ASERI
ALTA SCUOLA DI ECONOMIA E RELAZIONI INTERNAZIONALI
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Master in International Cooperation and Development (MIC&D)

Thinking strategically: Conflict and Cooperation

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Fifth lecture:
Which solution? The contract

Which solution? The contract

Ontology	*Deliberation*: Unplanned order	Planned order
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 contract

- Contract: planned and spontaneous order
  - In the canonical PD game potential cooperators act **independently** in an **interdependent situation**
  - The **contractarian view**: participants can as a group devise their own rules, institutions, and processes to avoid free riding, and opportunistic behaviour
  - But what makes contractarians **adhere** to an agreement without the Leviathan? How can a social contract evolve out of a Hobbesian state of anarchy?

Endogenous solutions? Yes, we can!

- Elinor Ostrom (Nobel Prize 2009) in her book *Governing the Commons* discusses several examples of resolution of collective action problems

- Most of these involve taking advantage of features specific to the local context in order to set up systems of defection and punishment

- The most striking feature of Ostrom's range of cases is their immense **variety**: some success, some failures

- Despite this variety, we can identify several common features that make it easier to solve cooperator's dilemmas

Which factors matter

1. It is essential to have a **stable group** of potential participants
2. It is very important that the members of the group can **communicate** with one another
3. The **benefits of cooperation** have to be large enough to make it worth paying the costs of monitoring and enforcing the rules of cooperation

Why do those factors matter? Usually the games are **played** more than once!

The shadow of the future

- Agents within a given context often confront the same CA problem period after period, in which uncoordinated actions can create considerable costs.

- Continual interactions bring a whole new dimension to the problems. Which ones?

- Two main changes in the game
- First: **temporal preferences**
- Second: **conditional strategies**

Which solution? The contract

- *Temporal preferences*

  • **Patient and impatient players**: better an egg today or a chicken tomorrow?

  In a PD, that means the short-run gains from defection on your promises must be weighed against the long-term losses from smaller cooperation or no cooperation whatsoever

  • How to model it?

Which solution? The contract

- *Temporal preferences*

  • The **discount rate** models how highly a person values the future as compared to the present

  • The discount rate at time *t* of player *i*: d^t_i, where $0< d^t_i,<1$, tells us the present value (PV) of *i*'s payoff to be made at *t* periods from the present (where *t* can refer to days, weeks, years, etc.)

  • A person with a discount rate close to 0 only cares about today. A person with a discount rate equal to 1 would be just happy to receive a million dollars in the future as she would be to receive it today

Which solution? The contract

- *Temporal preferences*
  - How to compute an infinite series
  - Two main scenarios (that we will employ…)
  - First: PV(present value) = $a+ad+ad^2+ ad^3+\ldots+ ad^n$ is equal to: PV=a/(1-d). How? Let's multiply both sides of the equation by (1-d)…
  - Second: PV(present value) = $ad+ ad^2+ ad^3+\ldots+ ad^n$ is equal to: PV=ad/(1-d)

Which solution? The contract

- *Conditional strategies:*
  - In iterated games there exists information about the **history of the game**. Strategy sets employed by each player may therefore expanded to include actions in one particular PD game-stage that are conditional upon prior PD game-stages
  - Conditional strategies (or *trigger stategy*): *grim strategy*; *tit-for-tat* (here a player begins by cooperating and then matches the opponents' previous-period play. With a tit-for-tat strategy, defection is immediately punished; this punishment is applied until a cooperative response is evoked)

Which solution? The contract

- *Conditional strategies:*
  - Cooperation is **more likely** if either the interaction is **never ending** or else the endpoint is **unknown**. Why?
  - Otherwise, if the players **know exactly** when the game is going to end, they will have an incentive to defect in the last period. But then the dominant strategy in the next-to-last period is to defect as well. And so it goes for all periods

Which solution? The contract

- When the game's **endpoint is unknown**, a player must compare the temptation payoff with the likely consequences or retribution on the defector in the future periods. And this depends on the kind of (**conditional**) strategies adopted by the players
- Let's assume just for sake of simplicity that player A expects that player B will employ a **grim-strategy**
- Which is the best reply for player A?

