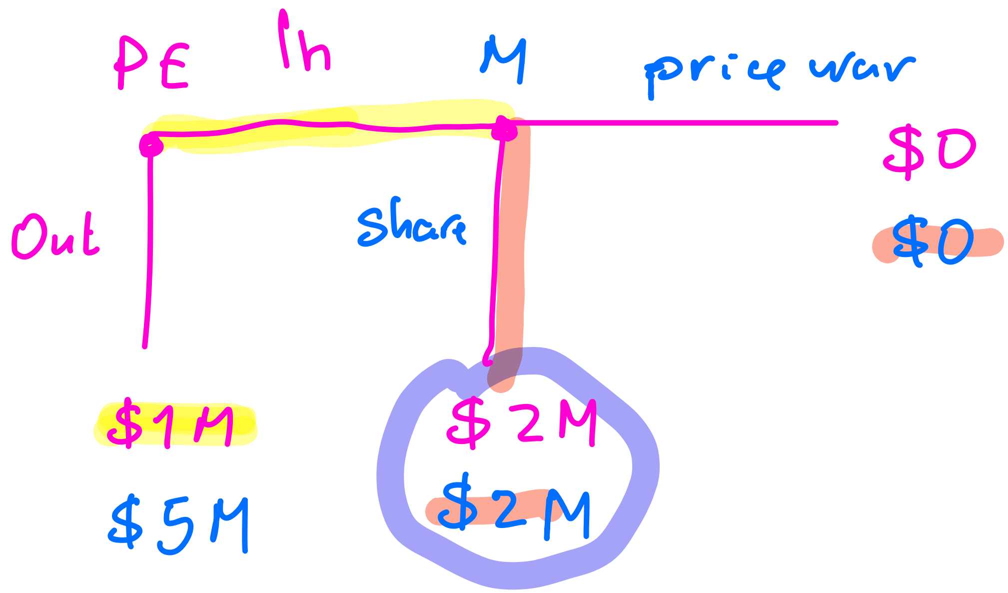
7 11 18 21 28

15

1	2	1	4	2	1
2	5	3	5	4	5
	7	11	20	26	32

A monopolist and a potential entrant

		Monopolist: fight	Monopolist: accommodate
Potential entrant	In	0 , 0	2 , 2
	Out	1 , 5	1 , 5



both selfish and greedy

(Out, Fight) is a NE but

"Fight" is not a credible threat

A chain-store (monopolist) and many potential entrants

The chain store is a monopoly in *n* towns. There are *n* potential entrants, one in each town. They make decisions sequentially with perfect knowledge of what happened in the past.