Applications of D+S. (government's Intervention)

1) Maximum Price (Ceiling Price)
2) Minimum Price (Floor Price)
3) Tax.

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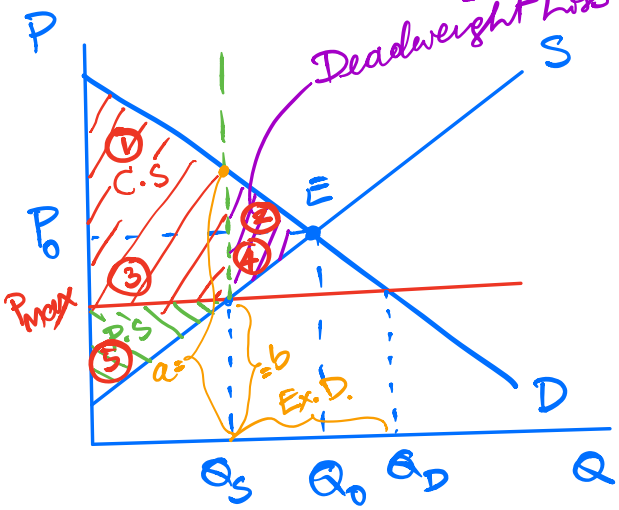
① Maximum Price



If the govt can impose and control the price to be at

$P_{max} < P_0$.

At P_{max}, Excess D = $Q_D - Q_S$

The market price cannot increase even with Ex. D > 0 because of the enforcement of price control.

Actual quantity bought & sold = $Q_S = \min\{Q_S, Q_D\}$.

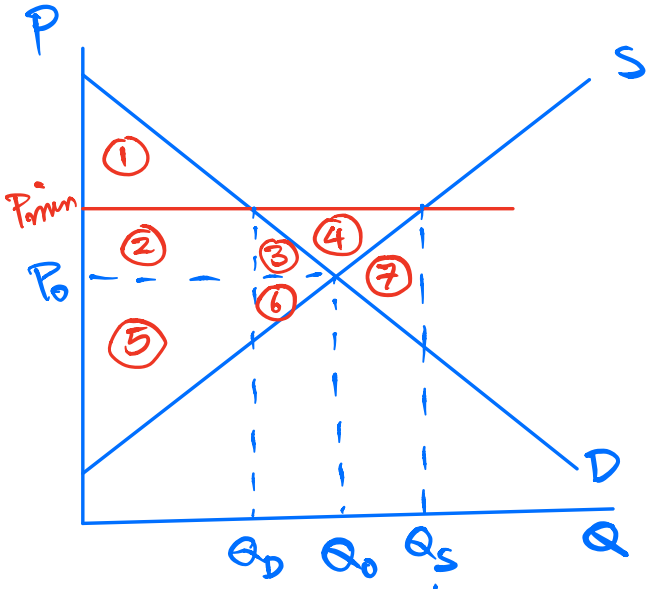
Deadweight Loss – Loss of Social welfare because the P_{max} reduces the total output.

a = value placed on the last unit bought at Q_S
b = cost of producing the last unit sold at Q_S.

	Before	After	Change
C.S	①+②	①+③	③−②
P.S.	③+④+⑤	⑤	−(③+④)

Deadweight Loss

② Minimum Price (Floor Price)



(sellers can sell Q_S at P_{min})

At P_{min}, we have Excess S.

$= Q_S - Q_D > 0$

Actual quantity bought + sold in the market $= Q_D = \min\{Q_D, Q_S\}$

If the govt buys all excess S.

they have to spend

$= P_{min} \times (Q_S - Q_D)$

	Before	After	change
CS	①+②+③	①	−(②+③)
P.S	⑤+⑥	②+③+④+⑤+⑥	②+③+④

Any quantity $> Q_0$, the value of the product is less than the cost of producing it.

∴ ⑦ is the deadweight loss that comes from over production.

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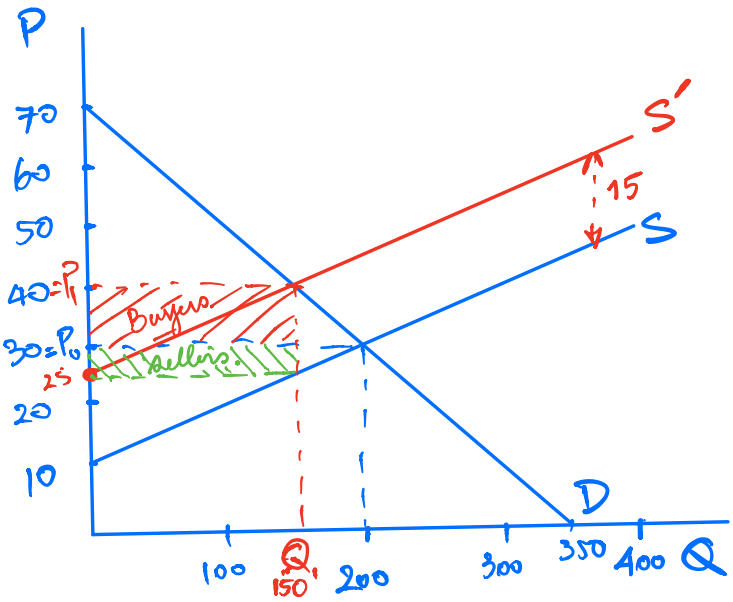
3. Tax. the sellers pay tax to the government

tax = t ฿/unit – specific tax.



