ASERI
ALTA SCUOLA DI ECONOMIA E RELAZIONI INTERNAZIONALI
Università Cattolica del Sacro Cuore

Master in International Cooperation and Development (MIC&D)

Thinking strategically: Conflict and Cooperation

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First theme:
The dilemma of cooperation

Variety of goods…

Which is/are the main difference(s) between an iPhone and a lighthouse?

The dilemma of cooperation

- Exclusion and Rivalness in either consumption or use

Exclusion	Rivalness: Rival	Rivalness: Not Rival
Feasible		
Infeasible		

Characteristics of Goods - I

- The benefits produced by the consumption/use of a good are **excludable** when it is relatively easy (feasible) to exclude someone from deriving benefits from the good once this good is provided
- The benefits are **non-excludable** when none can be excluded from deriving benefits from the good once this good is provided.

Characteristics of Goods - II

- The benefits produced by the consumption/use of a good are **rival** when one individual's consumption of the good detract from the consumption opportunities still available to others from the same unit of the good

- The benefits are **nonrival** when one individual's consumption of the good does not detract, in the slightest, from the consumption opportunities still available to others from the same unit of the good

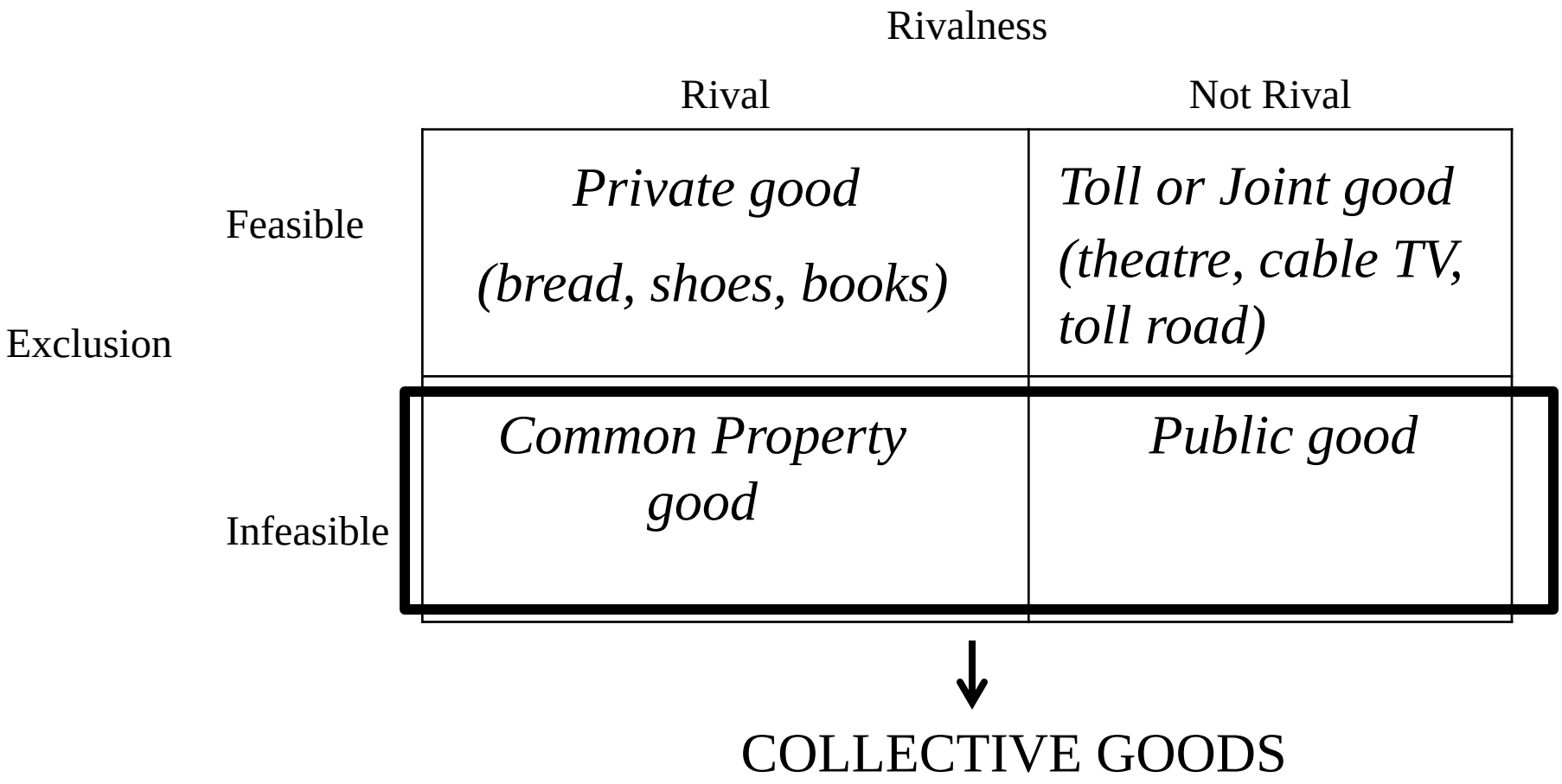
The dilemma of cooperation

- Exclusion and Rivalness in either consumption or use

Exclusion	Rivalness: Rival	Rivalness: Not Rival
Feasible	*Private good (bread, shoes, books)*	*Toll or Joint good (theatre, cable TV, toll road)*
Infeasible	*Common Property good*	*Public good*

The dilemma of cooperation

- Exclusion and Rivalness in either consumption or use



Public Goods

- A first property of a public good is that its benefits are **non-excludable**

- A second property of a public good is that its benefits are **nonrival**

- Some examples of Public Goods: national defense, the cleaning of a polluted river, the reduction of CO2 emission, the building of a lighthouse

Common Property Resources

- Analogously, CPR are characterized for being rival and **non-excludable** (i.e., they present an open access)

- Overfishing (whales; fish in a lake…)
- Forests
- Animals
- Water pollution (collective bad…)

The dilemma of cooperation

- A *collective good* is any good in which a group of individuals is interested (i.e., from which each of them thinks she will benefit) and which, if provided to one member of the group, cannot be withheld from any other member
