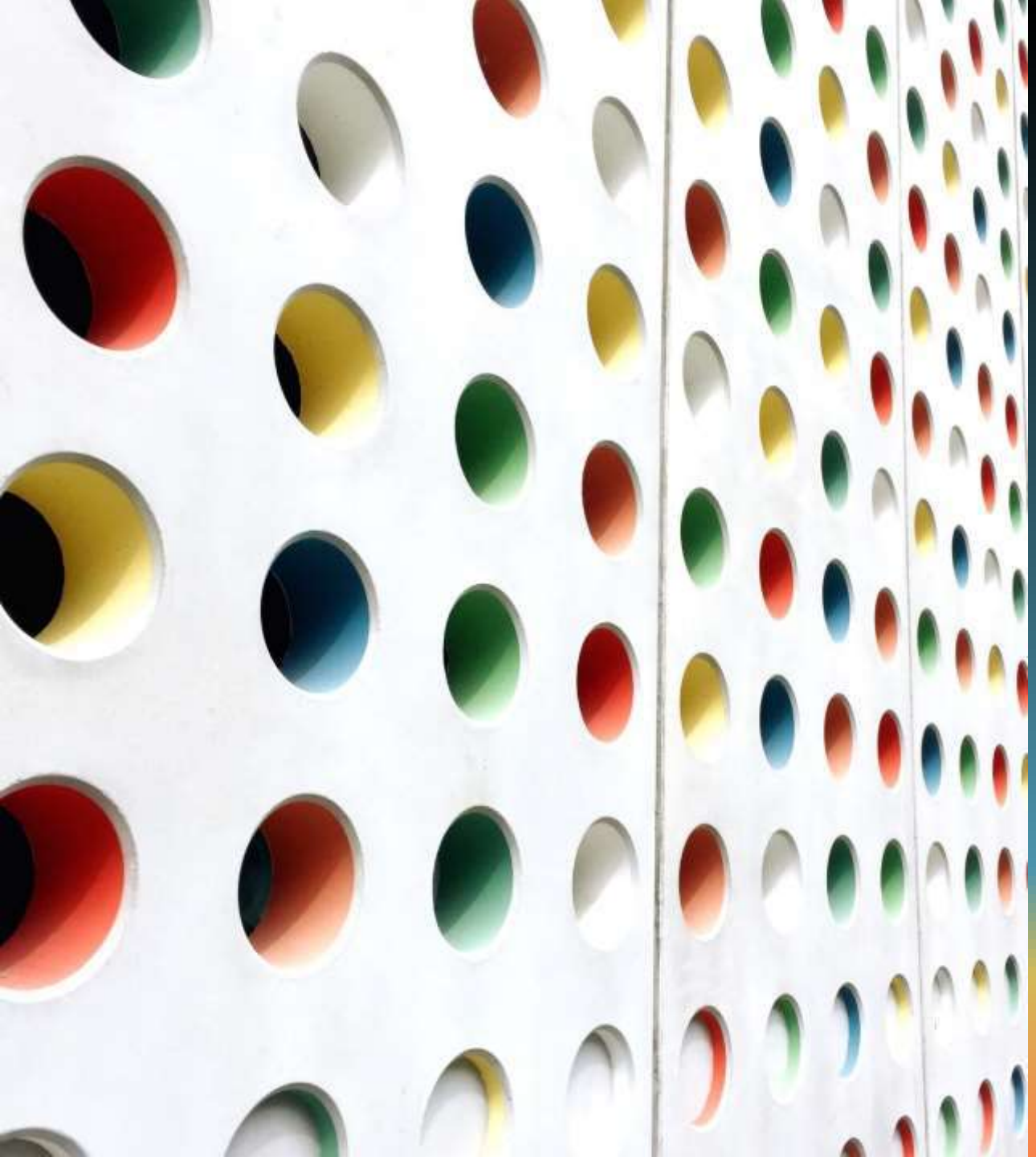


Module L1.
Strategic Interactions and Economic Outcomes (I)

A. Introduction
B. Social Dilemmas
C. Self-interest and Economic Outcomes
D. Social Preferences and Free Riding
E. Conflicts of Interest and Bargaining

ECON1000
S1 2024

ECONOMY, SOCIETY, AND PUBLIC POLICY

A. Introduction

CORE ESPP, sections from Unit 2: S2.1 to S2.15.
https://www.core-econ.org/espp/book/text/02.html

The Context for L1

- When self-interest works and when it doesn't
- **Public goods** and the problem of **free riding**
- **Conflicts of interest** and **bargaining**
- Application: global climate change problem [done in tutorial]

Economic tools:

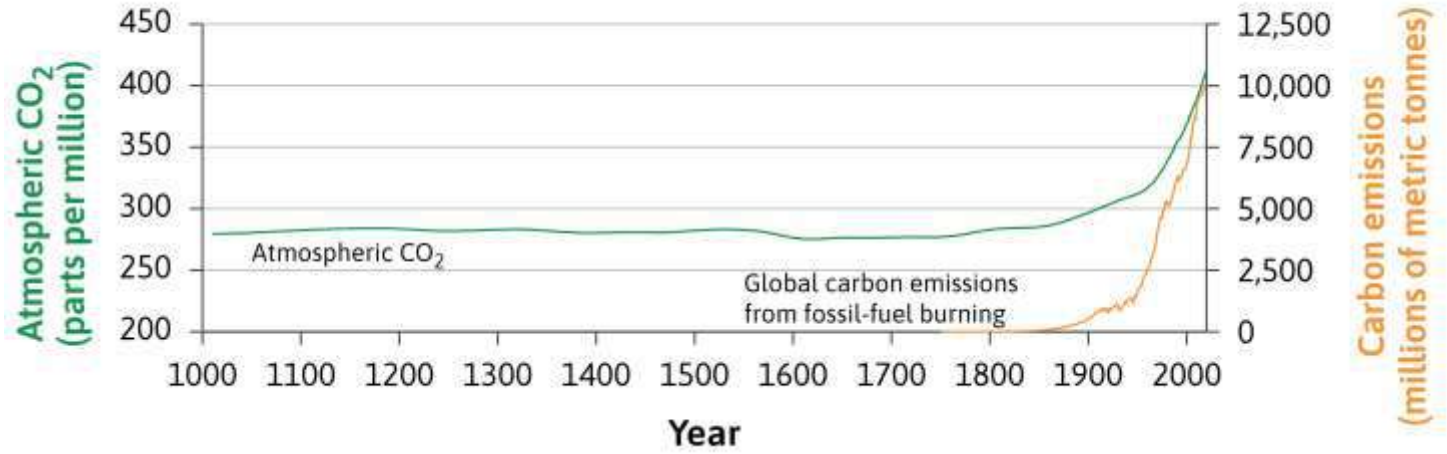
- **Game theory**: players, strategies, payoffs
- Predicting outcomes: **Nash equilibria**
- Analysing preferences through **behavioural experiments**

B. Social Dilemmas

Social dilemma

Social dilemma = a situation in which actions taken independently by self-interested individuals result in a <u>socially suboptimal outcome</u>
e.g. traffic jams, climate change.

One of the tasks of public policies is to address social dilemmas.



Source: https://core-econ.org/espp/book/images/web/figure-01-22.jpg

Resolving social dilemmas: Preferences (focus in this lecture)

1. Social preferences

A person with these preferences cares about the implications for other people. Given the chance he would prefer to help some other person, even if it cost something to do so.

Countless examples of willingness, or even desire, to help others, even at a cost to oneself – for example during wars, natural catastrophes.

Who will bell the cat?

Source: http://mythfolklore.net/aesopica/milowinter/6.htm

Resolving social dilemmas: Policies

2. **Public policies** in the form of quotas and taxes:
   - Quotas to prevent the over-exploitation of stocks of cod in the North Atlantic.
   - Landfill tax in the UK has reduced the amount of waste that is dumped in landfills.

3. **Local communities** can create their own **institutions** to regulate behaviour.
   - For example: Customary rules designed by farmers in Valencia, Spain, and the *Tribunal de las Aguas* (Water Court) to resolve conflicts.

C. Self-interest and Economic Outcomes

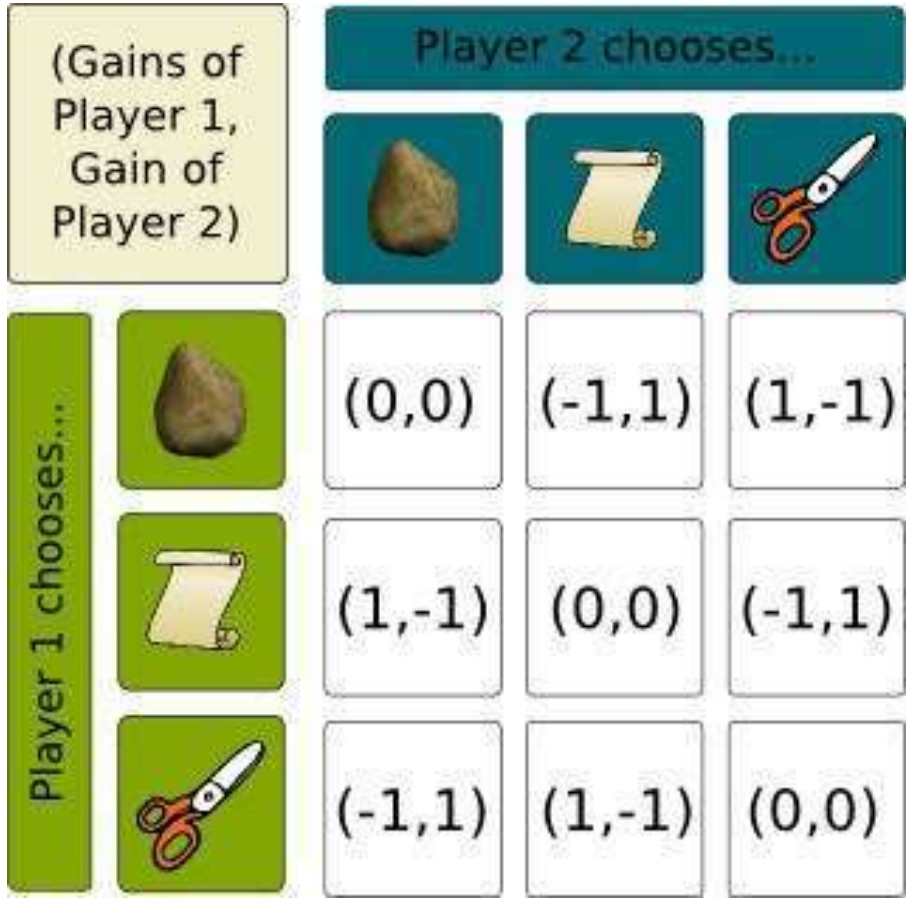
Game theory: Key concepts

- **Social interaction**: A situation involving more than one person/party, where one's actions affect both their own and other people's outcomes.
- **Strategic interaction**: A social interaction where people are aware of the ways that their actions affect others.
- **Strategy**: Action(s) that people can take when engaging in a social interaction.

