CHAPTER
12

Game Theory and Bargaining Models

https://doi.org/10.61030/c526-b4cs

Introduction

Negotiators are never alone. Whatever one side does, its result depends on what the other side does, and each side knows this. A firm cutting its price may win customers, unless its rival cuts too; a government raising tariffs may extract concessions, unless its trading partner retaliates; a union threatening to strike may win a higher wage, unless the employer calls its bluff. Situations of this kind, in which each party's best choice depends on the choices of others, are the subject of **game theory**, a branch of economics and mathematics that has become one of the most powerful tools for understanding negotiation.

This chapter introduces the main ideas of game theory and decision analysis that negotiators can use, without requiring advanced mathematics. Section 12.1 presents the prisoner's dilemma and shows why rational parties can end up worse off than if they had cooperated. Section 12.2 examines the ultimatum game and the experimental evidence that people reject offers they consider unfair, even at a cost to themselves. Section 12.3 explains the Nash bargaining solution, a benchmark for how a surplus might be divided according to the parties' alternatives. Section 12.4 shows how repetition, reputation and credible threats change incentives. Section 12.5 turns to decision analysis and shows how expected values and decision trees help negotiators to choose under uncertainty.

The chapter develops the second pillar of the book's framework, **power**, by showing how strategic interaction determines what each side can obtain. It formalises ideas met earlier: the negotiator's dilemma of Chapters 2 and 8, the war of attrition of Chapter 3, and the commitment and patience of Chapter 11. Its Deal File follows a contest between the two largest economies in the world which unfolded, in April 2025, with the speed and logic of a textbook game: an escalation of tariffs between the United States and China to levels halting much of their trade, followed by a retreat a month later.

DEAL FILE

The Tariff Escalation of April 2025

In February 2025 the United States imposed an additional tariff of 10 per cent on imports from China, citing the flow of fentanyl, and in March it doubled the rate to 20 per cent (Executive Order No. 14195, 2025; Executive Order No. 14228, 2025). On 2 April it announced "reciprocal" tariffs on almost all its trading partners, with a rate of 34 per cent for China (Executive Order No. 14257, 2025). What followed was an escalation of a kind rarely seen between large economies. On 4 April China announced an additional tariff of 34 per cent on all US goods from 10 April (Customs Tariff Commission of the State Council, 2025a). The United States raised its reciprocal rate to 84 per cent from 9 April, China announced the same day that it would raise its own rate to 84 per cent (Customs Tariff Commission of the State Council, 2025b), and from 10 April the United States raised its rate again, to 125 per cent (Executive Order No. 14259, 2025; Executive Order No. 14266, 2025). With the fentanyl duties, the total additional tariff on most Chinese goods now stood at 145 per cent. On 11 April China raised its own rate to 125 per cent, from 12 April (Customs Tariff Commission of the State Council, 2025c). At these levels, much trade between the two countries became uneconomic.

Then came the retreat. On 12 May, after talks in Geneva, the two governments issued a joint statement. By 14 May each side would suspend 24 percentage points of its tariff for an initial 90 days, leaving a rate of 10 per cent, and withdraw the increases of 8 to 11 April; China would also suspend or remove the non-tariff countermeasures it had taken since 2 April. A mechanism for continued talks was created, led on the Chinese side by Vice-Premier He Lifeng and on the American side by Treasury Secretary Scott Bessent and Trade Representative Jamieson Greer (*Joint Statement on U.S.–China Economic and Trade Meeting in Geneva*, 2025). Further rounds of consultations followed and led to the Busan truce described in Chapter 11. In February 2026 the US Supreme Court ruled that the emergency powers law under which the reciprocal and fentanyl tariffs had been imposed did not authorise them (*Learning Resources, Inc. v. Trump*, 2026), so that the legal basis of the American moves in this game was itself open to challenge, a development examined in Chapter 4. Figure 12.1 traces the main tariff rates.

Questions to keep in mind. Why did two governments, both of which stood to lose from a trade war, escalate to tariffs neither could sustain? Why did each match the other's move rather than back down? What changed between April and May to make retreat possible? And how might game theory help firms caught in such a contest to anticipate what their governments, and their competitors, will do next? The chapter answers these questions in turn.

Table 12.1

The tariff escalation of 2025 at a glance

Parties	The governments of the United States and China
At stake	Bilateral trade worth hundreds of billions of dollars a year; market access, technology and the balance of trade; each side's credibility in future negotiations
Timeline	Tariffs linked to fentanyl in February and March 2025; reciprocal tariffs announced on 2 April; escalation to 125 per cent on each side by 11 April; Geneva joint statement on 12 May, effective 14 May; further rounds through 2025
Outcome	A 90-day suspension that reduced reciprocal tariffs on both sides to 10 per cent, later extended, and a mechanism for continued negotiation

Note. Author, based on the sources of Figure 12.1.

