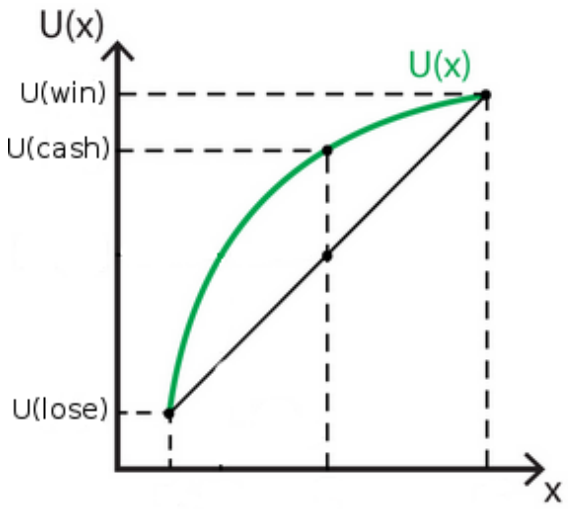
Games and Political-Economic Behavior

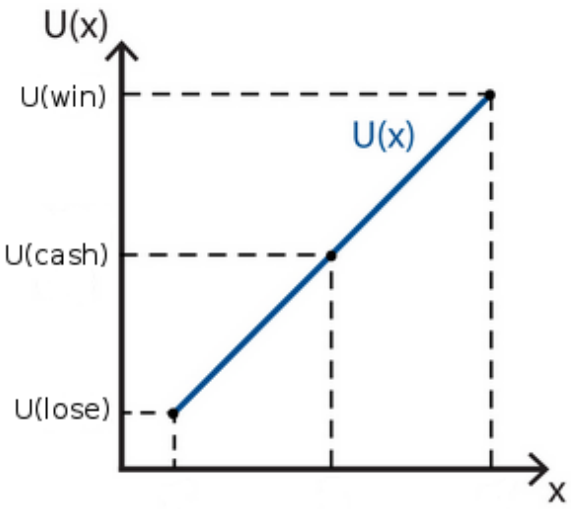
Political Science 442
North Dakota State University

Utility

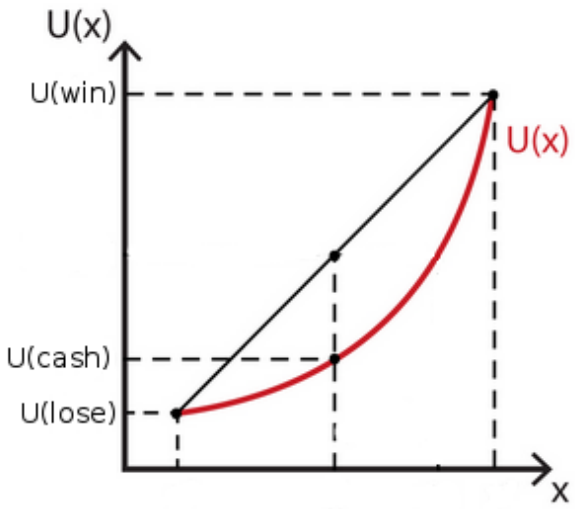
Utility represents actors' preferences over goods, services, outcomes, etc



Risk averse individual



Risk neutral individual



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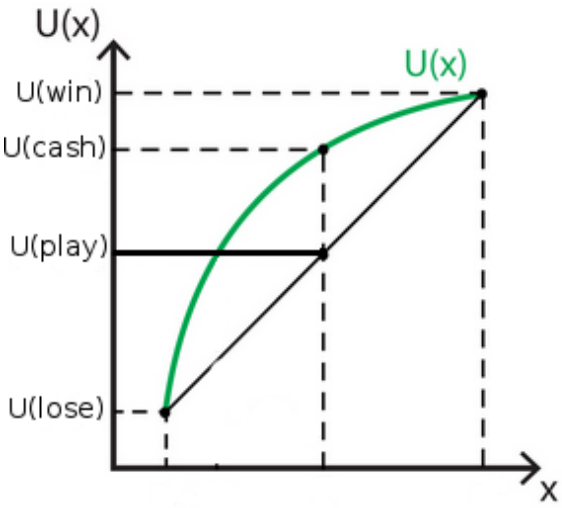

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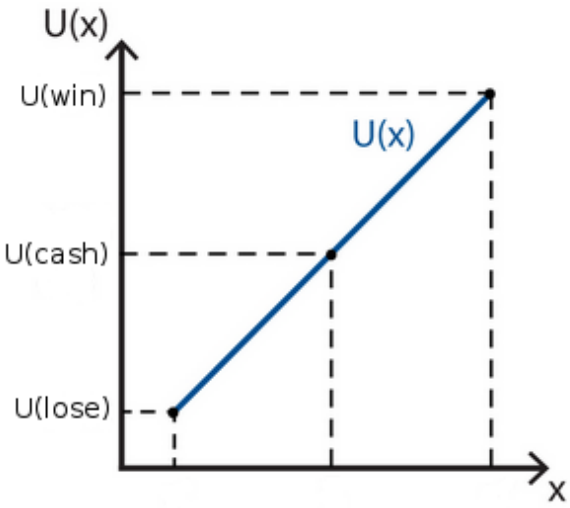

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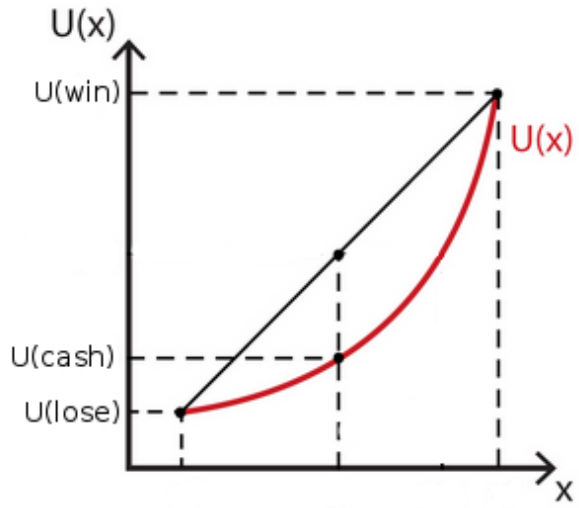