Game

A **game** describes a social interaction:

1. **Players** – who is involved in the interaction
2. **Feasible strategies** – actions each player can take
3. **Information** – what each player knows when choosing their action
4. **Payoffs** – outcomes for every possible combination of actions



Example: Rock-Paper-Scissors

Example: Crop choice

- Two farmers decide which crop to specialise in.
- They interact only once (**one-shot game**).

1. **Players** – Anil and Bala
2. **Feasible strategies** – Rice or Cassava
3. **Information** – each farmer does not know what the other chooses
4. **Payoffs** – depend on market prices and quality of land

		Bala	
		Rice	Cassava
Anil	Rice	Both produce rice: there is a glut of rice (low price) There is a shortage of cassava Anil not producing cassava, which he is better able to produce	No market glut High prices for both crops Both farmers producing the crop for which they are less suited
	Cassava	No market glut High prices for both crops Both farmers producing the crop for which they are better suited	Both produce cassava: there is a glut of cassava (low price) There is a shortage of rice Bala not producing rice, which he is better able to produce

Interpreting the payoff matrix

		Bala: Rice	Bala: Cassava
Anil: Rice		Anil gets 1 Bala gets 3	Both get 2
Anil: Cassava		Both get 4	Anil gets 3 Bala gets 1

		Bala: Rice	Bala: Cassava
Anil: Rice		1, 3	2, 2
Anil: Cassava		4, 4	3, 1

Payoff matrix = A table of the payoffs associated with every possible combination of strategies chosen by two or more players in a game.

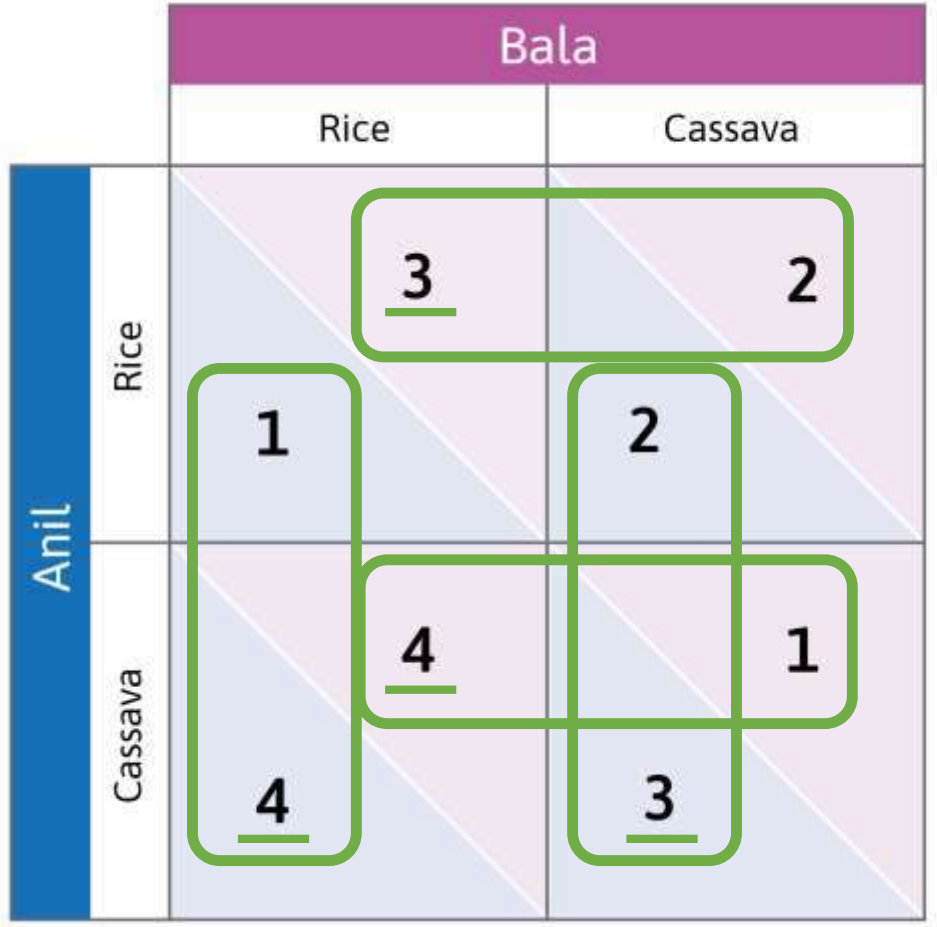
Understanding Best Responses and Dominant Strategies

- **Best response**: Strategy that yields the highest payoff, given the other player's strategy
- **Dominant strategy**: A best response to all possible strategies of the other player (but a dom. strat. does not always exist!)
- **Dominant strategy equilibrium**: An outcome of a game in which everyone plays their dominant strategy