12.1 Why Do Rational Players End Up Worse Off?

Games, Strategies and Equilibrium

A **game**, in the language of game theory, consists of players, the strategies available to each, and the payoffs each receives for every combination of strategies. A strategy is **dominant** if it gives a player a better payoff whatever the others do. A combination of strategies is a **Nash equilibrium** if no player can improve its payoff by changing its own strategy while the others keep theirs (Nash, 1950b). Equilibrium predicts where rational players will end up, but, as the prisoner's dilemma shows, it does not guarantee that they end up anywhere good.

The Prisoner's Dilemma

The best-known game is the **prisoner's dilemma**. Two players can each cooperate or defect. Each does better by defecting, whatever the other does; but if both defect, both are worse off than if both had cooperated. Table 12.2 applies the game to a tariff dispute between two countries. The numbers are illustrative gains in economic welfare.

Table 12.2

A tariff game as a prisoner's dilemma (payoffs to Country A, Country B)

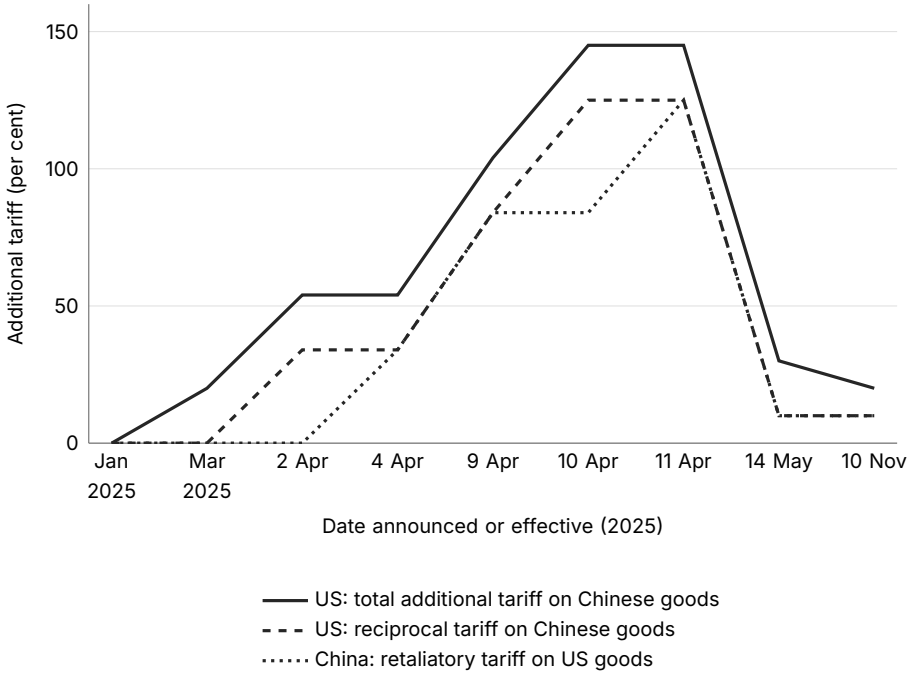
	Country B keeps tariffs low	Country B raises tariffs
Country A keeps tariffs low	10, 10	2, 12
Country A raises tariffs	12, 2	4, 4

Note. Author's illustrative example.

Whatever B does, A obtains more by raising tariffs (12 rather than 10 if B keeps tariffs low; 4 rather than 2 if B raises them), and the same is true for B. Raising

Figure 12.1

Additional tariffs imposed by the United States and China on each other's goods, 2025 (per cent)



Note. Author, based on the executive orders cited in the text, Customs Tariff Commission of the State Council (2025a, 2025b, 2025c), *Joint Statement on U.S.–China Economic and Trade Meeting in Geneva* (2025) and The White House (2025c). Dates are those on which each rate was announced or took effect. The US total includes the reciprocal tariff and the tariff linked to fentanyl, which was cut from 20 to 10 per cent from 10 November 2025. Rates apply to most goods; many products were subject to exemptions or other duties. China's targeted tariffs of February and March 2025 on selected US products, such as energy and farm goods, are not shown.

tariffs is therefore each country's dominant strategy, and the Nash equilibrium is for both to raise tariffs, with payoffs of 4 each. Yet both would be better off, with 10 each, if both kept tariffs low. Individual rationality leads to collective loss.

The prisoner's dilemma captures the negotiator's dilemma of Chapters 2 and 8: each side gains from claiming value, by concealing information or making extreme demands, but if both do so, the value cooperation would create is lost. It also explains why trade agreements, with binding commitments and enforcement mechanisms, exist: they change the payoffs so that cooperation becomes rational.