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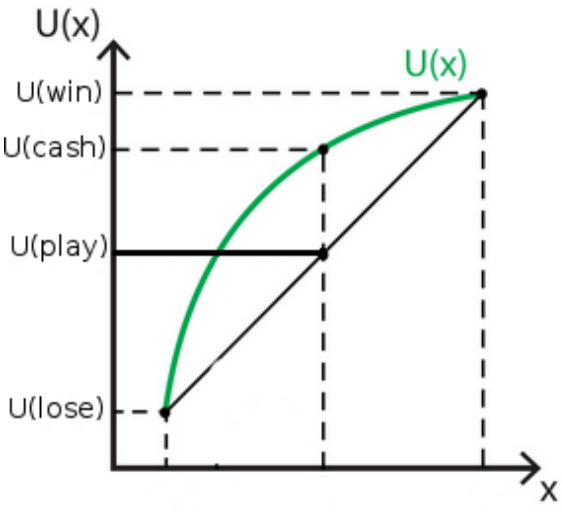

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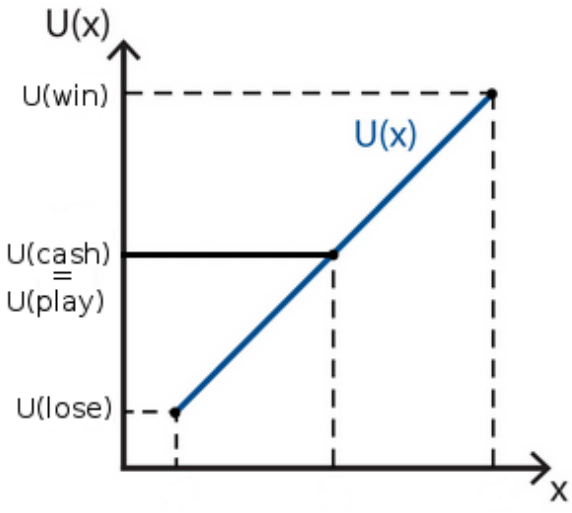

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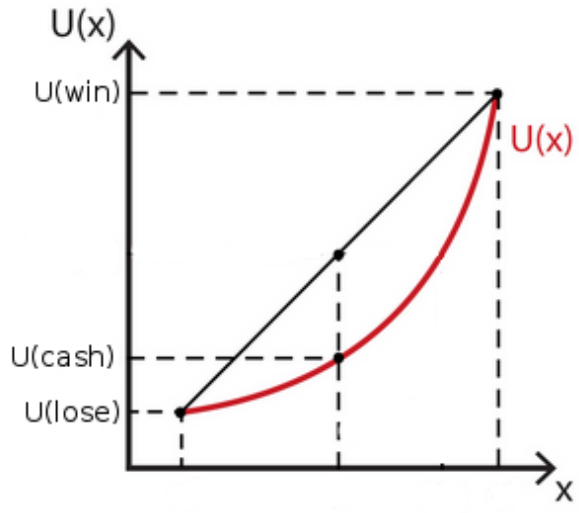

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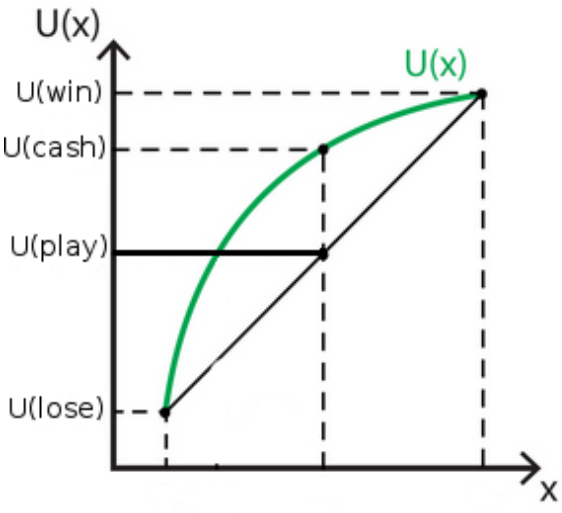

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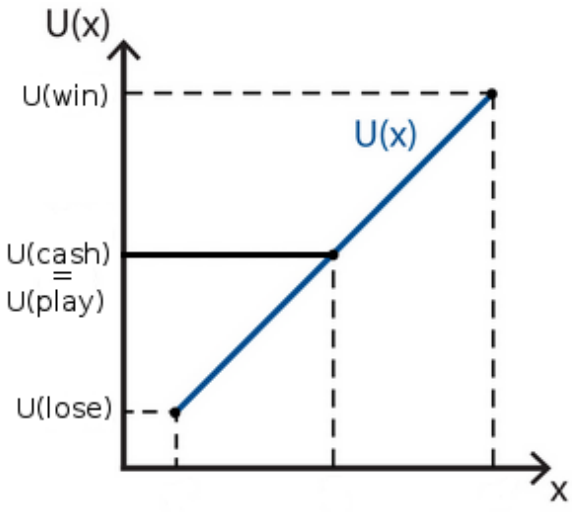

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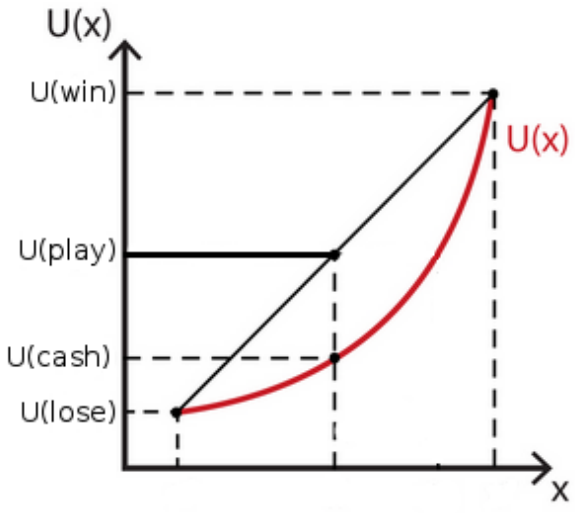

Risk loving individual

Homo Economicus

A simplified model of human behavior that assumes that people maximize their utility given:

- Preferences
- Available information
- Natural and institutional constraints

Nash Equilibrium

- Actors
- Strategies
- Payoffs

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Definition

A set of strategies is a Nash equilibrium if each actor pursues a strategy that is a best response to the strategies of the other actors.

Nash Equilibrium

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- Strategies
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Definition

A set of strategies is a Nash equilibrium if each actor pursues a strategy that is a best response to the strategies of the other actors.

In other words, a NE is a set of strategies from which no player would rationally deviate, if they knew the whole strategy set.

