POST-CONFLICT OPERATIONS

After having briefly introduced Game Theory...

A big war has just ended, leaving behind destruction and poverty for the losers.
With the aim to revive the international economy, the winners of the conflict are considering the possibility of financially helping all the stakeholders who suffered from the war, such as neutral countries that faced invasion, but also their former enemies, which underwent a government change due to the defeat.
The main debate among the winners is that helping the losers can result in economic advantage also for themselves, but the government change does not guarantee that their counterpart will not show hostility anymore, since a feeling of revanchism can eventually emerge.
On the other side, the losers are debating whether accepting the help, which would have the drawback of being practically obliged to accept the influence in economy and politics of the winners, or refusing it, keeping a substantial independence in all the decisions but at the cost of being on their own for recovering from the war.
Assuming that the two choices have to be taken at the same time and unbeknownst to each other, the situation can be modeled with the following tables:

W and L have similar economic and political systems	L accepts	L does not accept
W helps	2, 2	1, 2
W does not help	1, 1	3, 0

W and L have different economic and political systems	L accepts	L does not accept
W helps	3, 0	1, 2
W does not help	1, 1	2, 2

Indeed, for W helping is preferable to not helping if L accepts (given the availability of L to be helped), but not helping is preferable to helping if L refuses (reaching out but being refused is seen as a hostile

move).
For L, accepting can be better than not accepting (and never worse) if its economic and political systems are similar to those of W, but not accepting is for sure preferable to accepting if they are different, since the acceptance would imply recognizing that the systems of W are better, with potential repercussions outrunning the consequences of the economical renounce.

Task 1: try to play in both situations. Which outcome will result by playing? (*possible use of Wooclap for data collection*)

Introduction of Nash equilibria, then Task 1 is performed again, in order to detect possible differences in light of having introduced that theoretical tool.

Task 2: in a real past context (Marshall Plan), for W helping was preferable to not helping *regardless of L's choice* where W and L had *different* economic and political systems, since W hoped that reaching out would convince L that its systems at the time were not up to the standards of those of W (it was the case of Eastern European countries that joined the Axis during WW2). How the game would change under this assumption?
Students can take particular advantage from translating this context into a proper payoff matrix (different from those presented above), with the aim to answer consciously.

Introduction of Pareto optimalities.

Task 3: the following systems of interactive components allows for generalizing the payoffs:

	L accepts	L does not accept
W helps	$W=$ 2.5 , $L=$ 1	$W=$ 1 , $L=$ 2
W does not help	$W=$ 1 , $L=$ 2	$W=$ 2.5 , $L=$ 1

Compute! Rese...

• W helps, L accepts is not a Nash equilibrium and is

Pareto optimal.

- W helps, L accepts [is not] a Nash equilibrium and [is] Pareto optimal.
- W does not help, L does not accept [is not] a Nash equilibrium and [is] Pareto optimal.
- W does not help, L does not accept [is not] a Nash equilibrium and [is] Pareto optimal.

Try to vary the payoffs according to a proper context, and comment the results.

Task 4: let us consider now a situation where L is undergoing a phase of strong political instability after the war, so neither W nor L know if the two sides will have similar or different economic and political systems in the long run. The situation can be modeled with the following table, by averaging the two already presented with a minor modification:

L has an uncertain economic and political system	L accepts	L does not accept
W helps	2.5, 1	1, 2
W does not help	1, 2	2.5, 1

Which outcome will result by playing? (*possible use of Wooclap for data collection*)

Introduction of mixed Nash equilibria, then Task 4 is performed again, in order to detect possible differences in light of having introduced that theoretical tool.

Task 5: the following systems of interactive components allows for generalizing the payoffs:

	L accepts	L does not accept
W helps	$W =$ [ ] , $L =$ [ ]	$W =$ [ ] , $L =$ [ ]
W does not	$W =$	$W =$

help	, $L =$	, $L =$

Compute! Rese...

Let us suppose that L plays "accepts" with probability p; then, W expects to obtain _____ by playing "helps", _____ by playing "does not help".

Player W would choose randomly if they are equal, that is, if the first degree equation _____ is verified.

Its solution, that is the probability that L plays "accepts" in a mixed strategy equilibrium, is _____ .

Analogously, let us suppose that W plays "helps" with probability q; then, L expects to obtain _____ by playing "accepts", _____ by playing "does not accept".

Player L would choose randomly if they are equal, that is, if the first degree equation _____ is verified.

Its solution, that is the probability that W plays "helps" in a mixed strategy equilibrium, is _____ .

Try to vary the payoffs according to a proper context, and comment the results.

SOLUTIONS

Task 1: the only Nash equilibrium in the first table (W and L have similar economic and political systems) is "W helps, L accepts", with payoffs (2,2).

The only Nash equilibrium in the second table (W and L have different economic and political systems) is "W does not help, L does not accept", with payoffs (2,2).

Task 2: a proper matrix (not the unique possibility) can be constructed by starting from the one representing the case "W and L have different economic and political systems", by changing the payoffs in the cell "W helps, L does not accept", from (1,2) to (3,2). This results in that status being the only Nash equilibrium in the modified game.

Task 4: the game does not possess any (pure) Nash equilibrium, but it possesses a mixed Nash equilibrium where both players have probability 1/2 to play each strategy.