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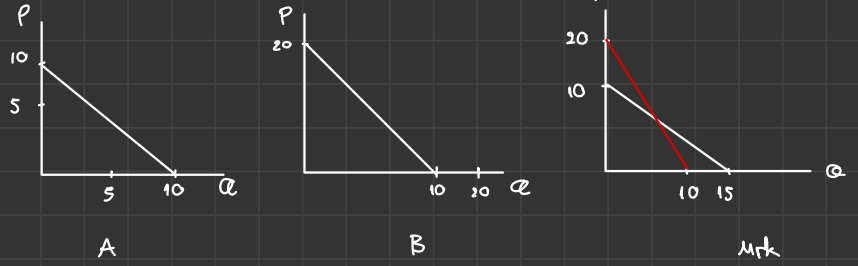
ee320 HW-2

1 2 consumers 1 seller

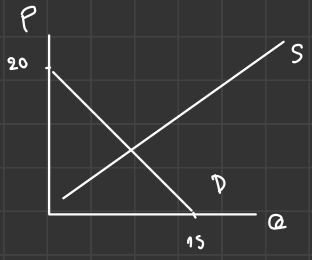
A : $Q_A = 10 - P \rightarrow P = 10 - Q$ $Q = P$

B : $Q_B = 40 - \frac{1}{2}P \rightarrow P = 20 - 2Q$

1.1 draw individual demand and market demand diagram



1.2 find equilibrium and how many buyer there are



there are 1 buyer in the market

Q^d_{mkt} $10 - \frac{1}{2}P$; $P > 10$

$20 - \frac{3}{2}P$; $P \leq 10$

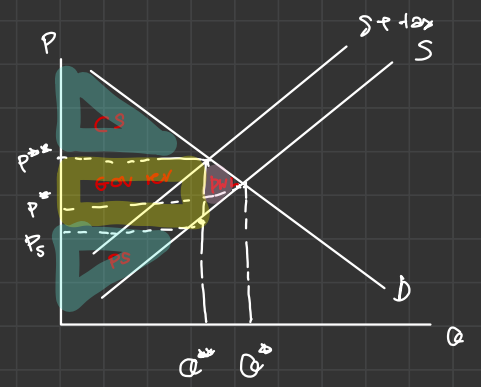
Example 35

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

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 :

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

$a - bQ = c + dQ$

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

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

$p^* = c + \frac{d(a-c)}{b+d}$

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

$p^* = \frac{cb+ad}{b+d}$

After tax :

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

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

$a - bQ = c + dQ + t$

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

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

P_s : $P_s = P_g + tax$

$P_s = \frac{bc+ad}{b+d} - \frac{dt}{b+d} + t$

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

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

P_t^* : $c + dQ_t$ from old Supply

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

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

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

- Derive the excess burden formula for buyers and sellers

excess burden :

consumer : $(P_B - P_t^*)Q_t$

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

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

Producer : $(P^* - P_s)Q_t$

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

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

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

tax rev ?

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

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

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

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

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

$$2t = a - c$$

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

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: $p = -2q_d + 160$

Supply: $p = q_s + 10$

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

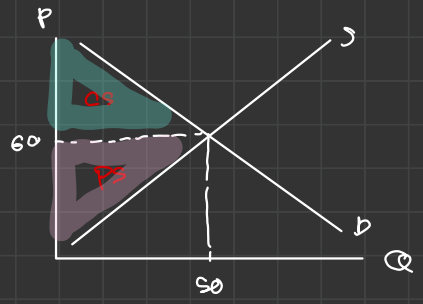
Example 3K : equilibrium : $P^s = P^d$

$$Q^s + 10 = -2Q^d + 160$$

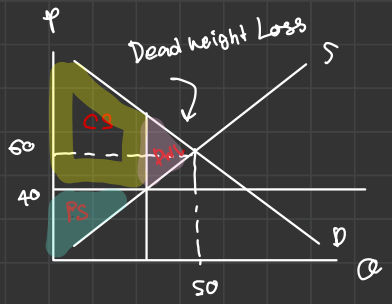
$$3Q = 150$$

$$Q = 50$$

$\therefore P = 50 + 10 \rightarrow P = 60$



- 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?



the policy is unreware to reduce the quality of renting an apartment
By having a cheaper price people will demand more of apartments, while the owner of the apartment does not want to rent their room out.