EC 101 - Chapter 4

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Introduction

- Up to now we just consider decisions of single person.
  - Free time(study time) vs Grade
  - Free time(working hours) vs consumption
- But in real life, we usually interact with people when we take actions.
- These interactions may lead to overall increase in well-being of society
- or will result in ***Social Dilemmas***
- ***Social Dilemmas*** occur when people do not take adequate account of the effects of their decisions on others, whether these are positive or negative
- An important example of ***Social Dilemmas*** is ***The Tragedy of the Commons*** (Garreth Hardin,1968):
  - "Resources that are not owned by anyone, such as the earth's atmosphere or fish stocks, are easily overexploited unless we control access in some way"
  - Overfishing some species of fish.
  - Carbon dioxide emissions
  - Water sources
- Free riding: one bears the cost others (free riders) also enjoy the good
- Altruism: Sacrificing yourself for the sake of others (maybe future generations)
- Social regulations.
- *Invisible Hand* (Adam Smith, 1759)

Social Interaction

- Self interest
  - can promote general wellbeing
- Game Theory: A way of modelling how people interact
  - **Strategic interaction**: When people are engaged in a social interaction and are aware of the ways that their actions affect others, and vice versa
  - **Strategy**: A strategy is defined as an action (or a course of action) that a person may take when that person is aware of the mutual dependence of the results for herself and for others.
  - **Games**: models of strategic interaction
  - **Game Theory**: Game theory is a set of models of strategic interactions

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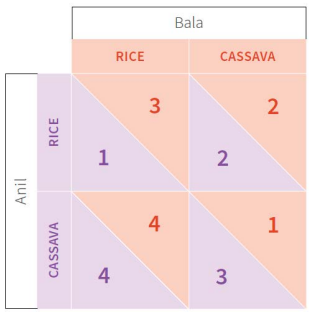
Game Theory

- A Game is a discription of social interaction which specifies:
  - Players: who is interacting with whom
  - The feasible strategies: Which actions are open to players
  - The information: Who knows what when making the decision
  - Payoffs: What the outcomes will be for each of the possible combinations of actions
  - An example Princess bride scene 29:31
- Some important assumptions for two player game:
  - There are no other people involved or affected in any way.
  - The selection of action is the only decision that players need to make.
  - At this point we assume that players will interact just once (this is called a one-shot game). And, they decide at the same time without knowing what the other player decide (simultaneous game)



- Because the market price falls when it is flooded with one crop, they can do better if they specialise.
- When they produce different goods they would do better to specialise in the crop for which their land is most suited.

Game Theory: Basic Concepts

- ***Best Response***: is the strategy that will yield the highest payoff, given the strategy the other person selects.
- ***Dominant Strategy***: is a strategy that is best response for **any** action of other player.
- If both player have a dominant strategy, they simply play it!: ***Dominant Strategy equilibrium***
- An equilibrium means that something of interest does not change or players do not want to deviate from their strategies.
- In previous game, Anil has a dominant strategy, raising cassava, and Bala raising Rice. Therefore, they specialize at their best option.
- Since they will pursue their dominant strategy and do not care about what the others do, this will lead to socially most desired outcome in this case.

Prisoners' Dilemma

- This time, we study another game where results will not be same as previous one

		Bala: IPC	Bala: TERMINATOR
Anil	IPC	3, 3	4, 1
Anil	TERMINATOR	1, 4	2, 2

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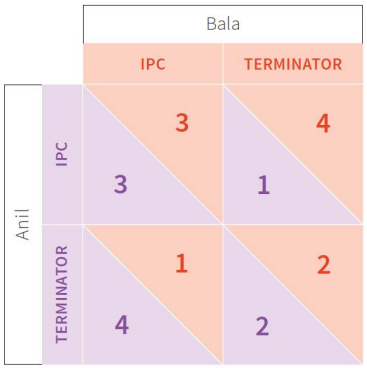

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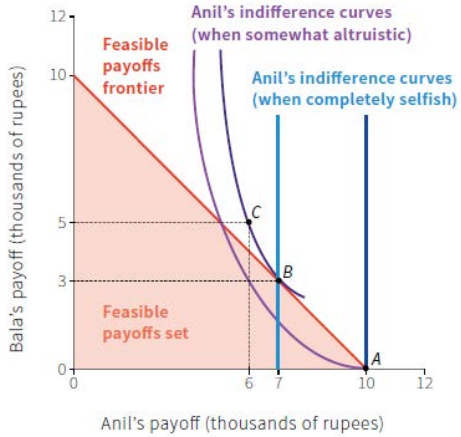
- At equilibrium, payoffs are lower for each player.