		Bala	
		Rice	Cassava
Anil	Rice	3 1	2 2
	Cassava	4 4	1 3

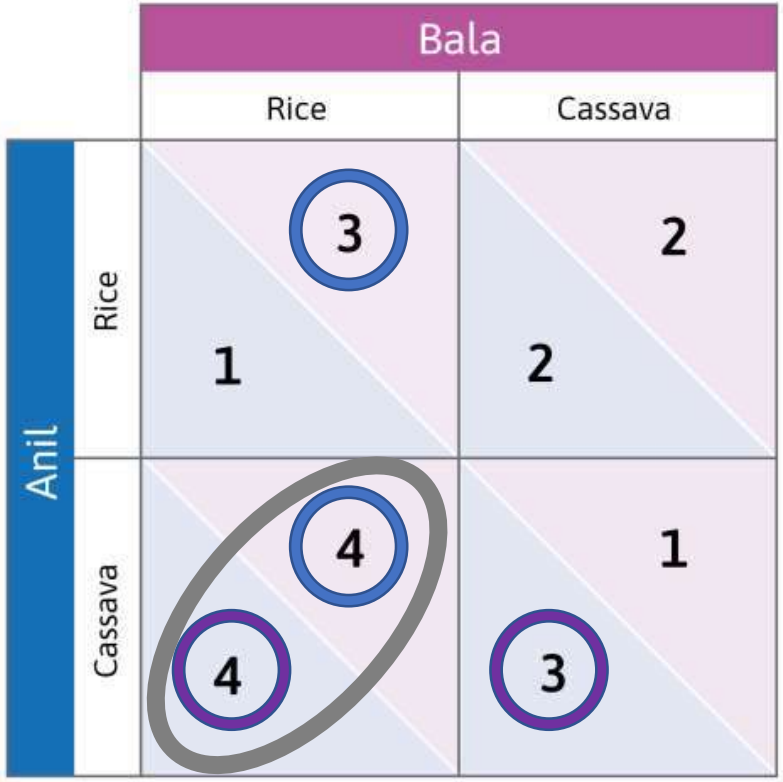
Finding Best Responses by Underlining Payoffs: crop choice example

- To find the best responses for the row player (Anil), look at each of the column player's actions and find what the best action for row player is for each of them.
- To find the best responses for the column player (Bala), look at each of the row player's actions and find what the best action for column player is for each of them.
- We learn Anil has a dominant strategy of cassava and Bala has a dominant strategy of rice.



The Invisible Hand

The pursuit of self-interest without regard for others is sometimes considered to be morally bad, but the study of economics has identified cases in which it can lead to outcomes that are socially desirable.



Simply pursuing their self-interest—choosing the strategy for which they got the highest payoff—resulted in an equilibrium outcome that was:

- the best of the four possible outcomes for each player
- the strategy that yielded the largest total payoffs for the two farmers combined.

The Prisoners' Dilemma

There are other cases, however, in which the pursuit of self-interest leads to results that are not in the self-interest of any of the players.

Prisoners' dilemma = A game in which the payoffs in the dominant strategy equilibrium are lower for each player, and also lower in total, than if neither player played the dominant strategy.

In this case, the socially optimal outcome is *not* achieved by people individually pursuing their own self-interest.

Example: Pesticide choice

Two farmers decide how to deal with pest insects

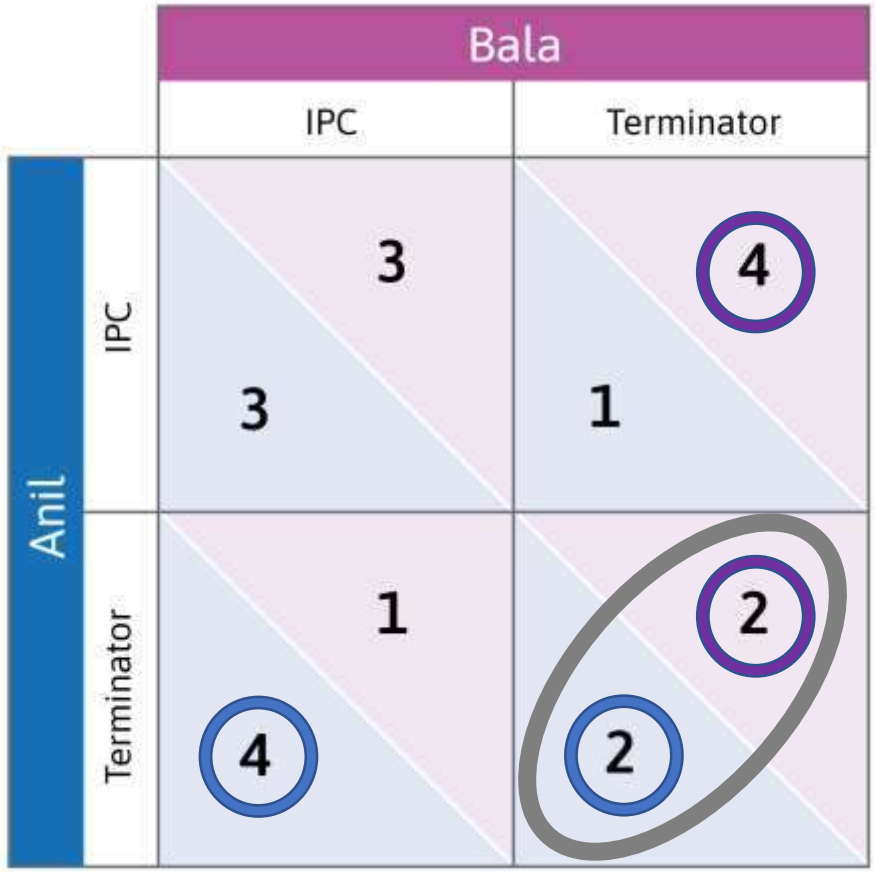
1. **Players** – Anil and Bala
2. **Feasible strategies** – Terminator or Integrated Pest Control (IPC)
3. **Information** – each farmer does not know what the other chooses
4. **Payoffs** – depend on the resulting combination of pest control instruments

		Bala	
		IPC	Terminator
Anil	IPC	Beneficial insects spread over both fields, eliminating pests No water contamination	Bala's chemicals spread to Anil's field and kill his beneficial insects Limited water contamination
	Terminator	Anil's chemicals spread to Bala's field and kill his beneficial insects Limited water contamination	Eliminates all pests Heavy water contamination Requires costly filtration system

Equilibrium in the pesticide game

When Anil and Bala each play their dominant strategy, the outcome is (Terminator, Terminator). This is the dominant strategy equilibrium.