- Therefore, *any activity aimed at the provision of a collective good is defined as a collective action*

The dilemma of cooperation

- Goods where exclusion is difficult to attain present **serious problems** in human organization. Why that?
- The **(Cooperator's) dilemma**: if a **non-excludable good** is supplied by *Nature* or by the efforts of *other individuals*, each individual will be free to take advantage of the good since (s)he **cannot** be excluded from its use or enjoyment

The dilemma of cooperation

- The likely short-run consequence is that voluntary efforts will usually fail to *supply* in case of a public good (or to *preserve* in case of a common) a satisfactory level of these goods. That is:

Not always a group of individuals who shares a common interest will voluntarily act so as to try to further this interest

- How is it possible? Which is the logic behind all that? A theoretical framework to analize these social dilemmas: **game theory**

The dilemma of cooperation

- What is a **game?** A game is a situation in which an individual's ability to achieve his/her goals depends on the **combination** of her choice with the choices made by other identifiable actors

The dilemma of cooperation

- What is **game theory**? Game theory investigates **strategic** behaviours, that is all those situations in which the choices of one actor depend (also) on the **choices** made by other actors. Game theory therefore is a means of organizing thinking about the underlying **motivations** of actors and its **consequences**

- Strategic behavior also involves a *recognition* of this **interdependency**. That is one player thinks that the other player will act in a certain way, and so the first player acts on this belief. Moreover, the other player **anticipates** the first player's belief-based action and, in turn, acts on this belief, and so it goes

The dilemma of cooperation

- The treatment of game theory here is **brief** and intended to provide some useful principles
- This will help us also to **(re)design** institutions or interactions to promote more desirable responses
- Sometimes simple actions can change the incentive structures so that individuals act in a way that furthers the common good

The dilemma of cooperation

- The basic concepts of a game:

  Games have a set of **Players**, and each player has a set of possible choices to make according to the **Rules** of games (a sequence of actions or simultaneous ones; information; etc.)

