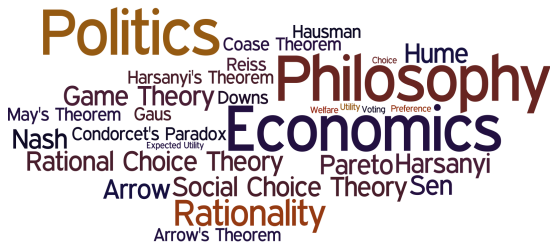


# PHPE 400

## Individual and Group Decision Making

Eric Pacuit  
University of Maryland  
[pacuit.org](http://pacuit.org)



		Everyone Else	
		C1	C2
Me	C1	2, 2	0, 4
	C2	4, 0	1, 1

- ▶ Athletes using performance-enhancing drugs

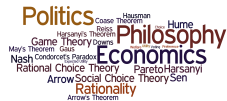
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- ▶ <http://www.radiolab.org/story/golden-rule/>

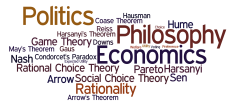
# Prisoner's Dilemma



		Bob	
		C	D
Ann	C		
	D		



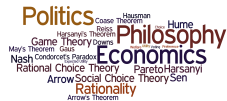
# Prisoner's Dilemma



		Bob	
		C	D
Ann	C	3	1
	D	4	2

Ann's preferences

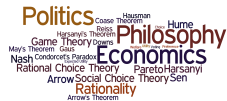
# Prisoner's Dilemma



		Bob	
		C	D
Ann	C	3	4
	D	1	2

Bob's preferences

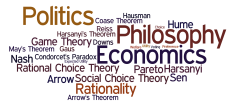
# Prisoner's Dilemma



		Bob	
		C	D
Ann	C	3,3	1,4
	D	4,1	2,2

What should Ann (Bob) do?

# Prisoner's Dilemma

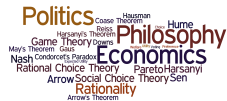


		Bob	
		C	D
Ann	C	3,3	1,4
	D	4,1	2,2

What should Ann (Bob) do?



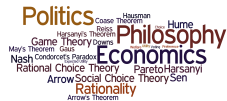
# Prisoner's Dilemma



		Bob	
		C	D
Ann	C	3,3	1,4
	D	4,1	2,2

What should Ann (Bob) do? *Dominance reasoning*

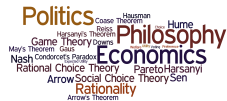
# Prisoner's Dilemma



		Bob	
		C	D
Ann	C	3,3	1,4
	D	4,1	2,2

What should Ann (Bob) do? *Dominance reasoning* is not **Pareto!**

# Prisoner's Dilemma

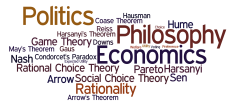


		Bob	
		C	D
Ann	C	3	2.5
	D	2.5	2

What should Ann (Bob) do? *Think as a group!*



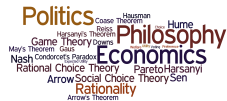
# Prisoner's Dilemma



		Bob	
		C	D
Ann	C	3,3	1,4
	D	4,1	2,2

What should Ann (Bob) do? *Play against your mirror image!*

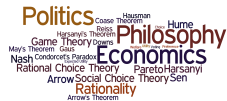
# Prisoner's Dilemma



		Bob	
		C	D
Ann	C	3,3	1,4
	D	4,1	2,2

What should Ann (Bob) do? *Play against your mirror image!*

# Prisoner's Dilemma



		Bob	
		C	D
Ann	C	$\epsilon, \epsilon$	1, 4
	D	4, 1	2, 2

What should Ann (Bob) do? *Change the game...*

# Nozick: Symbolic Utility



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# Nozick: Symbolic Utility



“Yet the symbolic value of an act is not determined solely by *that* act. The act’s meaning can depend upon what other acts are available with what payoffs and what acts also are available to the other party or parties.

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R. Nozick. *The Nature of Rationality*. Princeton University Press, 1993.



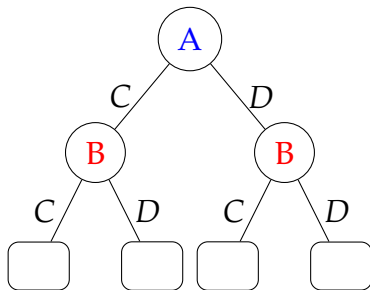
		Bob	
		C	D
Ann	C	3, <span style="color: red;">3</span>	1, <span style="color: red;">4</span>
	D	4, <span style="color: red;">1</span>	2, <span style="color: red;">2</span>

Prisoner's Dilemma

What should/will Ann (Bob) do?

