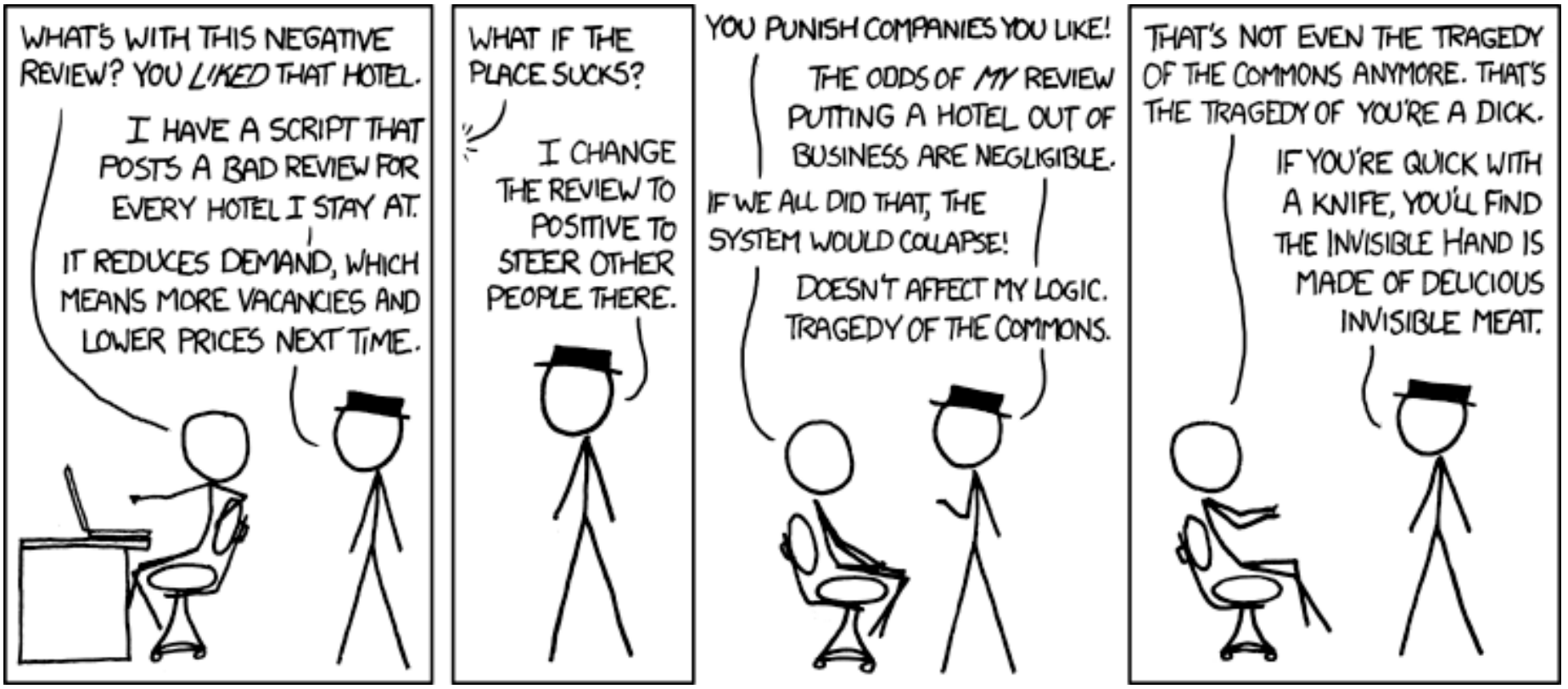
Research Methods for Political Science

Rational Choice and Game Theory



TRINITY COLLEGE DUBLIN
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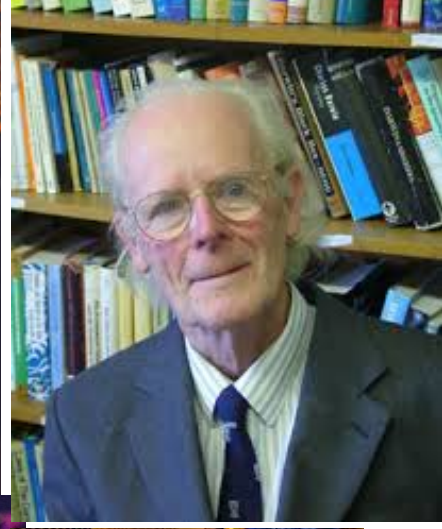
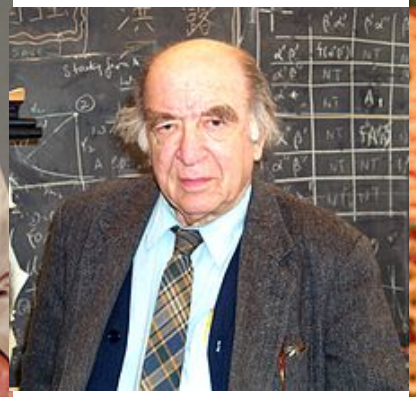
ALFRED NOBELS MINNE





Empirical and formal theories

Empirical theories: explaning (parts of) (social) reality

Formal theories: deduce conclusions from a number of (behavioural) assumptions

Why is it useful?