  Players are **Rational**, i.e, each player does what she believies is in her best interest given what she knows at the time of choosing (i.e., all actors present a **transitive** and **complete** preference ranking)

The dilemma of cooperation

- **Assumpion of completeness**: the decision maker is assumed to make her choices in accordance with a complete preference ordering over the available options (in the space)
- **Assumption of transitivity**: If alternative A is (weakly) preferred to alternative B, and B (weakly) to C, then A is (weakly) preferred to C

The dilemma of cooperation

The interests are reflected in the **Payoffs** associated with each possible outcome of the game

Therefore, the payoffs in a game indicate how the players value each of the possible outcomes.

Players **prefer** outcomes with higher payoffs to outcomes with lower payoffs.

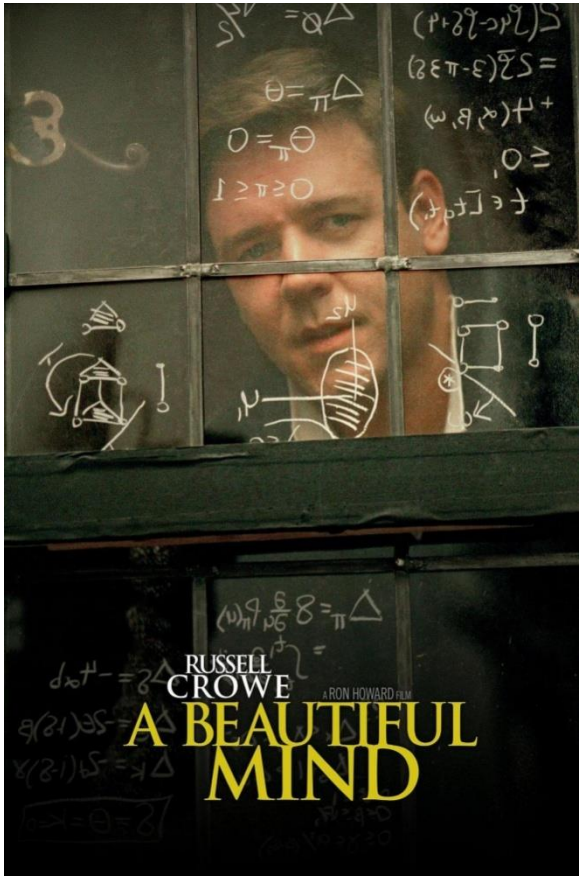
The dilemma of cooperation

- To solve a game we have to identify the **Strategies** (i.e., the sequence of actions) that the rational players would employ. By solving a game it becomes possible to say something about what we **expect** the players do in the type of strategic situation being examined

- An important solution concept for games is called a **Nash equilibrium**. A Nash equilibrium is a set of strategies in a game (one for each player) such that no player has an incentive to **unilaterally switch** to another strategy. In other words, no player has an incentive to change her mind given what the other player(s) is(are) doing

Solving a game

- A little help from a friend (part I):
- http://www.youtube.com/watch?v=36M_wWShgMY



The Prisoner's Dilemma

•The problem of cooperation through a game: the **Prisoner's Dilemma**

•The **storyline** behind: suppose that a **bank robbery** is committed by two individuals matching the description of two suspects, who were in the vicinity of the bank. The true culpability of the suspects is irrelevant to the game.

• Shortly after the crime, the suspects are caught and brought before a judge, who possesses **insufficient evidence** to convict them unless she can convince at least one of the suspects to confess. The judge however can always find some ways to condemn them to a **1-yea**r jail sentence no matter what

The Prisoner's Dilemma

- Further suppose that the maximum sentence for bank robbery is **9 years**
- The prisoners are **interrogated separately**, in which they are offered the **following deal**: a much-reduced sentence of just **2 months** if one of them confesses and the companion does not, or a reduced sentence of **5 years** apiece if both confess. In the case of a single confessor, the non-confesser receives the maximum sentence allowed (i.e., **9 years**).

The Prisoner's Dilemma: a 2 by 2 matrix

		Adam	
		Do not confess	Confess
Eve	Do not confess	*1 year, 1 year*	*9 years, 2 months*
	Confess	*2 months, 9 years*	*5 years, 5 years*

The Prisoner's Dilemma: comments

- Even thought the judge cannot convict on the robbery charge and it is in the suspects' **collective interests** not to turn state's evidence (i.e., to cooperate among themselves), it is likely that **both will confess**, claiming that the companion made him to do it. But **why**?