Nash Equilibrium: Example

- Choose a number from 0 to 100
- Guess closest to $\frac{2}{3} \times$ average wins

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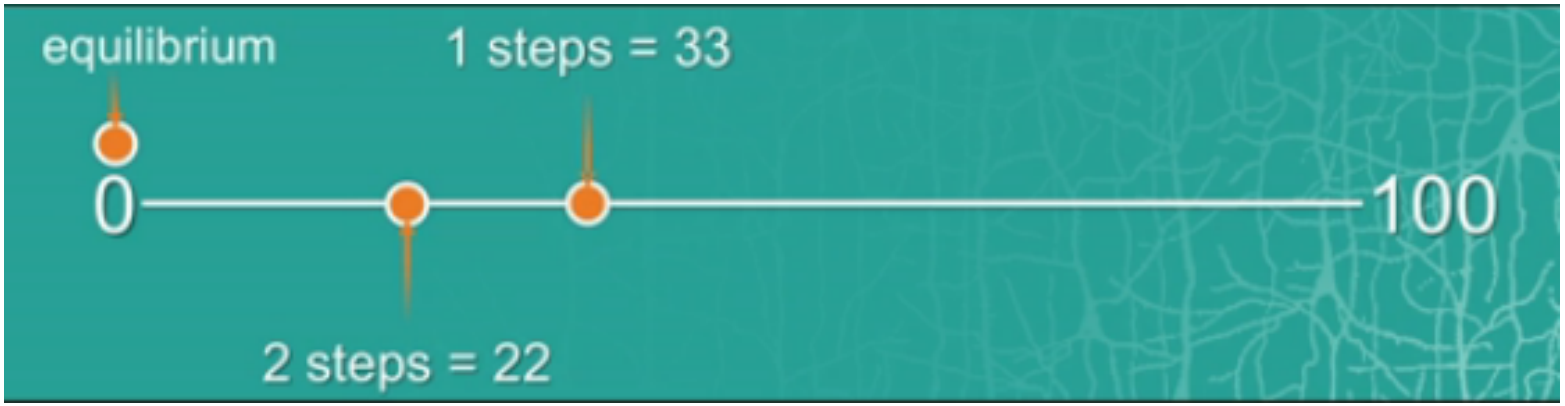

See `http://www.ted.com/talks/colin_camerer_neuroscience_game_theory_monkeys.html`

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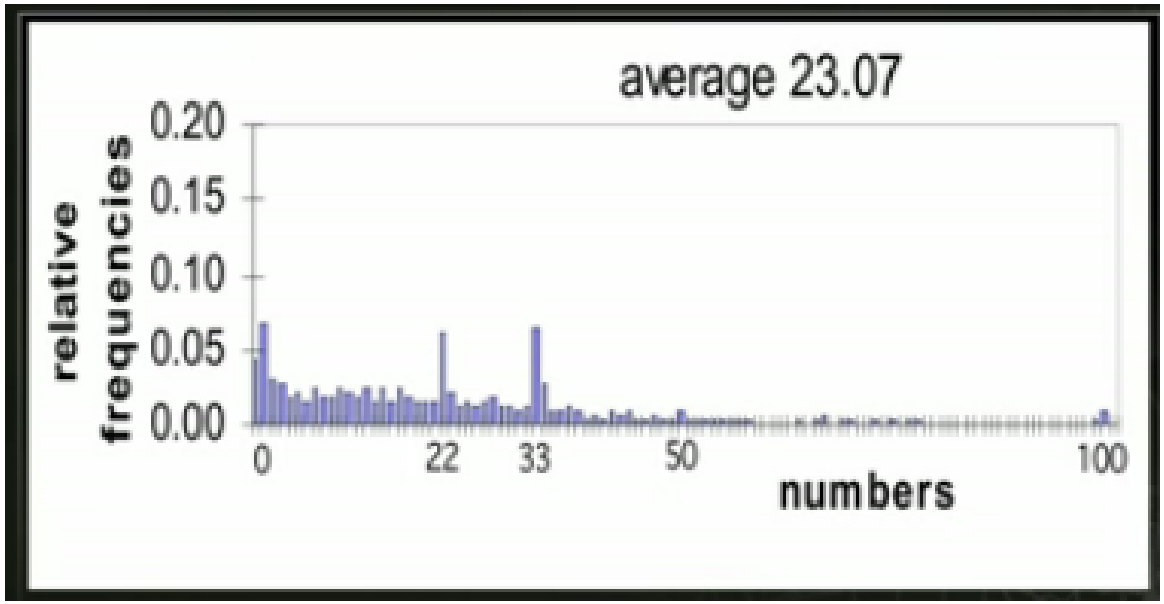

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Normal Form Games

- Payoff matrix
- Strategies on rows and columns
- Payoffs for row player are listed first

		Actor 2	
		Strategy 2A	Strategy 2B
Actor 1	Strategy 1A	P1AA, P2AA	P1AB, P2AB
	Strategy 1B	P1BA, P2BA	P1BB, P2BB

Pure Coordination

		Nancy: Out	Nancy: Home
Jim	Out	10, 10	0, 0
	Home	0, 0	5, 5

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Pure Coordination

		Nancy: Out	Nancy: Home
Jim	Out	**10**, **10**	0, 0
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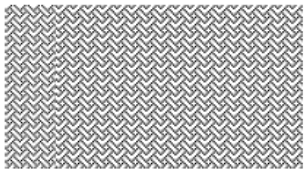
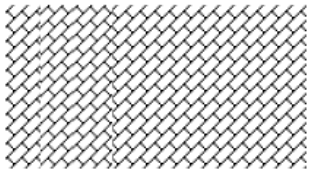
Battle of the Sexes

		Alex	
		Boxing	Opera
Sasha	Boxing	10, 5	0, 0
	Opera	0, 0	5, 10

Battle of the Sexes in the Lab

Option A  Option B 

	P1 Chooses A	P1 Chooses B
P2 Chooses A	P1: \$3, P2: \$2	P1: \$0, P2: \$0
P2 Chooses B	P1: \$0, P2: \$0	P1: \$2, P2: \$3

