

**EE375: Applied Economics for Natural Resources and Environment**  
**Assignment 2 (Group)**  
**Due on Tuesday August 30, 2022**

**Question 1:**

Suppose that the demand curve derived from marginal benefit associated with a consumption of chocolate is  $360 - 4Q$  and the marginal cost of chocolate production is  $6Q$ . The marginal damage from pollutions generated by chocolate production is  $2Q$

- a) Find the social optimum or efficient production level ( $P^*$ ,  $Q^*$ )
- b) Find the private equilibrium price and quantity when external costs could be ignored by firms
- c) What tax level should be set to achieve the efficient/social optimal
- d) Calculate deadweight loss from externalities in this case
- e) Drawing a graph to illustrate the result from a) to d)

**Question 2:**

The production of cigarettes increases water pollutions while the consumption of cigarettes can put their neighbors at health risks (Hint: Impact on social marginal benefits as a whole)

- a) Explain how externalities in this case create inefficiencies in the cigarette market and draw a graph to illustrate your explanation, including the market equilibrium for cigarettes at i) socially optimal level,  $P^*$  and  $Q^*$ ; ii) private optimal level ( $P_p$  and  $Q_p$ ) when externalities are not internalized by both firms and consumers and; iii) the deadweight loss area.
- b) What policies could be considered to reduce deadweight loss in this case and describe the effects of such policies in the cigarette market.

Question 1 :

Suppose  $D(WTP) \sim MB_p = 360 - 4Q$ ,  $MC_p = 6Q$ ,  $MD = 2Q$

a) social optimum

$$\begin{aligned}
 MB_p &= MC_p \\
 360 - 4Q &= 6Q + 2Q \\
 360 &= 12Q \\
 Q^* &= 30
 \end{aligned}$$

plug in  $Q=30$  in  $360-4Q$

$$P^* = 240$$

$$\therefore Q^* = 30, P^* = 240$$

b) inefficient allocation

$$\begin{array}{l|l}
 MB_p = MC_p & P_m = 360 - 4Q \\
 360 - 4Q = 6Q & = 360 - 4(36) \\
 Q_m = 36 & \boxed{P_m = 216}
 \end{array}$$

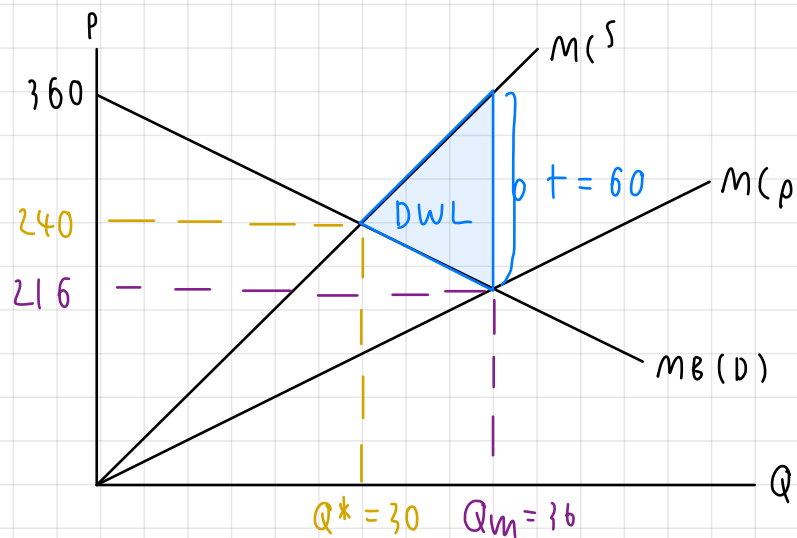
c) tax level

$$\begin{aligned}
 MB_p &= MC_s \\
 360 - 4Q^* &= 6Q^* + t \\
 360 &= 10Q^* + t \\
 360 - 10(30) &= t \\
 360 - 300 &= t \\
 \boxed{t} &= \boxed{60}
 \end{aligned}$$

d)  $DWL = \frac{1}{2} \times 6 \times 60$

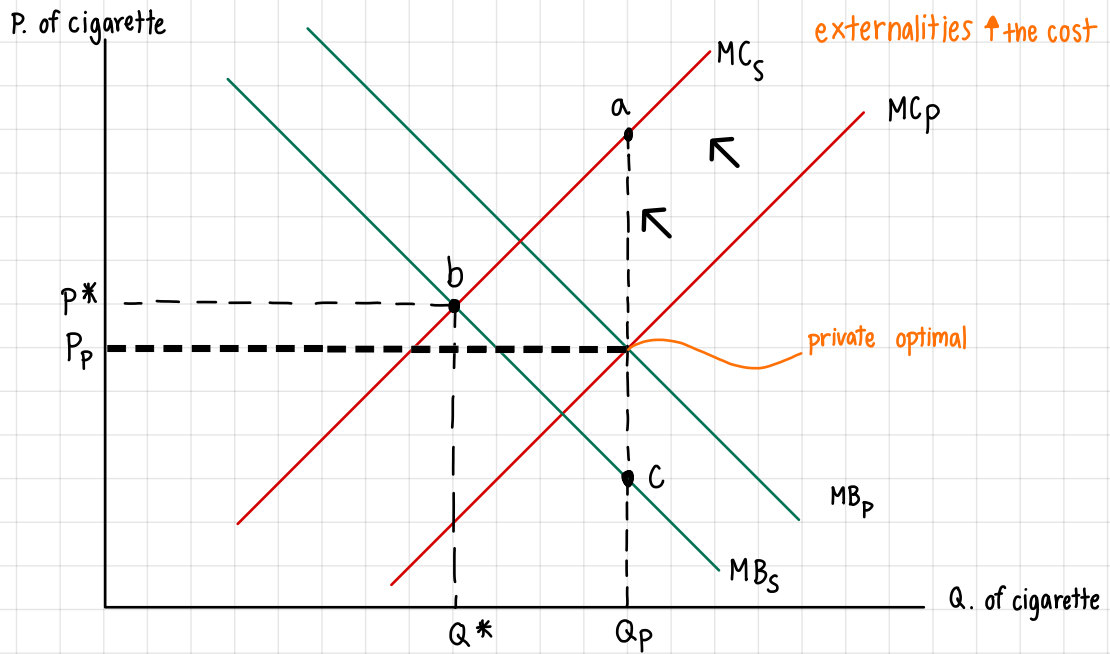
$$\boxed{DWL = 180}$$

e) graph



## Question 2

- a) at point  $P_p, Q_p$  (private optimal) firms and consumers did not take negative externalities (water pollution + health risk) into their concerns this lead to an increase in Marginal social cost ( $MC_p \rightarrow MC_s$ ). This reduce the private benefit of consumer to  $MB_s$ . Where the social optimal should actually be at  $P^*$  and  $Q^*$ . So, when  $Q_p > Q^*$  the deadweight loss will be the area of  $\Delta ABC$



- b) • Government can imposing tax on the producers, set a quota at  $Q^*$ .
- Taxes on both cigarette producers and cigarette consumers by the government, shift  $MC_p$  &  $MB_p$  line to  $MC^s$  &  $MB^s$