Social Interactions

ECONOMICS

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UCL

Lecture 4

This Lecture

Previously,

outcomes followed from people's *own choices* and not from others choices.

Individuals motivated by self-interest can produce outcomes that are beneficial for society e.g. entrepreneurship, innovation if there are *"proper rules"* in place.

However,

Self-interest can also be *harmful* to society.

When can self-interest be harmful for society?

Can setting up *"proper rules"* limit the damage?

Strategic Social Interaction

Social interaction: two or more people with *agency* interact and *affect* each other

creates a *scope* for strategic social interaction

given an *environment*, if people are aware of the ways that their actions affect others.

Strategy: Action(s) that people can choose when engaging in a social interaction.

Environment types *Rules based environments*

Decentralised environments (e.g. markets)

Introduction to the Farming Game

Local market: people choose to buy *rice* and *cassava*

Anil and Bala: only farmers that supply the local market

Anil's land better suited for producing *cassava*

Bala's land better suited for producing *rice*

If they produce *different crops,*

then there sufficient *rice* and *cassava* in the market

If they produce *the same crop,*

there is a *market glut* in that crop and its price drops sharply reducing their profitability

The Farming Game

		Bala: Rice	Bala: 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
Anil	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

		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

The Farming Game

Anil has to *choose* between growing rice and cassava

Bala also has to *choose* between growing rice and cassava

- Anil and Bala *don't know* what the other person has chosen when they make their choice
- The numbers represent the payoffs are Anil and Bala get in each situation

	rice	cassava
rice	3 / 1	2 / 2
cassava	4 / 4	1 / 3

Anil's Payoffs

Analysing from Anil's perspective:

Anil: What will I do if Bala chooses to grow rice?

... or what would be Anil's best response to Bala growing rice

Anil: What will I do if Bala chooses to grow cassava?

... or what would be Anil's best response to Bala growing cassava

	rice	cassava
rice	1	2
cassava	4	3

Best response

Best response: Action that yields the highest payoff for a player taking as given the taking the player's action

. . . it is logical way of deciding what you would do in each situation

. . . requires first fixing other player's action and

. . . then choosing your preferred action

Anil's Best Response to Bala's rice

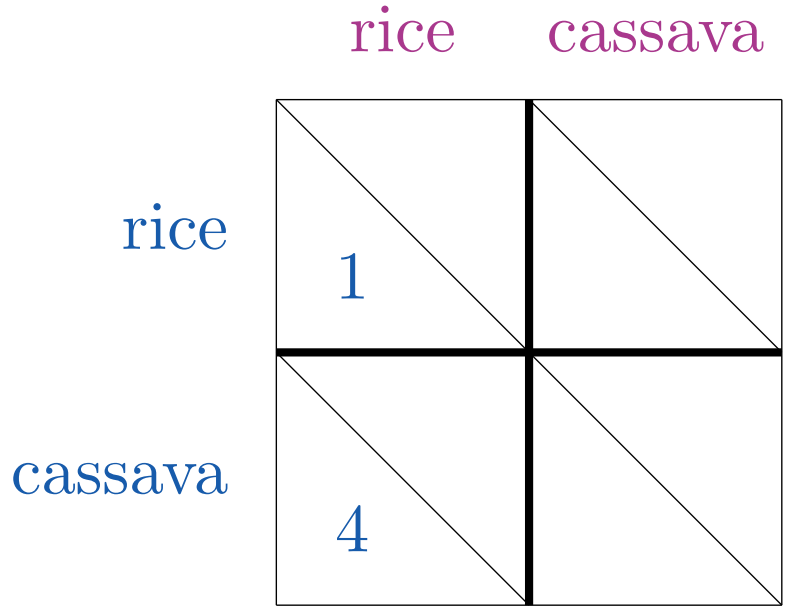
If Bala chooses rice *(left column)*,

- what is Anil's best response?