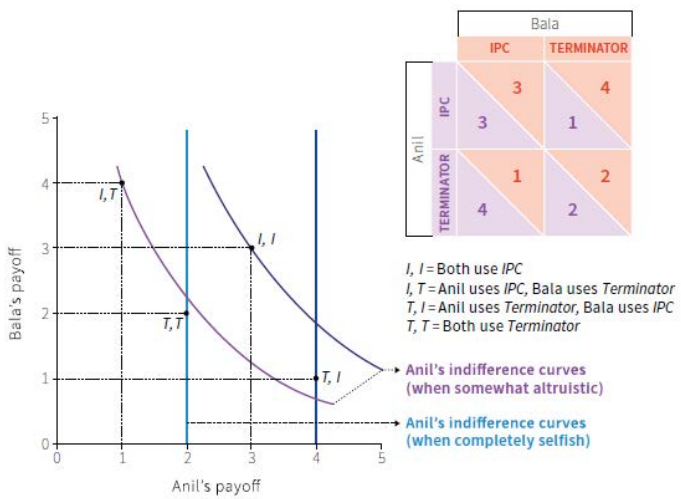
Altruism

- A person who is willing to bear a cost in order to help another person is said to have altruistic preferences.
- Altruism is a kind of social preferences.
- Envy and spite is also social preferences which acts in opposite direction of Altruism.
- Indifference curves may exhibit altrustic behaviour.



Altruistic Behaviour in Prisoner's Dilemma

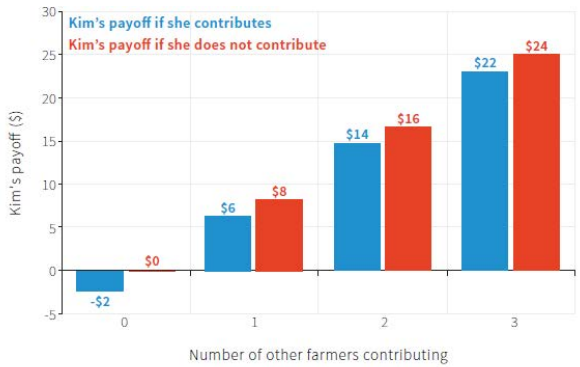
- If One agent care about other agents, the outcome of the game may be different.



- If both players are altruistic, they can achieve the socially optimal output $(3, 3)$.
- The main lesson is that if people care about one another, social dilemmas are easier to resolve.
- This helps us understand the historical examples in which people mutually cooperate for irrigation or enforce the Montreal Protocol to protect the ozone layer, rather than free riding on the cooperation of others.

Public Goods and Peer Punishment

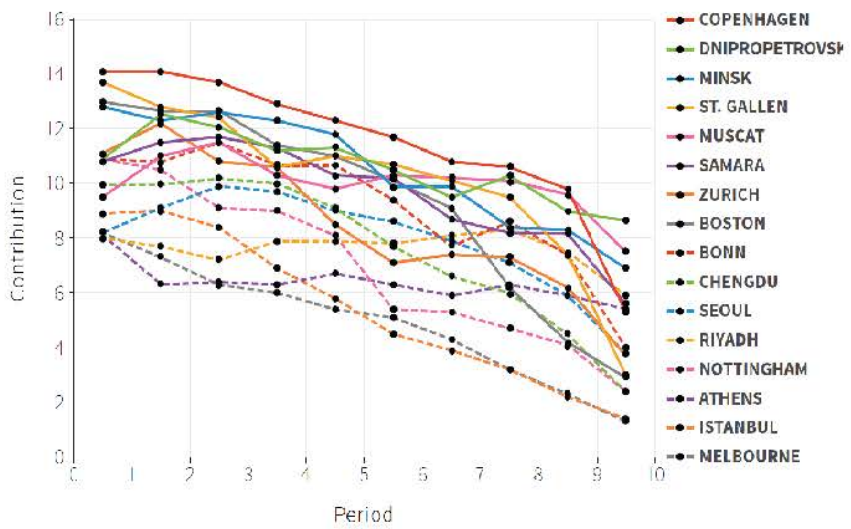
- 4 Farmers will contribute to a project about maintenance of irrigation system.
- If they decide to contribute they will pay 10 $
- To enjoy the benefit from maintenance, at least one of them should contribute
- For each contribution, all framers receive a benefit of 8$

