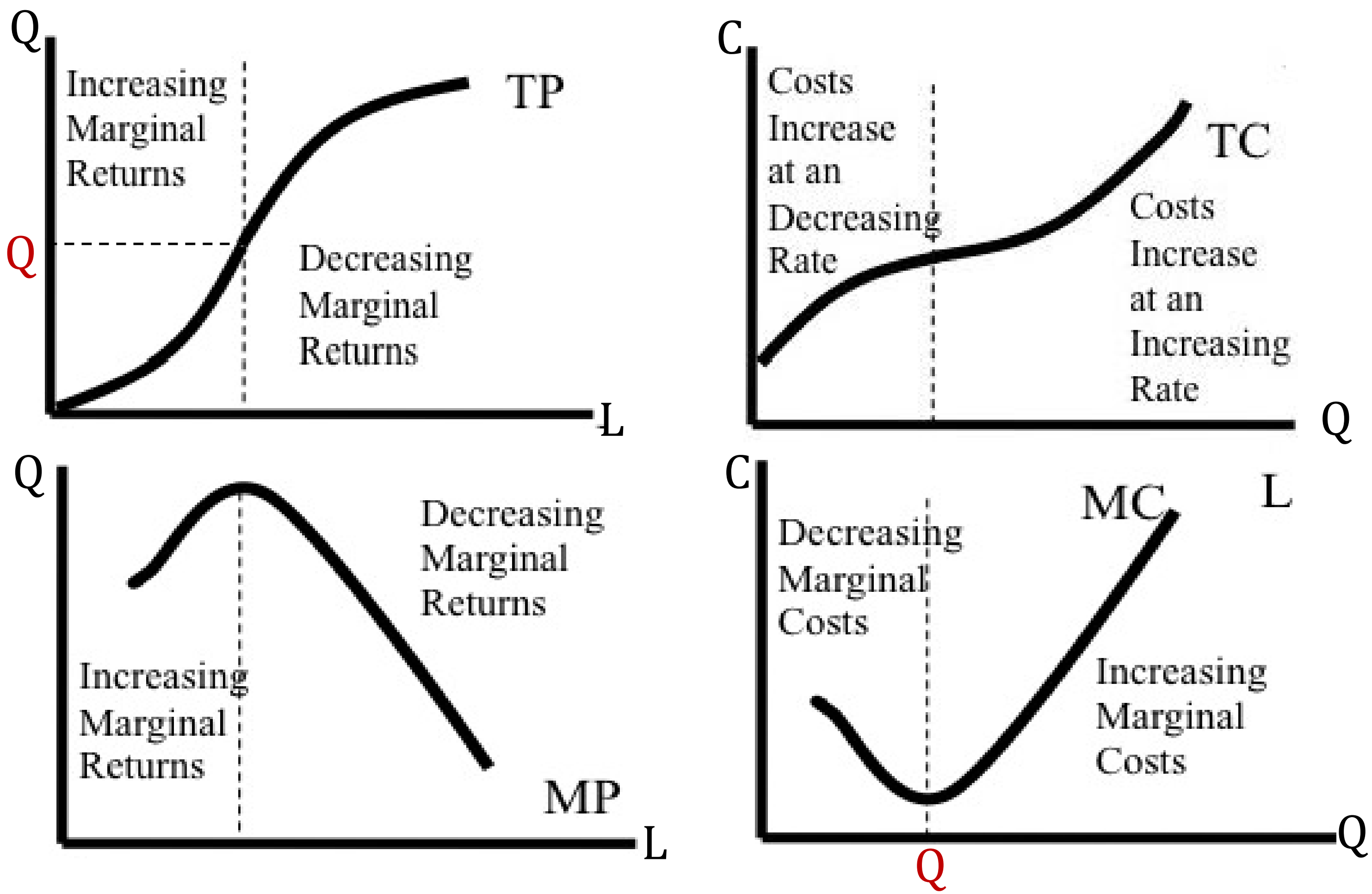
Introductory Microeconomics

Tutorial 10

Nhan La

Production functions



Market competition

- Perfectly competitive market:
  - Total revenue: $TR = P \times Q$
  - Marginal/Average revenue: $AR = MR = \frac{TR}{Q} = P$

- Imperfectly competitive market:
  - Total revenue: $TR(Q) = P(Q) \times Q$
  - Average revenue: $AR(Q) = \frac{TR(Q)}{Q} = \frac{P(Q) \times Q}{Q} = P(Q)$
  - Marginal revenue:

