Game Theory

Lenka Kopečková

What did we learn in previous economic courses…?

- Adam Smith – „Invisible hand“
- „Laissez-faire“
- Neoclassical economics

  ⇒ No state interventions…???

Game theory

- The study of mathematical models of conflict and cooperation between **rational decision-makers**

- Rational decision-maker
  - has all necessary information
  - has unlimited computational skills
  - has no emotions
  - has only purpose: to maximize his own utility

Prisoner's dilemma

- Bob and Dale have committed a crime. Police arrested them and put them into a separate cells so that they cannot communicate with each other. Both of them are offered a same deal by the police. The deal is:
  - **If one confess the crime and his partner denies** taking part in the crime, the one goes free (due to mitigating circumstances) and his partner goes to a prison for 20 years.
  - **If both confess the crime** they will serve 5 years each.
  - **If both deny taking part in the crime**, the police can only arrest them for some minor crimes and they both go to prison for 1 year.

	Bob		
Dale		Not confess	Confess
	Not confess	1,1	20,0
	Confess	0,20	10,10

- **Dominant strategy**: if, regardless of what other players do, one strategy earns player a larger utility than any other.

- **Pareto improvement:** a change to a different allocation that makes at least one individual better off without making any other individual worse off.

- **"Pareto efficient" or "Pareto optimal"** if no further Pareto improvements can be made.

Asymetric preferences

John and Anna like going out to dance. They definitely prefer going dancing over sitting at home. As it sometimes happenes, John likes Anna, but Anna does not like him at all. That is also the reason why they do not arrange the plans in mutual cooperation. John enjoys dancing the best if Anna is there, however he still has fun even if Anna is not coming. Anna, on the other hand, enjoys dancing only without John and she rather prefers staying at home over dancing with John.

	John		
Anna		Stay at home	Going to dance
	Stay at home	2,0	2,1
	Going to dance	3,0	1,2

Battle of sexes

Peter and Jane are dating. Before they went to work, they disccused plans for the evening. Jane wanted to see a balleet but Peter wanted to see a fotball game. They decided to make the final deal during the day, but Jane forgot her mobile phone at home, so they couldnt comunicate with each other. The most important for both of them is to spend the evening together with the other one, even though it wouldn’t be at the event that s/he wanted. If one goes to fotball and the other to ballet, they will not have fun and will rather go home.

	Jane		
Peter		Fotball	Ballet
	Fotball	2,1	0,0
	Ballet	0,0	1,2

- **Nash Equilibrium:** a set of strategies, one for each player, such that no player has an incentive to unilaterally change his action,because unilateral change would decrease his utility

- How is it with motivation to (not) cooperate in these situations?
  - one shot game
  - finitely repeated game
  - infintely repeated game

Hawks and Turtle-doves

In the population of birds exist only two species: Hawks and Turtle doves. Hawks are very agressive and they always fight to get all the food, even though fighting is very exhausting. Turtle doves prefer sharing and they avoid the fight even if it means, that they would have to leave the spot and they don't get anything.

One fight consumes 10 calories and one portion of the food contains 12 calories.

Which of the species will survive?

- If Turtle dove meets other Turtle dove, they share the food
- If Turtle dove meets Hawk, Turtle dove escapes and hawk gets everything.
- If Hawk meets Hawk, they fight and winner takes it all

If there are only 2 birds:

	Bird 1		
Bird 2		Hawk	Turtle-dove
	Hawk	-4,-4	12,0
	Turtle-dove	0,12	6,6