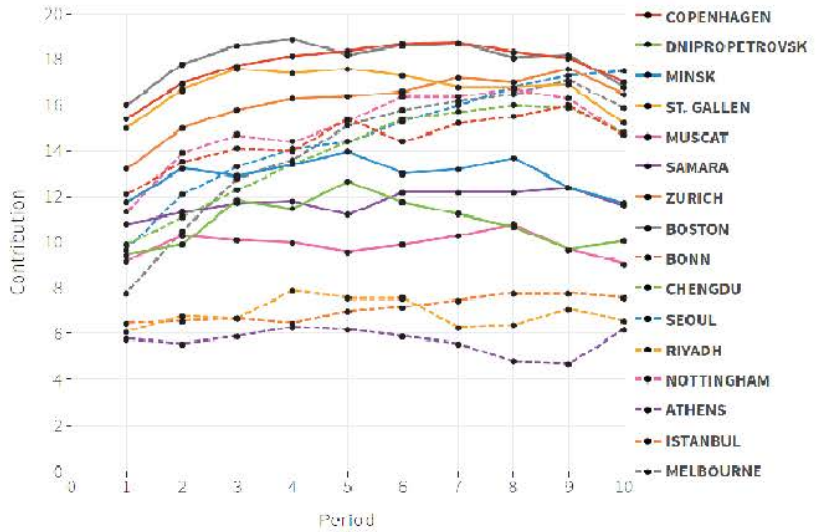


- Social dilemma: whatever the other farmers decide to do, Kim makes more money if she doesn't contribute than if she does.
- each would do better by free riding on the others irrespective of what others do. Therefore Free ride is a dominant strategy.
- This is an important feature of social interactions: life is not a one-shot game. Free riding on the contributions of others today may have unpleasant consequences for the free rider tomorrow or years from now

An Example of Repeated Games

- Each round you are given 20$ and you can contribute 10$.
- For each contribution you receive 4$
- After each round, the participants can see the total amount contributed, but not the amount that each of the others has contributed.





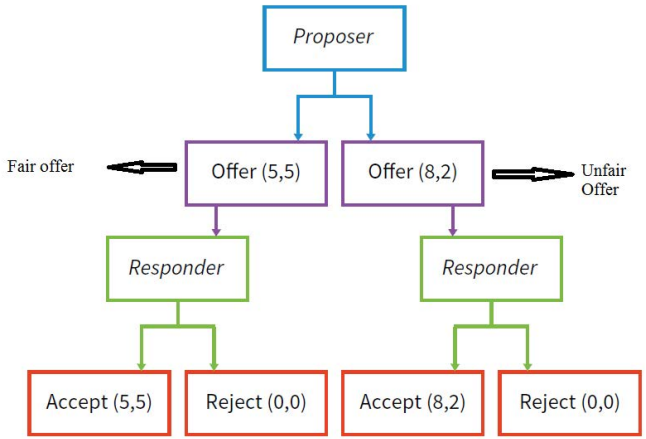
- Nevertheless, the results also show that despite a large variation across societies, most of them still have high contribution levels at the end of the experiment
- If we introduce punishment, we see that contributions increase.

Cooperation

- Cooperation means participating in a common project in such a way that mutual benefits occur.
- Cooperation need not be based on an agreement.
- The invisible hand: Anil and Bala acted entirely independently, but the division of labour that results from their pursuit of their own interests also results in mutual gains. Neither could do better by adopting another strategy. Their engagement in the village market facilitates this kind of cooperation without agreements.
- The prisoners' dilemma: If their pest control interaction is repeated, they could refrain from using Terminator simply by individually working out the future losses they would suffer as a result of abandoning IPC.
- The public goods game: With punishment of free riders, the payers made no agreements about how to play, but their willingness to punish others sustained high levels of cooperation in many countries.

