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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Third theme:
Which solution? The market

Which solution? The market

		Deliberation	
		Unplanned order	Planned order
Ontology	Spontaneous order	**Market (state of nature)**	Contract (constitution)
	Contingent order	Community (tradition)	Hierarchy (state)

- Deliberation: Do people forge a solution?
- Ontology: Are only individuals involved?

Which solution? The market

- Starting point of the market approach: a group consists of a number of individuals who share an interest in a collective good. They do not have any explicit organization or institutions (i.e., no community, hierarchy or contract). Any collective action by such group must be understood as the aggregated behaviour of its individual members, acting as "atoms"
- How can a change in **exogenous** variables create changes in endogenous dynamics?

Which solution? The market

- Increasing benefits (or lowering the costs): creating a **privileged group**
  - For at least **one** individual *in the group* must be true that the marginal benefits of cooperation are greater than the marginal costs
  - To better understand this point, let’s introduce the utility fuction for player *i* linked to the production of either a collective-good not-rival (public good) or rival (common good)

Which solution? The market

- Some definitions:

U_i= utility for player *i*
k_i = the choice of *i*. If she cooperates, then k=1; otherwise k=0
n = group size
c = **marginal cost** for player *i* to cooperare
b = **marginal benefit** for player *i* of the availability one more unit of the not-rival collective good (i.e., a public good)
b/n = **marginal benefit** for player *i* of the availability of one more unit of the rival collective good (i.e., a common good)

Which solution? The market

- Utility function for a **common good** produced by a CA :

$$U_i = \frac{b}{n}\sum_{j=1}^{n} k_j - ck_i$$

- Utility function for a **public good** produced by a CA :

$$U_i = b\sum_{j=1}^{n} k_j - ck_i$$

PD and Collective Goods

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

Which are the **three main properties** of a PD (i.e., of the dilemma of cooperation?)

Which solution? The market

- **First**: there must be an incentive to defect (to free-rider). That is $D(m)>C(m)$ (where "m" is the number of people who cooperates). If we have just 2 players, then: $D(1)>C(1)$

- **Second**: everyone prefers a situation where everyone cooperates rather than a situation where none does it. That is $D(0)<C(n-1)$. If we have just 2 players, then: $D(0)<C(1)$

- **Third**: everyone prefers a situation where everyone defects rather than being the only one to cooperate. That is $D(0)>C(0)$. If we have just 2 players, then once again: $D(0)>C(0)$

- Let's try to express these two assumptions in the previous utility functions

- If the players are two, it must be true that…

Which solution? The market

- For rival goods: b>c>b/2 with c>0
- For not-rival goods: 2b>c>b with c>0
- In both cases, **marginal cost** > **marginal benefit**!
- Let’s go back at the begininng of our discussion

Which solution? The market

- What happens if at least for <u>player A</u> now is true that **marginal cost** < **marginal benefit**? Let's find the new NE in the case of a commons (in the case of a public good the results are the same). If **marginal cost** < **marginal benefit for player A,** then b/2>c

		Player B	
		Cooperate	Defect
Player A	Cooperate	*b-c, b-c*	*b/2-c, b/2*
	Defect	*b/2, b/2-c*	*0, 0*

Which solution? The market

- Now the NE has changed! A **privileged group** is a group in which for at least one player is true that **marginal benefits > marginal costs**. When this happens (at least) some quantity of the collective good can be produced!

Which solution? The market

- **How to create a privileged group**? In the previous case player A gains great(er) benefits from contributing toward the CA, and hence will do so. Or to put it another way, a person's contribution to a **collective good is a function** of the public benefits that a person can internalize by means of contributing to that collective good (i.e., the marginal benefit of his contribution to herself…), rather than the public benefits or externalities generated for everyone else by that contribution

- In short: preferences (and the **degree of intensity of them**) are relevant to CA problems!
- **First lesson**: try always to frame a CA so to create a privileged group!

Which solution? The market

- Privileged group in practice
- Examples from the *international relations* (IR) literature: a single member of the group who sustains most or all of the cost of a collective good is referred to as a “hegemon” (Kehoane 1984). This single, strong actor acts as a leader and stabilizer: it absorbs the costs of CA, making and enforcing rules, regimes, and institutions
- Kehoane puts this idea at the centre of the theory of **hegemonic stability in international relations**. *Pax Romana*, *Pax Britannica*, and *Pax Americana* are examples of international order by a single dominant player who acts as an international leader

Which solution? The market

- The role of **expectations**: in a PD the expectations on others' behaviours are not that relevant…Why?
- In other situations, however, they could become relevant…
- Let's go back to our game with the two farmers
- Now something has changed…

Which solution? The market

- Suppose that an NGO can help the farmers by introducing a **new technology** that **reduces the time needed for work**.