Which solution? The contract

		Player B: Cooperate	Player B: Defect
Player A	Cooperate	3,3	1,4
	Defect	4,1	2,2

Under which condition player A would be induced to play cooperation?

Which solution? The contract

		Player B: Cooperate	Player B: Defect
Player A	Cooperate	3,3	1,4
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When d>1/2 (i.e., player A should be enough patient/forward looking)

Which solution? The contract

		Player B: Cooperate	Player B: Defect
Player A	Cooperate	3,3	1,6
	Defect	6,1	2,2

Under which condition player A would be induced to play cooperation?

Which solution? The contract

		Player B: Cooperate	Player B: Defect
Player A	Cooperate	3,3	1,6
	Defect	6,1	2,2

When d>3/4 (i.e., player A should be **more** patient/forward looking than in the previous situation)

Which solution? The contract

- Let’s generalize our findings…
- Let’s call F the free-riding payoff, C the cooperation payoff, N the mutual defection payoff and L (“loser”) the payoff of the lone cooperator
- We have a PD, if F>C>N>L

A PD

		Player B: Cooperate	Player B: Defect
Player A	Cooperate	C, C	L, F
	Defect	F, L	N , N

F > C > N > L

Which solution? The contract

- Let's further assume that player A expects that player B will employ a grim-strategy
- Which is the best reply for player A?
- Player A will have an incentive to cooperate, iff: $d>(F-C)/(F-N)$
- Therefore, the probability to cooperate increases when: 1) d ↑; 2 C ↑; 3) F ↓; 4) N ↓

Linking the theory with the empirical facts!!!

- For example, a discount rate close to 1 is most likely to characterize members of a long-lived community

Which solution? The contract

- Interpretation:
  - Cooperation in the repeated PD game can happen! In this case, players will employ an initially suboptimal policy (a dominated strategy) in the long run because such a policy trades smaller short-term gains for larger long-term ones

Which solution? The contract

- Linking two (or more) games: **parallel games**
- Players do not only interact over time. Sometimes they play **more** games **at the same moment**
- The example of the Japanese firms. Why Japanese firms use (used) to subsidize the social activities of their workers outside of the working place?
- We have two games now. The work-game and the social-game

Which solution? The contract

• We just saw that in an iterated game, if d>(F-C)/(F-N), then a possibility of cooperation arises. But now we have two games **played simultaneously**!

• In this scenario, the **conditional strategy** is not only affected of what is happening in one single game, but also to what is happening in the other game

• A typical **conditional strategy** now requires to link the behaviour of one player to what the other player is doing in **both** games

Which solution? The contract

• Let's assume that in the second game (the social one) coooperation is feasible, that is : d>(F-C)/(F-N), while in the first game (the working one) it is not so, that is: : d<(F-C)/(F-N)

• Let's call Bs the net benefits from cooperation in the **second** game (Bs = C/(1-d)-[F+dN/(1-d)]) and Ps the net costs of cooperation in the **first** game (Ps = [F+dN/(1-d)]-C/(1-d))

• If Bs>Ps, then if we have connected the two games, cooperation in the second game allows to **produce** cooperation also in the first game

• However, if Bs<Ps, then connecting two games can **destroy** the cooperation also in the second game

Details can make a difference!

- Let’s see the relevance of what just discovered
- A well-known, and pretty useful, example: **irrigation systems** in Nepal (i.e. they are collective goods!!!)
- Donor intervention through the Agency Managed Irrigation Systems: to increase agricoltural yields and crop intensities, several traditional irrigation systems, usually managed by the farmer community by its own, have been replaced by new ones with a **permanent structure** made by concrete. Beyond being more modern, the new structure required also **less maintenance-work** from the farmer community to keep it clean and working

Details can make a difference!

- The results:

- On average the replaced (and more modern) irrigation systems worked (much) more poorly than the traditional ones after just few years.

Let’s see why

Details can make a difference!