Escaping the Dilemma

Players caught in a prisoner's dilemma can escape it only by changing the game. Four approaches are common in business and international negotiation. The first is a **binding agreement** with enforcement: the commitments that members of the World Trade Organization make on their maximum tariffs, backed by dispute settlement, are designed to stop countries from sliding into the mutual defection of Table 12.2. The second is **monitoring**, which makes defection visible and therefore punishable; cartels and arms-control agreements depend on it. The third is **changing payoffs** through side payments, penalties or rewards, so that cooperation becomes each player's best response. The fourth is **repetition**, examined in Section 12.4, which allows today's cooperation to be rewarded and today's defection to be punished tomorrow. When none of these is available, as in the spring of 2025, when the usual constraints of trade agreements were set aside by both sides, the dilemma can play out in its harshest form.

Escalation and the Game of Chicken

The tariff escalation of April 2025 resembled a different game as well. In the **game of chicken**, two drivers race towards each other; the one who swerves loses face, but if neither swerves, both crash. Each player wants the other to back down and tries to convince it that it will not back down itself. Commitment, discussed in Chapter 11, is the key: a player who can credibly show that it cannot swerve forces the other to do so. The escalation of tariffs to 125 and 145 per cent was, in part, an attempt by each government to demonstrate resolve and to convince the other that it would bear the costs longer. When the costs became visible to both, both swerved, presenting the retreat at Geneva as a mutual de-escalation rather than a defeat.

KEY MOVE

When you face a prisoner's dilemma, look for ways to change the payoffs: binding agreements, monitoring, penalties for defection or rewards for cooperation. When you face a game of chicken, look for a way for both sides to step back without losing face.

12.2 Take It or Leave It? The Ultimatum Game

The Game and Its Prediction

In the **ultimatum game**, one player, the proposer, is given a sum of money and proposes how to divide it with a second player, the responder. If the responder accepts, the money is divided as proposed; if the responder rejects, both receive nothing. Standard economic reasoning predicts that the proposer will offer the smallest possible amount and the responder will accept it, since something is better than nothing.

What People Actually Do

Experiments tell a different story. In the first experiments, Güth et al. (1982) found that proposers commonly offered far more than the minimum, and responders often rejected small offers. Thousands of later experiments have confirmed the pattern: offers typically average 40 to 50 per cent of the sum, and offers below about 20 per cent are frequently rejected (Camerer, 2003). Responders are willing to give up money to punish an offer they regard as unfair, and proposers, anticipating this, offer more. Cross-cultural studies by Henrich et al. (2001) found that the size of offers varies across societies, reflecting local norms of fairness and cooperation, a theme taken up in Chapter 18.

The ultimatum game teaches three lessons for negotiation. First, fairness matters: a party feeling exploited may reject an agreement which would make it better off, as the Boeing machinists did in Chapter 7. Second, take-it-or-leave-it offers are powerful but risky: the proposer gains if the offer is accepted, but an offer perceived as unfair may be rejected at a cost to both. Third, perceptions of fairness depend on reference points, such as previous agreements, the other side's gains or what others have received, which negotiators can shape through persuasion, the subject of Part IV.

Why Do People Care about Fairness?

Economists have developed models that explain these results. Fehr and Schmidt (1999) proposed that many people are **inequity averse**: they dislike receiving less than others, and to a lesser extent more than others, and are willing to sacrifice some of their own payoff to reduce the difference. A responder who rejects a small offer is not irrational; he or she simply values equality, or the punishment of an unfair proposer, more than the money forgone. Fairness also shapes ordinary business relationships. In a famous survey, Kahneman et al. (1986) found that most respondents considered it unfair for a hardware store to raise the price of snow shovels after a snowstorm, even though economic theory would predict precisely such a response to higher demand. Firms that ignore such perceptions may gain in the short run and lose customers, employees and partners in the

DEAL SNAPSHOT

The EU, China and Electric Cars, 2024 to 2026

On 30 October 2024 the European Union imposed countervailing duties for five years on battery electric vehicles imported from China, having found that Chinese producers benefited from unfair subsidies. The duties, added to the ordinary EU tariff of 10 per cent, varied by company, as Figure 12.2 shows (Commission Implementing Regulation (EU) 2024/2754, 2024). Talks on an alternative, under which exporters would commit to minimum prices instead of paying duties, had not produced agreement when the duties took effect, and the Commission said it remained open to negotiating such price undertakings with individual exporters (European Commission, 2024). The game then continued as a series of bilateral bargains. In February 2026 the Commission accepted an undertaking from Volkswagen's Chinese joint venture in Anhui and its EU importer, SEAT, for the CUPRA Tavascan, a model built in China. In return for exemption from the duties, the company committed to respect minimum import prices based on the cost of a comparable car made in the EU, to export no more than a set number of vehicles a year, to send no other electric cars from China to the EU and to make significant investments in the EU's electric vehicle industry (Commission Implementing Decision (EU) 2026/328, 2026). The sequence illustrates how a game of retaliation can evolve into a set of bilateral bargains in which minimum prices replace tariffs.