- One way of addressing the endogeneity problem: Strong theoretical reasons to expect x -> y, and not y -> x
- Game theory and modeling provide micro-foundations for your argument

Rational choice theory

- Actors are able to order their alternative goals, values, tastes, and strategies.
  Tea > Coffee > Milk
- Preferences are
  - Complete
  - Transitive

- Actors choose from available alternatives so as to maximize their satisfaction.

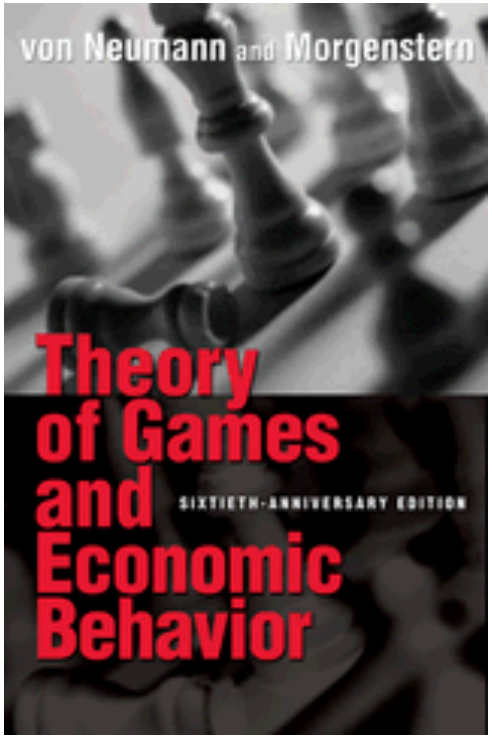
Aside: How rationality can fail

Andrew's preferences	Beth's preferences	Connor's preferences
Candidate A	Candidate C	Candidate B
Candidate B	Candidate A	Candidate C
Candidate C	Candidate B	Candidate A

A v. B: A wins
A v. C: C wins
B v. C: B wins

→ A>B>C>A !

Game theory



Von Neumann and Morgenstern, Theory of Games and Economic Behavior (1944)

Cooperative vs. Non-cooperative

Cooperative games: players in the game can interact

Non-cooperative games: players make decisions independently

Strategic game

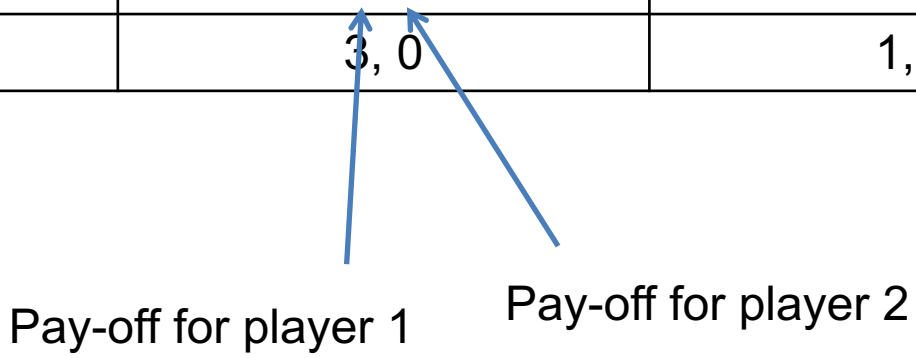
Set of **players**

For each player, set of **actions**

For each player, set of **preferences** over the set of action profiles

Prisoner's dilemma

		Player 2	
		Quiet	Fink
Player 1	Quiet	2, 2	0, 3
	Fink	3, 0	1, 1



Bach or Stravinsky

(Battle of the Sexes)