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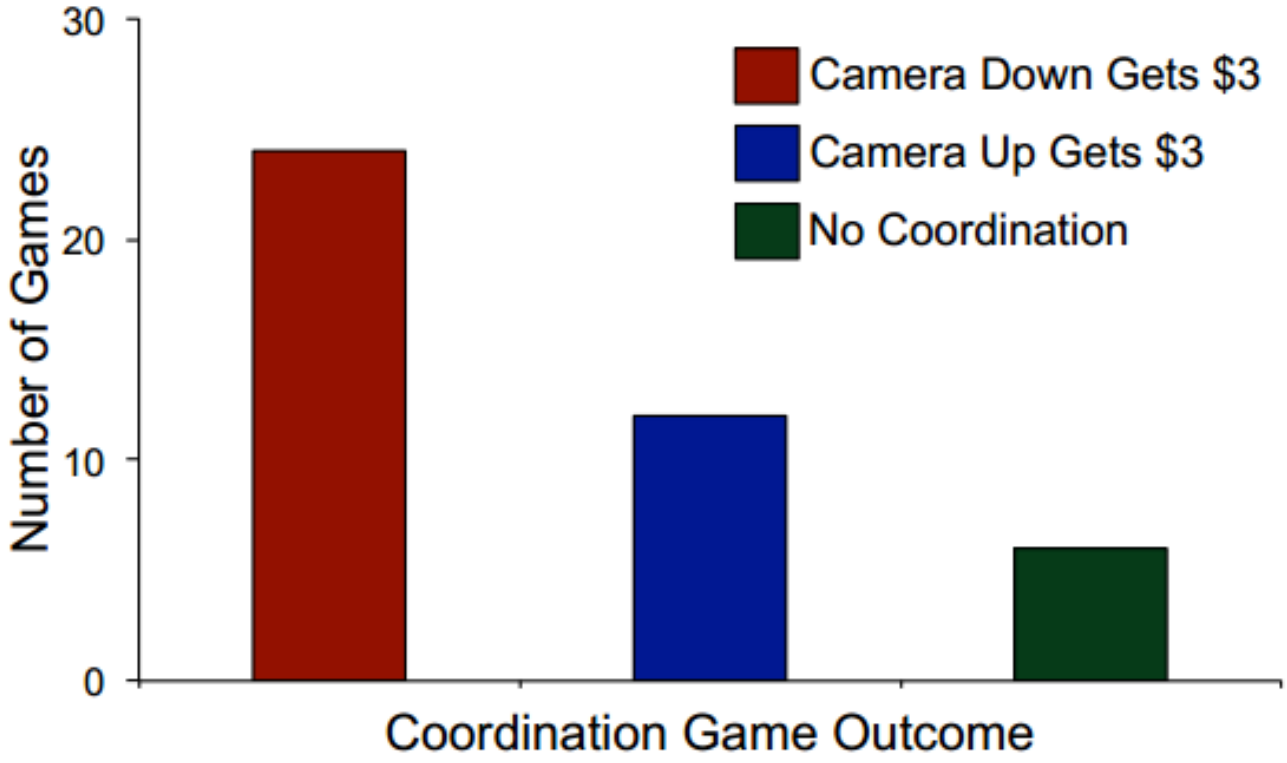


Stag Hunt

		Artemis: Stag	Artemis: Hare
Orion	Stag	10, 10	0, 7
	Hare	7, 0	7, 7

Choosing Sides

- Two actors
- Two strategies: left and right
- If both players choose the same strategy they both do equally well, otherwise they fare equally poorly
- Neither has a particular preference for left or right

Coordination Games

Formalizes a *coordination problem* where a group can obtain a mutually beneficial outcome by coordinating around a particular strategy.

- Multilple nash equilibria
- Players choose corresponding strategies in equilibrium
- Unilateral strategy changes lead to mutual gain/loss
- Equilibrium selection, communication, focal points

Chicken/Hawk-Dove

		Chuck	
		Swerve	Straight
Ren	Swerve	Tie, Tie	Lose, Win
	Straight	Win, Lose	Crash, Crash

What's the preference ordering?

Chicken/Hawk-Dove

		Chuck: Swerve	Chuck: Straight
Ren	Swerve	Tie, Tie	Lose, Win
	Straight	Win, Lose	Crash, Crash

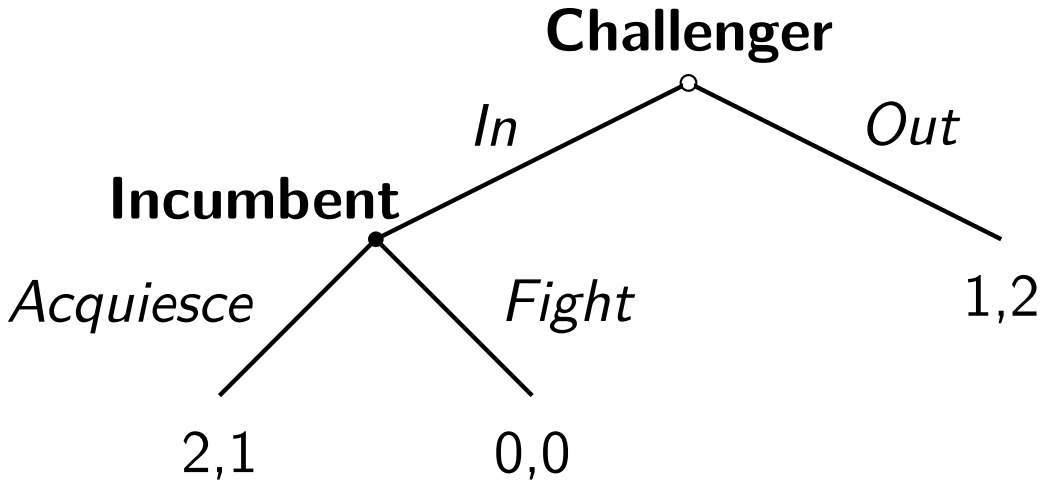
What's the preference ordering?

Win $>$ Tie $>$ Lose $>$ Crash

The Prisoner's Dilemma

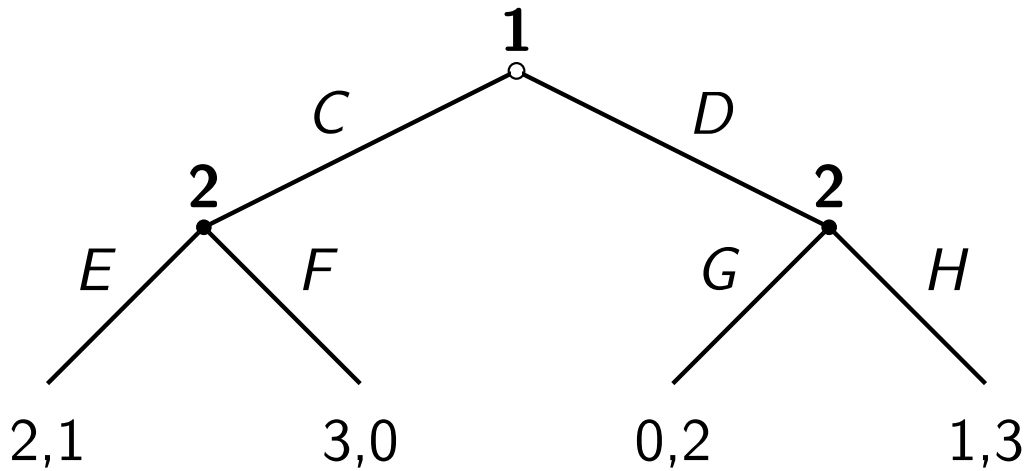
- Actors: two perps
- Strategies: rat or stay quiet
- Payoffs:
  - Cops have enough to put both perps away for 2 years
  - If either perp talks she'll receive a one year sentence reduction
  - If the other person rats on you, you'll get convicted of a second charge that will add 10 years to your sentence

