

Exercise walk-through

4.5

Oligopoly and Game Theory

AP Microeconomics

Read each firm's incentive, holding its rival fixed

An **oligopoly** has few major sellers and barriers to entry. Firms are **interdependent**.

Game 1: independent, simultaneous choices

Profits are in \$ millions. The first entry is A's profit; the second is B's. Both firms know the **payoff matrix**; they do not cooperate.

	B: High	B: Low
A: High	(10, 10)	(4, 14)
A: Low	(14, 4)	(6, 6)

Does A prefer Low for *each* B choice? Check B separately. Can either firm gain by switching alone from (Low, Low)?

Game 1: prove dominance and equilibrium

A's comparisons

If B High: Low gives 14 rather than 10.

If B Low: Low gives 6 rather than 4.

Low is A's **dominant strategy** :
better whatever B does.

At (Low, Low), either firm's unilateral switch cuts its own payoff from 6 to 4. Neither gains: a **Nash equilibrium** .

B's comparisons

If A High: Low gives 14 rather than 10.

If A Low: Low gives 6 rather than 4.

Low is also B's dominant strategy.

Dominance compares a strategy across all rival choices. Nash checks unilateral switches at a particular outcome.

Why is the cooperative outcome unstable in this game?

	B: High	B: Low
A: High	(10, 10)	(4, 14)
A: Low	(14, 4)	(6, 6)

Payoffs (A, B), \$ millions. At the Nash outcome, each receives 6.

At (High, High), combined profit is $10 + 10 = 20$, above $6 + 6 = 12$.

But either firm can raise its own profit from 10 to 14 by switching alone.

This **prisoners' dilemma** explains an incentive to cheat when **colluding** or forming **cartels**.

Game theory studies these interacting choices. The incentive to cheat does not prove that every real cartel immediately collapses.

Game 2: what if neither firm has a dominant strategy?

Same assumptions and payoff order (A, B), in \$ millions. New illustrative choices and payoffs:

	B: Reliability	B: Power
A: Safety	(12, 18)	(24, 25)
A: Comfort	(22, 30)	(20, 15)

Find A's best response to each B choice. Find B's best response to each A choice. Then check each cell for profitable unilateral switches.

A Nash equilibrium can exist without a dominant strategy. Do not assume every matrix is a prisoners' dilemma.

Game 2: two equilibria, no dominant strategy

A's best response

B Reliability: Comfort, $22 > 12$.

B Power: Safety, $24 > 20$.

A's choice changes with B's: no dominant strategy.

Nash: Safety, Power. A switching gets 20 instead of 24; B switching gets 18 instead of 25.

Nash: Comfort, Reliability. A switching gets 12 instead of 22; B switching gets 15 instead of 30.

B's best response

A Safety: Power, $25 > 18$.

A Comfort: Reliability, $30 > 15$.

B's choice changes with A's: no dominant strategy.

Exercises 2.1-2.3

2.1 State two features of an oligopoly.

[2]

2.2 Define a dominant strategy.

[1]

2.3 State why firms in a prisoner's dilemma may fail to cooperate.

[2]

Exercises 2.1-2.3

2.1 State two features of an oligopoly. [2]

2.1

- any two of: few firms, mutual interdependence, barriers to entry, differentiated or identical products

2.2 Define a dominant strategy. [1]

2.2

- a choice that is best for a firm no matter what its rival does

2.3 State why firms in a prisoner's dilemma may fail to cooperate. [2]

2.3

- each firm has an incentive to defect for a better individual payoff, so the cooperative outcome is not a stable equilibrium

Exercises 3.1-3.2

3.1 An oligopoly has

[1]

☐

A one firm

B a few interdependent firms

C very many firms

D no firms

3.2 A successful cartel raises prices toward the

[1]

☐

A competitive outcome

B monopoly outcome

C zero-price outcome

D marginal-cost outcome

Exercises 3.1-3.2

3.1 An oligopoly has

[1]

☐

- A one firm
- B a few interdependent firms
- C very many firms
- D no firms

3.1 B

- a few interdependent firms.

3.2 A successful cartel raises prices toward the

[1]

☐

- A competitive outcome
- B monopoly outcome
- C zero-price outcome
- D marginal-cost outcome

3.2 B

- monopoly outcome.

Exercise 3.3 (a)

3.3 Two firms each choose “high price” or “low price”. Each earns more by cutting its price whatever the other does.

(a) Name each firm’s strategy.

[1]

Exercise 3.3 (a)

3.3 Two firms each choose “high price” or “low price”. Each earns more by cutting its price whatever the other does.

(a) Name each firm’s strategy.

[1]

(a)

- a dominant strategy (charge the low price)

Exercise 3.3 (b)

3.3 Two firms each choose “high price” or “low price”. Each earns more by cutting its price whatever the other does.

(b) Name the likely outcome (both charge a low price).

[1]

Exercise 3.3 (b)

3.3 Two firms each choose “high price” or “low price”. Each earns more by cutting its price whatever the other does.

(b) Name the likely outcome (both charge a low price). [1]

(b)

- the Nash equilibrium

Exercise 3.3 (c)

3.3 Two firms each choose “high price” or “low price”. Each earns more by cutting its price whatever the other does.

(c) Name this type of game.

[1]

Exercise 3.3 (c)

3.3 Two firms each choose “high price” or “low price”. Each earns more by cutting its price whatever the other does.

(c) Name this type of game.

[1]

(c)

- a prisoner's dilemma