Prisoners' dilemma

1

There are two prisoners whose aim is to minimize the years of imprisonment. They have committed a crime jointly. Each prisoner is interviewed separately and there are not any contacts whatsoever between them. They decide individually to confess or deny the crime taking into account possible decisions of the other prisoner (strategic game). Each prisoner chooses his dominant strategy, that is the behaviour giving the best result regardless of the decision of the other prisoner.

		prisoner **B**			
		confess		**deny**	
prisoner **A**	**confess**	3	3	1	4
	deny	4	1	2	2

The first number shows the years imprisonment of A, the second number of B. If for example A confesses and B denies, A gets 1 year imprisonment and B 4 years (field at the top right).

2

Basic terms

- **Players:** decision makers ("prisoner A or B")
- **Strategy:** behaviour of the players ("confess"/"deny")
- **Pay-off:** outcome (x years inmprisonment)
- **Dominant strategy:** the best outcome for a player regardless of the decision of the other player

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Which are the **dominant strategies** in this game?

from the point of view of prisoner A

- if B confesses, I should also confess (3 years are less than 4 years)
- if B denies, I should again confess (1 year is less than 2 years)

➡ **strategy of A:**
I confess irrespective of the decision of B. "Confess" ist the **dominant strategy** of A (3 years imprisonment).

from the point of view of prisoner B

- if A confesses, I should also confess (3 years are less than 4 years)
- if B denies, I should again confess (1 year is less than 2 years)

➡ **strategy of B:**

"Confess" is his **dominant strategy**, too (3 years imprisonment).

Remarks:

If both prisoners could cooperate successfully, they would get a better outcome for both (2 years imprisonment). But they cannot cooperate, thus, the dominant strategy is the best result which can be achieved when deciding individually. That is the dilemma of the prisoners: By cooperation they could get a better result than by deciding individually.

4

The prisoners' dilemma charakterizes many economic decisions where only a few participants have to decide individually and where the outcome is influenced not only by the own decision but also by the decisions of the other participants. This is often in oligopolistic situations the case.

On the next page there are several examples. Pay-off is always the firm's profit. Can you see a dominant strategy?

41 Advertising, yes or non?

		cigarette company 2			
		advertising		not advertising	
cigarette company 1	advertising	30	30	50	20
	not advertising	20	50	40	40

42 Restricting output, yes or non?

		firm B			
		restricting		not restricting	
firm A	restricting	300	300	100	400
	not restricting	400	100	200	200

43 Cutting prices, yes or non?

		firm B			
		cutting		not cutting	
firm A	cutting	90	90	80	110
	not cutting	110	80	100	100

44 Producing, yes or no?

		firm B			
		producing		not producing	
firm A	producing	-60	-85	+60	0
	not producing	0	+70	+50	0

+ (profit) / - (loss)

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for both cigarette companies "advertising" is the dominant strategy (profit of 30 for each). The market shares do not change; the cost of advertising, hower, lowers the profits. By coordination they could get a better outcome ("not advertising", profit of 40 for each).

42

for both firms "not restricting" is the dominant strategy (profit of 200 for each). By a cartel about "restricting" they could get a higher profit (300 for each) and behave like a monopoly (cartels of this type are forbidden in many countries).

43

for both firms "not cutting" prices are the dominant strategy (profits of 100 for each). By coordination there could **not** be achieved a better outcome. That's why in this case there does not exist a prisoners' dilemma.

44

There is no dominant strategy for either firm, that's why there is no prisoners' dilemma with possible rational decisions.

from the point of view of A:

- if B produces, I do **not** produce (0 > -60)
- if B does **not** produce, then I produce (+60 > +50)

from the point of view of B:

- if A produces, I do **not** produce (0 > -85)
- if A does **not** produce, then I produce (+70 > 0)