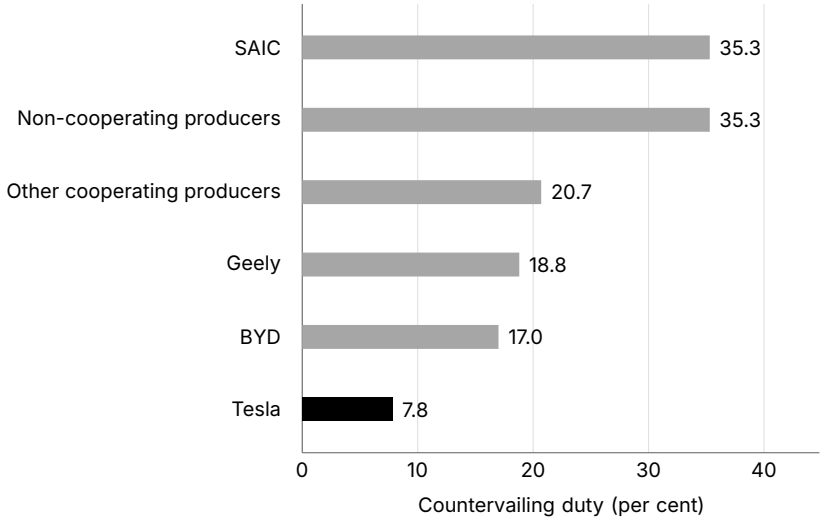
long run, which is why perceived fairness is an asset to be managed in every negotiation.

KEY MOVE

Never assume that the other side will accept an offer simply because it is better than nothing. Test your offer against the other side's sense of fairness, and give it a reason to regard the division as legitimate.

Figure 12.2

EU countervailing duties on battery electric vehicles imported from China, by producer, from October 2024 (per cent)



Note. Author, based on Commission Implementing Regulation (EU) 2024/2754 (2024). The duties are added to the ordinary EU import tariff of 10 per cent. "Other cooperating" refers to producers that cooperated with the investigation but were not individually examined; Tesla's rate followed an individual examination at its request.

12.3 How Should the Surplus Be Split? The Nash Bargaining Solution

The Solution

Nash (1950a) asked a simple question: if two rational parties bargain over how to divide a surplus, what division should they agree on? He showed that, under a small set of reasonable conditions, there is a unique answer. Each party has a **disagreement point**, the payoff it receives if bargaining fails, which corresponds to its BATNA. The **Nash bargaining solution** is the division that maximises the product of the two parties' gains above their disagreement points. When the parties value the surplus in the same way, the solution gives each party its disagreement payoff plus half of the remaining surplus.

A Worked Example

Return to the brake housing of Chapter 2. The supplier's cost is €40, and the carmaker could buy elsewhere for €60, so the surplus is €20. Suppose, however,

that the supplier has an alternative customer who would pay €45, while the carmaker's alternative remains €60. The supplier's disagreement point is now €45, not €40. Table 12.3 shows how the Nash solution changes.

Table 12.3

The Nash bargaining solution with different alternatives (€ per unit)

Case	Supplier's alternative	Carmaker's alternative	Surplus above alternatives	Nash price
No alternative customer	40	60	20	50
Alternative customer at €45	45	60	15	52.50
Alternative customer at €55	55	60	5	57.50

Note. Author's worked example.

The table shows the central lesson of the Nash solution: improving one's alternative improves one's share, even if the alternative is never used. Each euro by which the supplier's alternative rises moves the price towards the supplier by half a euro, as the remaining surplus is split in two. This is the formal counterpart of the argument in Chapter 11 that the BATNA is the foundation of bargaining power.

Asymmetric Bargaining Power

The basic Nash solution splits the remaining surplus equally. The **generalised Nash solution** allows for asymmetric bargaining power, represented by a parameter that gives one party a larger share. Rubinstein (1982), discussed in Chapter 11, showed that such an asymmetry arises naturally when one party is more patient than the other. In practice, the parameter captures everything that makes one side stronger apart from its alternative: patience, information, commitment and skill.

The Nash solution is a benchmark, not a prediction of what will happen in every negotiation. Real negotiators may fail to agree, may misjudge each other's alternatives or may be guided by norms of fairness, such as an equal split of the total rather than of the surplus above alternatives. But the benchmark is useful in preparation: by estimating each side's alternatives and the surplus between them, a negotiator can judge whether a proposed division is reasonable and where the pressure points lie.