		Player 2	
		Bach	Stravinsky
Player 1	Bach	2, 1	0, 0
	Stravinsky	0, 0	1, 2

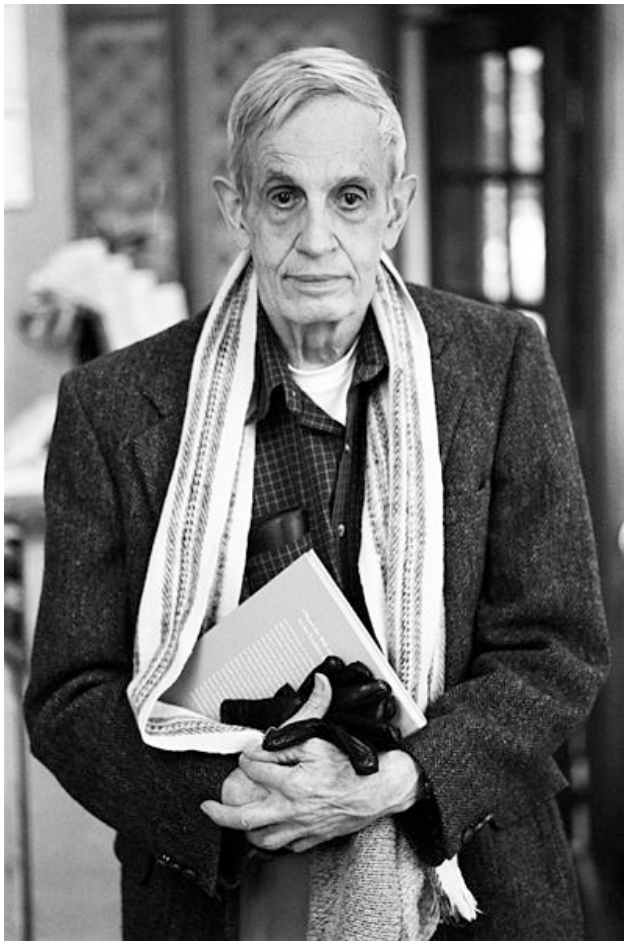
Stag Hunt

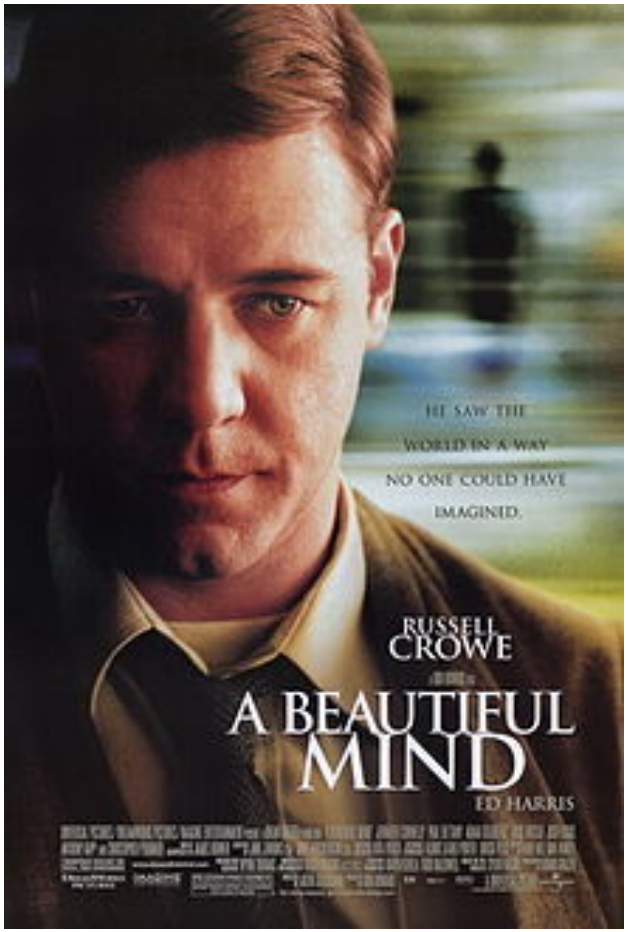
		Player 2	
		Stag	Hare
Player 1	Stag	2, 2	0, 1
	Hare	1, 0	1, 1

Matching Pennies

		Player 2	
		Head	Tail
Player 1	Head	1, -1	-1, 1
	Tail	-1, 1	1, -1

John Nash




HE SAW THE
WORLD IN A WAY
NO ONE COULD HAVE
IMAGINED.
RUSSELL
CROWE
A BEAUTIFUL
MIND
ED HARRIS

Nash equilibrium

A Nash equilibrium is an action profile $a*$ with the property that no player *i* can do better by choosing an action different from a^*_i , given that every other player *j* adheres to a^*_j.

Nash equilibrium

No player can improve his pay-off by unilateraly changing his action.