Anil and Bala each receive payoffs of 2, but both would be better off if they both used IPC instead. The predicted outcome is therefore not the best feasible outcome.



Why did we predict this outcome?

1. Players only care about their own payoffs
   - Introduce **social preferences**

2. Nobody could make players pay for the consequences of their actions on others
   - Introduce **repeated games**, **social norms**, and **peer punishment**

3. Players could not coordinate their actions beforehand
   - Change the rules of the game (**institutions** and **policies**)

D. Social Preferences and Free Riding

Social preferences

People generally care, not only about what happens to themselves, but also what happens to others. Then we say that the individual has social preferences.

Social preferences: Preferences that place a value on how your actions affect other people as well as yourself.

Social preferences are not necessarily a good thing.
For example, they can take the form of hatred of people of a different race or religion.

Learning about preferences

1. Survey questions (problem: subjective answers)

2. Statistical studies of economic behavior (problem: cannot control the decision-making environment in which preferences were revealed)

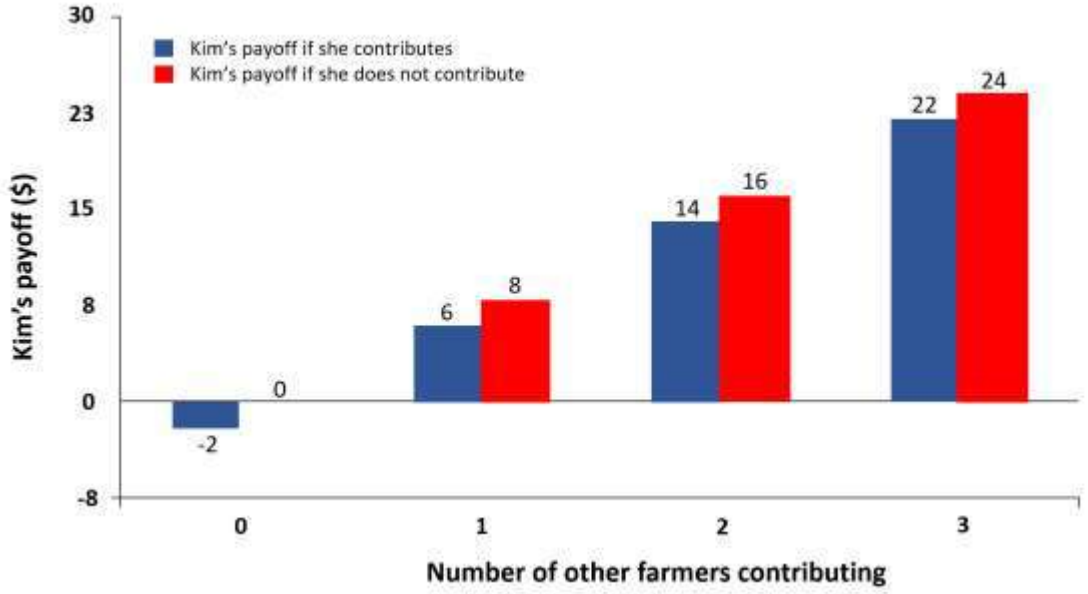
3. Lab experiments:
   - Can create a control/treatment group for comparison
   - Results can be replicated

4. Field experiments:
   - Lab experiments may not predict real-world decision making
   - More realistic context in which people make decisions

Example: Public goods game

Public good = a good for which use by one person does not reduce its availability to others (also called a *non-rival* good).

- Each farmer decides whether to contribute to the public good (e.g. irrigation project).
- Contributing has a <u>personal cost</u> of $10, but <u>everyone benefits</u> from this (by $8 each).