		Bob	
		C	D
Ann	C	3, <span style="color: red;">3</span>	1, <span style="color: red;">4</span>
	D	4, <span style="color: red;">1</span>	2, <span style="color: red;">2</span>

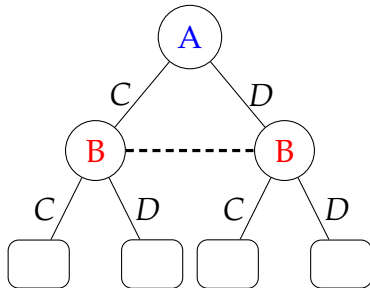
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		Bob	
		C	D
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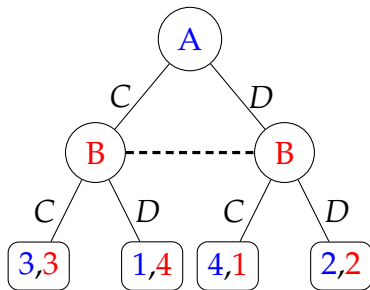
Prisoner's Dilemma



What should/will Ann (Bob) do?

		Bob	
		C	D
Ann	C	3, <span style="color: red;">3</span>	1, <span style="color: red;">4</span>
	D	4, <span style="color: red;">1</span>	2, <span style="color: red;">2</span>

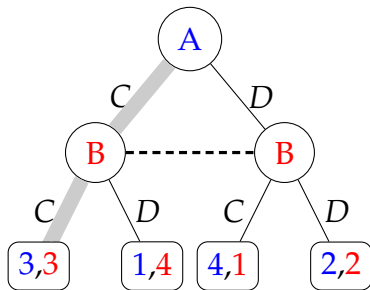
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		Bob	
		C	D
Ann	C	3, <span style="color: red;">3</span>	1, <span style="color: red;">4</span>
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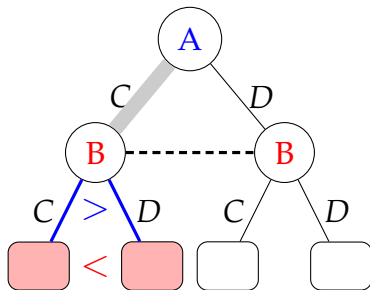
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What should/will Ann (Bob) do?

		Bob	
		C	D
Ann	C	3, <span style="color: red;">3</span>	1, <span style="color: red;">4</span>
	D	4, <span style="color: red;">1</span>	2, <span style="color: red;">2</span>

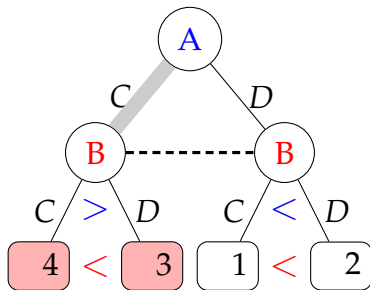
Prisoner's Dilemma



What should/will Ann (Bob) do?

		Bob	
		C	D
Ann	C	3, <span style="color: red;">3</span>	1, <span style="color: red;">4</span>
	D	4, <span style="color: red;">1</span>	2, <span style="color: red;">2</span>

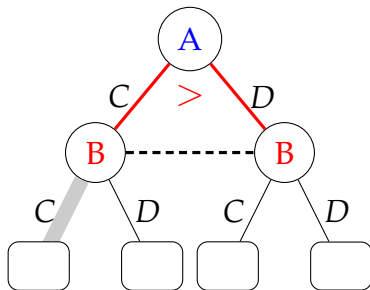
Prisoner's Dilemma



What should/will Ann (Bob) do?

		Bob	
		C	D
Ann	C	3, <span style="color: red;">3</span>	1, <span style="color: red;">4</span>
	D	4, <span style="color: red;">1</span>	2, <span style="color: red;">2</span>

Prisoner's Dilemma

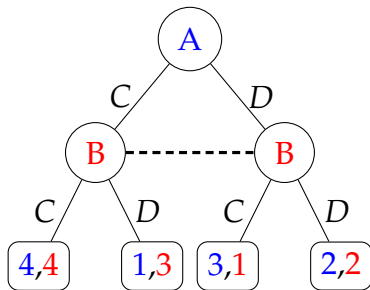


What should/will Ann (Bob) do?



		Bob	
		C	D
Ann	C	3, <span style="color: red;">3</span>	1, <span style="color: red;">4</span>
	D	4, <span style="color: red;">1</span>	2, <span style="color: red;">2</span>

Prisoner's Dilemma



What should/will Ann (Bob) do?