- To understand this outcome, we must explore the **underlying** configuration of payments and its implication for identifying the anticipated strategy or choice of the suspects.

The Prisoner's Dilemma: solving the game

- Let's solve the game by looking for its NE
- Remember: A NE is a set of strategies in a game (one for each player) such that no player has an incentive to unilaterally switch to another strategy. In other words, no player has an incentive to change her mind given what the other players are doing

- **Hint**: according to the story, both players **know** the strategies available and the associated payoffs (in game-theoretical jargon: these aspects are *common knowledge*...)

The Prisoner's Dilemma: solving the game

- Phase 1: If you were Eve…
  - What would you do – which is your best-reply – if Adam chose to confess?
  - What would you do – which is your best-reply – if Adam chose not to confess?

The Prisoner's Dilemma: a 2 by 2 matrix

		Adam: Do not confess	Adam: Confess
Eve	Do not confess	*1 year, 1 year*	*9 years, 2 months*
	Confess	*2 months, 9 years*	*5 years, 5 years*

The Prisoner's Dilemma: solving the game

- Phase 2: If you were Adam…
  - What would you do – which is your best-reply – if Eve chose to confess?
  - What would you do – which is your best-reply – if Eve chose not to confess?

The Prisoner's Dilemma: a 2 by 2 matrix

		Adam: Do not confess	Adam: Confess
Eve	Do not confess	*1 year, 1 year*	*9 years, 2 months*
	Confess	*2 months, 9 years*	*5 years, 5 years*

The Prisoner's Dilemma: solving the game

- Each situation where both players play their best-response to each other actions at the same moment is a NE!
- So which is the NE in our case?

The Prisoner's Dilemma: a 2 by 2 matrix

		Adam: Do not confess	Adam: Confess
Eve	Do not confess	*1 year, 1 year*	*9 years, 2 months*
	Confess	*2 months, 9 years*	*5 years, 5 years*

The Prisoner's Dilemma: comments

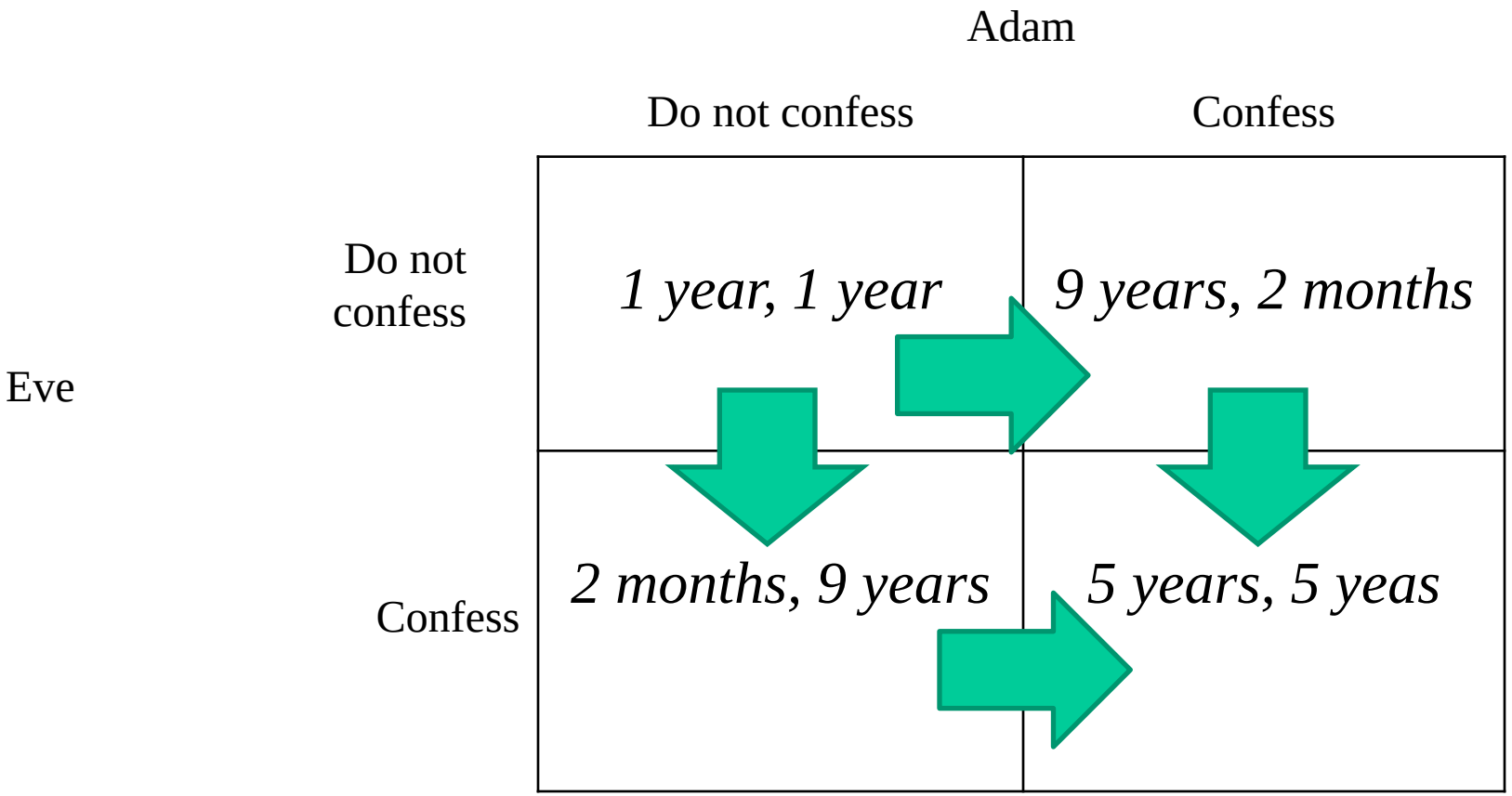
• Mutual confession is a Nash equilibrium (**the best reply to each other strategy**)