KEY MOVE

Use the Nash solution as a benchmark: estimate each side's alternative, calculate the surplus between them and ask what an equal split of that surplus would imply. Then work to improve your alternative, because each improvement moves the benchmark in your favour.

12.4 What Changes When the Game Repeats?

The Shadow of the Future

The prisoner's dilemma predicts defection when the game is played once. Most business negotiations, however, are part of continuing relationships: suppliers and customers, employers and unions, and trading nations deal with each other again and again. In a **repeated game**, each player's choice today affects how the other will treat it tomorrow, and cooperation can be sustained by the threat of future punishment.

Axelrod (1984) explored this idea through computer tournaments in which strategies for the repeated prisoner's dilemma competed against one another. The winner was a simple strategy called **tit for tat**: cooperate in the first round, and thereafter do whatever the other player did in the previous round. Tit for tat succeeded because it was nice (it never defected first), retaliatory (it punished defection at once), forgiving (it returned to cooperation as soon as the other did) and clear (its behaviour was easy to recognise). Axelrod concluded that cooperation is sustainable when the **shadow of the future** is long enough, in other words when the parties expect to interact often and value future payoffs highly.

Reputation and Credible Threats

Repetition also creates reputation. A party known to keep its promises can make agreements others will trust; a party known to retaliate can deter defection without having to retaliate often. Threats and promises influence the other side only if they are **credible**: the other side must believe that the party will carry them out when the time comes, even if doing so is costly. Schelling (1960) showed that credibility can be built by commitment, by reputation and by making the threatened action automatic.

The tariff escalation can be read in this light. Each side's immediate matching of the other's tariffs resembled tit for tat: retaliation was swift and proportional. The retreat at Geneva was the forgiving phase, in which both returned to lower tariffs together. Throughout, each side sought to maintain a reputation for resolve, since any appearance of weakness would invite further demands in later rounds.

DEAL SNAPSHOT

OPEC+ between Restraint and Market Share, 2025

The members of OPEC+, a group of oil producers led by Saudi Arabia and Russia, face a classic repeated game. Each member gains from producing more than its quota, but if all do so, prices fall and all lose. Cooperation is sustained by regular meetings, the monitoring of each country's output and the possibility that the largest producers will raise output to punish those who cheat. In 2023 eight members (Saudi Arabia, Russia, Iraq, the United Arab Emirates, Kuwait, Kazakhstan, Algeria and Oman) made two rounds of additional voluntary cuts, of 1.65 million barrels a day in April and 2.2 million in November. From April 2025 they began to return the second round to the market, a process first planned to last eighteen months and then accelerated with larger monthly steps (Organization of the Petroleum Exporting Countries [OPEC], 2025a). In September they started on the first round, adding 137,000 barrels a day in each of October, November and December, and then paused further increases for the first three months of 2026 (OPEC, 2025b, 2025c, 2025d). In November 2025 the wider group also approved a mechanism for assessing each country's maximum sustainable production capacity, to serve as the reference for production baselines from 2027 (OPEC, 2025e). The decisions show the trade-off at the heart of any cartel: restraint supports prices, but producers that have restrained output for years seek to recover market share, and the group must constantly renegotiate the balance.

KEY MOVE

In a continuing relationship, cooperate first, respond promptly and proportionately to defection, forgive when the other side returns to cooperation and make your strategy easy to read.

12.5 How Do We Decide under Uncertainty?

Expected Value

Many negotiation decisions are made under uncertainty: whether to accept an offer or hold out for a better one, whether to settle a dispute or go to court, whether to make a concession now or wait. **Decision analysis**, developed by Raiffa (1968), offers a disciplined way of making such choices. Its basic tool is the **expected value**: the average outcome of a decision, calculated by multiplying the value of each possible outcome by its probability and adding the results.

Decision Trees

A **decision tree** represents a decision as a sequence of choices and uncertain events. Table 12.4 sets out the calculation for a firm deciding whether to accept a settlement of €2 million in a commercial dispute or to pursue arbitration. Its lawyers estimate a 50 per cent chance of winning €5 million, a 30 per cent chance of winning €2 million and a 20 per cent chance of losing; the arbitration will cost €600,000 whatever the result.