Extensive Form Games



- Players at *nodes*
- Strategy components on *vertices*
- Payoffs at *terminal nodes*
- Strategies are complete sets of actions for each player
- A *subgame* starts at every node

Extensive Form Games: Strategies



- Player 1 strategy set $=$

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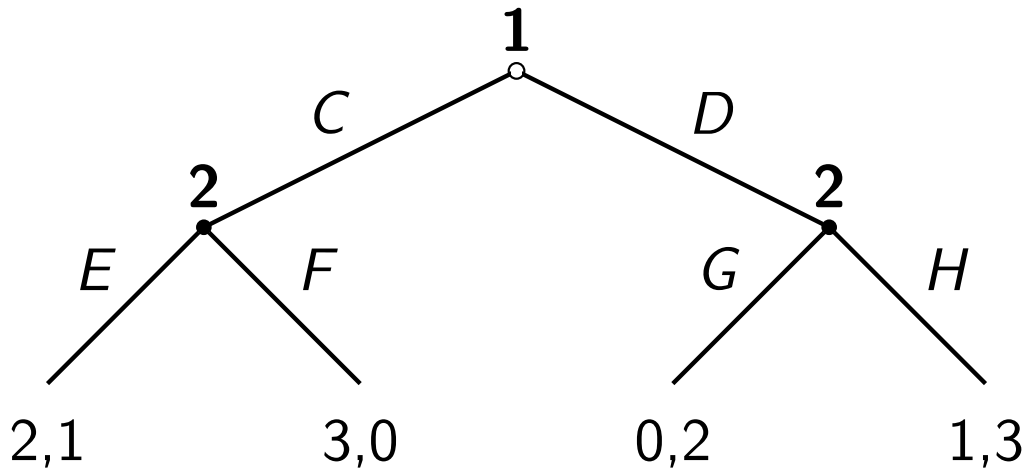

- Player 1 strategy set $= \{C, D\}$

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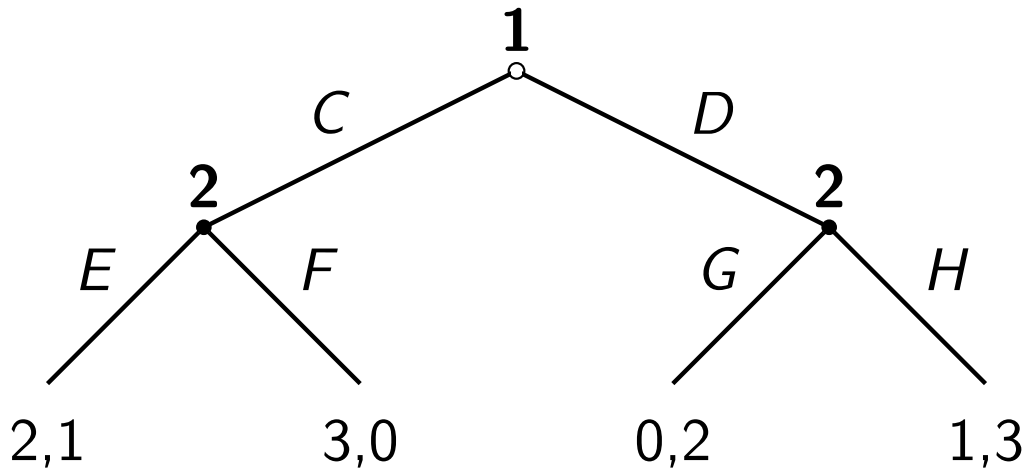

- Player 1 strategy set $= \{C, D\}$
- Player 2 strategy set $=$

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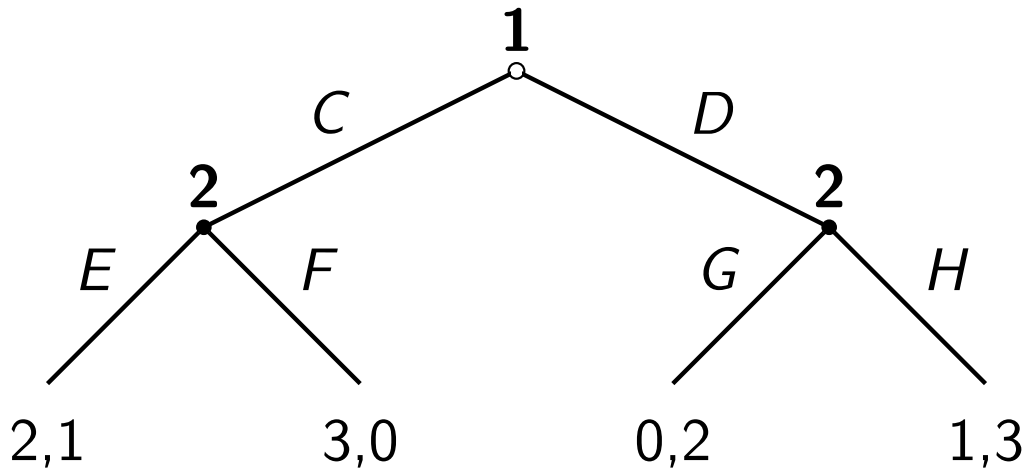
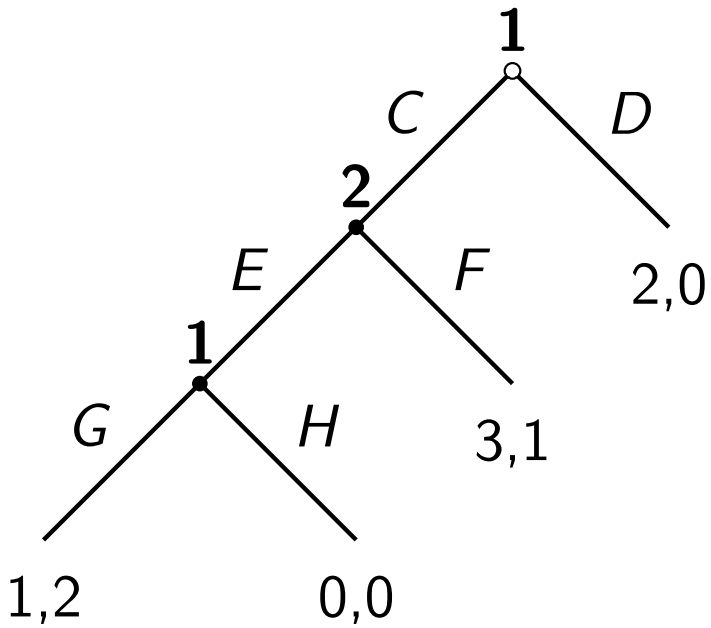


