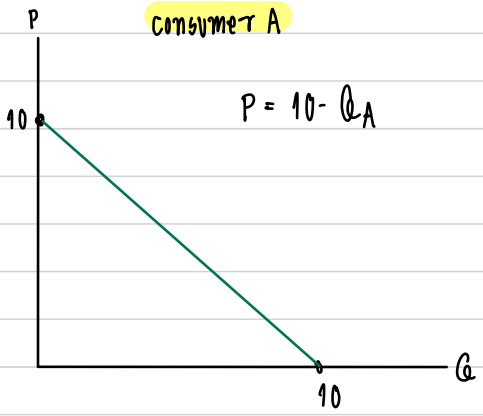
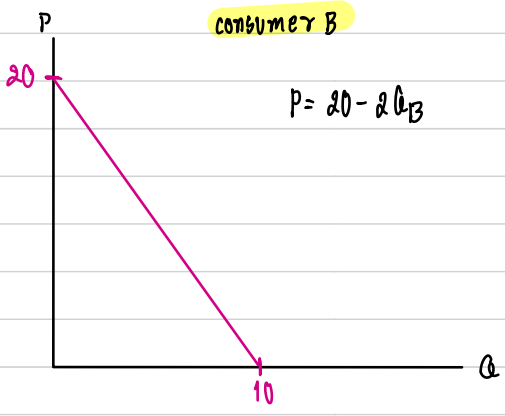
- 2 consumers → A, B
- A ; $Q_A = 10 - P$
  B ; $Q_B = 10 - \frac{1}{2}P$
- 1 seller
  $Q = P$

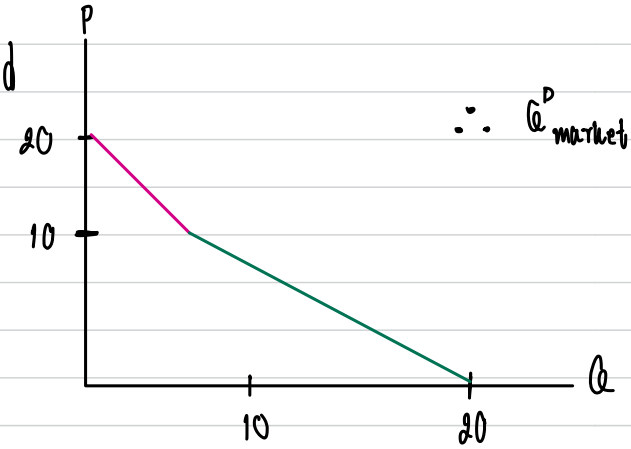
1) Draw diagrams
   - individual demand
   - market demand
2) Find equilibrium
   - How many buyers buy?

Sol (1)



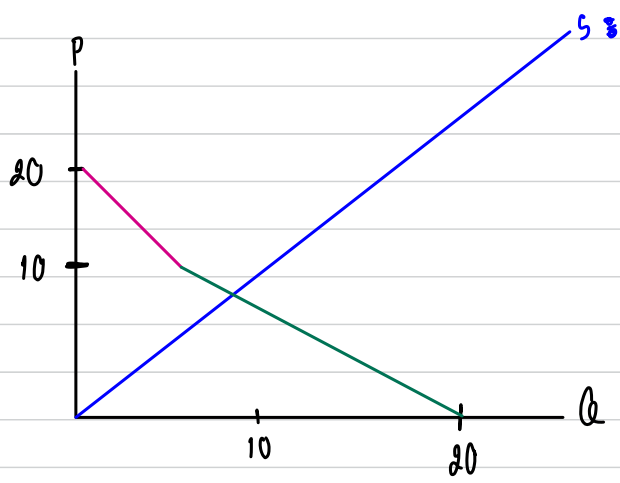


Market demand



$\therefore Q^D_{market}$ $\begin{cases} = 10 - P & ; P > 10 \\ Q_A + Q_B = 20 - 1.5P & ; P \le 10 \end{cases}$

(2) Equilibrium.



