HOME WORK : draw diagrams & find eqbm

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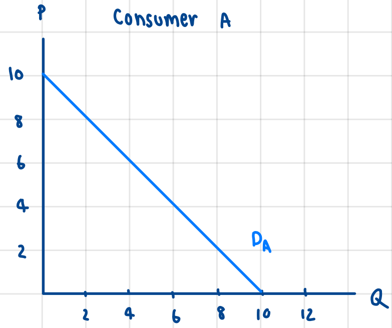
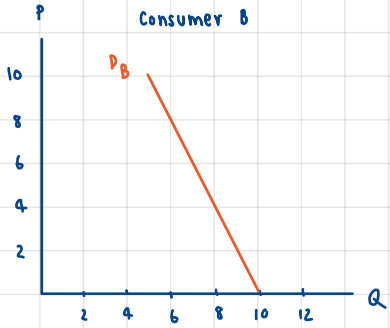
2 consumers

A : $Q_A = 10 - P \rightarrow P = 10 - Q$

B : $Q_B = 10 - 0.5P \rightarrow P = 20 - 2Q$



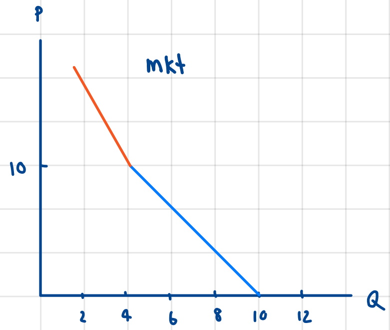


if $P = 10$,

$Q^d_A = 0 \qquad Q^d_B = 5$

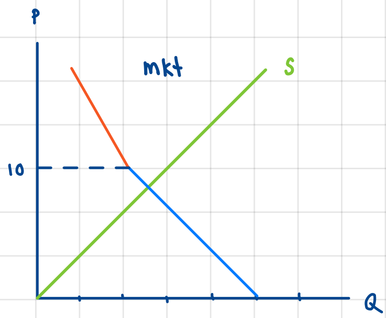
for $P \geq 10$, consumer A will not buy

$$Q^P_{mkt} = \begin{cases} 10 - 0.5P & \text{if } P \geq 10 \\ 20 - 1.5P & \text{if } P < 10 \end{cases}$$



1 seller

$Q_s = P$



Eqbm cond' : $Q_s = Q_d$

① when $P \geq 10$

$P = 10 - 0.5P$

$1.5P = 10$

$P^* = \frac{20}{3} \qquad Q^* = \frac{20}{3}$

② when $P < 10$

$P = 20 - 1.5P$

$2.5P = 20$

$P^* = 8 \qquad Q^* = 8$

∴ In equilibrium, we will have 2 buyers and 1 seller.

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

HOMEWORK

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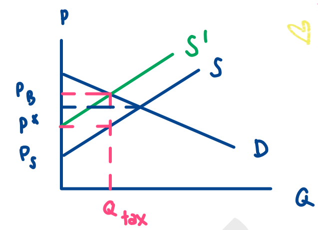
Demand: $p^d = a - bQ^d \quad ; \; a \geq 0, \quad b \leq 0.$

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



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

Before tax:

find Q^* : $p^d = p^s$

$a - bQ = c + dQ$

$a - c = (b+d)Q$

$\therefore Q^* = \dfrac{a-c}{b+d}$

find P^* : $P^* = c + \dfrac{d(a-c)}{b+d}$

$= \dfrac{cb + \cancel{cd} + ad - \cancel{cd}}{b+d}$

$= \dfrac{cb+ad}{b+d}$

After tax:

Assume that tax per unit $= t$

new S : $p^s = c + dQ + t$

find Q_t^* : $p^d = p^s$

$a - bQ = c + dQ + t$

$a - c - t = (b+d)Q$

$Q_t^* = \dfrac{(a-c-t)}{(b+d)} = \dfrac{a-c}{b+d} - \dfrac{t}{b+d}$

find P_t^* $= P_s$: $P_t^* = c + dQ_t \rightarrow$ old supply

$= c + d\left[\dfrac{a-c}{b+d} - \dfrac{t}{b+d}\right]$

$= \dfrac{cb+cd}{b+d} + \dfrac{da-dc}{b+d} - \dfrac{dt}{b+d}$

$= \dfrac{cb+ad}{b+d} - \dfrac{dt}{b+d}$

find P_s : $P_B = P_s + \text{tax}$

$\therefore P_B = \dfrac{bc+ad}{b+d} - \dfrac{dt}{b+d} + t$

$= \dfrac{bc+ad}{b+d} - \cancel{\dfrac{dt}{b+d}} + \left[\dfrac{bt+\cancel{dt}}{b+d}\right]$

