

### Exercise 9

Two retailers (Hardperson and Durodumb) dominate the hardware supply market in Dubboville and advertise the products they sell and their prices. They each have three policy options. Each can set low or high prices for their products or each can play a match policy (a 'meet the competition' policy) which involves advertising a high price but promising to meet any lower price advertised by a competitor. The resulting payoffs are as follows:

		Hardperson		
		Low	High	Match
Durodumb	Low	2,000 2,000	4,000 0	2,000 2,000
	High	0 4,000	3,000 3,000	3,000 3,000
	Match	2,000 2,000	3,000 3,000	3,000 3,000

If both firms advertise high prices, they earn monopoly profits. If they charge low prices, they get lower profits. If one advertises high prices and the other low prices, then the one advertising a low price gets all the profits. The match strategy involves advertising a high price but offering to meet any lower price advertised by the competitor. The match policy yields the same profit to a firm which prices high when its opponent does, but involves no losses to that firm even when the opposing firm advertises a low price. With the match strategy, one firm playing 'low' and the other playing 'high' is equivalent to both playing 'low'. One firm playing 'high' while the other plays 'match' is equivalent to both playing 'high'.

- What is the industry equilibrium without the match policy for either firm?
- What is the industry equilibrium with the match policy as a possible strategy for each firm?
- Who benefits from the match policy? Explain the gain derived by the individual.

### Answer

- There is a Prisoner's Dilemma. They each set low prices.
- They each price high, since even if the other firm undercuts them, the match policy guarantees they are no worse off.
- Firms benefit and consumers lose.

## Exercise 10

### Trade subsidies and national advantage

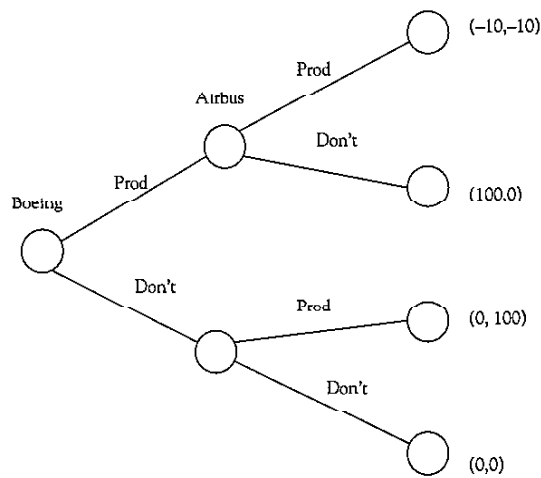
Consider the market for aircraft. The aircraft production industry has such large scale economies that possibly only a single large producer can survive. Suppose there are two firms, Boeing and Airbus, and that the payoffs (in billions) from their individual or joint production of aircraft are as summarised in the following payoff table:

		Airbus	
		Produce	Don't produce
Boeing	Produce	-10, -10	100, 0
	Don't produce	0, 100	0, 0

- Show there are two Nash equilibria in the simultaneous-moves version of this game. Interpret these possibilities.
- Show that, if the game is played sequentially with Boeing moving first, then, in equilibrium, Boeing will produce, but Airbus will not.
- Suppose that European governments offer to provide Airbus with a subsidy of 20 if it produces, regardless of what Boeing does. How does this affect the outcome of the game?
- Suppose that following the moves by European governments, the United States government responds and offers a subsidy of 20 to Boeing (if Boeing produces) regardless of what Airbus does. How does this influence the game outcome?

**Answers**

- a. Cell-by-cell inspection or the arrows method shows these are (produce, don't produce), (don't produce, produce). If either firm produces, then the other should not produce.
- b. Setting out the game tree:



Here, if Boeing produces, then Airbus will not produce, because Airbus then gets 0 rather than -10 and Boeing will get 100. If Boeing does not produce, then Airbus will produce, since it then gets 100 rather than 0, and Boeing gets nil.

Hence, Boeing will produce and Airbus won't.

- c. In this case, irrespective of what Boeing does, the dominant strategy for Airbus is to produce.
- d. In this case the payoffs become:

		Airbus	
		Produce	Don't produce
Boeing	Produce	10, 10	120, 0
	Don't produce	0, 120	0, 0

Both firms now have dominant strategies to produce.