- Benefits are the same (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), but **now** the one-person project requires 4 weeks of work, and the two-person project takes 3 weeks from each.

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

A Chicken game!

		Adam: Cooperate	Adam: Defect
Eve	Cooperate	*5, 5*	*2, 6*
	Defect	*6, 2*	*0, 0*

Which is the (Nash) equilibrium(a)?

A Chicken game!

		Adam: Cooperate	Adam: Defect
Eve	Cooperate	*5, 5*	***2, 6***
Eve	Defect	***6, 2***	*0, 0*

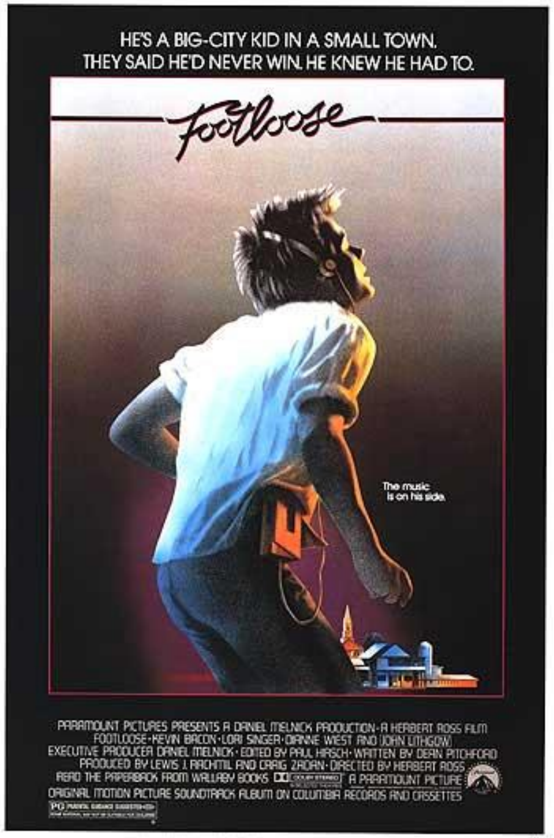
Solving a game

- A little help from our friend (part II): http://www.youtube.com/watch?v=Fn7d_a0pmio&feature=related

- A Chicago teenager called Ren moves to a small city in Iowa. Ren's love of dancing and partying causes friction with the community. Much of the movie centers on the competition between Ren and the local tough guy named Chuck

- At one stage Chuck challanges Ren to a "**tractor face-off**". In this face-off Ren and Chuck have to drive tractors directly at each other.
Whoever swerves out of the way first is considered a "chicken"

- But wait a minute…that's once again our game!



Which solution? The market

- Now suppose that the NGO can help the farmers by introducing a **new technology** (for example, a new type of vegetable) that is more efficient compared to what is normally grown by farmers but **that requires a larger amount of water** for that

- This leaves the costs of building as originally set out (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). On the other side, it reduces the benefit of a one-person project to 3 while increasing the benefit of a two-persons project to 12 (given that the two-persons project is of a better quality, i.e., provides more water)

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

An assurance game

Eve \ Adam	Cooperate	Defect
Cooperate	*8, 8*	*-4, 3*
Defect	*3, -4*	*0, 0*

Which is the (Nash) equilibrium(a)?

An assurance game

		Adam: Cooperate	Adam: Defect
Eve	Cooperate	***<u>8, 8</u>***	*-4, 3*
	Defect	*3, -4*	***<u>0, 0</u>***

Which is the (Nash) equilibrium(a)?

Which solution? The market

- Let's generalize now our "irrigation system game"
- Let's define:
- b1 = benefits for each player when the irrigation system is built by one farmer
- b2 = benefits for each player when the irrigation system is built by both farmes
- c1 = costs for building the irrigation system alone
- c2 = costs for building the irrigation system together

A generalization

		Player 2	
		Cooperate	Defect
Player1	Cooperate	*b2-c2, b2-c2*	*b1-c1, b1*
	Defect	*b1, b1-c1*	*0, 0*

1. We have a PD iff : $b1>b2-c2$; $b2-c2>0$; $0>b1-c1$
2. We have a chiken iff: $b1>b2-c2$; $b2-c2>0$; **$0<b1-c1$** (we have to decrease the “risk of participation”: either by increasing b1 or decreasing c1)
3. We have an assurance iff: **$b1<b2-c2$**; $b2-c2>0$; $0>b1-c1$ (we have to decrease the “tempatation to free-riding” either by increasing b2 or decreasing b1 or c2)

Which solution? The market

- So a possible way to partly solve the Cooperator's Dilemma is trasforming it in either Chicken or an Assurance game. How? By affecting "*the risk or participation*" or "*the temptation to free-riding*"

