



INNOVATORS
EDUCATORS

Economics in the Real World for Pre-University Students

THE UNIVERSITY OF WARWICK
IN LONDON

Abhinay Muthoo

University of Warwick

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Session #1: Cooperation in the time of Corona

Behaviour, Cooperation and Game Theory

- How to encourage - and sustain - **cooperation**?
- How to **incentivise** social distancing amongst people?
- How to get countries to **cooperate**?

A Classic Example: Buyer-Seller Exchange

- One Buyer and One Seller
- Mutually Beneficial Trade (**Cooperation**)
- Terms of Trade – At What Price? (**Conflict**)
- Will they reach a deal or not? [**Efficiency?**]
- And if they do, what the agreed terms? [**Distribution?**]

Game Playing?

A “game” is any situation involving two or more “players” in which the “fate” of each player depends not only on her “actions” but also on the actions of the other players.

Notes:

1. A “*situation*” can be economic, social or political, etc. (e.g., social distancing)
2. A “*player*” can be a person or a group such as a firm, a political party, a school, a country etc. (e.g., a citizen)
3. The “*fate*” of a player is what she cares about such as profit, happiness, winning an election, growth, money etc. (e.g., catch the virus or not)
4. An “*action*” is a choice or a strategy. (e.g., to social distance or not)

Main Ingredients of a Game:

1. Who are the **players**?
2. What **strategies** does each player have?
3. What are the **payoffs** to each player?

Prisoners' Dilemma (The PD game)

(A classic game, with many applications; two players, each of whom has two strategies)

C = Cooperate – [e.g., social distance]

D = Don't Cooperate - [e.g., don't keep social distance]

Joseph

Sophie:

	<i>C</i>	<i>D</i>
<i>C</i>	5, 5	0, 8
<i>D</i>	8, 0	1, 1

Outcome of the PD Game:

- Unique “dominant” (or “rational”) strategy for each person is: **Not to Cooperate.**
- Hence: outcome is “(1,1)” - everyone catches the virus, high death toll.
- The outcome “(5,5)” is preferred *by both* (everyone) but is **unstable** in that each person has an “incentive to cheat” – there is a temptation to go out when everyone is locked inside their respective homes.
- **Tension between “Individual Rationality” and “Collective Rationality”**

Lessons from the PD Game:

- How to get from “(1,1)” to “(5,5)”? That is, how can one make the good outcome happen? Requires Cooperation; Trust and such like....
- Thomas Hobbes’s classic, *Leviathan*, 1651 provides a solution, which is?:
- Need for a “third” party to enforce the peace, to enforce cooperation, to enforce a lockdown.....
- The “third” party can be the Sovereign (i.e., the State).
- Hence the *raison d’etre* of the modern state.

The Stag-Hunt game

S = Stag
 H = Hare

Mo

		S	H
Aru	S	4, 4	1, 3
	H	3, 1	2, 2

Nash Equilibrium

- [John F. Nash](#) – Nobel Prize in Economics, 1994.
- [Beautiful Mind](#) - 2001 Blockbuster movie
- What is the Nash Equilibrium (NE)?
- Captures a notion of **stability** – stable outcomes. In what sense “stable”?:
- **An outcome is a Nash Equilibrium if *no* player has an *incentive to cheat*.**
- **More precisely, an outcome is a Nash Equilibrium if no player can *unilaterally deviate (from it) and be strictly better-off*.**