Dividing a Pie

- Ultimatum Game with two rules:
  1. Proposer will divide the pie into two slices
  2. Responder will accept the division or reject: If he accepts they will get the share decide by Proposer, if he/she rejects both will get nothing



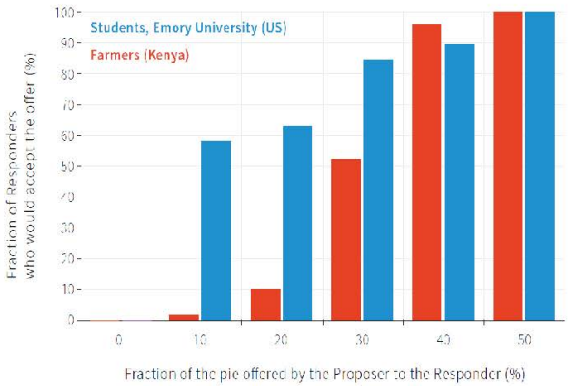
- This is a ***Sequential Game***

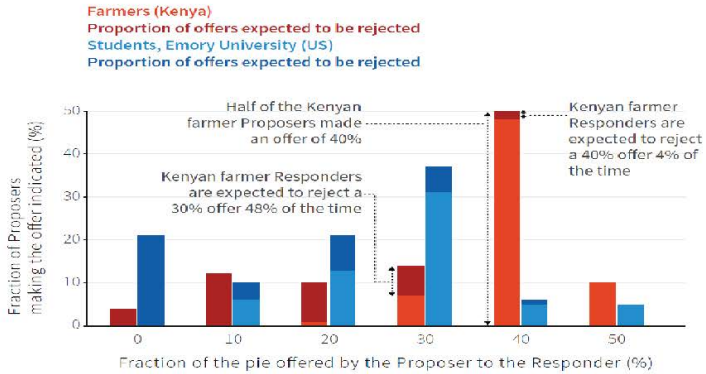
Ultimatum Game: Optimal Solution

- There exist a social norm of $50-50$ share, we need to consider this information since responder may want to punish the offers which breach the social norm.
- Let responder is offered y and proposer get x where $x+y=100$
- We first define a number R, which indicates how strong is her private reciprocity motive:
  - If R is large then she cares a lot about whether the Proposer is acting generously and fairly or not
  - If $R=0$ she not at all reciprocal
  - Satisfaction from rejecting a low offer is $R(50-y)$
- If responders share y is larger than satisfaction from rejecting $R(50-y$, he/she will accept the offer
- Otherwise reject it.
- The rule for accepting the offer is $y<\frac{50R}{1+R}$

Fair Farmers, Self-Interested Students

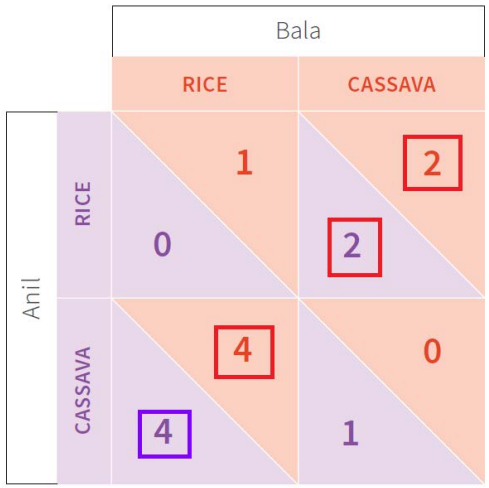
- The pie Division game is applied to Kenyan Farmers and American Students





Nash Equilibrium

- The outcome when each individual plays his or her best response to the strategies chosen by everyone else is called as ***Nash Equilibrium***.
- Multiple Nash Equilibria may arise!



- If there is more than one Nash equilibrium, and if people choose their actions independently, then an economy can get "stuck" at a Nash equilibrium in which all are worse off than they would be at the other equilibrium.

Nash Equlibruim in Prisoner's Dilemma