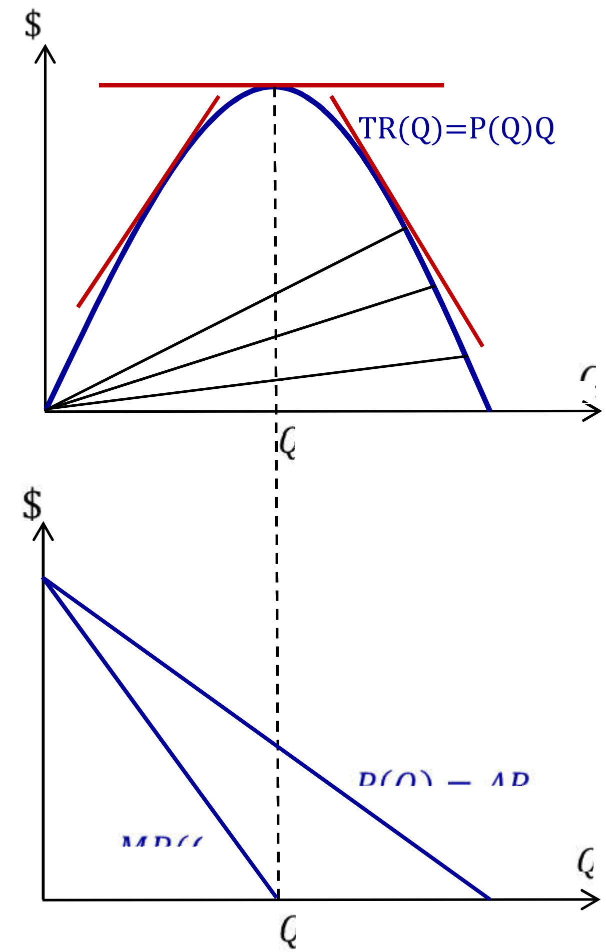
$$MR(Q) = \frac{\partial TR(Q)}{\partial Q} = \frac{\partial P(Q) \times Q}{\partial Q} = P(Q) + Q\frac{\partial P(Q)}{\partial Q} = AR(Q) + Q\frac{\partial P(Q)}{\partial Q}$$

Price and quantity decision

- $P(Q) = AR$
  - *Market demand curve*
- $TR(Q) = P(Q) \times Q = AR(Q) \times Q$
  - Concave $TR(Q)$
- $MR(Q) = AR(Q) + Q\dfrac{\partial P(Q)}{\partial Q}$
  - $MR(Q) < AR(Q)$
- $MR(Q) > 0 \Rightarrow \varepsilon_D < -1$

$$P(Q) + Q\frac{\partial P(Q)}{\partial Q} > 0$$

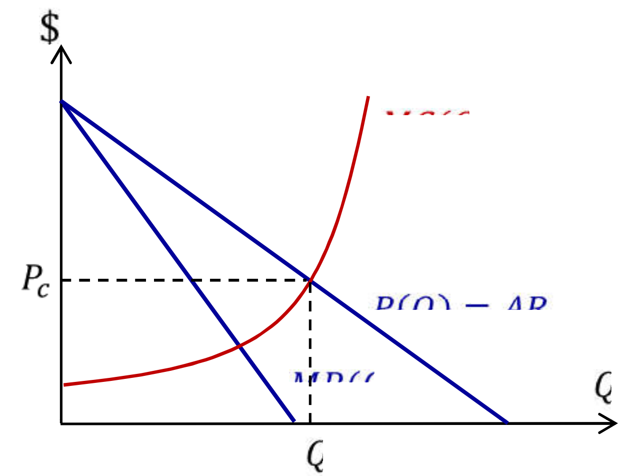
$$\Rightarrow P(Q) > -Q\frac{\partial P(Q)}{\partial Q} \Rightarrow \frac{P}{Q}\frac{\partial Q}{\partial P} < -1$$



Profit maximisation

- Perfectly competitive market:

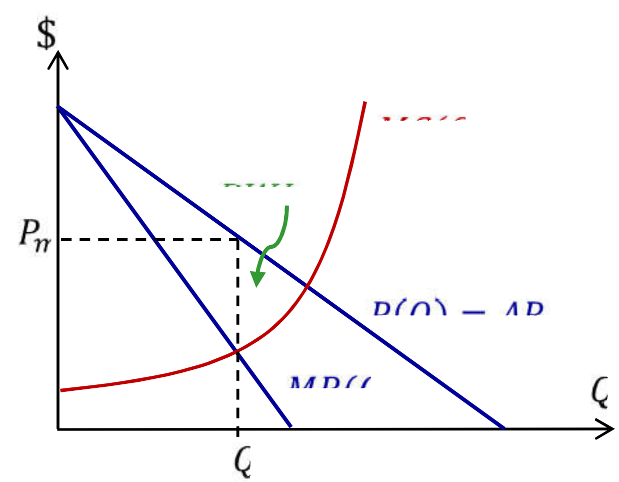
$$P(Q) = MC(Q)$$



- Imperfectly competitive market:

$$MR(Q) = MC(Q)$$

- Dead weight loss



Profit maximisation

- Imperfectly competitive market:

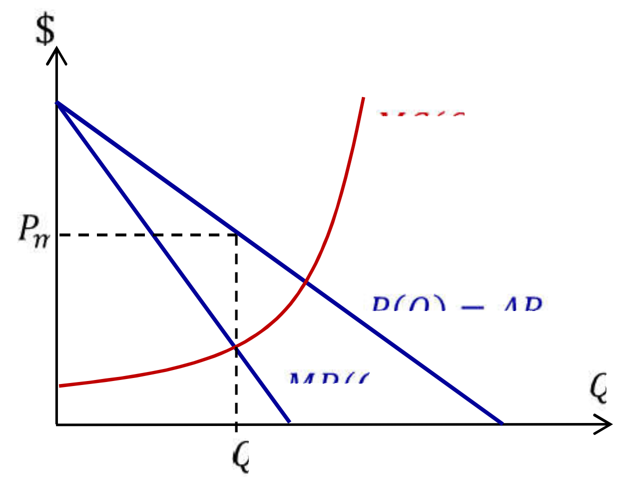
$$\frac{P(Q) - MC(Q)}{P(Q)} = \frac{1}{\varepsilon_D}$$

- The ability of firm to set $P(Q)$ over $MC(Q)$ depends on ε_D (absolute)
- $\varepsilon_D = 2$ (less elastic)

$$\frac{P(Q)-MC(Q)}{P(Q)} = \frac{1}{2} \Rightarrow P(Q) = 2MC(Q)$$

- $\varepsilon_D = 20$ (more elastic)