  1 if Anil chooses rice

  4 if Anil chooses cassava

- Anil's **best response** would be to choose cassava



Anil's Best Response to Bala's cassava

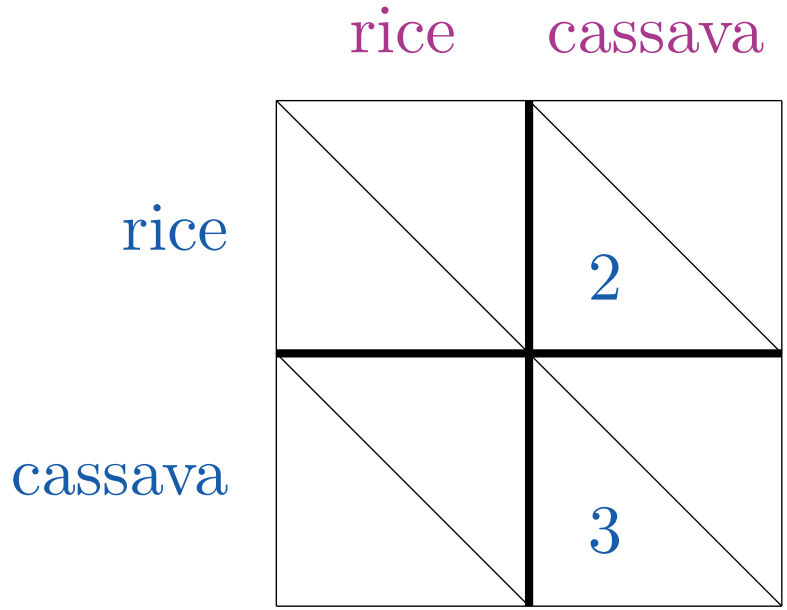
If Bala chooses cassava *(right column)*,

- what is Anil's best response?

  2 if Anil chooses rice

  3 if Anil chooses cassava

- Anil's **best response** would be to choose cassava



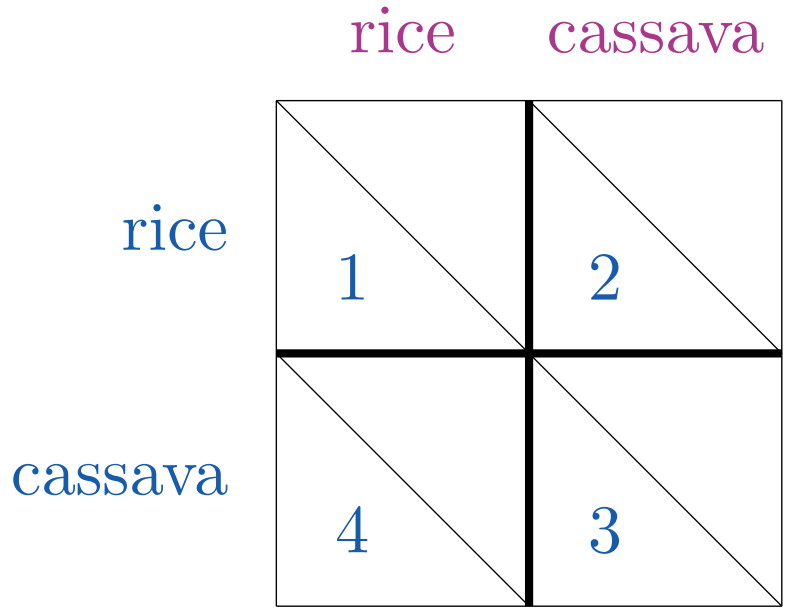
Anil's Dominant Strategy

Anil's best response is to **always** choose cassava irrespective of what Bala chooses.

In this game,

cassava always gives Anil a higher payoff than rice.

... that means that cassava is Anil's *dominant strategy*.



Dominant Strategy

Dominant strategy: A strategy that is the best response for a player, irrespective of what the other player chooses to play

if a *dominant strategy exists*, then the player would always play the dominant strategy

. . . there are lots of games in which players don't have a dominant strategy

. . . in these games a player's best response is contingent on the other player's choice

Bala's Payoffs

If Anil chooses rice,

Bala's best response would be to choose rice

If Anil chooses cassava,

Bala's best response would be to choose rice

rice is Bala's *dominant strategy*

	rice	cassava
rice	3	2
cassava	4	1

Dominant strategy equilibrium:

A game in which a dominant strategy exists for all player,

and all players will play their dominant strategy,

the outcome reached is called the *dominant strategy equilibrium*

If a dominant strategy equilibrium exists for a game,
then it is very easy to predict what will happen in that game.