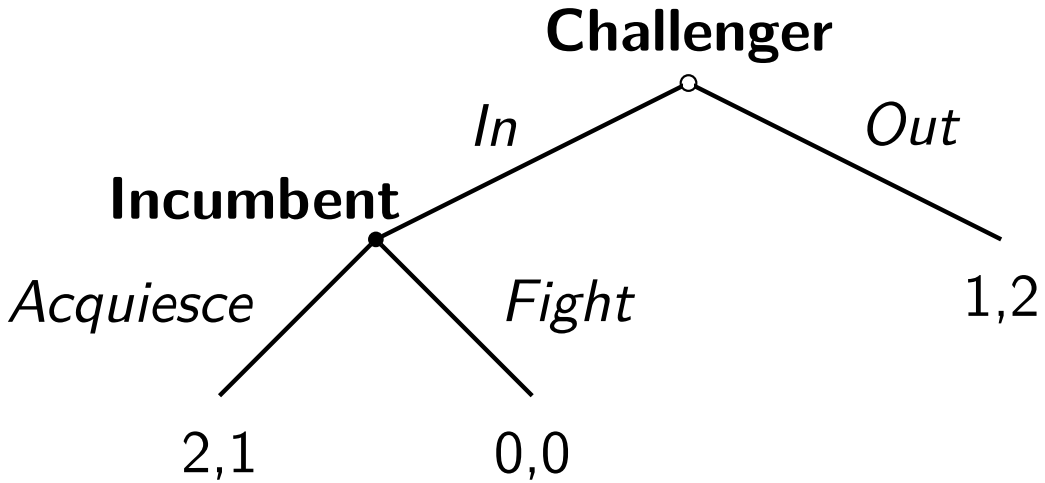
- Player 1 strategy set = {C, D}
- Player 2 strategy set = {EG, EH, FG, FH}

Extensive Form Games: Multiple Moves



Extensive Form Games: Subgame Perfect Nash Equilibrum

SPNE are NE strategy sets that are optimal in every subgame



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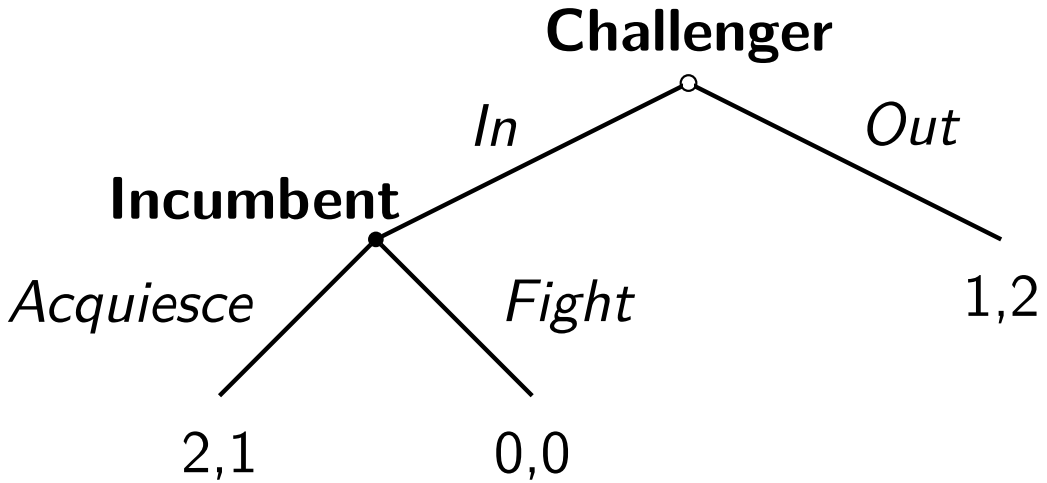

		Incumbent	
		Acquiesce	Fight
Challenger	In	2, 1	0, 0
	Out	1, 2	1, 2

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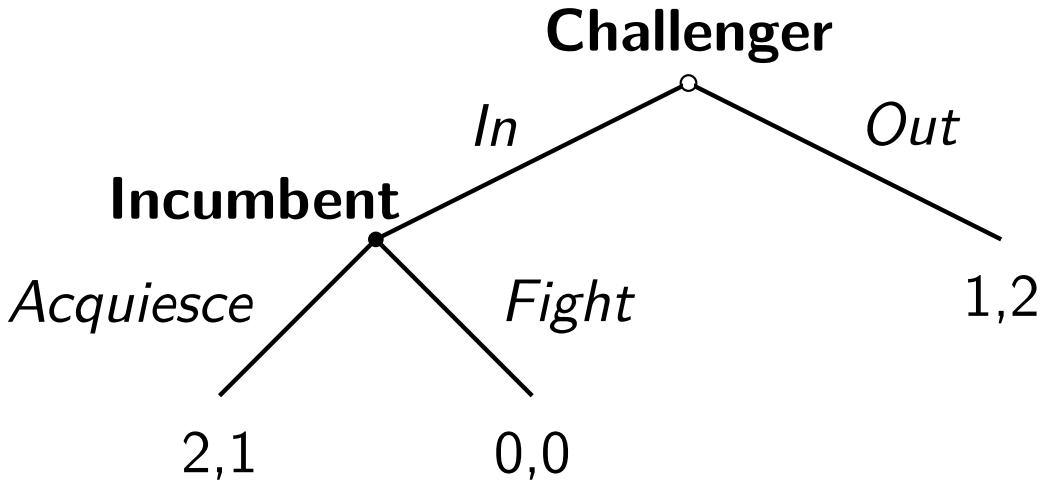