How external interventions may create disruptive asymmetries as an *unintended* effect of financial assistance

- For farmers to seriously consider constituting themselves into even a loose form of association to construct an irrigation system, they would need to share the following:

Details can make a difference!

1. A **common** understanding that they would each be able to increase their **agricultural yields** enough through the provision of an irrigation system potentially to compensate each of them – depending on the sharing formula agreed upon – for the costs of their immediate and long-term investment
2. A **common** understanding that if they agree to a set of rules and follow accepted procedures to signify their agreement, then each participant would be *credibly* precommitted (will have an incentive…) to follow these rules or be sanctioned by the others for non-conformance

Details can make a difference!

3. **Trust** that most of the farmers, who agreed to a set of rules, would actually follow these rules most of the time so that the effort to monitor and enforce these rules would not be itself extremely costly (i.e. in equilibrium, everybody cooperates, so no need to enforce the rules!)

If this set of beliefs is not altered by experience so as to destroy the assessment made by each about the beliefs that others share and the likely strategies that others will adopt, such a set of farmers **would be able** to construct a system and operate it for a long period of time

Details can make a difference!

•In a nutshell, an institutional agreement (i.e., the set of rules that will be used to allocate the benefits derived from a physical facility and to assign responsibility for paying the costs of the facility) is successful when those who contribute to its continuance expect net benefits for themselves and their families that are *greater* than the alternative available to them

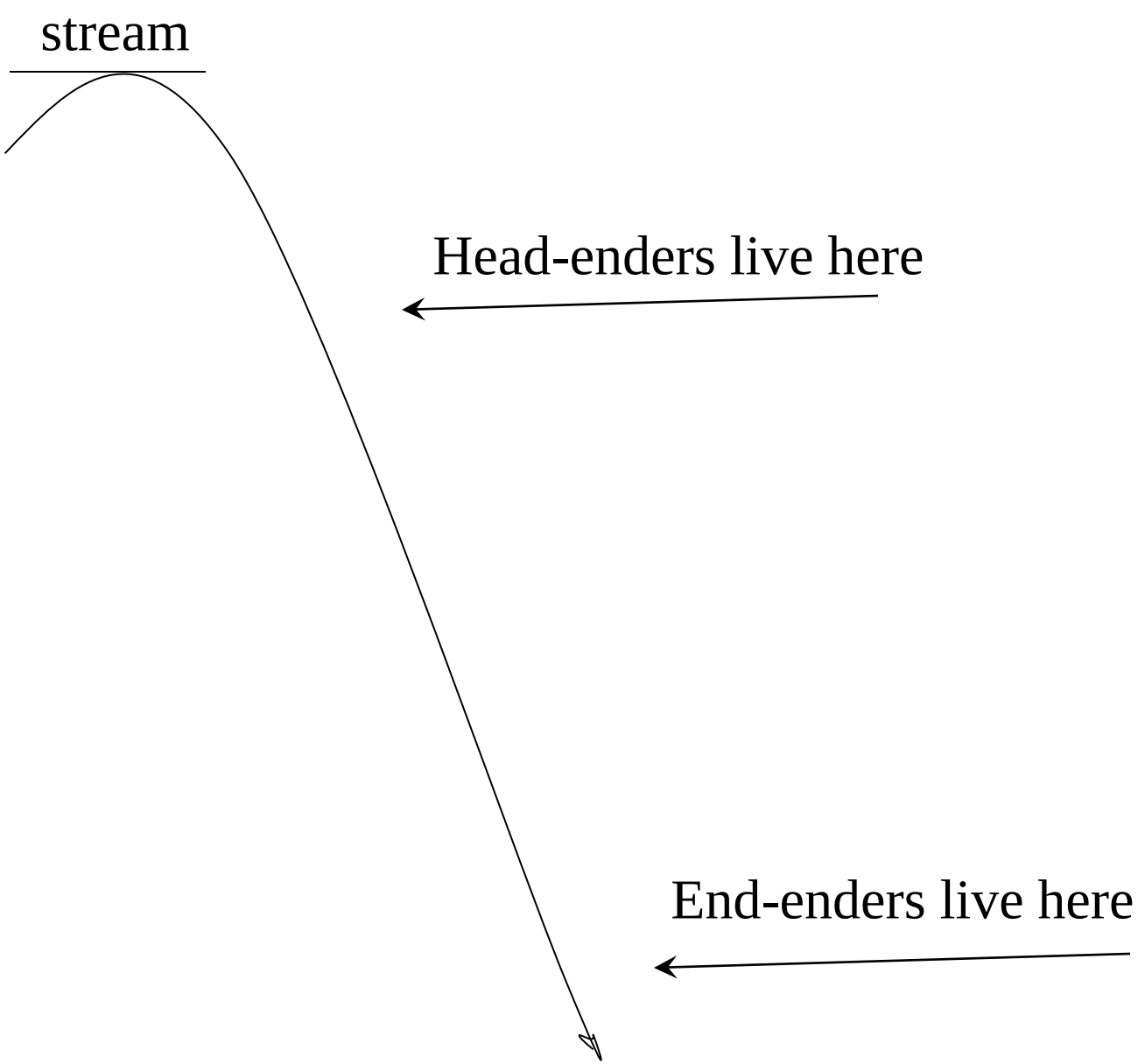
• Note that this also can imply that some farmers may be left **better off** than others. The less advantaged must feel, however, that they receive a positive gain from participation or they will not voluntarily participate

