# Nash Equilibrium and Coordination Games

iterated strict dominance is a powerful argument if it leads to a conclusion

Battle of the Sexes Game

| | Opera | Ball Game |
|---|---|---|
| Opera | 1,2 | 0,0 |
| Ball Game | 0,0 | 2,1 |

No strategies are dominated

this is an example of a coordination game

a pure coordination game: meeting in a strange city

| | Airport | Train Station |
|---|---|---|
| Airport | 1,1 | 0,0 |
| Train Station | 0,0 | 1,1 |

(also: which side of the street to drive on?)

# Nash Equilibrium

Each player plays optimally and correctly guesses what the other player will do

Connection to Best-Response

Connection to dominant strategy equilibrium

| | Opera | Ball Game |
|---|---|---|
| Opera | 1*,2* | 0,0 |
| Ball Game | 0,0 | 2*,1* |

Battle of the Sexes has two Nash equilibria at 1,2 and 2,1

## *Focal Points*

meeting in a strange city

| | Airport | Train Station |
|---|---|---|
| Airport | 1*,1* | 0,0 |
| Train Station | 0,0 | 1*,1* |

## *Pareto Dominance and Coordination*

another coordination game

| | A | B |
|---|---|---|
| A | 1*,1* | 0,0 |
| B | 0,0 | 2*,2* |

## *Risk Dominance and Coordination*

| | A | B |
|---|---|---|
| A | 2*,2* | -10,0 |
| B | 0,-10 | 1*,1* |

# Why Nash Equilibrium

reasoning versus learning

at a Nash equilibrium, there is nothing further to learn

example of the traffic game

## *Nash Equilibrium and Dominance*

- Nash equilibria are contained in the set of strategies that remain after iterated strict dominance
- There can be Nash equilibria where players play weakly dominated strategies

| | L | R |
|---|---|---|
| U | -1,-1 | 2*,0* |
| D | 1*,1* | 1,1* |

- L is weakly dominated by R, but D,L is a Nash equilibrium
- The second equilibrium at UR makes more sense

## *Nash Equilibrium and the Reaction Function*

Nash equilibrium is where the best response functions cross

## *Duopoly Again*

$$p = a - bx$$

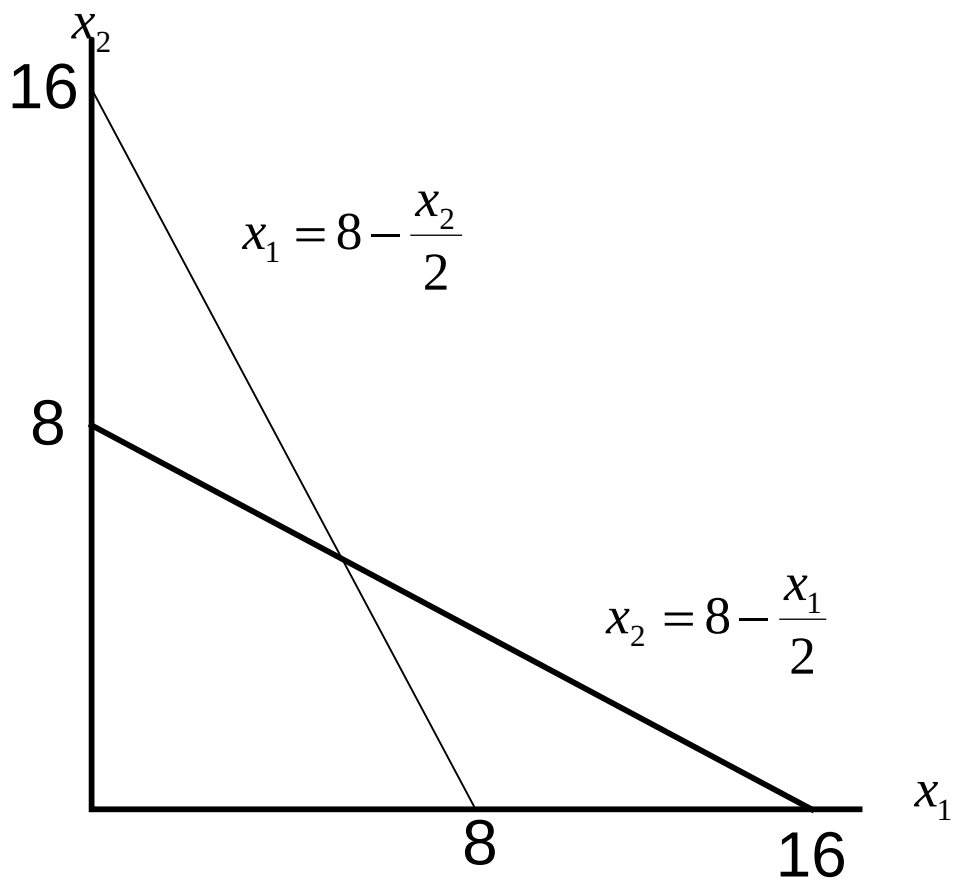
$$a = 17, c = 1, b = 1$$

so that the competitive solution is 16 units of output and the monopoly solution is 8 units of output

profits $\pi_i = \left[17 - (x_i + x_{-i})\right]x_i - x_i$

recall that the best-response function is

$$x_i = 8 - \frac{x_{-i}}{2}$$


$x_2$
16
$x_1 = 8 - \frac{x_2}{2}$
8
$x_2 = 8 - \frac{x_1}{2}$
$x_1$
8
16

$$x = \frac{16}{3}$$