This exercise was created by Pindyck, R. & Rubinfeld, D. (2001) from an example used by Paul Krugman. They give the following description of events following the actual European subsidy of Airbus:

'European governments did commit to subsidizing Airbus, and during the 1980s, Airbus successfully introduced several new airplanes. The result, however, was not quite the one reflected in our stylized example. Boeing also introduced new airplanes (the 757 and 767 models) that were extremely profitable. As commercial air travel grew, it became clear that both companies could profitably develop and sell a new generation of airplanes. Nonetheless, Boeing's market share would have been much larger without the European subsidies to Airbus. One study estimated that those subsidies totalled \$25.9 billion during the 1980s and found that Airbus would not have entered this market without them.'

## Exercise 1

### The Hawk-Dove game

Two birds of the same species compete for a territory with a fixed value. They can each adopt a hawkish or a dovelike strategy. If both behave like doves, then they share the territory. If one behaves like a dove and the other behaves like a hawk, the hawk gets all of the territory. If they both behave like a hawk, then a fight results. This leads to an equal division of the territory but also to costs which might exceed the value of the territory gained.

Discuss the character of each of the following versions of this game.

Figure 7.4 a and b *The Hawk-Dove game*

Pay-off matrix a	Dove	Hawk
Dove	3,3	0,6
Hawk	6,0	1,1

Pay-off matrix b	Dove	Hawk
Dove	1,1	0,2
Hawk	2,0	-1,-1

- Each bird has a dominant strategy of playing Hawk. This is a Prisoner's Dilemma, since both birds would be better off playing the non-equilibrium strategy Dove.
- There are two Nash equilibria. (Dove, Hawk) and (Hawk, Dove). It is a version of the 'Chicken game'.

## Exercise 2

Throughout the twentieth century, some soldiers in battle refused to fire their weapons. Some studies of WWII found that up to 80 per cent of weapons were not fired when the enemy was engaged. Why is this an example of the PD?

### Answer

It is collectively sensible for soldiers to fire their weapons in order to defeat their opponent. But firing may attract an enemy response so it is individually rational for each fighter to not fire. This is a classic team example of a Prisoner's Dilemma. (A related story, that may be a myth, is that in ancient China rowers who competed in a boat race agreed to appoint an overseer to punish physically any rower who exerted insufficient effort. This can be seen as a team attempt to collectively prevent a possible Prisoner's Dilemma).

## Exercise 3

Two firms operating in Melbourne distribute imported Italian Blunko ovens in Australia. These ovens are fashionable and face little competition. Ignoring legal issues, how can these firms maximise joint profits by co-operating to set a high price? What factors might disturb this cartel arrangement and lead to the resumption of competitive pricing?

### Answer

To secure co-operation, they could offer a meet-the-competition (MTC) clause. They could integrate. Factors upsetting their co-operation might include a deteriorating economy that puts pressure on margins or increased competition from other brands.

When is co-operation likely? This is asking when tit-for-tat or co-operation is plausible. Co-operation is more plausible if the current gain from defecting by discounting is less than the long-term benefits from cooperating and pricing high. This is more likely if each firm has a low discount rate, if their monopoly position is likely to continue into the future with good business prospects, if the probability of detecting discounting is high, and if demand for Blinkos is not a 'fad' demand.

#### Exercise 4

As the number of firms in a Cournot industry equilibrium increases, price will typically fall. Why?

#### Answer

Revenue destruction effects are greater when there are many firms, since a firm's private gain from keeping price high is smaller. An individual firm has less to gain from pursuing market power.

#### Exercise 5

Which competitive strategies are pursued by firms in the following oligopolistic market structures?

- a. The Australian soap and detergents market.
- b. The market for Australian newspapers. (Note that *The Australian* is a national newspaper competing in various state markets.)

#### Answer

- a. Much non-price competition and low price competition. A wide range of products produced by a concentrated industry.
- b. Newspapers are regionally or state-based and operate in highly concentrated markets. Competition from national newspapers (*The Australian* and *The Australian Financial Review*), magazines, TV, and radio. Much non-price competition is in the form of advertising. Occasionally, price competition. *The Australian* was sold for a period in Victoria at a discount, perhaps due to the dominant position of *The Age* in that state. Strong quantity discounts and price discrimination (*The Australian Financial Review* sells for half price in universities).