Details can make a difference!

• Let us assume that there is an **untapped mountain stream** and that a group of farmers wants to divert such stream to their area. Let us further introduce a substantial **asymmetry** related to physical location on the irrigation canal

• This a typical situation in Nepal: there are lots of mountains there after all!!!

Details can make a difference!



Details can make a difference!

• In this situation, the canal enters from one side. When this happen, some plots will receive water **before** the last ones. Irrigators located at the head end of a system (the head-enders) have differential capabilities to capture water and may not fully recognize the **costs** others bear as a result of their actions

• In addition, farmers located at the head end of a system receive proportionately less of the **benefits** produced by keeping canals (located below them) in good working order than those located at the tail (the tail-enders). These asymmetries are the source of considerable **conflict** on many irrigation systems

Details can make a difference!

• There is therefore a **close interrelationship** among the willingness to invest in maintenance, farmers' expectations about obtaining water, their expectations about the contributions others will make and the tensions that can exist among head-end and tail-end farmers. How to deal with this situation?

• One way is to craft rules that actually create and link two different games: the *game of water* and the *game of canal preservation*

• Why connecting the two games should matter?
• Which kind of **credible strategies** this connection make possible?

Details can make a difference!

•The connection of the two games allow the **following conditional strategy:**

•The head-enders commit not to take too much water in the **first game**, while the tail-enders commit to provide a disproportional amount of work for the preservation of the canal in the **second game**. What does this commitment **credible**?

• Keeping a traditional irrigation canal, usually built with **mud**, in good conditions require a large amount of work!
• That is, for both groups of farmers it is true that Bs>Ps as soon as the two games become interlinked
• Of course, farmers at the tail-end have more bargaining power in relationship to the farmers at the head-end if the amount or resources needed for preservation is (relatively) large

Details can make a difference!

• The previous analysis provides a potential answer to the puzzle of why many effective farmer-organized systems (such as the ones in Nepal) collapse soon after their system have been modernized using funds provided by international donors

Why?

Details can make a difference!

• Project evaluations usually consider any **reduction** in the labor needed to maintain a system as a project benefit. Thus, investments in permanent structure and lining canals are justified because of the presumed increase in agricultural productivity and the reduction in annual maintenance costs

• *However* the possibility that greatly reducing the need for resources to maintain a system would substantially alter the **bargaining power** of head-enders versus tail-enders is not usually considered in project evaluations.

Details can make a difference!

• What therefore usually happens is that the credibility of previous rules simply disappears, given that Bs<Ps at least **for the head-end farmers.** As a consequence…

• The head-end farmers now grab all the water they can and make no investment in maintenance. The head-enders can ignore the contributions of the tail-enders to maintenance because for a few years the concrete structure will operate well without any maintenance. And as a consequence of these behaviors, now the tail-enders will do the same (i.e., even for them Bs<Ps). *But not only that…*

Details can make a difference!