• This final outcome does not depend on the fact that the players are in some "metaphysical" sense bad or egoistic! It is also due to their **uncertainty**

• **Interestingly**, both players **would be better off** if they kept quiet than if they played their Nash equilibrium strategy. However…

• The criminals may well have promised each that if they were both caught they would keep quite. The problem is that these promises are **not credible**. Once they are caught, the criminals have a (dominant) strategy to talk

The trap of the game!



Which lesson(s) have we learnt?

The absence of cooperation represents therefore a **dilemma** – **individual rationality** leads players to an outcome that is an inferior one, i.e., both players agree on the fact that the same alternative outcome is a better one for them. Still they **cannot** reach it

The Prisoner's Dilemma: a generalization

Let's rank the payoffs of players from the lowest to the highest one. Any game (any strategic interaction) that presents this same preference ranking (irrespective of the value of the payoffs itself) is a PD!

		Player B: Cooperate	Player B: Do not cooperate
Player A	Cooperate	*3,3*	*1,4*
	Do not coopeare	*4,1*	*2,2*

PD and Collective Goods

- Image you are a farmer. Your neighbouring farmer and you can both benefit by constructing an irrigation and flood-control project.
- The two of you can join together to do this, or one might do so on his own. However, once the project has been built, the other automatically gets some benefit from it (it is a **collective good** for the two farmers!!!). That is the essence of their strategic interaction and the difficulty of securing collective action

- The costs and the benefits associated with building an irrigation project can **depend** on which player partecipates

PD and Collective Goods

- Suppose each of you acting alone could complete the project in 7 weeks, whereas if the two of you acted together, it would take only 4 weeks of time from each. The two-person project is also of better quality; each farmer gets benefits worth 6 weeks of work from a one-person project (whether constructed by you or by your neighbour), and 8 weeks' worth of benefit from a two-person project (there are some economies of scale and scope when you work together!)

- Let's represent the matrix of the situation and predict the equilibrium

PD and Collective Goods

Eve \ Adam	Cooperate	Defect
Cooperate	*4, 4*	*-1, 6*
Defect	*6, -1*	*0, 0*

Which is the (Nash) equilibrium?