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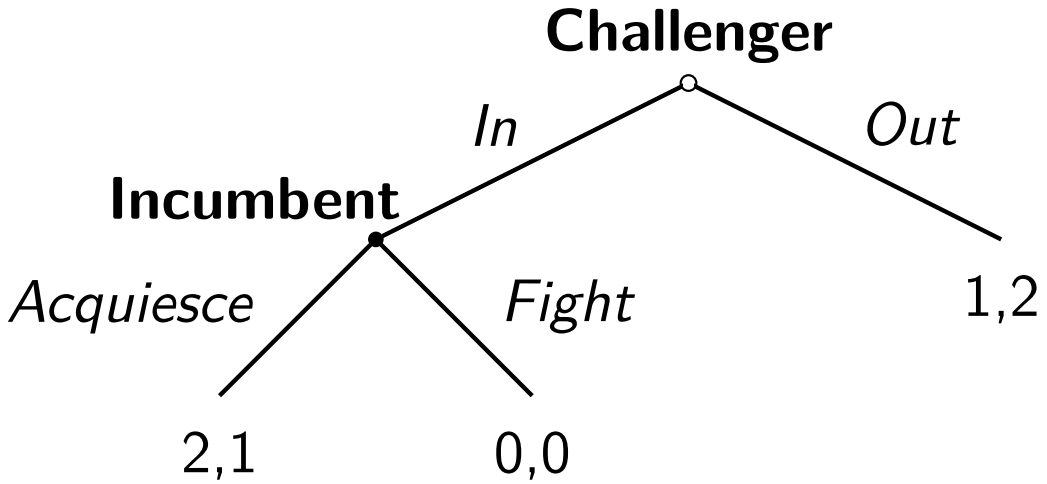

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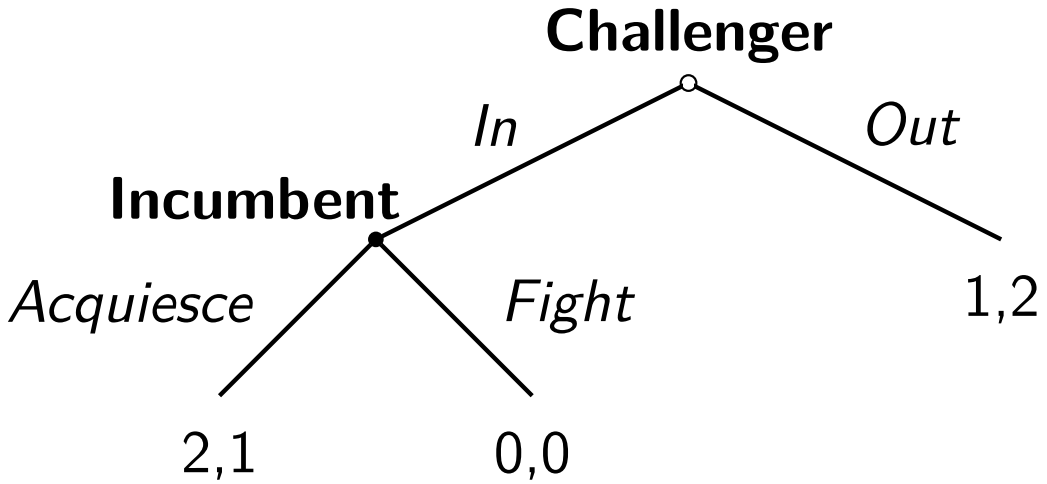

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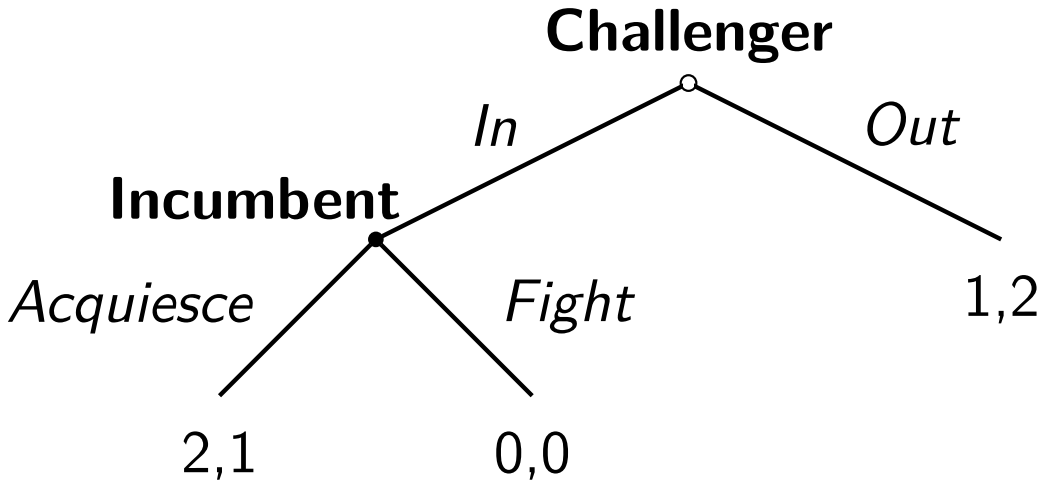

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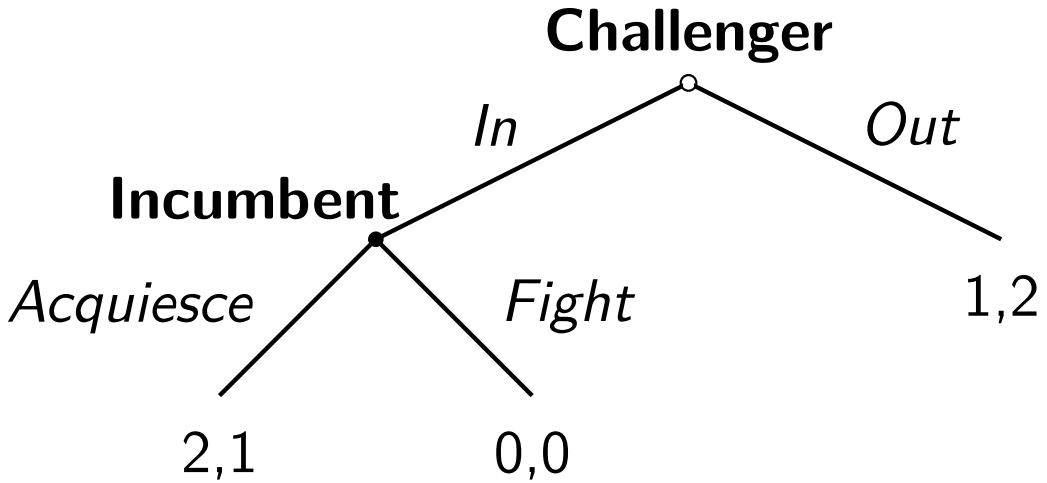
Extensive Form Games: Backwards Induction