The Farming Game Outcome

- Anil's dominant strategy is cassava *(bottom row)*
- Bala's dominant strategy is rice *(left column)*

The *dominant strategy equilibrium* of this game is {cassava, rice} with respective payoffs {4, 4}

	rice	cassava
rice	3 / 1	2 / 2
cassava	4 / 4	1 / 3

The Pesticide Game

Pest insects are destroying Anil and Bala's crop

The options for getting rid of the pest are:

Terminator	inexpensive and powerful chemical, kills insects for miles, leaks into groundwater
IPC *(integrated pest control)*	no chemicals, introduces beneficial insects that eat the pest insects

- If one of them uses *Terminator* and other uses *IPC*, ground water contamination is limited
  - If both of them use *Terminator*, the ground water contamination is extensive
    - requires buying expensive filtration system

The Pesticide Game

		Bala: IPC	Bala: 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
Anil	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

		Bala: IPC	Bala: Terminator
Anil	IPC	3 / 3	4 / 1
Anil	Terminator	1 / 4	2 / 2

Pesticide Game Payoffs

If both use *IPC*, both get 3 each

If Anil uses Terminator and Bala uses IPC, Anil's payoff is higher and Bala's payoff is lower

If both use *Terminator*, both get 2 each

For both, {IPC, IPC} is better than {Terminator, Terminator}

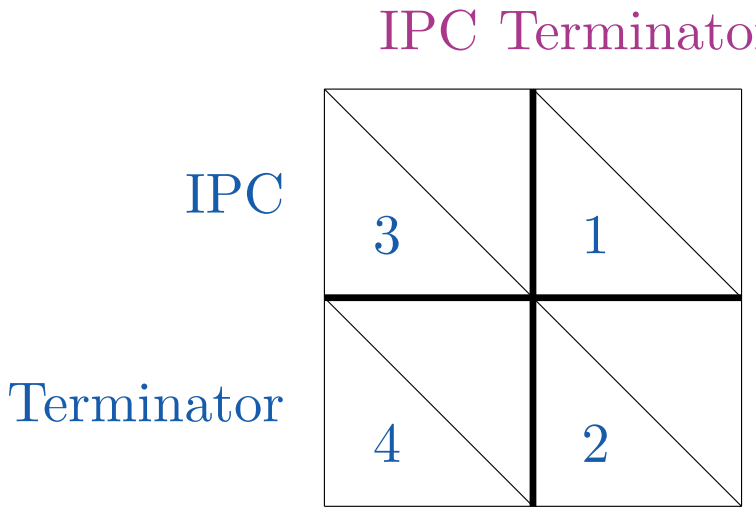
. . . possible to socially rank the outcomes