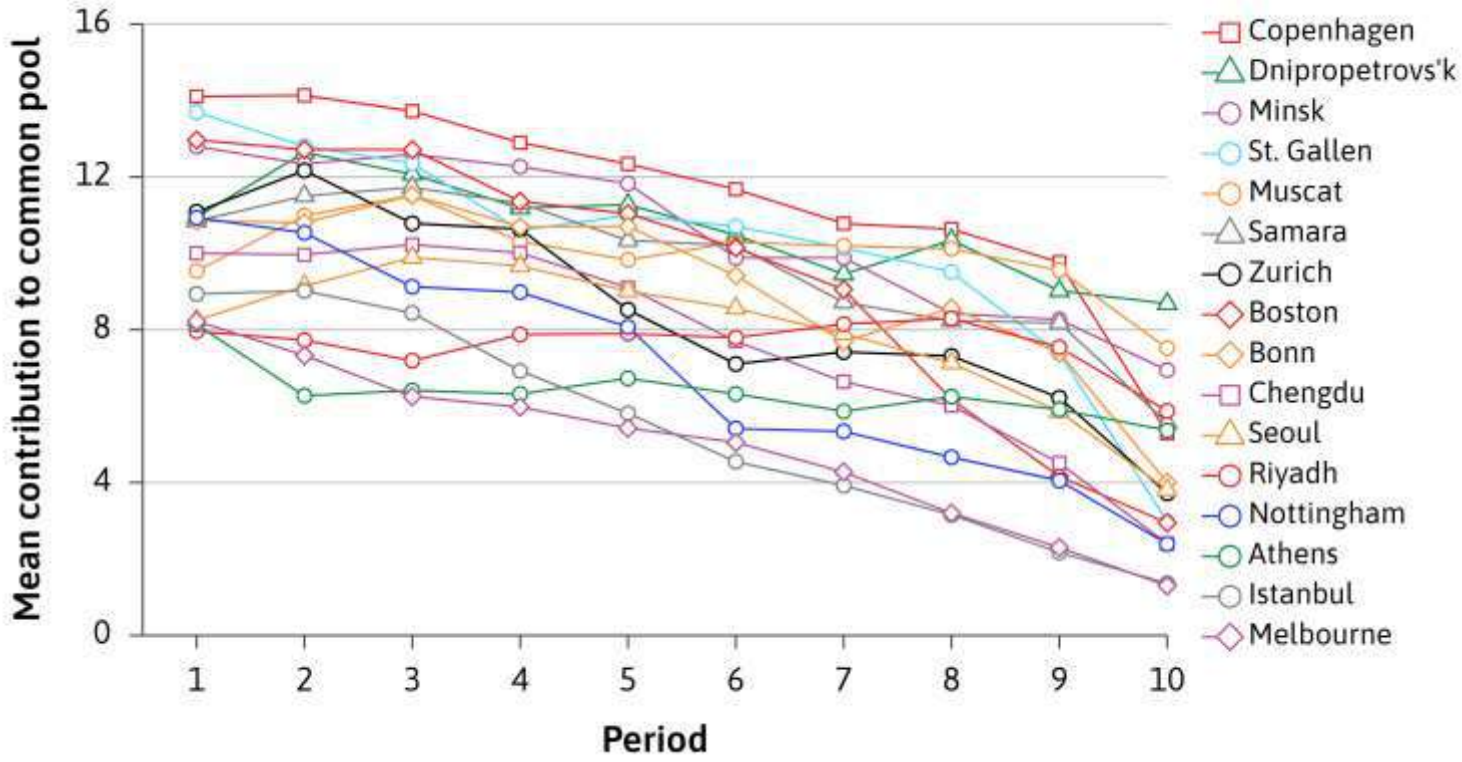
Not contributing is a dominant strategy.
Here, Kim (one farmer) can **free ride** on others' contributions.

Repeated games

- We have so far looked at **one-shot games**.
- Better outcomes can arise in **repeated interactions** due to social norms, reciprocity, and peer punishment.
- Behaving selfishly in one period has consequences in future periods, so it may no longer be a dominant strategy.

Reciprocity and Social Norms

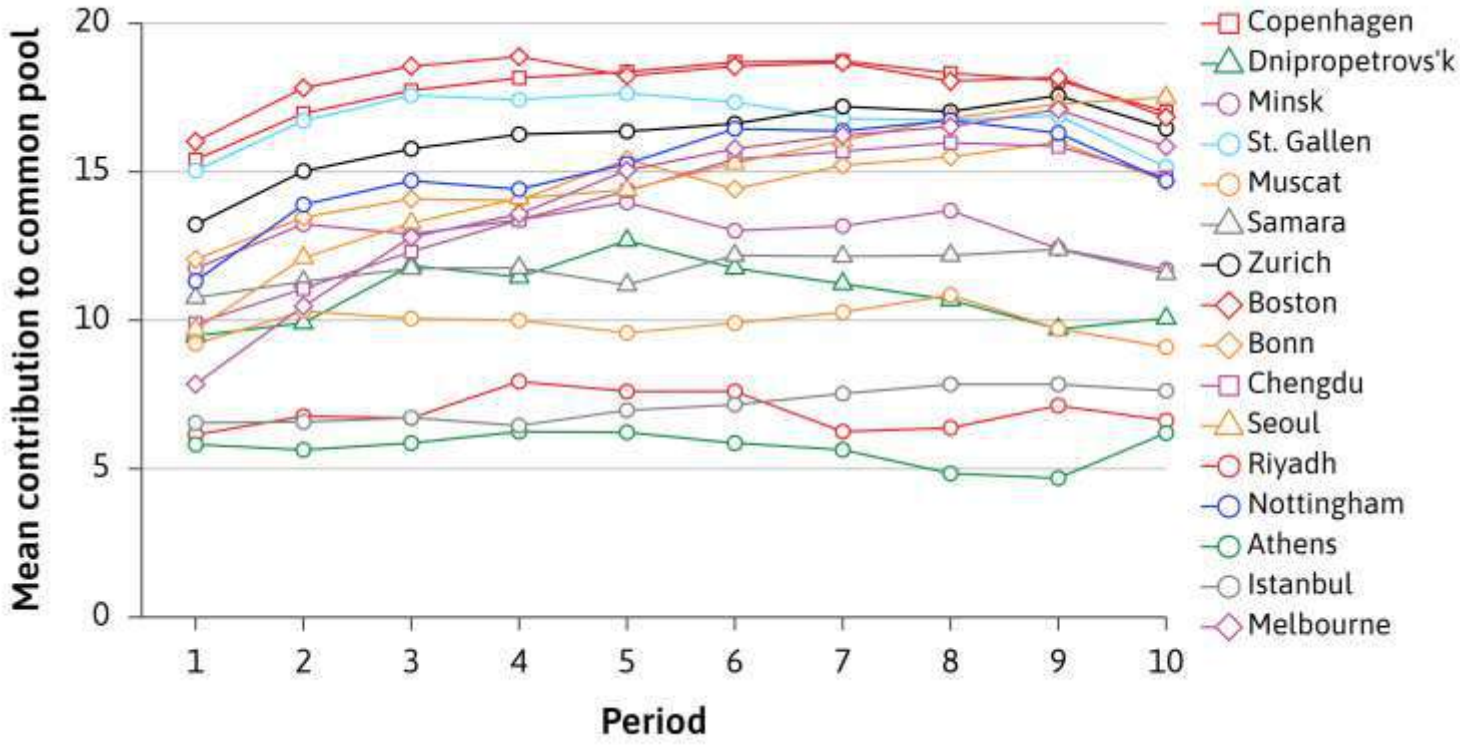
In public goods experiments, people were happy to contribute as long as others reciprocate. Contributions differ according to **social norms**.