• At some time in the future the productivity of the system will fall below what it was prior to outside help. The tail-enders may initiate **violence** against the head-enders due to their perception that the water rights they had achieved with their hard labor had been taken from them

•The **end result** can easily be that a community which had been knitted together by their mutual dependence dissipates into a setting of considerable conflict and low overall productivity

Details can make a difference!

•If the farmers were expected to **pay back the costs of the investment** made in physical capital (or to pay taxes to keep the system well maintained) tail-end farmers would again find themselves in a better bargaining relationship with head-enders

• Paradoxically, a very disruptive aspect of external assistance was that it was **free** to the farmers involved. Without any need for resources (of any sort) from tail-enders, head-enders could ignore the interests of the less advantaged and take a larger share of benefits

What have we learnt in terms of (development) policies?

- When a development program aims to provide some sort of **collective good(s)** then the cooperator's dilemma becomes relevant compared to a situation in which what is at stake is providing private good(s)
- In such situations, focusing primarly on the technology of constructing physical capital and ignoring local institutions can result in a quite misplaced strategy: infrastucture can be unsustainable without appropriate institutions.
- For all that, we need to know pretty well a given context before acting and to look carefully at all the **institutional details of a development policy**, including their interaction with the local (and often informal) institutions that are (eventually) already present

What have we learnt in terms of (development) policies?

- This latter point becomes even more pressing once we link it to concepts such as co-production, participatory development, bottom-up projects

- The example of **microfinance/microcredit**

- What is MFI: the provision of financial services to micro-entrepreneurs and small businesses, which lack access to banking and related services due to the high transaction costs associated with serving these client categories (and the lack of collaterals...)

What have we learnt in terms of (development) policies?

- **Two main mechanisms** (among the others) for the delivery of financial services to such clients are (1) **relationship-based** banking for individual entrepreneurs and small businesses; and (2) **group-based** models, where several entrepreneurs come together to apply for loans (i.e., joint-liability)

- Meaning of **Joint Liability**: the borrowers make a group among themselves and the microfinance institutions give loan to that group. Each person is responsible for the loan taken by any member of the group. If any one person in the group defaults then other group members will have to pay for that

What have we learnt in terms of (development) policies?

- Which are the advantages of the joint-liability mechanism for the MFI? It allows to reduce…

- **Adverse selection** (before the contract is signed)
- **Moral hazard** (after the contract is signed)
- **Enforcement** (social instead of legal pressure)

- But why in some countries/contexts credit group seems to work better than in other countries/contexts?

What have we learnt in terms of (development) policies?

- Once again **collective action problems**! A credit-group that works as it is supposed to work, provides a **non-excludable advantage** for everyone within the group…
- Therefore, each member of a credit group has a private incentive to act as a free-riding!
- According to the context, this "intangible" cost of a credit group can become simply too large…

What have we learnt in terms of (development) policies?

- The failure of credit-groups in Bosnia after the civil war
- An analysis on 100 countries shows that the group lending methodology is more difficult to implement credit-groups where people leave in **large disperse areas** (remember Elinor Ostrom's lesson!)

What have we learnt in terms of (development) policies?

- Once again, the **interaction** between the content of the good provided by a development policy in its context becomes crucial…
- This does not mean that you do not have to implement MFI in “difficult” contexts. Just do not use credit-groups!

Summing up

1. Every time a group of individuals is expected to be involved in a collective action, the temptation to free-riding is **always** present
2. This implies that the existence of joint benefits from cooperation is **not enough** to produce by itself a successful collective action
3. Having said that, individuals are not **always** trapped into a NE of mutual defections. According to internal (to the game) and external circumstances, cooperation is possibile
4. We have disccussed **several** of the potentional solutions to a cooperator's dilemma. What we have learnt is that those solutions, by themselves, are not always sufficient, and that one solution can be better than another one in different situations