Prisoner's dilemma

		Player 2	
		Quiet	Fink
Player 1	Quiet	2, 2	0, 3
	Fink	3, 0	1, 1

Nash equilibrium

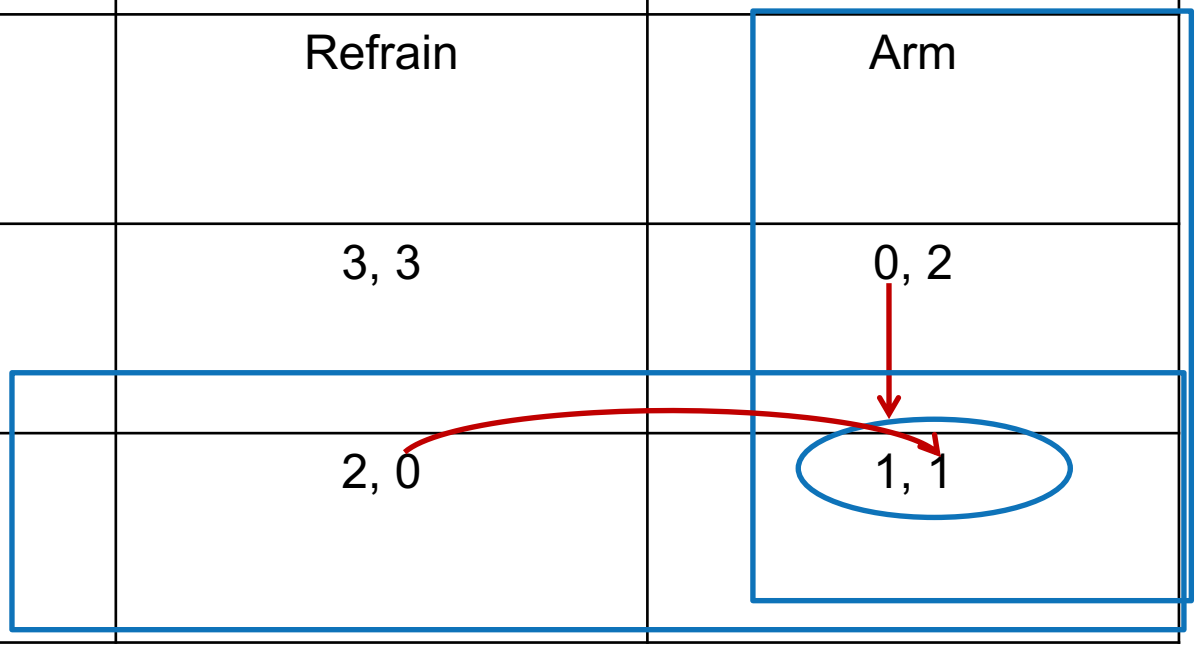
Prisoner's dilemma

		Player 2	
		Quiet	Fink
Player 1	Quiet	2, 2	0, 3
	Fink	3, 0	1, 1

Not a Nash equilibrium

Security dilemma
(Stag Hunt variant)

		Player 2	
		Refrain	Arm
Player 1	Refrain	3, 3	0, 2
	Arm	2, 0	1, 1



Nash equilibrium

Security dilemma
(Stag Hunt variant)

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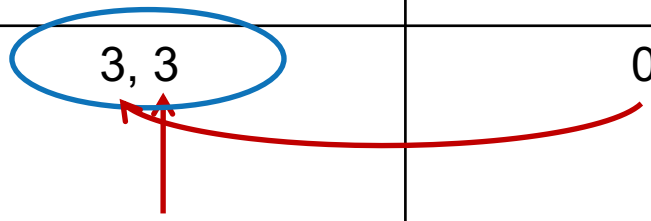

Also a Nash equilibrium

Best response function

‘Best response’ for player *i* given a certain action by player *j* (or any other players): the response(s) with the highest pay-offs

A Nash equilibrium is a profile of actions such that each action is a best response to the others’ actions.

Prisoner's dilemma

		Player 2	
		Quiet	Fink
Player 1	Quiet	2, 2	0, 3
	Fink	3, 0	1, 1

Prisoner's dilemma

		Player 2	
		Quiet	Fink
Player 1	Quiet	2, 2	0, 3
	Fink	3*, 0	1*, 1

Prisoner's dilemma

		Player 2	
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Prisoner's dilemma

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Nash equilibrium

Bach or Stravinsky

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Best responses for player 1

Best responses for player 2

Strengths and limitations of game theory and rational choice

Modelling behaviour: simplification

Purely deductive; compare to empirical evidence.