	IPC	Terminator
IPC	3, 3	4, 1
Terminator	1, 4	2, 2

Anil's Payoff

For Anil,

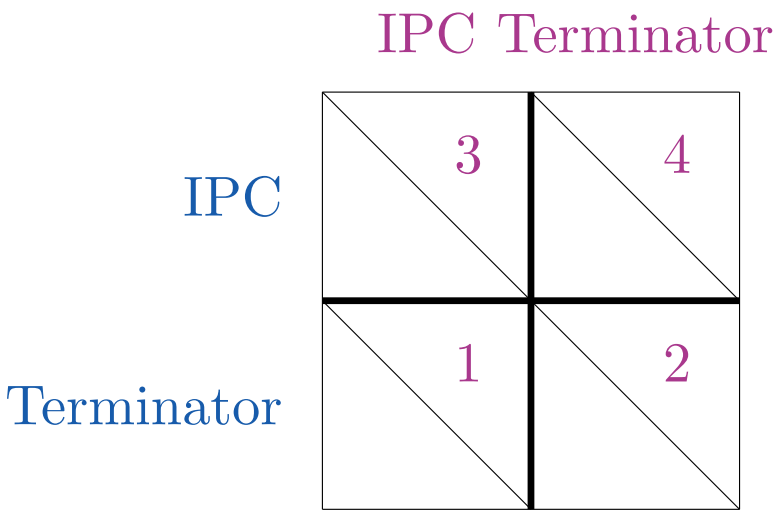
Terminator is the *dominant strategy*



Anil's Payoff

For Bala,

Terminator is the *dominant strategy*



Dominant Strategy Equilibrium

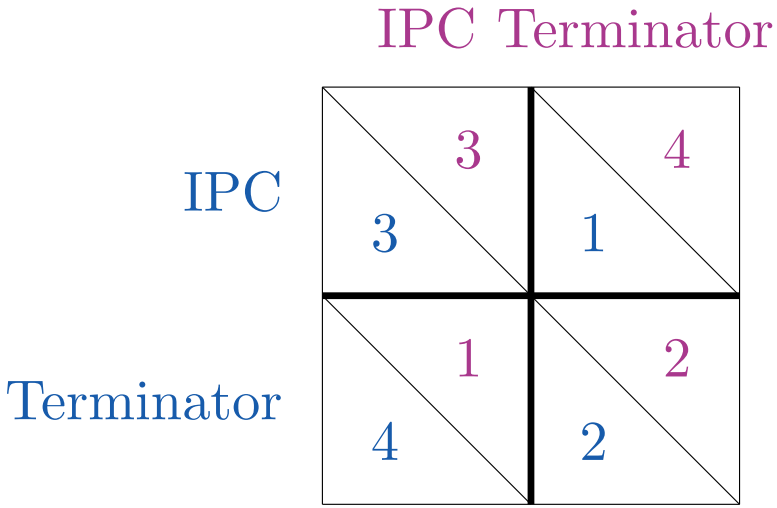
{Terminator, Terminator} is the *dominant strategy equilibrium*

{IPC, IPC} is worse for both as compared to {Terminator, Terminator}

Yet, why do they end up at {Terminator, Terminator}

Strategic interaction

This game is an example of the famous *Prisoner's dilemma*



Prisoner's Dilemma

A *prisoner's dilemma* occurs when the following two conditions hold

The game has a *dominant strategy equilibrium*

The dominant strategy equilibrium *leads to a sub-optimal outcome*,

i.e., there is a *socially superior outcome* in which all players would be better off than they are in the dominant strategy equilibrium

Prisoner's Dilemma

Prisoner's dilemma illustrates the inefficiency that results because people interact strategically

If people can *cooperate*, then they can reach the socially superior outcome

But, players *benefit from reneging* from cooperation, so what stops the player from reneging

. . . *punishments*

Public goods game: Irrigation example

Farmers contribute to build irrigation.

- No one can be excluded from the benefit of irrigation.
- The more people contribute, the larger the irrigation system, the higher the benefits for the community.

Each farmer *chooses* whether to *contribute* to the public good (e.g. irrigation project) or *not contribute*.

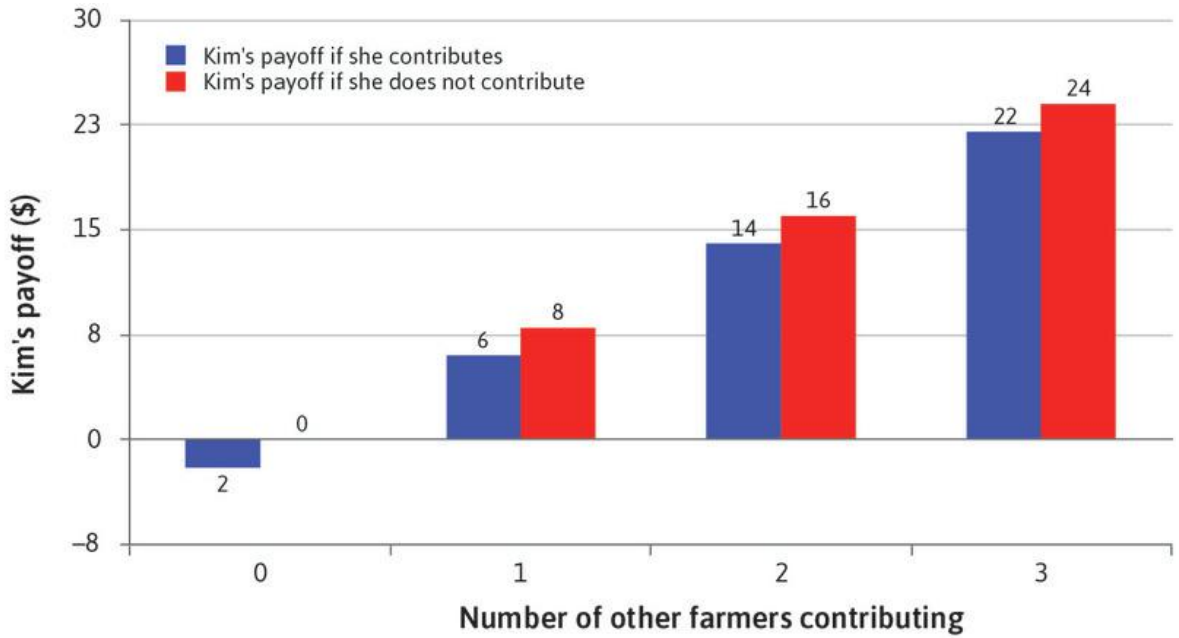
- Contributing has a personal cost, but everyone benefits.