D : $Q(P) = 20 - 1.5P$; $P \le 10$
S : $Q = P$
$D = S$
$20 - 1.5P = P$
$20 = 2.5P$
$P = 8$

∴ 2 buyers
1 seller Ans

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

HW

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

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

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

Hint

Before tax → solve for P^*, Q^*

equilibrium $P^* = f(a, b, c, d)$

$Q^* = f(a, b, c, d)$

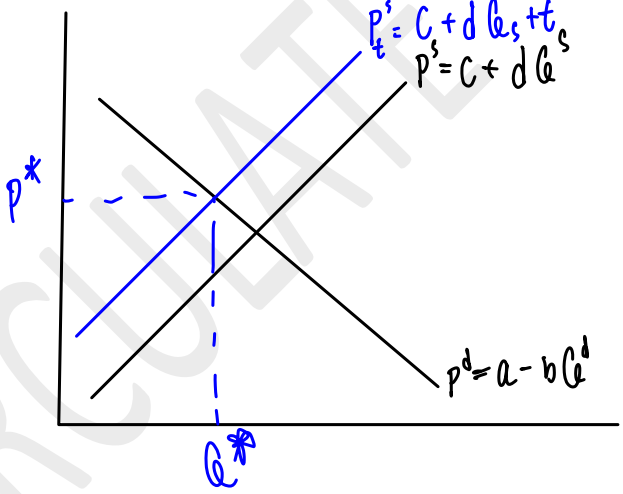
Aftertax → Assume tax per unit = t

∴ new S curve: $P^s = c + dQ + t$

equilibrium $P^*_{tax} = f(a, b, c, d, t)$

$Q^*_{tax} = f(a, b, c, d, t)$

sol



$P^d_{tax} = a - bQ^d$ —①

$P^s_{tax} = c + dQ_s + t$ —②

$P^{d*}_{tax} = P^{s*}_{tax}$

$a - bQ^* = c + dQ^* + t$

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

$Q^*_{tax} = \frac{(a-c-t)}{(d+b)}$

$P^*_{tax} = a - b\left[\frac{(a-c-t)}{(d+b)}\right]$

Demand: $p^d = a - bQ^d$

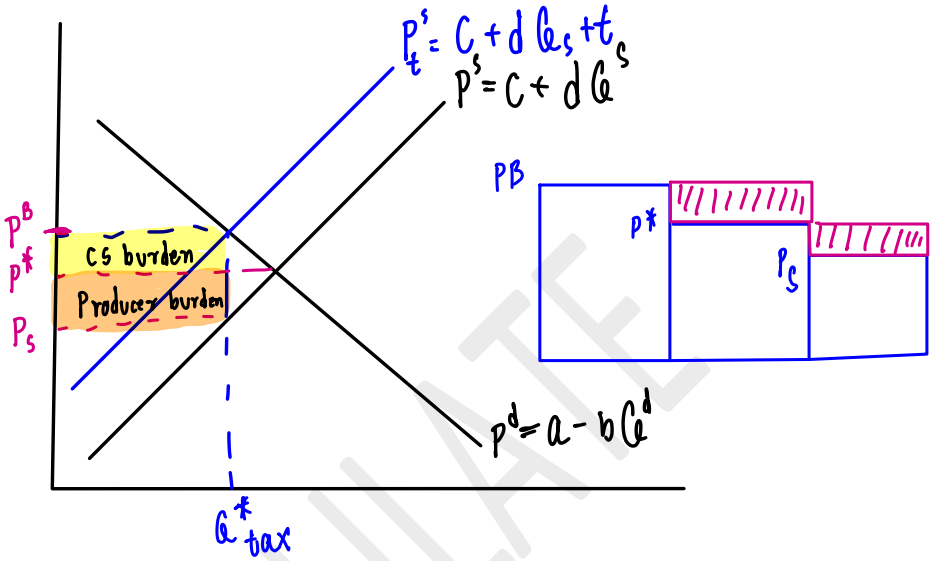
Supply : $p^s = c + dQ^s$

- Derive the excess burden formula for buyers and sellers

consumers' burden
$= (P_B - P^*)(Q_{tax})$

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

$Q^*_{tax} = \frac{(a-c-t)}{(d+b)}$



Consumers' burden

$= (P_B - P^*)(Q^*_{tax})$

$= [P_B - P^*]\left[\frac{(a-c-t)}{(d+b)}\right]$

$= \left[(a - bQ^B) - \left(a - b\left[\frac{a-c-t}{(d+b)}\right]\right)\right]\left(\frac{a-c-t}{(d+b)}\right)$

