

1. 市場需求函數 $P = 60 - q$

成本函數 $TC = 30q$

(A) 採統一訂價，生產者剩餘、消費者剩餘及無謂損失

$$60 - 2q = 30 \Rightarrow q = 15 \rightarrow P = 45$$

$$\pi = 45 \times 15 - 30 \times 15 = 225 \text{ (生產者剩餘)}$$

$$CS = 15 \times 15 / 2 = 112.5$$

$$\text{總剩餘} = 225 + 112.5 = PS + CS = 337.5$$

$$\text{無謂損失 } DWL = 112.5$$

(B) 採完全差別訂價

$$60 - q = 30 \Rightarrow q = 30$$

$$\pi = 30 \times 30 / 2 = 450$$

$$CS = 0$$

$$TS = 450 + 0 = 450$$

$$DWL = 0$$

(C) 採第二級差別取價，分成兩個價格區間

$$\pi = (60 - q_1) \times q_1 + (60 - q_2)(q_2 - q_1) - 30q_2$$

$$= q_1^2 - q_2^2 + 30q_2 + q_1q_2$$

$$\Rightarrow \begin{cases} -2q_1 + q_2 = 0 \\ -2q_2 + 30 = 0 \end{cases}$$

$$\Rightarrow \begin{cases} q_1 = 10 \\ q_2 = 20 \end{cases}$$

$$\Rightarrow \begin{cases} p_1 = 50 \\ p_2 = 40 \end{cases}$$

$$\pi = 50 \times 10 + 40 \times (20 - 10) - 30 \times 20 = 300$$

$$CS = (10 \times 10 / 2) + (10 \times 10 / 2) = 100$$

$$TS = 100 + 300 = 400$$

$$DWL = 450 - 400 = 50$$

(D) 採第三級差別取價，分成三個價格區間