

Example: Public Goods

$$PMB_1 = 6 - Q_1$$

$$PMB_2 = 6 - 2Q_2$$

$$SMC = Q$$

If Q is a private good:

SMB is horizontal sum of person 1 and 2 PMB curves.

$$PMB_1 = 6 - Q_1$$

$$Q_1 = 6 - PMB_1$$

$$PMB_2 = 6 - 2Q_2$$

$$2Q_2 = 6 - PMB_2$$

$$Q_2 = 3 - 0.5 PMB_2$$

$$Q_{total} = Q_1 + Q_2$$

$$Q_{total} = 6 - PMB_1 + 3 - 0.5 PMB_2$$

$$= 9 - 1.5 SMB$$

OR

$$1.5 SMB = 9 - Q_{total}$$

$$SMB = 6 - 2/3 Q_{total}$$

Private market equilibrium:

$$SMB = SMC$$

$$6 - 2/3 Q_{total} = Q_{total}$$

$$5/3 Q_{total} = 6$$

$$Q_{total} = Q^* = 18/5$$

$$P^* = SMB^* = SMC^* = 18/5$$

If Q is a public good:

SMB becomes the vertical sum of person 1 and 2 PMB curves.

$$\begin{aligned}\text{SMB} &= \text{PMB}_1 + \text{PMB}_2 \\ &= 6 - Q_{\text{total}} + 6 - 2 Q_{\text{total}} \\ &= 12 - 3 Q_{\text{total}}\end{aligned}$$

BUT

$$\text{PMB}_2 = 0 \text{ if } Q_{\text{total}} \geq 3$$

Therefore,

$$\text{SMB} \begin{cases} 12 - 3 Q_{\text{total}} & \text{if } Q_{\text{total}} < 3 \\ 6 - Q_{\text{total}} & \text{if } Q_{\text{total}} \geq 3 \end{cases}$$

Social welfare maximum with a public good:

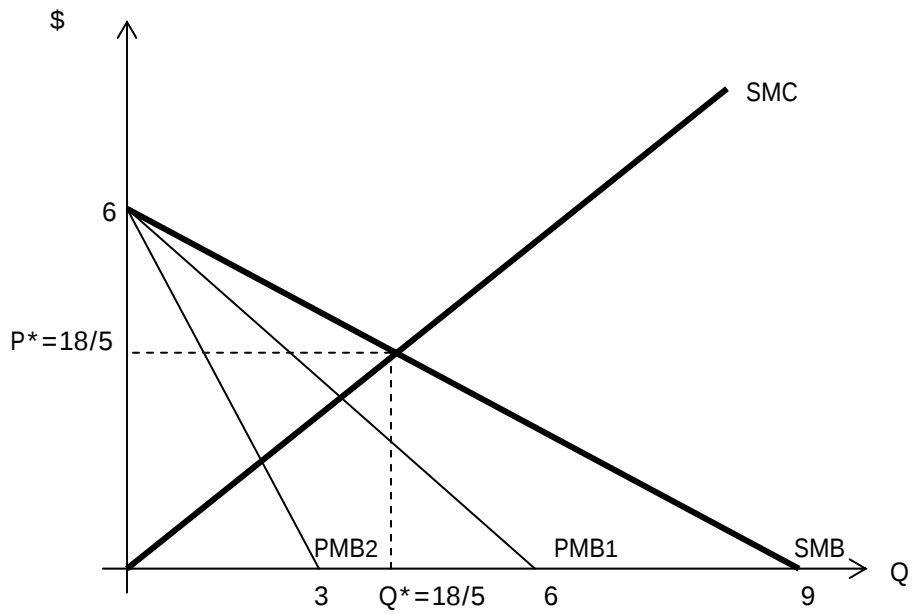
$$\begin{aligned}\text{SMB} &= \text{SMC} \\ 12 - 3 Q_{\text{total}} &= Q_{\text{total}} \\ 4 Q^{**} &= 12 \\ Q^{**} &= 3\end{aligned}$$

$$P^{**} = \text{SMB}^{**} = \text{SMC}^{**} = 3$$

What else might I ask?

- (1) If Q was a public good, but it was exchanged at the market equilibrium, what would the lost social welfare be?
- (2) If the government privatized this (formerly) public good, what would happen to prices and quantities? Why?

PRIVATE GOOD MARKET EQUILIBRIUM / WELFARE MAXIMIZATION



PUBLIC GOOD WELFARE MAXIMIZATION