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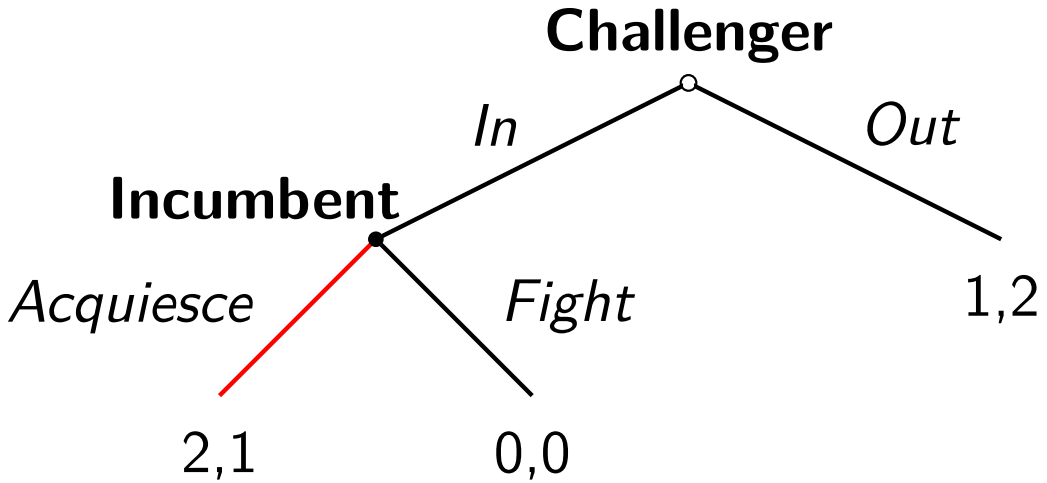

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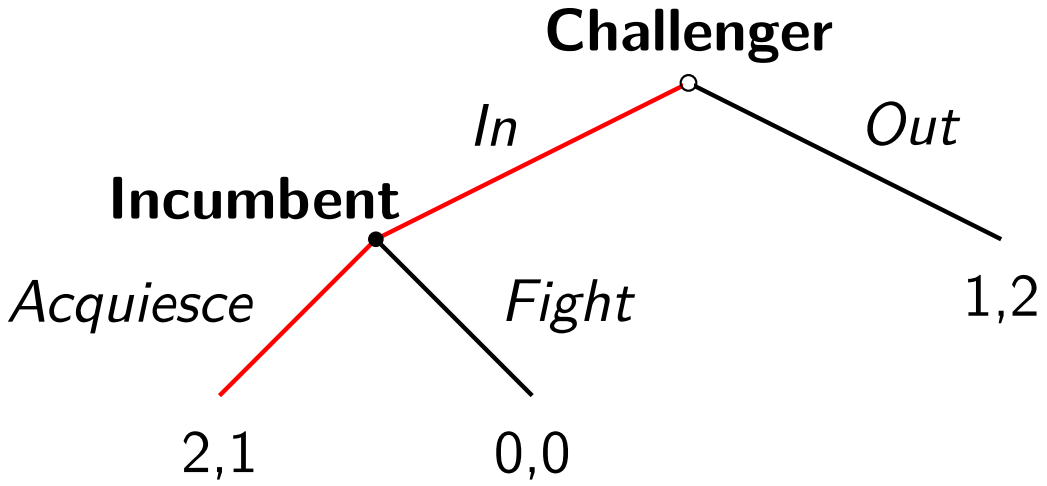

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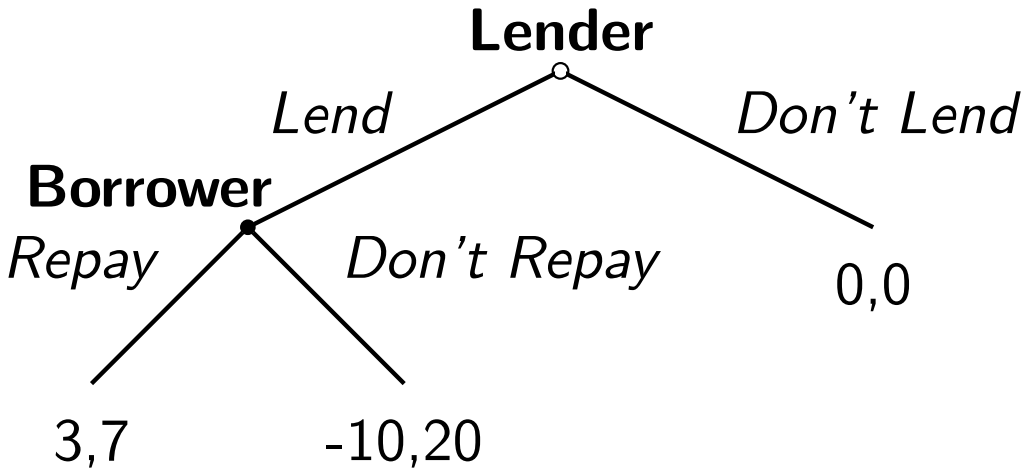
Trust Games



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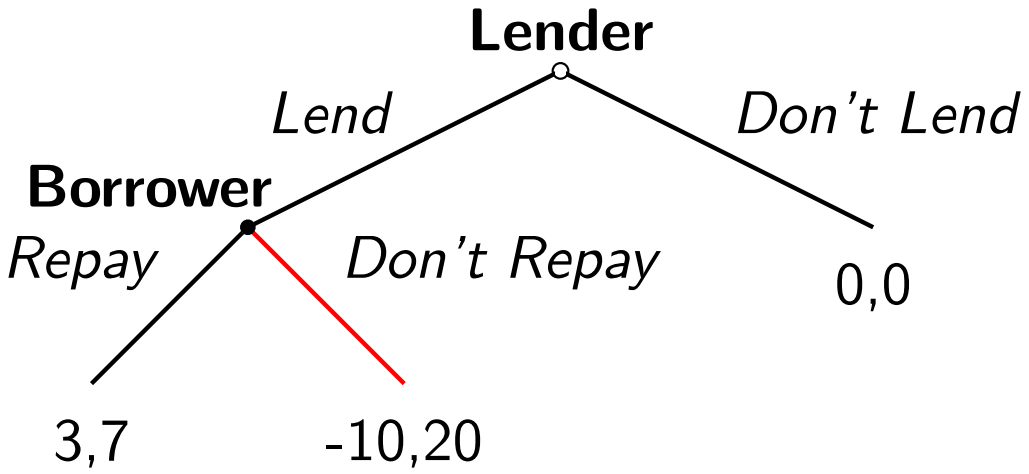

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