Table 12.4

Accept a settlement or go to arbitration? An expected-value calculation (€ million)

Outcome of arbitration	Probability	Award	Cost of arbitration	Net value	Probability × net value
Win in full	0.5	5.0	0.6	4.4	2.20
Win in part	0.3	2.0	0.6	1.4	0.42
Lose	0.2	0.0	0.6	-0.6	-0.12
Expected value of arbitration					**2.50**
Settlement offered					**2.00**

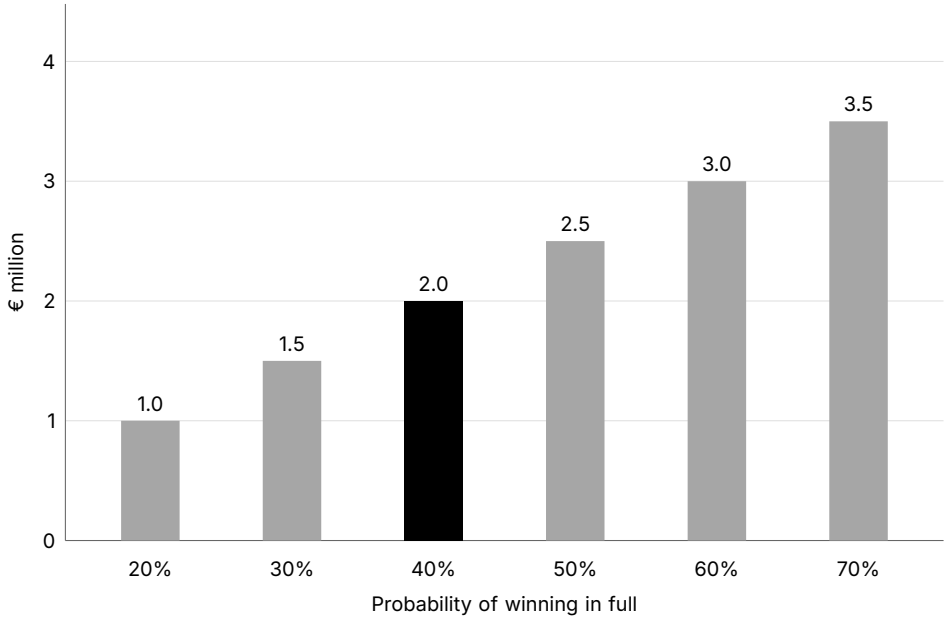
Note. Author's worked example.

The expected value of arbitration, €2.5 million, exceeds the settlement of €2 million, so a decision maker who is neutral to risk would reject the offer. The analysis does not end there, however. A firm unable to afford the 20 per cent chance of losing €600,000, or one valuing a quick resolution, may rationally prefer the certain settlement. The calculation also shows the firm its reservation price: any settlement above €2.5 million is better than arbitration on average, and the other side, if it makes a similar calculation, may be willing to offer more than €2 million. Decision analysis thus connects directly to the concept of bargaining in the shadow of the law in Chapter 5.

Because the probabilities are estimates, the conclusion should be tested. Figure 12.3 holds the chance of a partial win at 30 per cent and varies the chance of winning in full, with the chance of losing taking up the remainder. In this example the expected value of arbitration is simply five times the probability of a full win. If the lawyers' estimate fell from 50 to 40 per cent, the expected value would fall to €2 million, exactly the settlement on offer; below 40 per cent, the settlement is the better choice even for a decision maker who is neutral to risk.

Figure 12.3

Sensitivity of the expected value of arbitration to the probability of winning in full (€ million)



Note. Author's calculation from the worked example in Table 12.4. The chance of a partial win is held at 30 per cent; the chance of losing is the remainder. The highlighted bar marks the break-even point at which arbitration and the settlement of €2 million have the same expected value.

Uses and Limits

Decision analysis forces negotiators to make their assumptions explicit, to separate judgements about probabilities from judgements about values and to test how sensitive their conclusions are to changes in the assumptions. Its limits are equally clear: probabilities are often subjective, outcomes may be hard to value, and people's attitudes to risk and loss depart systematically from the assumptions of expected-value reasoning, as Chapter 16 shows. Dixit and Nalebuff (2008) and Raiffa (1982) offer accessible introductions to the use of these tools in strategy and negotiation.

The author's research on business and trade in a fragmented world economy examines how firms make decisions under the uncertainty created by tariffs and geopolitical tension, and how they seek new partners to reduce their exposure (Kumar, 2026b).

KEY MOVE

Before accepting or rejecting an offer under uncertainty, draw the decision tree. Estimate the probabilities and values honestly, calculate the expected value of your alternative and then ask how much risk you are willing to bear.

BACK TO THE DEAL FILE

Reading the Tariff Escalation

The tools of this chapter explain both the escalation of April 2025 and the retreat of May.

The underlying game was a prisoner's dilemma. Each side could gain by imposing tariffs if the other did not retaliate, but mutual tariffs left both worse off. Without a binding agreement, each had an incentive to defect.

The escalation was a game of chicken. By matching each other's increases, each government signalled that it would not back down. Tariffs of 125 and 145 per cent served less as instruments of trade policy than as demonstrations of resolve, in an attempt to convince the other side to swerve first.