$$\frac{P(Q)-MC(Q)}{P(Q)} = \frac{1}{20} \Rightarrow P(Q) = \frac{20}{19}MC(Q)$$



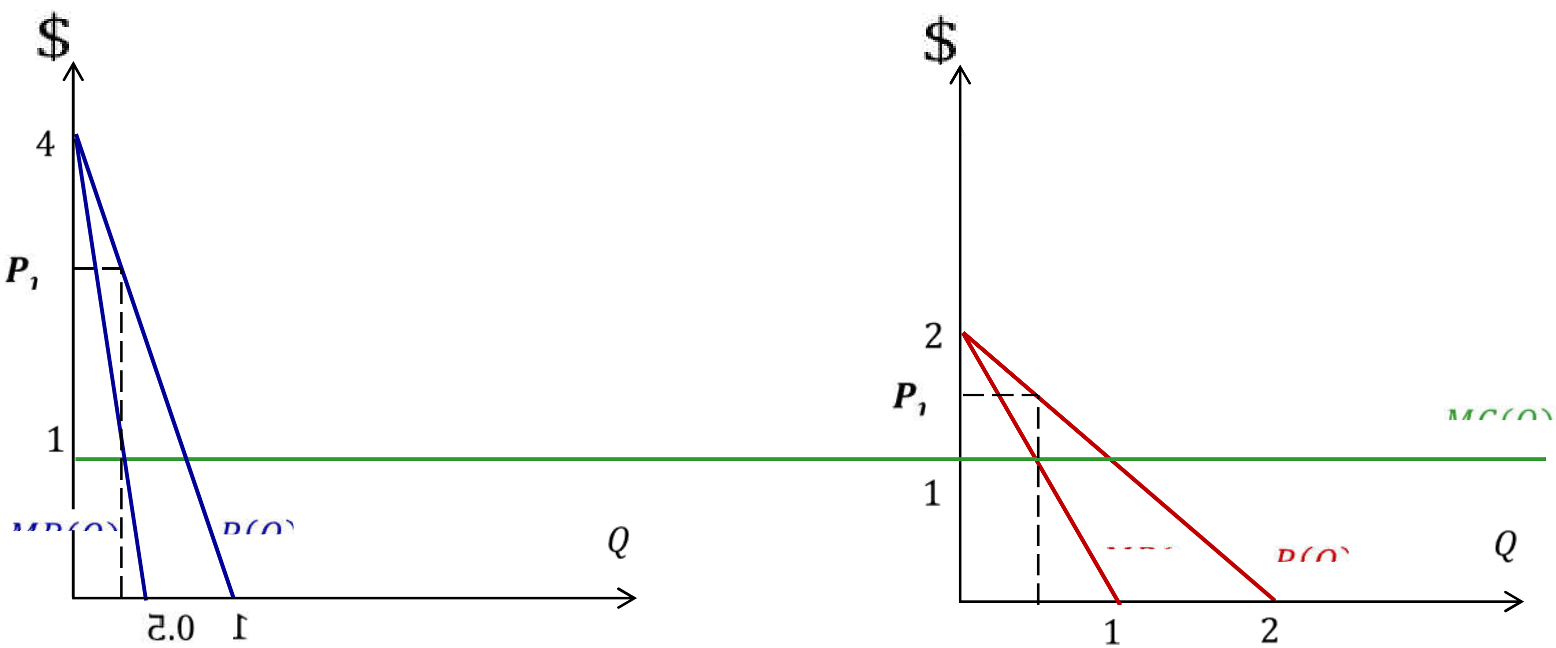
Profit maximisation

$P(Q) = 2 - 4Q$

$MR(Q) = 2 - 8Q$

$P(Q) = 2 - Q$

$MR(Q) = 2 - 2Q$



Price discrimination

- First-degree (perfect) price discrimination
  - Personalised pricing

- Second-degree price discrimination
  - Group pricing (unobservable)

- Third-degree price discrimination
  - Group pricing (observable)

Task 1

A major airline, e.g. Qantas, assesses that its business customers have a less elastic demand curve for airline travel than non-business customers, and that business customers have shorter intervals between forward and return trips than other customers. Assuming that Qantas is able to accurately identify business and non-business travellers

Task 1a

a/ Explain how this market situation provides an opportunity for third-degree price discrimination to increase Qantas profits over a common ticket price for all.

- Segment market: (i) business and (ii) non-business travelers
- Use duration of return tickets: short (business customers) vs. long (non-business customers)
- Higher price for short-term return tickets
  - Less elastic demand
- Lower price for long-term return tickets
  - More elastic demand

Task 1b

b/ $\varepsilon_D = 0.8$

$$MR(Q) = \frac{\partial TR(Q)}{\partial Q} = \frac{\partial P(Q)\times Q}{\partial Q}$$

$$MR(Q) = P(Q) + Q\frac{\partial P(Q)}{\partial Q}$$

$$MR(Q) = P(Q) + \frac{P(Q)}{P(Q)}Q\frac{\partial P(Q)}{\partial Q}$$

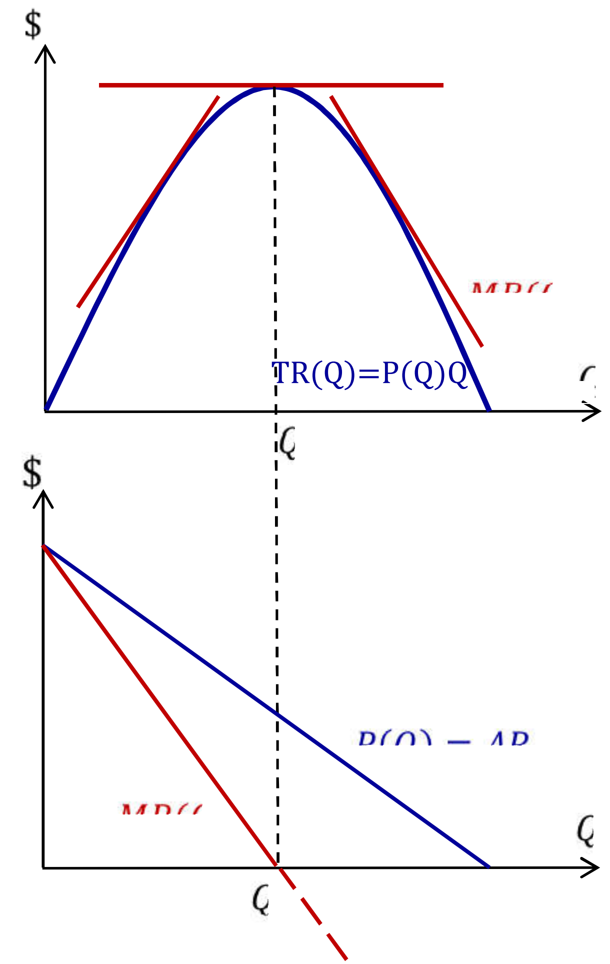
$$MR(Q) = P(Q)\left(1 + \frac{Q}{P(Q)}\frac{\partial P(Q)}{\partial Q}\right)$$