Before Tax.

D: $P = 70 - \frac{1}{5}Q_D$

S: $P = 10 + \frac{1}{10}Q_S$

Eq at $P_0 = 30$

$Q_0 = 200$.

Tax = 15 ฿/unit.

– paid by sellers.

Before tax. if the price is 30 ฿, sellers want to sell 200 units.

After tax. D: $P = 70 - \frac{1}{5}Q_D$

S': $P = 10 + \frac{1}{10}Q_S + \text{tax}$.

$= 10 + \frac{1}{10}Q_S + 15$

$= 25 + \frac{1}{10}Q_S$

New eq. $Q_D = Q_S = Q_1$

$$70 - \frac{1}{5}Q_1 = 25 + \frac{1}{10}Q_1$$

$$\left(\frac{1}{10} + \frac{1}{5}\right)Q_1 = 45$$

$$\frac{1+2}{10}Q_1 = 45$$

$$Q_1 = \frac{10 \times 45}{3} = 150$$

$$P_1 = 40$$

With tax, the quantity is lower from $Q_0 = 200$ to $Q_1 = 150$

price is higher from $P_0 = 30$ to $P_1 = 40$. (paid by buyers.)

Tax burden on the buyers $= P_1 - P_0 = 40 - 30 = 10$ ฿/unit. (received by sellers.)

sellers $= P_0 - (P_1 - \text{tax})$

$= 30 - (40 - 15) = 5$ ฿/unit.

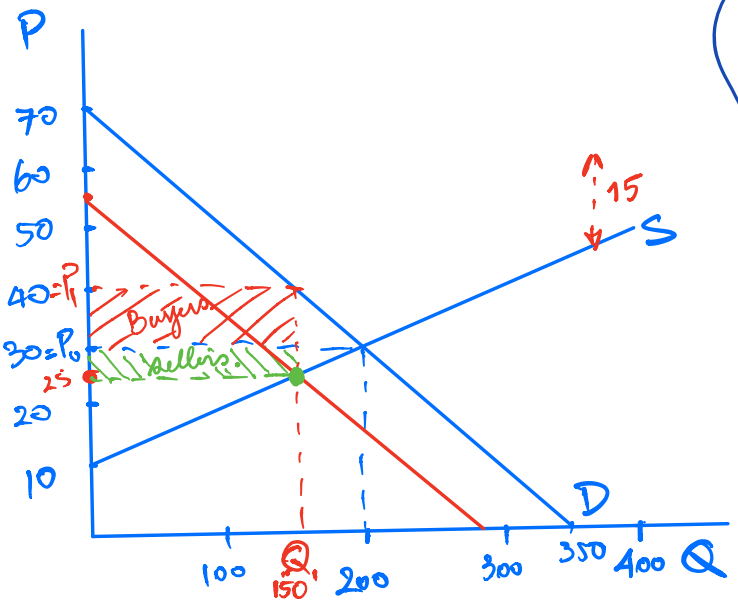
Tax = 15 Baht { shared by buyers = 10 ฿ ; shared by sellers = 5 ฿

Total burden on buyers $= 10 \times 150 = (P_1 - P_0)Q_1 = 1{,}500$

sellers $= 5 \times 150 = (P_0 - (P_1 - \text{tax}))Q_1 = 750$

Total Tax revenue collected $= (15) \times 150 = \text{tax} \times Q_1 = 2{,}250$

Tax = 15฿ paid by buyers.



$D: P = 70 - \frac{1}{5}Q_D$

$S: P = 10 + \frac{1}{10}Q_D$

$D': P = 70 - \frac{1}{5}Q_D - tax$

$= 70 - \frac{1}{5}Q_D - 15$

$= 55 - \frac{1}{5}Q_D$

Solving $(Q_D = Q_S = Q_1)$

$70 - \frac{1}{5}Q_1 - tax = 10 + \frac{1}{10}Q_1$

$70 - \frac{1}{5}Q_1 = \underbrace{25 + \frac{1}{10}Q_1}_{= 10 + tax + \frac{1}{10}Q_1}$

$\therefore Q_1 = 150.$

from new D': $P_1 = 70 - \frac{1}{5}Q_1 - 15$

$= 70 - \frac{1}{5}(150) - 15$

$= 25$ – price paid by the buyer to the sellers.