Retaliation followed tit for tat. Each step by one side was met immediately by an equivalent step from the other. This made escalation rapid, but it also made the path back clear: when one side signalled a willingness to reduce, the other could follow.

The retreat reflected changed expected values. As the costs to both economies mounted, each government's estimate of the cost of continuing rose. The Geneva statement allowed both to reduce tariffs simultaneously, preserving face, while keeping the option of restoring them in reserve.

The game repeated. The 90-day suspension, its extensions and the later Busan truce turned a single confrontation into a repeated game with deadlines, in which each side's reputation for resolve and reliability mattered for every later round.

MA EXTENSION

Bargaining with Outside Options and Threats

In the Nash bargaining solution, the disagreement point is usually treated as fixed. In practice, parties can influence it by threats, as Nash (1953) himself recognised in a later paper on variable threats. In a tariff dispute, each side's ability to raise the other's cost of disagreement, by imposing tariffs or export controls, shifts the disagreement point and therefore the solution. The *outside option principle* in bargaining theory adds that an outside option affects the outcome only if it is credible, in other words if the party would really take it. Apply these ideas to the Deal File and to the rare earths case in Chapter 11. How did each side try to worsen the other's disagreement point? Which threats were credible, and why? How would you model the effect of the 90-day suspension on the parties' incentives to reach a lasting agreement?

ETHICS CHECK

In April 2025 tariffs of more than 100 per cent were imposed and removed within weeks, causing losses to firms, workers and consumers in both countries and beyond. Game theory treats such moves as strategies in a contest of resolve. Is it ethical for governments to impose large costs on their own citizens and on third parties as a negotiating tactic? Does the analysis of negotiation as a game risk making such tactics seem more acceptable than they are?

Pillar Scorecard

Table 12.5

Pillar Scorecard: the tariff escalation of 2025

Pillar	Importance in this case	Evidence
Profit	Very high	Bilateral trade worth hundreds of billions of dollars was disrupted, with large costs to firms and consumers
Power	Very high	Each side's ability to impose costs and to endure them determined the escalation and the terms of retreat
Persuasion	Moderate	Each government presented its actions as a defence of national interests and the retreat as a mutual success

Your Move

This is a constructed teaching case.

You are the chief executive of one of two cement producers that supply most of the market in a region of southern Poland. For years both firms have kept prices stable. Your rival has just cut its price to large construction firms by 8 per cent, and your sales director wants to respond with a cut of 10 per cent. A major construction company has also offered you a five-year supply contract at a price 5 per cent below your current list price, and says it will sign with your rival if you refuse. Your analysts estimate a 60 per cent chance that the rival will win the contract if you refuse, in which case your profits would fall by €3 million a year.

1. Model the price competition between your firm and your rival as a game. Is it a prisoner's dilemma? What equilibrium would you expect?
2. How would a strategy like tit for tat apply here? What are the risks of matching or exceeding the rival's cut?
3. Use a decision tree to decide whether to accept the construction company's offer, stating any additional assumptions you need.
4. Within the limits of competition law, which prohibits agreements on prices between competitors, how could you avoid a price war?

Conclusion

Game theory provides a rigorous language for negotiations in which each side's best move depends on the other's. The prisoner's dilemma explains why rational parties can end up worse off than if they had cooperated, and why binding agreements and enforcement mechanisms are valuable. The game of chicken explains escalation and the importance of commitment and face. The ultimatum game shows that people care about fairness and will reject offers they regard as unfair, even at a cost to themselves. The Nash bargaining solution provides a benchmark for dividing a surplus and shows formally why better alternatives bring larger shares. Repeated games explain how cooperation can be sustained by the shadow of the future, by reputation and by credible threats, and decision analysis helps negotiators to choose under uncertainty. The tariff escalation of April 2025 illustrates all these ideas: a prisoner's dilemma played as a game of chicken, with tit-for-tat retaliation, followed by a mutual retreat when the expected costs became clear. Game theory explains the logic of strategic choices; negotiators must still carry them out. Chapter 13 turns to the practical phases, techniques and tools through which negotiations are conducted, from the opening offer to the implementation of an agreement.