Example: 4 farmers, Kim and 3 other farmers

- Each farmers makes an independent choice whether to contribute £10 or contribute nothing.
- If n farmers contribute, then each farmer benefit is given by £$8 \times n$

Kim's payoff in the Irrigation example

Kim's payoff



Not contributing is the *dominant strategy* for Kim.

Dominant strategy equilibria is where no one contributes *(no irrigation)*

Public goods game

Public goods game:

Not contributing (free riding) is a dominant strategy.

Dominant strategy equilibrium is a sub-optimal outcome

In *public goods experiments:*

People were happy to contribute as long as others do (*reciprocity*).

Contributions differ according to *social norms*.

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

Better outcomes can arise in *repeated interactions*

. . . due to *social norms*, *reciprocity*, and *peer punishment*.

Social Dilemmas ...

Where do rules comes from?

if people care about one another, social dilemmas are easier to resolve.

... 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.

INSTITUTION

What is an *Institution*?

an environment where rules are followed

Where do these rules come from?

. . . game theory gives us some answers

Examples:

Firms

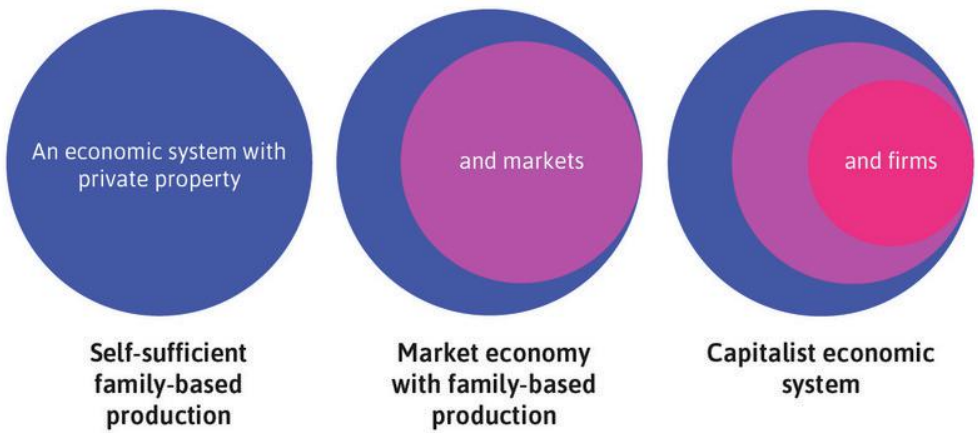
Family

University

Capitalism

Institutions: are the *laws* and *social customs* governing the production and distribution of goods and services.

Capitalism: an economic system where the main institutions are *private property*, *markets*, and *firms*.



Summary

Social interactions can be modelled as games players choose best responses to others' strategies

Social dilemmas e.g. prisoners dilemma can be resolved by social preferences, peer punishment, or binding agreements

> The rules of the game shape the social interaction and drive social equilibrium outcomes

Sub-optimal *dominant strategy equilibria* can cause prisoner's dilemma

Economic and political *institutions* can help achieve socially optimal outcomes