	C	D
C	(1 year, 1 year)	(20 years, 0)
D	(0, 20)	(10, 10)

D is a dominant strategy

(10, 10) in prison

playing rationals yields an outcome which is bad for everyone

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price war model

2 firms (players)

each chooses price

demand is $(5-p)^+$ consumers choose store with lower price

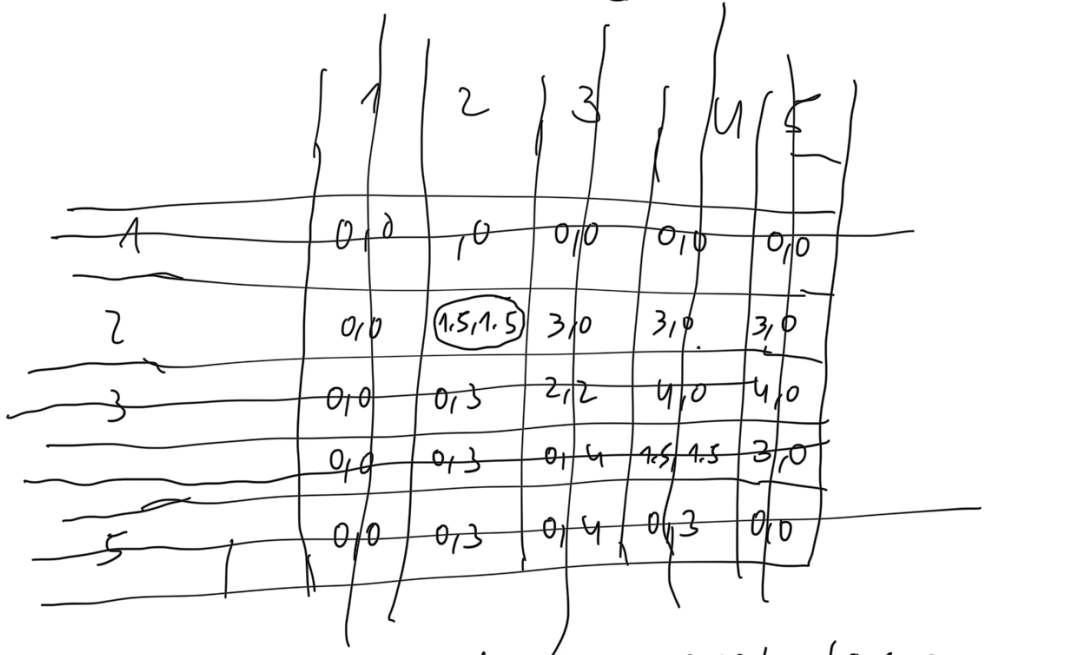
price can be $\{0, 1, 2, 3, 4, \dots\}$

production cost is $c=1$ per item

$S_1 = S_2 = \{0, 1, 2, 3, \dots\}$

$$u_i(p_i, p_{-i}) = \begin{cases} (5-p_i)^+ * (p_i - 1) & p_i < p_{-i} \\ \frac{1}{2}[5-p_i)^+ * (p_i - 1) & p_i = p_{-i} \\ 0 & p_i > p_{-i} \end{cases}$$

my payoff — my price — opponent price



3 is not dominant; If opponent plays 2 the best thing for me is to play 2, not 3

2 is not dominant; If opponent plays 3 I want to play 3, not 2

Bertrand Competition

"People of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the public, or in some contrivance to raise prices."

Adam Smith (wealth of the nations)

	H	L
H	10,10	0,12

L (defect) is dominan

a jail out came 6,6

L	12,0	6,6

MC: Match the competition;
my price is H, but if competition prices L
then my price reduces to L

	H	L	MC
H	10,10	0,12	10,10
L	12,0	6,6	6,6
MC	10,10	6,6	10,10

Is L dominant? No If oppent plays MC
I prefer H over L

MC is not dominant: If oppenent plays H
I want to play L, not H

H is dominated by MC; MC sometimes give
same payoff, sometimes higher payoff than H,

After eliminating H, MC is weakly dominant

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marketing war;

or both not advertise

If both firm advertise, each get
revenue 50

If only one firm advertise, that firm gets
80 and the other firm 20 revenue.

advertising cost 20

prisoner's dilem

	not advertise	advertise
not advertise	50, 50	20, 60
Advertise	60, 20	30, 30

	how much time save on own task	payoff
Alice	2	0
Bob	5	-3
craig	2	0
David	1	1
Evon	3	
Faruk	4	

total minutes save for takeoff is 1

each players payoff: $(-1) * \text{own effort} + 2 * 1$

what is best for society?

if everyone chooses 7 everyone gets 7

$$S_1 = S_2 = \cdots = S_6 = \{1, 2, \cdots, 7\}$$

$$u_i(s_i, s_{-i}) = (-1) * s_i + 2 * \min(s_1, \cdots, s_6)$$

is 7 dominated? no. If everybody else chooses 7, then 7 is the best option

Nash equilibrium

A game in normal form is given by

$S_1, S_2, \ldots, S_n$ strategy sets

payoff functions $u_i : S_1 \times \ldots \times S_n \to \mathbb{R}$

A profile $(s_1^*, s_2^*, \ldots, s_n^*)$ is a Nash equili

if $u_i(s_i^*, s_{-i}^*) \geq u(s_i, s_{-i}^*)$ for er s_i

Nash eq; Self-enforcing agreement; If agree on playing this profile, then no player has the incentive to unilaterally deviate

	S	H
S	50, 50	0, 3
H	3, 0	3, 3

	C	D
C	3, 3	0, 4
D	4, 0	1, 1

Penalty kicks game

Kicker \ Keeper	L	R
L	64, 36	94, 6
R	89, 11	44, 56

A mixed strategy for player i is

a probability distribution over S_i

If every player uses mixed strategies we calculate expected payoff.

		keeper L	keeper R
kicker	p L	0,1	1,0
	1-p R	1,0	0,1

mixed strategy equilibrium:
every player plays $(\frac{1}{2}, \frac{1}{2})$

If I the kicker and opponent plays $(\frac{1}{2}, \frac{1}{2})$

If I play $(p, 1-p)$ I get

$$\frac{1}{2} * (1-p) + \frac{1}{2} * p = \frac{1}{2}$$

I have no incentive to deviate.