- Such a **swap in a player's preference** ordering could easily be seen as resulting from a marginal change in their priorities, constraints, or perceptions of their strategic situation

Which solution? The market

- An example taken from the arms race during the Cold War and its ending

- During the Cold War both URSS and USA had plausibly a typical PD preference ranking with respect to the arms race: b1>b2-c2; b2-c2>0; 0>b1-c1

		URSS: Stopping	URSS: Going on
USA	Stopping	*4, 4*	*-1, 6*
USA	Going on	*6, -1*	*0, 0*

Which solution? The market

- Now suppose that due to the **prolonged economic slowdown**, URSS economy was no longer able to sustain the enormous costs imposed by the arms race. Which are the consequences on URSS preference ranking?

- "*going on*" is not anymore always preferable to "*stopping*". The NE in this situation changes dramatically…(as well as the Cold War…)

Which solution? The market

		URSS	
		Stopping	Going on
USA	Stopping	*4, 4*	*-1, 6*
	Going on	*6, 1*	*0, 0*

For URSS now we have: b1>b2-c2; b2-c2>0; **0<b1-c1**

Which solution? The market

		URSS	
		Stopping	Going on
USA	Stopping	*4, 4*	-*1, 6*
	Going on	***6, 1***	*0, 0*

This illustrates how a change in one player's priorities or constraints can fundamentally change the nature of the game

Which solution? The market

- The impact of the **social composition function (technology)**: it refers to the manner in which individuals' provision or participation levels are aggregated to yield a group provision or consumption level of the collective good

Summation technology: $Q=\sum^{n}_{i=1}q_i$. where q_i is the collective good's provision level of individual *i* and *n* is the group size. Here the quantity supplied is **additive** with respect to each individual's contribution. Summation implies perfect **exchangeability** between the q_i's. For example: the elimination of pollution from a shared ecosystem

Which solution? The market

Weakest-link technology: $Q=\min(q_1,\ldots q_n)$. the **smallest provision level** of the group determines the collective provision. Here the failure of anyone is fatal to the all. The weakest link may apply to the scenario where a **military alliance** fortifies a perimeter against a common threat. If security depends on keeping the enemy from breaking through, then the poorest fortification along the front determines the level of collective security. Prophylactic actions to forestall the advance of a disease may also abide by the weakest-link technology

Best-shot technology: $Q=\max(q_1,\ldots q_n)$. It equates provision to the **largest** individualized effort. The discovery of a cure for a disease, or a dragon slaying

Which solution? The market

- According to the **technology**, the probabilities to solve the cooperator's dilemma can increase or decrease. Which of the previous technologies represents the most favorable scenario and why?
- The *weakest-link technology* scenario: here the participation of each player is decisive! Therefore, for each participant is true that **marginal benefits > marginal costs**!

Which solution? The market

• Even the **type of collective good** that we must produce **matters** The production of a **step** (or **lumpy**) good: a collective good that is provided or not

- Let's assume a group of *n* individuals
- If *K* persone cooperate, then the collective good is produced (for example, a lobbying effort is succesfull). However, if $z>K$ cooperate, the amount of collective good does not change
- If the collective good is produced, everyone gains *b* (*b/n* if we consider a commons…)
- If a player cooperate, she pays a cost $c>0$
- Let's assume also that $b> c$

Let's represent the situation from the point of view of player *i*

The step-good game

		Number of other players cooperating		
		Less than K - 1	K - 1	K or more
Player *i*	Cooperate	$-c$	$b - c$	$b - c$
	Defect	0	0	b

What should do player *i*?

The step-good game

Number of other players cooperating

Player *i*	Less than K - 1	K - 1	K or more
Cooperate	$-c$	$b - c$	$b - c$
Defect	0	0	b

The step-good game

- Each player prefers to not contribute rather than contribute as long as any number other than *K*-1 players is contributing
- We can have just **two** possible NE. Which ones?

The step-good game

- First NE: **None cooperate**
- Second NE: **Exactly *K* players cooperate**

- In both cases no one has an incentive to change his/her own behavior (that's why it is an equilibrium!)