The tragedy of commons

- **Avoiding a collective bad:** since Garrett Hardin's challenging article in Science (1968), the expression *tragedy of the commons* has come to symbolize the degradation of the environment (of CPRs) to be expected whenever many individuals use a **scarce resource** in common.
- To illustrate the logic structure of his model, Hardin asks the reader to envision a pasture **open to all**. He then examines the structure of this situation from the perspective of a rational herder
- Suppose that the pasture has reached a balance in terms of cows grazing on it and that, by increasing the number of cows grazing, the pasture will start to detoriate itself
- So what about **herders' incentives**?

The tragedy of commons

- If the herder decides to **defect** (i.e. bringing one more cow on the hear to graze):
  - ***Benefits***:

  a direct benefit from bringing his own animals

  - ***Costs***:

  (delayed) costs from the deterioration of the commons when his and others' cattle **overgraze**

  Besides, these costs are **shared** with the others.

  Finally, it is **only** one more cow, come on! It will have just a very tiny impact on the commons!

The tragedy of commons

- If the herder decides to **cooperate** (i.e. restraining his/her behaviour):
  - ***Benefits***:

  the pasture does not risk to be overgrazed. But this benefit (shared with others!) is **uncertain** (it depends also on the behaviors of the other herders).

  Moreover, by **restraining** your behaviour, you will just leave more commons available to the over-exploitation of the other farmers…

  - ***Costs***:

  a direct and personal one

A Collective-good example with N players

- To restrain or not to restrain? This is the (Mr. Red) dilemma! One more cow or no?

		Others' choice	
		To restrain	Not to restrain
Mr. Red choice	To restrain	**Benefit** (shared)= pasture not overgrazed **Cost** (personal) = giving up the benefits of one more cow	**Benefit** (personal)= 0 **Cost** (shared) = pasture overgrazed
	Not to restrain	**Benefit** (personal+shared) = the benefits of one more cow pasture not overgrazed **Cost** (shared) = almost zero	**Benefit** (personal)= the benefits of one more cow **Cost** (shared)= pasture overgrazed

The tragedy of commons

- Each herder is motivated to add more and more animals…

"Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit – in a world that is limited"

The tragedy of commons

- Many of the earth's greatest treasures – its oceans, its atmosphere, its fisheries – are **owned in common with open access** and thus are subject to wasteful exploitation
- Not only global commons though! Local commons are crucial for the well-being of many (poor) families in the developing world

A pessimistic ending????

The borders of collective action

- Accepting the "free-rider" as an *analytical tool* does not **necessarily** implies that its predictions always turn into reality

- In other words: the central question of collective action (CA) theory is not **whether** collective action is rational, but rather **when** it is rational, that is, under which circumstances individuals find that the benefit of participation exceeds their personal cost

The borders of collective action

• REMEMBER: Common interests are the mere **occasion** for collective action. But the mere fact of common interest does not define nor determine behaviour

• In this sense, we must always keep the participants' incentives in mind to devise the **right solution** to a problem, without assuming that the problem is not present

The borders of collective action

•The first thing to notice is that the dilemma of CA is not the **same** for *anyone*, *anywhere* and *anytime*: i.e., attempts to make sweeping generalizations about collective action are misguided

• Instead, the **specifics of the problem** and the nature of **potential solutions** can vary greatly depending on the nature of the collective good and the social structural situations within which people make interdependent choices

•So which possible solutions are available out there?

The borders of collective action

(possible) Solutions to CA problems

		Deliberation	
		Unplanned order	Planned order
Ontology	Spontaneous order	Market (state of nature) (private interest)	Contract (constitution) (reason)
	Contingent order	Community (civil society) (tradition)	Hierarchy (state) (force)

- Deliberation: Do people forge a solution?
- Ontology: Are only individuals (and their norms) involved?

The borders of collective action

• Of these four possibilities, Market approaches change the **parameters** of the canonical model of CA. The other three sets of solutions vary the **context** in which the baseline model is placed

• The search for solutions to the CA problem is *therefore* a search for the impact of institutions, in combination with actors' resources and possibilities, preferences, and beliefs /expectations, on the location and nature of equilibria