		Bob	
		C	D
Ann	C	3,3	1,4
	D	4,1	2,2

Prisoner's Dilemma

		Bob	
		C	D
Ann	C	4,4	1,3
	D	3,1	2,2

Assurance Game

What should/will Ann (Bob) do? *Change the game* (eg., Symbolic Utilities)

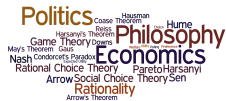
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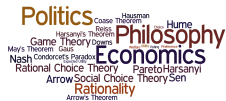
K. Binmore. *Natural Justice*. Oxford University Press, 2005.

# Iterated Prisoner's Dilemma



	<i>C</i>	<i>D</i>		<i>C</i>	<i>D</i>		<i>C</i>	<i>D</i>		<i>C</i>	<i>D</i>	...
<i>C</i>	3,3	0,4	<i>C</i>	3,3	0,4	<i>C</i>	3,3	0,4	<i>C</i>	3,3	0,4	
<i>D</i>	4,0	1,1	<i>D</i>	4,0	1,1	<i>D</i>	4,0	1,1	<i>D</i>	4,0	1,1	

# Iterated Prisoner's Dilemma



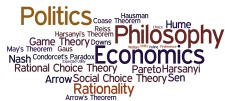
	C	D
C	3,3	0,4
D	4,0	1,1

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

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

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

# Iterated Prisoner's Dilemma



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

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

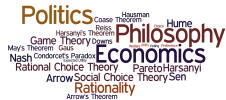
	C	D
C	3,3	0,4
D	4,0	1,1

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





# Iterated Prisoner's Dilemma



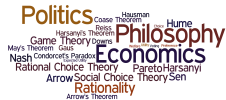
	C	D
C	3,3	0,4
D	4,0	1,1

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

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

# Iterated Prisoner's Dilemma



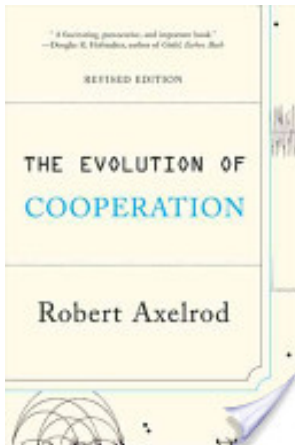
	C	D
C	3,3	0,4
D	4,0	1,1

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

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

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

...



# Strategies



- ▶ Periodic: All-C, All-D, CD, CCD, CDD, CCDD, ...
- ▶ Random
- ▶ Memory: Tit-for-Tat, Two-Tit-for-Tat, ...

# Additional Reading



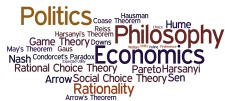
- ▶ S. Kuhn, Prisoner's Dilemma, Stanford Encyclopedia of Philosophy, [plato.stanford.edu/entries/prisoner-dilemma/](http://plato.stanford.edu/entries/prisoner-dilemma/)
  
- ▶ W. Poundstone, Prisoner's Dilemma, Anchor, 1993

# Ultimatum Game



There is a good (say an amount of money) to be divided between two players.

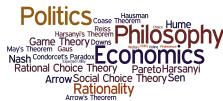
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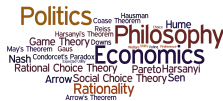
There is a good (say an amount of money) to be divided between two players. In order for either player to get the money, both players must agree to the division. One player is selected by the experimenter to go first and is given all the money (call her the “Proposer”): the Proposer gives an ultimatum of the form “I get  $x$  percent and you get  $y$  percent — take it or leave it!”.

# Ultimatum Game



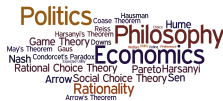
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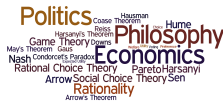
Suppose the players meet only once. It would seem that the Proposer should propose 99% for herself and 1% for the Disposer. And if the Disposer is instrumentally rational, then she should accept the offer.

# Ultimatum Game



But this is not what happens in experiments: if the Disposer is offered 1%, 10% or even 20%, the Disposer very often rejects. Furthermore, the proposer tends demand only around 60%.

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# Ultimatum Game



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A typical explanation is that the players' utility functions are not simply about getting funds to best advance their goals, but about acting according to some norms of fair play. But acting according to norms of fair play does not seem to be a goal: it is a principle to which a person wishes to conform.

“Rationality has a clear interpretation in individual decision making, but it does not transfer comfortably to interactive decisions, because interactive decision makers cannot maximize expected utility without strong assumptions about how the other participant(s) will behave. In game theory, common knowledge and rationality assumptions have therefore been introduced, but under these assumptions, rationality does not appear to be characteristic of social interaction in general.” (pg. 152, Colman)

A. Colman. *Cooperation, psychological game theory, and limitations of rationality in social interaction*. Behavioral and Brain Sciences, 26, pgs. 139 - 198, 2003.



# Collective decision making

Voter 1



>



>



Voter 2



>



>



Voter 3



>



>



⋮

Voter  $N$



>



>



