BEAUTIFUL ECONOMICS • GAME THEORY

PRISONER'S DILEMMA

When self-interest can leave both players worse off.

THE CENTRAL QUESTION

Why do individually rational choices sometimes create a worse shared outcome?

3, 3	0, 5
5, 0	1, 1

A clear guide to strategic incentives and Nash equilibrium

BEAUTIFUL ECONOMICS

01 / THE GAME

Two people. Two choices.

A classic model of cooperation and self-interest.

Two suspects are questioned separately. Each can Cooperate (stay silent) or Defect (confess). They cannot coordinate. Each person's payoff depends on both choices.

The dilemma: defection is tempting individually, but mutual cooperation gives both players a better payoff.

Illustrative payoff matrix

YOUR CHOICE	PARTNER: COOPERATE	PARTNER: DEFECT
COOPERATE	**3, 3** Both do well	**0, 5** You lose out
DEFECT	**5, 0** You gain most	**1, 1** Both do poorly

Read each cell as (your payoff, partner's payoff). Higher numbers mean better outcomes. The payoffs are illustrative.

Four possible outcomes

3, 3 Both cooperate • total 6

0, 5 You cooperate; partner defects

5, 0 You defect; partner cooperates

1, 1 Both defect • total 2

02 / THE INCENTIVES

Why defect is tempting

Compare your payoff based on your partner's choice.

IF PARTNER COOPERATES

Cooperate → 3 Defect → 5

IF PARTNER DEFECTS

Cooperate → 0 Defect → 1

Dominant strategy: Defect gives a higher payoff regardless of the partner's choice.

Nash equilibrium: (Defect, Defect). If the partner defects, switching alone to Cooperate lowers your payoff from 1 to 0. Neither player can improve by switching alone.

Stable does not mean best for the group

Mutual defection

1 + 1 = 2

Mutual cooperation

3 + 3 = 6

03 / OUT IN THE WORLD

Where the pattern appears

These are analogies to the model, not exact copies.

CLIMATE POLICY

Countries may hope others pay the cost of emissions reduction. Mutual free-riding weakens the shared goal.

PRICE COMPETITION

Firms may prefer high prices collectively, yet each can gain by undercutting. Both may end with lower profits.

TEAM PROJECTS

Each member may save effort while benefiting from team success. If everyone free-rides, the result suffers.

ARMS RACES

Each side invests for security; mutual escalation can become costly for both.

Can cooperation emerge?

Repeated interaction, credible communication, reputation, monitoring, contracts, or penalties can change incentives and make cooperation more attractive.

Careful: repetition alone does not guarantee cooperation. Outcomes depend on the horizon, information, strategies, and enforceability.

04 / REMEMBER & APPLY

Think like an economist

Explain choices by comparing payoffs.

Takeaway: individually rational choices can create a collectively worse outcome when private incentives conflict with shared interests.

01 Why is Defect a dominant strategy in this payoff matrix?

02 Why is (Defect, Defect) a Nash equilibrium, even though mutual cooperation gives a higher total payoff?

03 What rule, reward, or penalty could encourage cooperation? Which payoff would it change?

Further reading

- Osborne, M. J. (2004). An Introduction to Game Theory. Oxford University Press.
- Axelrod, R. (1984). The Evolution of Cooperation. Basic Books.
- Dixit, A. K., & Skeath, S. (2015). Games of Strategy (4th ed.). W. W. Norton.