$$MR(Q) = P(Q)\left[1 - \left(-\frac{Q}{P(Q)}\frac{\partial P(Q)}{\partial Q}\right)\right]$$

$$MR(Q) = P(Q)\left(1 - \frac{1}{\varepsilon_D}\right)$$

$$\varepsilon_D = 0.8 \Rightarrow 1 - \frac{1}{\varepsilon_D} < 0 \Rightarrow MR(Q) < 0$$

- Reduce Q



Task 1c

c/ At profit maximisation: $\frac{P(Q)-MC(Q)}{P(Q)} = \frac{1}{\varepsilon_D}$

First, consider business customers: $\varepsilon_D = 2 \Rightarrow P^* = 2MC(Q)$

Next: $MC(Q) = AVC(Q)$

We can write: $MC(Q) = \frac{\partial TC(Q)}{\partial Q} = \frac{\partial TFC + \partial TVC(Q)}{\partial Q} = \frac{\partial TVC(Q)}{\partial Q}$

That gives: $\frac{\partial TVC(Q)}{\partial Q} = \frac{TVC(Q)}{Q}$

$\Rightarrow \frac{\partial TVC(Q)}{TVC(Q)} = \frac{\partial Q}{Q}$

$\Rightarrow TVC(Q) = Q$

$\Rightarrow MC(Q) = \frac{\partial TVC(Q)}{\partial Q} = 1$

$\Rightarrow P^* = 2$

Task 1c

c/ As firm maximises profit: $\frac{P(Q)-MC(Q)}{P(Q)} = \frac{1}{\varepsilon_D}$

$\Rightarrow MC(Q) = \frac{\partial TVC(Q)}{\partial Q} = 1 \Rightarrow P^* = 2$

- Suppose the demand function: $Q = a + bP$

Then: $\varepsilon_D = \left|\frac{\partial Q}{\partial P}\frac{P}{Q}\right| = 2 \Rightarrow \left|b \times \frac{P}{a+bP}\right| = 2$

- At profit maximisation: $\left|b \times \frac{2}{a+2b}\right| = 2$

$\Rightarrow \left(b \times \frac{2}{a+2b}\right) = 2$ OR $\left(b \times \frac{2}{a+2b}\right) = -2$

$\Rightarrow a = -b$ OR $a = -3b$, <u>subject to the validity of the demand function</u>

- For example: $a = 3; b = -1 \Rightarrow Q = 3 - P \Rightarrow P(Q) = 3 - Q$

$P^* = 2; Q^* = 1$

Task 1c

c/ As firm maximises profit: $\frac{P(Q)-MC(Q)}{P(Q)} = \frac{1}{\varepsilon_D}$

Non-business customers: $\varepsilon_D = 4 \Rightarrow P^* = \frac{4}{3}MC(Q)$

That gives: $P^* = \frac{4}{3}$

- Suppose the demand function: $Q = a + bP$

Then: $\varepsilon_D = \left|\frac{\partial Q}{\partial P} \times \frac{P}{Q}\right| = 4 \Rightarrow \left|b \times \frac{P}{a+bP}\right| =4$

- At profit maximisation: $\left|b \times \frac{4/3}{a+4/3b}\right| = 4$

$\Rightarrow \left(b \times \frac{4/3}{a+4/3b}\right) = 4$ **OR** $\left(b \times \frac{4/3}{a+4/3b}\right) = -4$

$\Rightarrow a = -b$ **OR** $a = -5/3b$, <u>subject to the validity of the demand function</u>

- For example: $P(Q) = \frac{5}{3} - \frac{1}{2}Q; P^* = \frac{4}{3}; Q^* = \frac{2}{3}$

Profit maximisation

$P(Q) = 3 - Q$

$MR(Q) = 3 - 2Q$

$P(Q) = \frac{5}{3} - \frac{1}{2}Q$

$MR(Q) = \frac{5}{3} - Q$