GEQ1000 Asking Questions
Economics (Social Science) Segment

Video 3-3
Experimenting with the model

In the last video, we saw a famous model of strategic interaction called the Prisoner's Dilemma. We learned the language of Game Theory - players, strategies, outcomes and payoffs. We also learned about the concept of Nash Equilibrium. But what do economists do with the Prisoner's Dilemma? And why do economists think of it as a successful model?

What an economist will do with a model to understand it is to play around with it. What if we change this assumption or that assumption? Let's see if the model's result continues to apply.

Modifying the payoffs

Our original version of the model has this payoff matrix

Prisoner's Dilemma

		Player Two C	Player Two D
Player One	C	4 , 4	0 , 6
	D	6 , 0	2 , 2

Now what if we changed some of the numbers? Suppose instead of (0,6) in the top-right cell we had (0,3), and instead of (6,0) in the bottom left cell we had (3,0).

Not a Prisoner's Dilemma

		Player Two C	Player Two D
Player One	C	4 , 4	0 , 3
	D	3 , 0	2 , 2

If this is the payoff matrix, then Player One does best with Cooperate if Player Two chooses Cooperate. Player Two also does best with Cooperate if Player One chooses Cooperate. So, both players want to Cooperate if the other Cooperates.

That means (Cooperate, Cooperate) is now a Nash Equilibrium! This is no longer a Prisoner's Dilemma. It becomes a different game.

Iterated Prisoner's Dilemma

Another modification is to have the players play the game not just one time, but multiple times. This is called an **Iterated Prisoner's Dilemma**. In each round, a player can decide how to play, based on what the other player did in previous rounds.

For example, one possible strategy would be: Cooperate in Round 1; in all other rounds Cooperate if the other player Cooperates in the previous round, and Defect if the other player Defects in the previous round. In other words, just do whatever the other player did in the previous round. This is called a **Tit-for-Tat** strategy. It punishes other players who Defect, but is forgiving if defectors return to cooperating.

Another possible strategy would be: Cooperate in Round 1; if in any round the other player Defects, then Defect in all upcoming rounds. This is called a **Grim Trigger** strategy, and is totally unforgiving.

This modification results in an entirely different way of thinking about the Prisoner's Dilemma. Cooperation is now at least possible because Defecting can hurt a player if the other player can retaliate. Indeed, in a famous tournament in 1980 run by political scientist Robert Axelrod, researchers were asked to submit strategies to play the iterated Prisoner's Dilemma, and the winning strategy turned out to be Tit-for-Tat.