

# WHAT DECISIONS DO WE TAKE?

Sometimes, the outcome depends, not only on our own decisions, but also on someone else's. Hence, it is necessary to bear in mind the actions of others!

- How is the price set



in a fish auction?

- If two bakeries are close to each other,



how do they set their prices?

- In an election,



what should the program of a party be?

Game theory helps us to analyze these kinds of situations.

## THE TRAGEDY OF THE COMMONS

We exploit the resources if it is a profitable operation. If we are talking common goods, the individuals make an excessive use of them; instead, if managed jointly, profits can be higher.

«The water wells belonging to individuals exploit a common good, namely the aquifer, and they might even lead to the drying-out of ponds and fountains.»

«Excessive fishing might lead to the depletion of marine resources.»

«CO2 emissions lead to greenhouse effect and, thus, to climate change.»

They must be regulated!

## COORDINATION

Two bicycle riders meet in a path.



If both riders deviate keeping their direction (right or left), they cross without a problem. However, if they do not coordinate, they will have an accident.

How do they coordinate? There are two equilibria, riding on their left side or on their right side.

In Sweden, up to the year 1967, cars circulated on the left side of the road. Starting on September 3rd. of that year, at 5:00 AM (day H for *Höger*, "right" in Swedish) they started to circulate on the right side.



Situations that raise coordination problems are plenty. Can you think of any?

## PRISONER'S DILEMMA

Two thieves have committed a crime and have been arrested. They are being questioned in separate cells, so that the first prisoner does not know what the other is testifying, and vice versa.



The police have promised the first prisoner that, if he confesses, he will be set free, provided that the other prisoner doesn't confess. If both confess, the sentence will be moderately more lenient.

If the first prisoner does not confess, but the other does and incriminates the first one, the first prisoner's sentence could be longer. On the other hand, if none of them confesses (henceforth, none of them incriminates the other), they must serve a sentence for a lesser crime.

Each of the thieves takes the decision separately. Which one is the best strategy?

		PRISONER 2	
		CONFESSES	DOESN'T CONFESS
PRISONER 1	CONFESSES	4 YEARS EACH	NOTHING FOR THE FIRST ONE, 6 YEARS FOR THE SECOND ONE
	DOESN'T CONFESS	6 YEARS FOR THE FIRST ONE, NOTHING FOR THE SECOND ONE	1 YEAR EACH

You can see that both prisoners have a dominant strategy: it is always better to confess, because the prison sentence will be shorter. However, if both confess, each one of them will spend 4 years in prison.

The paradox is that, even though both prisoners have a dominant strategy, namely, to confess, both would spend a shorter time in prison if none of them confessed.

## ANOTHER DILEMMA: INNOVATION OR NOT?

In a city, two companies in the same industry share the customers 50/50 and have the same profits. They are then offered a modern machine, which they could use as a marketing attraction. What should they do?

If only one of the companies innovates, its profits will increase because, the cost of the machine notwithstanding, more clients will be attracted to it. Yet, if both companies add the new machine, both will have made an investment, but they will have the same clients, so their profits won't increase and, on top of it, they will have made an expense.

We can estimate the profits for each company, depending on the situation:

		COMPANY 2	
		INNOVATING	NOT INNOVATING
COMPANY 1	INNOVATING	400, 400	700, 200
	NOT INNOVATING	200, 700	500, 500

If both innovate, they earn the same: 400,000 Euros. Each company has two available strategies: innovating or not innovating.

Once again, we meet the prisoner's dilemma: both companies have a dominant strategy: innovating is always better.

### The technological race never ends

Nowadays, many companies face the dilemma of technological innovation. A new technology turns up, and they should decide whether they embrace it or not. If one company does and the rest don't, some share of the market will change to the innovating company.

From the perspective of the market share, the reasonable stance is for the companies to innovate always in order to defend their position in the market. Conversely, if the objective is short-term profits, the new technology could be the wrong option.

Have you ever found yourself in an everyday situation that fits with this dilemma? Grooming yourself for a dinner or not? Give an expensive present in a wedding, or an inexpensive one, given that we do not know what the others will do?

For further information...



«For that which is common to the greatest number has the least care bestowed upon it. Everyone thinks chiefly of his own, hardly at all of the common interest.»

(Aristotle [IV century B.C.], *Politics*, book II, chapter 2)