

Homework

- Market demand
$$P = 10 - Q$$
- Marginal cost of upstream
$$MC_u = m = 2$$
- Downstream firm has no additional MC other than intermediate input price charged by upstream firm
- Calculate $P_D^*, P_u^*, Q_D^*, Q_u^*, \Pi_D^*, \Pi_u^*$
- If two firms merge to form a single monopolist
 - ↳ calculate P^*, Q^*, Π^*
- Compare welfare of consumers and producers

case I : two firms not merge

market demand : $P = 10 - Q$

$$MC_u = m = 2$$

$$\begin{aligned} TR &= P \cdot Q \\ &= (10 - Q)Q \\ &= 10Q - Q^2 \end{aligned}$$

$$MR = \frac{dTR}{dQ} = 10 - 2Q$$

Demand of upstream firm (D_u)

$$P_u = 10 - 2Q$$

$$\begin{aligned} TR_u &= P_u \cdot Q \\ &= (10 - 2Q)Q \\ &= 10Q - 2Q^2 \end{aligned}$$

$$MR_u = \frac{dTR_u}{dQ} = 10 - 4Q$$

$$CS = \frac{1}{2} \times 2 \times 2 = 2$$

$$\begin{aligned} PS_D &= 4 \\ PS_u &= 8 \end{aligned} \quad \left. \vphantom{\begin{aligned} PS_D &= 4 \\ PS_u &= 8 \end{aligned}} \right\} \text{Total PS} = 4 + 8 = 12$$

$$DWL = \frac{1}{2} \times 6 \times 6 = 18$$

$$\begin{aligned} \Pi_u &= TR_u - TC_u \\ &= 6(2) - 2(2) \\ &= 12 - 4 = 8 \end{aligned}$$

$$\begin{aligned} \Pi_D &= TR_D - TC_D \\ &= 8(2) - 6(2) \\ &= 16 - 12 = 4 \end{aligned}$$

$$\text{Total } \Pi = \Pi_u + \Pi_D = 8 + 4 = 12$$

upstream firm (monopolist)

$$\text{max } \Pi \text{ cond. ; } MR_u = MC_u$$

$$10 - 4Q = 2$$

$$4Q = 8$$

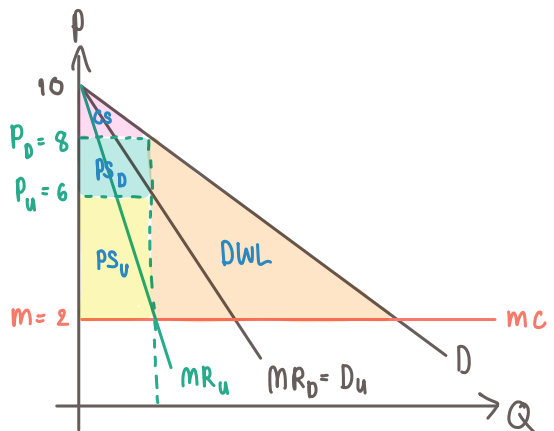
$$Q = 2$$

substitute $Q = 2$ in D_u

$$\Rightarrow P_u = 10 - 2(2) = 6$$

substitute $Q = 2$ in D_{mkt}

$$\Rightarrow P = 10 - 2 = 8$$



case II : two firms merge & become one monopoly firm

market D ; $P = 10 - Q$

MC_u ; $MC_u = 2$

$$MR = 10 - 2Q = MC = 2$$

$$10 - 2Q = 2$$

$$2Q = 8$$

$$Q_m = 4$$

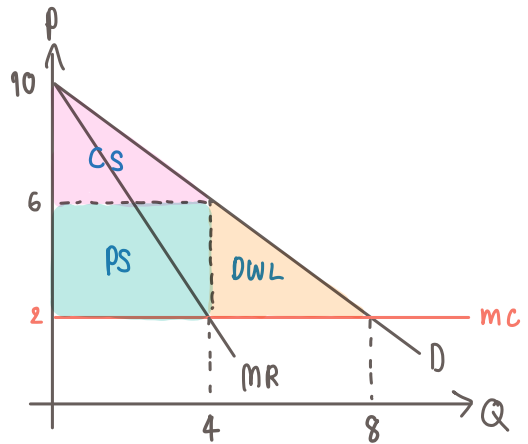
$$P_m = 10 - 4 = 6$$

$$\pi_m = 6(4) - 2(4) = 24 - 8 = 16$$

$$CS = \frac{1}{2} \times 4 \times 4 = 8$$

$$PS_m = 16$$

$$DWL = \frac{1}{2} \times 4 \times 4 = 8$$



$\therefore$ The profit of merging firm will be larger than not merge.

also the welfare of both consumers and firm in case 2 will be larger.