- So to solve this CA, we must have *K* individuals that must believe that them, and exactly them, have a positive probability to cooperate. A crucial aspect is related to *K* and to the relation between *n* and *K*

The step-good game

- If $K = n$, then there is no incentive to *free-riding*. A similar situation to the *weakest-link technology* case
- Everyone must cooperate to get the collective good and everyone knows it
- If $K < n$, then an incentive to free-ridings arises
- The greater the difference between K and n, the greater is the incentive to free-riding
  - Given that only few persons must cooperate, why bothering of being one among them?
- In all cases, the type of collective good to produce can move a CA far away from a typical PD

The step-good game

•A limiting case: the Kitty Genovese case (New York, Queens, 1963) and the diffusion of responsability

• Saving the life of Kitty is worth b; the (opportunity) cost of calling the policy is c; clearly c is MUCH HIGHER than c, however…The **problem arises** because the number of spectators is multiple: Kitty's problem was not so much that she was object of <u>indifference</u>, but that she was <u>overobserved</u>

		The other spectators	
		Call	Not call
A typical spectator *i*	Call	*b-c*, …	*b-c*,..
	Not call	*b*, …	*0*, …

Team competition

- Assume that a dissident group is competing with a regime group. Both regime and opposition are thus **teams of players**. Each player on each team plays two games simultaneously. There is, first, the **between-team game**. This result is settled by the relative number of people **mobilized** by each team. Depending on the numbers of players mobilized by team 1 and team 2, each player on team 1 and 2 will receive some payoff.

- There is, second, the **within-team game**. Each player in this game faces a CA problem. Given that each member of the team hopes to enjoy a **costless victory** in the between-team game, each team member prefers that the other members of the team participate and the she does not.

Team competition

- Important difference between:

- ***Step-level*** *team game*: here the group that wins the competition and receives the public good is the one whose members' **total contribution** of some relevant input, like effort, money, bravery, **exceeds** that of the other group: sports competition and elections exemplify this type of conflict in its purest form. Three possible outcomes: winning, losing or drawing

Team competition

- *<u>Continuous</u> team game*: here the **reward** is divided between the two group based on the **margin** and not merely the **direction** of victory (i.e., how to divide a pie…), so that members of the group with more contributors receive a higher payoff, whereas those in the group with fewer contributors receive a lower payoff: labour-management negotiations, political disputes reflect this kind of situation

Team competition

- ***An example:*** 2 groups of students competing against each other for the best collective essay that is a function of the number of students cooperating. For each student that decides to cooperate, the **cost** is 1 hour of work

- **Step-level game**: if a group wins, everyone in that group gets a benefit equal to 2 hours of work; if it loses, everyone pays 2 extra hours of work; if it draws, everyone gets a benefit equal to 1 hour of work. What will you do?

- **Continuous game**: all the students in the group with more contributors, for each extra-person that participates, will receive a benefit equal to 30 minutes of work. What will you do?

Team competition

- With respect to the *continuous team game*, everytime the marginal costs are greater than the marginal benefits (i.e., 1 hour > 30 minutes in the previous example!), then team competition does **not** solve the CA

- This game remains a PD! Each player prefers that all the others, but himself, to cooperate; but as a single individual, he has an incentive to free-riding

- In this kind of game, you are never decisive or crucial for the final outcome (i.e., you are never decisive in moving the final result from losing to draw or from draw to winning)

Team competition

•With respect to the *step-level team game*, on the contrary, the CA is **solved** by team competition under some given circumstances . Which conditions?

•…**if** players assume that the two groups are roughly of **equal size** and that **all** the other enemies are **ready** to cooperate!

• In this case, the decision of each individual is once again crucial! $n=K$ for all!

Team competition

- The incentive to free-riding is minimized when the competing groups are perceived as equal in size, strength and cohesion (it is therefore advisable to avoid **overconfidence** or defeatism among members of your group!)
- This provides a valuable insight as to why intergroup conflicts are often portrayed in "**all-or-nothing**" terms (it's either victory for them or victory for us!). **Framing the conflict** as a step-level game has clear advantages from the perspective of the group, as it makes it rational for group members to contribute when they believe this is critical for their group's success (or to tie a game!!!)
- It is the need to overcoming the cooperator's dilemma that explains why leaders tend to frame the competition between teams in a **dramatic way**

Team competition

- However although cooperation is a **good thing** for the groups, in intergroup conflicts cooperation is typically **bad** from the collective point of view (ethnic conflicts for example)
- This finding suggests that framing intergroup as a "**win some, lose some**" rather than an "**all or nothing**" game, as well as downplaying the impact of individual contribution, can contribute to a peaceful solution
- *Peace initiative* that stresses the futility of individual contribution (given the high personal cost and the negligible effect on the outcome) have a good chance to succeed, as they have "**the temptation to free-riding on their own side**"!

Which solution? The market

- Evaluation of the Market solution: the key characteristics of all Market solutions is that they examine the **parameters** of a person’s decision-making situation

- However…

Which solution? The market

- We should also give the right attention to the **decision-making environment itself**. For example, from where a change of benefits or costs of beliefs come from? We should look at the **context** within which an actor makes decisions. So it is useful to regain a sense of that context
- Contract and Hierarchy solutions place the baseline model of CA (the Market one) in the context of contractual, and hierarchical institutions