Exercises

A. Objective Questions

1. A Nash equilibrium is a combination of strategies in which:
   a) both players receive the highest possible payoff
   b) one player dominates the other
   c) players cooperate
   d) no player can improve its payoff by changing its own strategy alone

2. In Table 12.2, the Nash equilibrium is for:
   a) both countries to keep tariffs low
   b) both countries to raise tariffs
   c) A to raise and B to keep tariffs low
   d) neither country to act

3. In experiments with the ultimatum game, responders typically:
   a) reject offers they regard as unfair, even at a cost to themselves
   b) accept any positive offer
   c) always demand half
   d) make the first offer

4. The Nash bargaining solution maximises:
   a) the sum of the parties' payoffs
   b) the payoff of the stronger party
   c) the product of the parties' gains above their disagreement points
   d) the number of issues agreed

5. In Table 12.3, if the supplier's alternative rises from €40 to €45, the Nash price:
   a) falls to €47.50
   b) remains €50
   c) rises to €52.50
   d) rises to €60

6. Axelrod's (1984) tournaments were won by a strategy that:
   a) cooperated first and then copied the other player's previous move
   b) always cooperated
   c) always defected
   d) chose moves at random

7. Under the Geneva joint statement of May 2025, the United States and China each reduced the tariff in question for an initial 90 days to:
   a) 0 per cent
   b) 10 per cent
   c) 34 per cent
   d) 125 per cent

8. In Table 12.4, the expected value of going to arbitration is:
   a) €2.0 million
   b) €2.5 million
   c) €4.4 million
   d) €5.0 million

B. Short-Answer Questions

1. Explain the prisoner's dilemma and why it leads rational players to a worse outcome than cooperation.
2. How does the game of chicken differ from the prisoner's dilemma? Which better describes the tariff escalation of April 2025?
3. Summarise the experimental evidence from the ultimatum game and explain its lessons for negotiation. How does the theory of inequity aversion explain this evidence?
4. Explain the Nash bargaining solution and show, with a numerical example, how improving one's alternative changes the outcome.
5. Why can cooperation be sustained in a repeated game but not in a single game?
6. What makes a threat credible? Give two examples.
7. Explain how a decision tree can help a negotiator to decide whether to accept a settlement.
8. Name four ways in which players can escape a prisoner's dilemma, and give a business or international example of each.

C. Long-Answer Questions

1. Analyse the tariff escalation between the United States and China in April and May 2025 using the prisoner's dilemma, the game of chicken and the theory of repeated games.
2. "Fairness is not an obstacle to rational bargaining but part of it." Discuss with reference to the ultimatum game and to cases from this book.
3. Use the Nash bargaining solution to analyse a negotiation of your choice. How useful is it as a benchmark, and what are its limitations?
4. Evaluate the usefulness of decision analysis for negotiators, illustrating your answer with a decision tree for a business decision under uncertainty.

Further Reading

Axelrod, R. (1984). *The evolution of cooperation*. Basic Books.
How cooperation can emerge and survive in repeated interactions.

Camerer, C. F. (2003). *Behavioral game theory: Experiments in strategic interaction*. Princeton University Press.
The experimental evidence on how people actually play strategic games.

Dixit, A. K., & Nalebuff, B. J. (2008). *The art of strategy: A game theorist's guide to success in business and life*. W.W. Norton.
An accessible introduction to game theory for managers.

Fehr, E., & Schmidt, K. M. (1999). A theory of fairness, competition, and cooperation. *Quarterly Journal of Economics, 114*(3), 817–868.
The model of inequity aversion.

Güth, W., Schmittberger, R., & Schwarze, B. (1982). An experimental analysis of ultimatum bargaining. *Journal of Economic Behavior and Organization, 3*(4), 367–388.
The first experiments with the ultimatum game.

Henrich, J., Boyd, R., Bowles, S., Camerer, C., Fehr, E., Gintis, H., & McElreath, R. (2001). In search of homo economicus: Behavioral experiments in 15 small-scale societies. *American Economic Review, 91*(2), 73–78.
Cultural variation in fairness and cooperation.

Kumar, P. (2026a). *Multinational enterprise strategy in the global economy: Theory, evidence, and international case studies*. University of Opole Publishing House (forthcoming).
The author's companion text, including the strategic interaction of multinational firms and governments.

Kumar, P. (2026b). Entrepreneurship in a fragmented world: India–Europe trade cooperation as a catalyst for business development. *Ovidius University Annals, Economic Sciences Series, 26*(1), 59–68.
How firms adapt their strategies to trade conflict and fragmentation.

Nash, J. F. (1950a). The bargaining problem. *Econometrica, 18*(2), 155–162.
The original statement of the Nash bargaining solution.

Nash, J. F. (1950b). Equilibrium points in n-person games. *Proceedings of the National Academy of Sciences, 36*(1), 48–49.
The definition of Nash equilibrium.

Raiffa, H. (1968). *Decision analysis: Introductory lectures on choices under uncertainty*. Addison-Wesley.
The foundations of decision analysis.

Raiffa, H. (1982). *The art and science of negotiation*. Belknap Press of Harvard University Press.
Game theory and decision analysis applied to negotiation.

Schelling, T. C. (1960). *The strategy of conflict*. Harvard University Press.
Commitment, credibility and the strategy of threats.