

Hlw

Example 3.G: Solve for the market equilibrium using the information in ~~Example 3.E~~ and ~~Example 3.F~~. Justify your answer!

2 Consumers

A: $Q_A = 10 - P$

B: $Q_B = 10 - \frac{1}{2}P$

1 Seller

$Q = P$

1) draw the diagram

2). Find eqbm.

$Q^* = 10$

$Q_{market} = 10 - \frac{1}{2}P \therefore P \geq 10$

$Q_A + Q_B = 10 - P + 10 - \frac{1}{2}P$

$Q_{market} = 20 - \frac{3}{2}P \therefore P < 10$

check

$Q^S = Q^D$

$Q^S = Q^D$

$P = 20 - \frac{3}{2}P$

$P = 10 - \frac{1}{2}P$

$\therefore P \geq 10$

$\frac{5}{2}P = 20$

$\frac{3}{2}P = 10$

$P = 8$

$P = \frac{20}{3} = 6.66$

$10 - Q = 20 - 2Q$

$Q = 10$

$P = 10 - Q_A$

$\frac{1}{2}P = 10 - Q_B$

$P = 20 - 2Q_B$

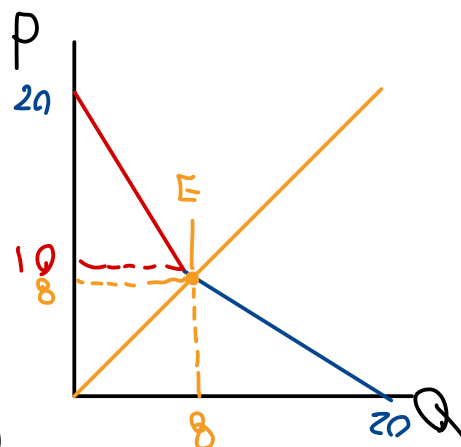
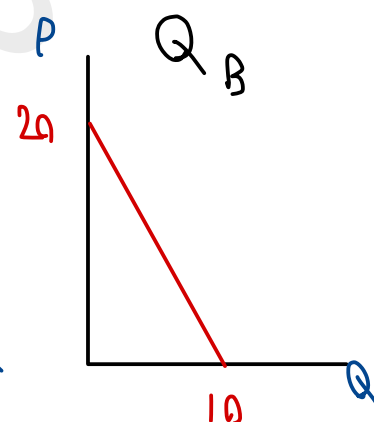
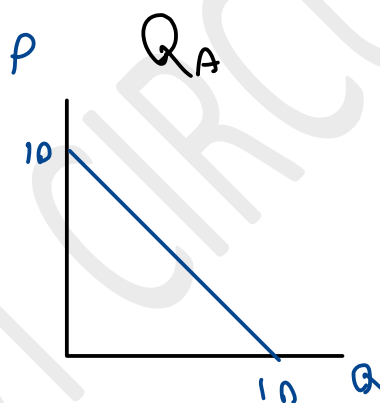
$P = 20$

$2Q_B = 20 - P$

$2Q_B = 20$

$Q_B = 10$

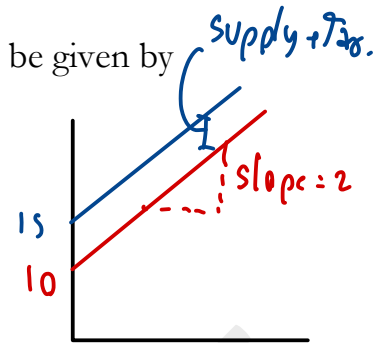
$P = 0$



Example 3.I Suppose that demand/supply equation can be given by

$$P^d = 80 - 3Q^d$$

$$P^s = 10 + 2Q^s$$



- Find the market equilibrium.

$$P^d = P^s$$

$$80 - 3Q = 10 + 2Q$$

$$70 = 5Q \rightarrow Q^* = 14$$

$$P^* = 38$$

- Suppose that government imposes tax on producer equal to \$5 per unit, determine market equilibrium under taxation.