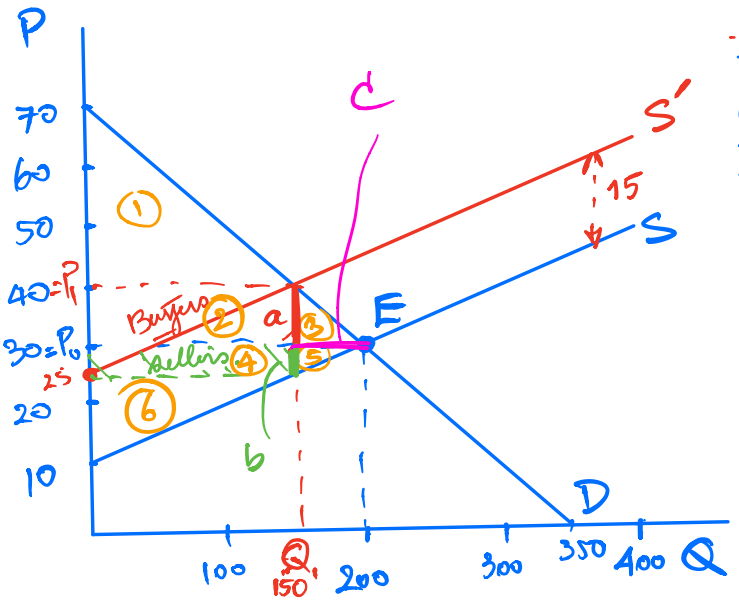
But the buyers also pay tax = 15฿/unit

$\therefore$ Total price paid by buyers = 25 + 15 = 40฿/unit

∴ the burden will be shared exactly the same way as in the case the sellers pay tax.

Change in Consumer's & Producer's Surplus

Tax on sellers.



	Before	After	Change
CS	①+②+③	①	−(②+③)
PS	④+⑤+⑥	⑥	−(④+⑤)

Tax revenue to Govt. (④+⑤)

Deadweight loss. (②+③)

Determination of share of burden of tax.

a = burden on buyers = $P_1 - P_0$

b = burden on sellers = $P_0 - (P_1 - \text{tax})$

at point E, the point elasticities of D & S are

$$\eta_D = \frac{1}{\text{slope } D} \cdot \frac{P_0}{Q_0} = \frac{1}{-a/c} \cdot \frac{P_0}{Q_0}$$

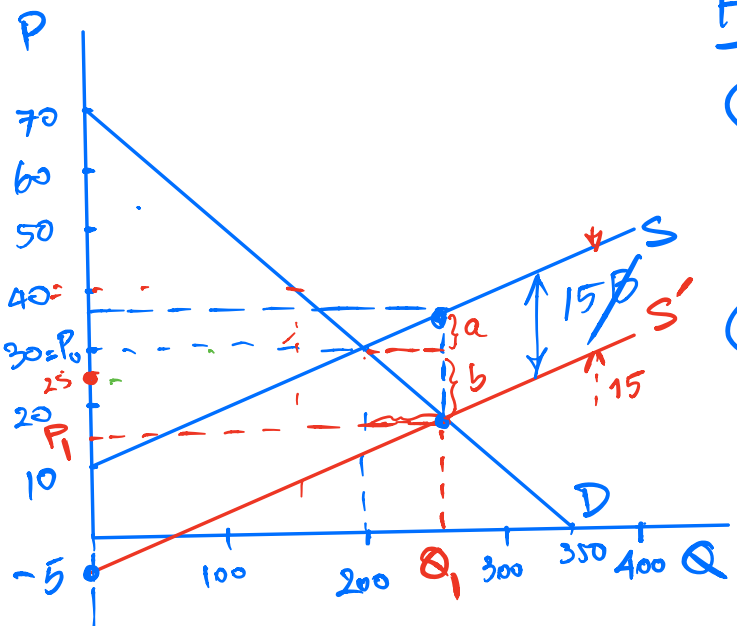
$$\eta_S = \frac{1}{\text{Slope } S} \cdot \frac{P_0}{Q_0} = \frac{1}{b/c} \cdot \frac{P_0}{Q_0}.$$

$$\therefore \frac{\eta_S}{|\eta_D|} = \frac{\frac{1}{b/c} \cdot P_0/Q_0}{\frac{1}{a/c} \cdot P_0/Q_0} = \frac{a}{b} = \frac{\text{burden on buyers}}{\text{burden on sellers}}.$$

if $\eta_S > |\eta_D|$ – more burden on buyers.

Ex. $\eta_S = 0.5$, $|\eta_D| = 0.3$. $\Rightarrow \frac{\eta_S}{|\eta_D|} = \frac{.5}{.3} = 1.67$

Subsidy = 15 ฿/unit received by sellers.



H.W.

(a) Find the new eq price P_1 and new eq quantity Q_1

(b) Find the share of the benefit of the subsidy.

(c) a = benefit to sellers.
b = benefit to buyers.
show how a & b are related to η_D & η_S.

(d) Find the change in Consumers + Producers Surpluses and deadweight Loss.