A disappointed expectation of reciprocity is the most convincing explanation of why contributions fell in later rounds.

Peer Punishment

The ability to identify and punish free-riders also increases individual contributions.



Experiment shows that even in large groups of people, a combination of repeated interactions and social preferences can support high levels of contribution to the public good.

Social preferences and social dilemmas

3 kinds of social preference can explain how people play the public goods game with punishment:

- **Altruism**: A willingness to help someone else at a cost to yourself.
- **Reciprocity**: A desire to help those who have (in your opinion) acted well, and to harm those who have acted poorly.
- **Inequality aversion**: Disliking outcomes in which some individuals receive more than others (especially if others are doing better than you).

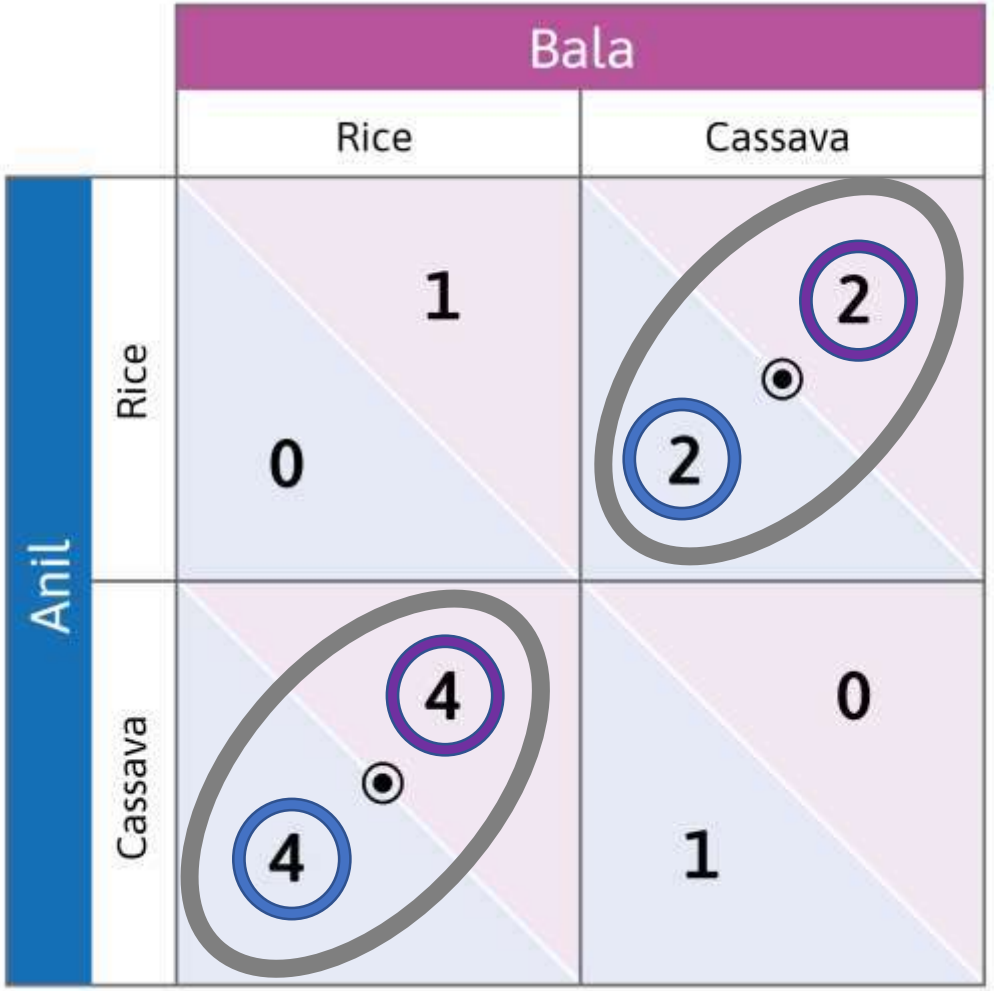
These motives affect outcomes, as discussed in the tutorials on Module L1 and Module L2(b).

