D dominates U; R dominates L
Two dumb players do better than two wise players

Game 8

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>L</td>
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<tr>
<td>R</td>
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</table>

-5 10

U 10

D

-2 -2
Game to be repeated large number of times. No cheap talk between successive plays.

Game 10

<table>
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<tr>
<th></th>
<th>Coop</th>
<th>Defect</th>
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Game to be repeated 20 times. No cheap talk between successive plays.

Game 10

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<td>-2</td>
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</table>
Repeated Social Dilemma Game

What would be your first move?
Repeated Social Dilemma Game

TRIAL: 1 2
Row: C ?
Col: D ?
Repeated Social Dilemma Game

TRIAL: 1 2 3
Row: C D ?
Col: D C ?
Repeated Social Dilemma Game

<table>
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<tr>
<th>TRIAL</th>
<th>1</th>
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<th>3</th>
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</table>
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<tr>
<td>Col</td>
<td>D</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
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</table>
Repeated Dilemma Game -- Insights

Trust is fragile, once destroyed it may be hard to re-establish!
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Empathetic trust, while important, is not a necessary condition for cooperation!
Repeated Dilemma Game -- Insights

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**Even enemies may choose to collaborate!**
Repeated Dilemma Game -- Insights

Trust is fragile, once destroyed it may be hard to re-establish!

Empathetic trust, while important, is not a necessary condition for cooperation!

Even enemies may choose to collaborate!

Beware of end play and changes in players.
Advice on how to play such games

Start by being **nice**

Be responsive to defections by the other

(Being **provocable**)

Be somewhat forgiving early on to try to establish a working trust. Do **not** be **vindictive** in punishing the other side.

Be **Simple** -- subtle signals go undetected

Life goes on even at end of game
Advice on how to play such games

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N-Person Social Dilemma Game
N-Player Social Dilemma Game

No. of players: N, number of willing parties in the room

Strategic Choices: C, D

Payoffs:

  To D- players: \((\text{Number of C-players})\) (in $)

  To C- players: \([(\text{Number of C-players}) - 5]\)
N-Player Social Dilemma Game

No. of players: N, number of willing parties in the room

Strategic Choices: C, D

Payoffs:

To D- players: \((\text{Number of C-players})\) (in $)

To C- players: \([\text{(Number of C-players)} - 5]\) (in $)

Observations: The C-players create the wealth.

No matter what others do, if you switch from D to C you give everyone a bonus of $1 (including yourself) but you personally get penalized by $5 for your good deed.
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No matter what others do, if you switch from D to C you give everyone a bonus of $1 (including yourself) but you personally get penalized by $5 for your good deed.
N-Player Prisoner’s Dilemma

Illustrative Examples:

N = 20

No. of C’s: 20

Payoff to each D: ---

Payoff to each C: +$15
Illustrative Examples:

N = 20

No. of C’s: 15

Payoff to each D: $15 (Free-Riders)

Payoff to each C: +$10
N-Person Social Dilemma Game

What would you do if you could talk to the other players but could not make binding commitments?
N-Person Social Dilemma Game Variations

1. No pre-talk and the Cs and Ds remain anonymous
2. No pre-talk, Cs and Ds are ex-post identifiable.
3. Pre-talk, but no way of enforcing pre-play agreements.
4. Pre-play with ex-post penalties.

Play!!!
N-Player Social Dilemma

What are some real-world interpretations of such games?
N-Player Social Dilemma

Global Warming
Use of Commons
Over population
Charitable Giving and the Free-Rider Problem
The Ultimatum Game
The Ultimatum Game

Prize to be shared: $100

Players: Allocator (A) and Recipient (R)

Move #1: A offers X to R and (100 - x) to A

Move #2: R accepts X -- giving (100 - X) to A --
or R rejects X and both get nothing.
The Ultimatum Game

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- X is ultimatum bid (offer) of A to R
- R has veto power
- No pre-play communication
- Single shot game
Variations of the Ultimatum Game

• Respondent is not known by Allocator
  • Responder remains anonymous

• Allocator is not known by Respondent
  • Allocator is anonymous

• Prize is $10,000
Variations of the Ultimatum Game

• Responder no longer has veto power (Called the Dictator Game)
Variations of the Ultimatum Game

• Player 1 is given $100 and can offer $x to Player 2.
• The $x that Player 2 receives is immediately converted into $3x.
• Player 2 can transfer an amount $y back to Player 1
• Neither player has veto power
Components of Utility

• What are your objectives?

  Money
  Fairness
  Reputation
  Justice
Zero-Sum Games

Strictly Opposing Games
Illustrative Cases of Strictly Opposing Interests

- sports
- card games
- war
- cut-throat economic

Warning: Real-world situations are often treated as strictly opposing when they should not be!
Why the prominence of this class of game?

- Historical (developmental) importance
- Of methodological interest to study polar extremes
- There is a profound inter-connectedness between the strictly opposing game and the development of linear programming
Zero-Sum Games:

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<th>C O L I N</th>
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<td>Cn</td>
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<td>W</td>
<td>Ri</td>
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<tr>
<td>A</td>
<td>Rm</td>
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Assumptions
1. Common Knowledge
2. Colin and Rowena have strictly opposing interests
3. Both can assign utility values to the outcomes
4. Colin can either minimize his expected utility return or equivalently maximize Rowena's Expected utility return
<table>
<thead>
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<th>R1</th>
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**Rowena's Utility Values**

Rowena wants to **Maximize** her return
Colin wants to **minimize** Rowena's return

Colin's Utility for \((I,j)\) cell = \(-U(I,j)\)

Sum of Utilities for \((I,j)\) cell = 0, hence **zero-sum**

**Assumptions**