$= \dfrac{bc+ad}{b+d} - \dfrac{bt}{b+d}$

- Derive the excess burden formula for buyers and sellers

excess burden :

for consumer $= (P_B - P_t^*) Q_t$

$$= \left[\cancel{\frac{cb + ad}{b+d}} - \frac{dt}{b+d} - \cancel{\frac{cb+ad}{b+d}} \right] \left[\frac{a-c}{b+d} - \frac{t}{b+d} \right]$$

$$= \frac{dt}{b+d} \left[\frac{a-c}{b+d} - \frac{t}{b+d} \right] \#$$

for producer $= (P^* - P_s) Q_t$

$$= \left[\cancel{\frac{bc + ad}{b+d}} - \cancel{\frac{bc+ad}{b+d}} + \frac{bt}{b+d} \right] \left[\frac{a-c}{b+d} - \frac{t}{b+d} \right]$$

$$= \frac{bt}{b+d} \left[\frac{a-c}{b+d} - \frac{t}{b+d} \right] \#$$

HOMEWORK

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

find tax rev :

$$\text{Tax rev} = t\,Q_t = t\left[\frac{a-c}{b+d} - \frac{t}{b+d}\right]$$

$$= \frac{at-ct}{b+d} - \frac{t^2}{b+d}$$

$$\frac{\partial\,\text{Tax rev}}{\partial t} = \frac{\cancel{b+d}\,(a-c)}{(b+d)^{\cancel{2}}} - \frac{(\cancel{b+d})(2t)}{(b+d)^{\cancel{2}}}$$

$$0 = \frac{a-c}{b+d} - \frac{2t}{b+d}$$

$$0 = a-c-2t$$

$$2t = a-c$$

$$t = \frac{a-c}{2} \quad \#$$

<u>Example 3.K</u> ***Price control and Welfare***

Consider the market for apartment rentals in Chicago. The price of rent is determined by the following system of equations.

HOME WORK

Demand: $p = -2q_d + 160$

Supply: $p = q_s + 10$

- What is the equilibrium price and quantity in the market for apartment rentals?

$$p^d = p^s$$

$$-2q_d + 160 = q_s + 10$$

$$150 = 3q$$

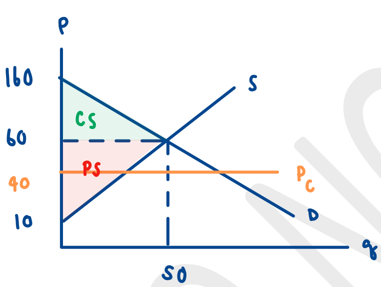
$$q^* = 50 \quad \#$$

$$p^* = 50 + 10$$

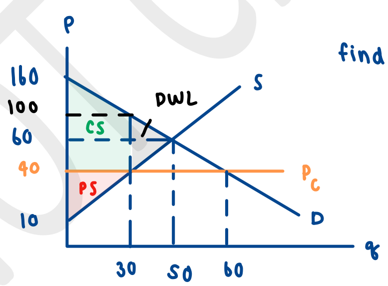
$$\therefore p^* = 60 \quad \#$$

HOME WORK

- Suppose the government tries to control the rent prices through a price ceiling of \$40. Discuss the implication of this policy. Is there any deadweight loss?



without ceiling price



with ceiling price

find q_s : $P_c = P_s$

$$40 = q_s + 10$$

$$\therefore q_s = 30$$

q_d : $P_c = P_d$

$$40 = -2q_d + 160$$

$$\therefore q_d = 60$$

At $q = 30$

$$P = -2(30) + 160$$

$$P = 100$$

The implication of this policy creates the DWL to the society which equals $\frac{1}{2}(20)(60) = 600$. It also increases consumer surplus by 200, but lowers the producer surplus by 800.

	w/o ceiling price	w/ ceiling price
CS	$\frac{1}{2} \cdot 100 \cdot 50 = 2500$	$30 \cdot 60 + \frac{1}{2} \cdot 60 \cdot 30 = 2700$
PS	$\frac{1}{2} \cdot 50 \cdot 50 = 1250$	$\frac{1}{2} \cdot 30 \cdot 30 = 450$
DWL	0	600
total	3750	3750