$= \left[(a) - (b)(Q^B) - (a) + (b)\left(\frac{(a-c-t)}{(d+b)}\right)\right]\left[\left(\frac{a-c-t}{d+b}\right)\right]$

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

$= -2b\left(\frac{a-c-t}{(d+b)}\right)^2$

Producers' burden

$= (P^* - P_S)(Q^*_{tax})$

$= [P^* - P_S]\left[\frac{(a-c-t)}{(d+b)}\right]$

$= \left[\left(a - b\left(\frac{a-c-t}{(d+b)}\right) - (c + dQ^S)\right]\left[\frac{(a-c-t)}{(d+b)}\right)\right]$

$= \left[(a) - (b)\left(\frac{a-c-t}{(d+b)}\right) - (c) - (d)(Q)\right]\left[\frac{a-c-t}{d+b}\right]$

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

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

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

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

$$\text{tax revenue} = (\text{tax rate})(Q_{tax})$$

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

$$\text{Max } t \rightarrow \frac{d\,\text{revenue}}{d\,t} = \frac{(a-c-t)'\cdot(d+b) - (d+b)'(a-c-t)}{(d+b)^2}$$

$$= -\frac{(t)(d+b) + a+c+b}{(d+b)^2}$$

$$= \frac{-td - tb + a+c+t}{(d+b)^2} = 0$$

$$= -t(d+b-1) + a+c = (d+b)^2$$

$$-t = \frac{(d+b)^2 - (a+c)}{(d+b-1)}$$

$$t = -\frac{(d+b)^2 - (a+c)}{(d+b-1)}$$

Example 3.K ***Price control and Welfare***

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

Demand: $p = -2q_d + 160$ – (D)

Supply: $p = q_s + 10$ – (S)

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

$P_d = P_s$

$-2q + 160 = q + 10$

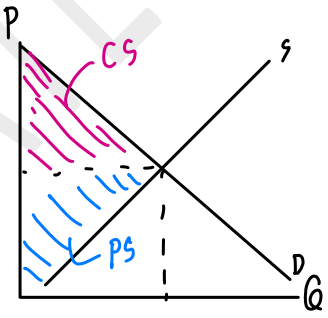
$150 = 3q$

$q = 56.67$

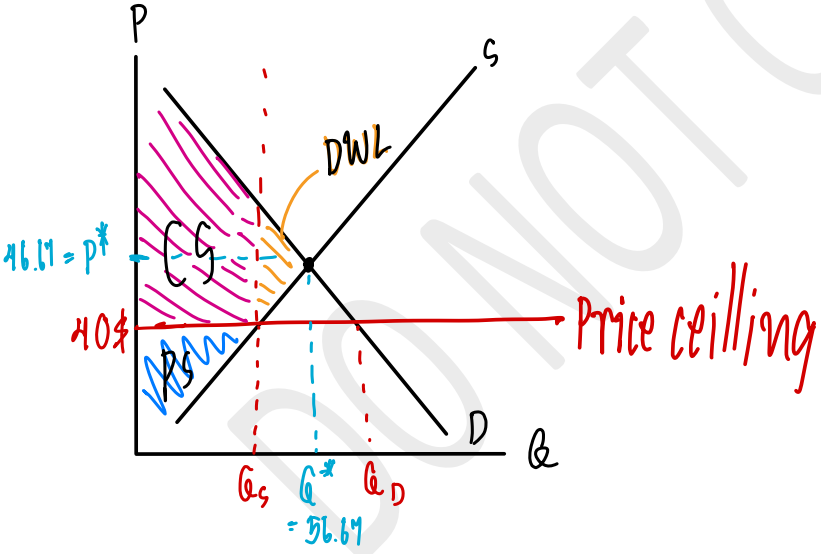
as $Q^* = 56.67$

$p^* = -(2)(56.67) + 160$

$= 46.66$



- 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?



Before intervention.

- the $P^* = 46.66$, $Q^* = 56.67$
  - $Q_d = Q_s$

After intervention

- Price is set lower than equilibrium P
- ∴ there will be excess Demand
  - $Q_D > Q_S$ → shortaged

However, Firm supply lower

this cause DWL at