MW,

$$\text{new } S : P = 10 + 2Q + 5$$

$$P = 15 + 2Q$$

$$P^d = P^s_{\text{new}}$$

$$80 - 3Q = 15 + 2Q$$

$$65 = 5Q$$

$$Q = 13$$

$$P^*_{\text{tax}} = 47$$

$$Q^*_{\text{tax}} = 13$$

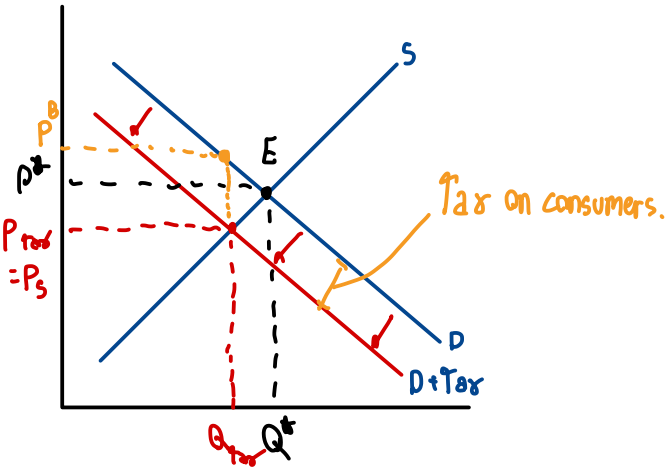
Tax on consumers.

HW.

$$P^d = 80 - 3Q^d$$

$$P^s = 10 + 2Q^s$$

Tax per unit = 5



$$80 - 3Q = 10 + 2Q$$

$$7Q = 5Q$$

After tax

$$Q = 14$$

$$80 - 3Q^d = 10 + 2Q^d + 5$$

$$P = 38$$

$$5Q^d = 65$$

$$Q^d = 13$$

$$P = 41$$

Example 3.J: Excess burden formula under linear model & Tax-Revenue-maximizing tax rate

Demand: $p = a - bQ$; $a \geq 0, b \leq 0$.

Supply: $p = c + dQ$; $d \geq 0$.

- Solve for quantity and prices equilibrium when the unit tax is imposed. Analyze the result

solve for P^*, Q^*

$$\left. \begin{aligned} P^* &= F(a, b, c, d) \\ Q^* &= F(a, b, c, d) \end{aligned} \right\} \text{Before tax.}$$

Tax/unit = τ

After Tax

new S : $p = c + dQ + \tau$

$$P_{\text{tax}}^* = F(a, b, c, d, \tau)$$

$$Q_{\text{tax}}^* = F(a, b, c, d, \tau)$$

Before Tax

$$a - bQ = c + dQ$$

$$Q = \frac{a - c}{b + d}$$

$$P = c + d \left(\frac{a - c}{b + d} \right)$$

$$P = \frac{cb + cd - ad - cd}{b + d}$$

$$P = \frac{cb - ad}{b + d}$$

After Tax

$$a - bQ = c + dQ + \tau$$

$$Q = \frac{a - c + \tau}{b + d}$$

$$P = c + d \left(\frac{a - c + \tau}{b + d} \right)$$

$$P = \frac{ab - ad + d\tau}{b + d}$$

MW,

- Derive the excess burden formula for buyers and sellers

$$\text{Consumers' burden} = (P_B - P^*) \times Q_{\text{tax}}$$

$$= \left(\left(\frac{cb - ad + d\tau}{b+d} \right) - \left(\frac{cb - ad}{b+d} \right) \right)$$

$$= \frac{d\tau}{b+d}$$

$$\text{Producers' burden} = (P^* - P_S) \times Q_{\text{tax}}$$

$$= \tau - \frac{d\tau}{b+d}$$

$$= \frac{b\tau}{b+d}$$

HW,

- Calculate the tax rate that maximizes the tax revenue of government.

Tax rev

$$= \tau \times Q_{\text{tax}}(\dots, \tau)$$

$$\frac{\partial \text{Tax rev}}{\partial \tau} = 0$$

$\downarrow$
 τ

$$\text{Total Tax} = \tau \left(\frac{a - c + \tau}{b + d} \right)$$

$$= \frac{a\tau - c\tau + \tau^2}{b + d}$$

$$\frac{d \text{ Total}}{d \tau} = 0 = \frac{a - c + 2\tau}{b + d}$$

$$\tau = \frac{c - a}{2}$$