E. Conflicts of Interest and Bargaining

Introducing Nash equilibria

- In many other games, players do not have dominant strategies.
- For exmple, your best response of which side to drive will depend on what the others choose to do.
- **Nash equilibrium**: a set of strategies, one for each player in the game, such that each player's strategy is a best response to the strategies chosen by everyone else.
- In the driving game, and in this new crop game, there are <u>two</u> Nash equilibria!

Crop game with different payoffs



Bargaining to resolve problems

- People commonly resort to **negotiation** to solve their economic and social problems. For example, international negotiation resulted in the Montreal Protocol, which eliminated the use of CFCs.
- But we know negotiations can fail. The economy may end up 'stuck' in a Nash equilibrium in which all players are worse off.

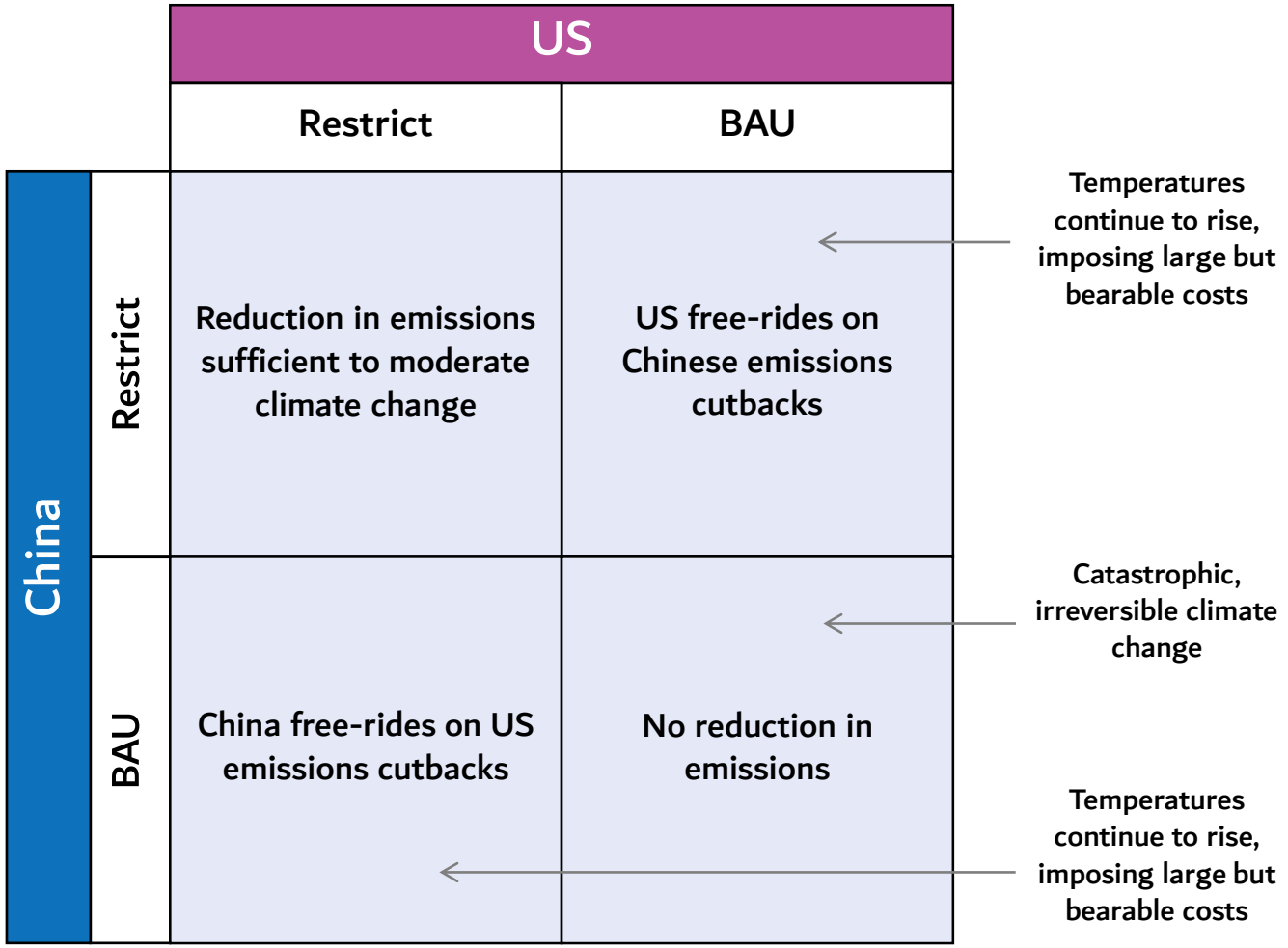
- Situations with two Nash equilibria prompt us to ask two questions:

1. Which equilibrium would we expect to observe in the world?
2. Is there a **conflict of interest** because one equilibrium is preferable to some players, but not to others?

A Climate Change Game

(an important topic covered extensively in the tutorial on L1, not in the lecture)

- The worst outcome for both countries is that both persist with BAU, running a significant risk of human extinction.
- The best for each is to continue with BAU and let the other one Restrict.
- The only way to moderate climate change significantly is for both to Restrict.



Summary for **L1**

1. **Social interactions** offer opportunities for mutual gains, but conflicts arise over how these gains should be distributed.
   - **Preferences** and policies to address **social dilemmas**
   - The individual pursuit of **self-interest** can lead to socially beneficial outcomes, but can also produce undesirable outcomes

2. **Game theory** has helped us model strategic interactions
   - Players choose **best responses** to others' **strategies**
   - The **rules of the game** matter for outcomes
   - Multiple Nash equilibria can cause coordination problems