EE211
PRINCIPLES OF MICROECONOMICS

Topic 5:

Applications on Demand, Supply, and Government Policies

Topics

- Price floors (Minimum Price)
- Price ceilings (Maximum Price)
- Tax/subsidy

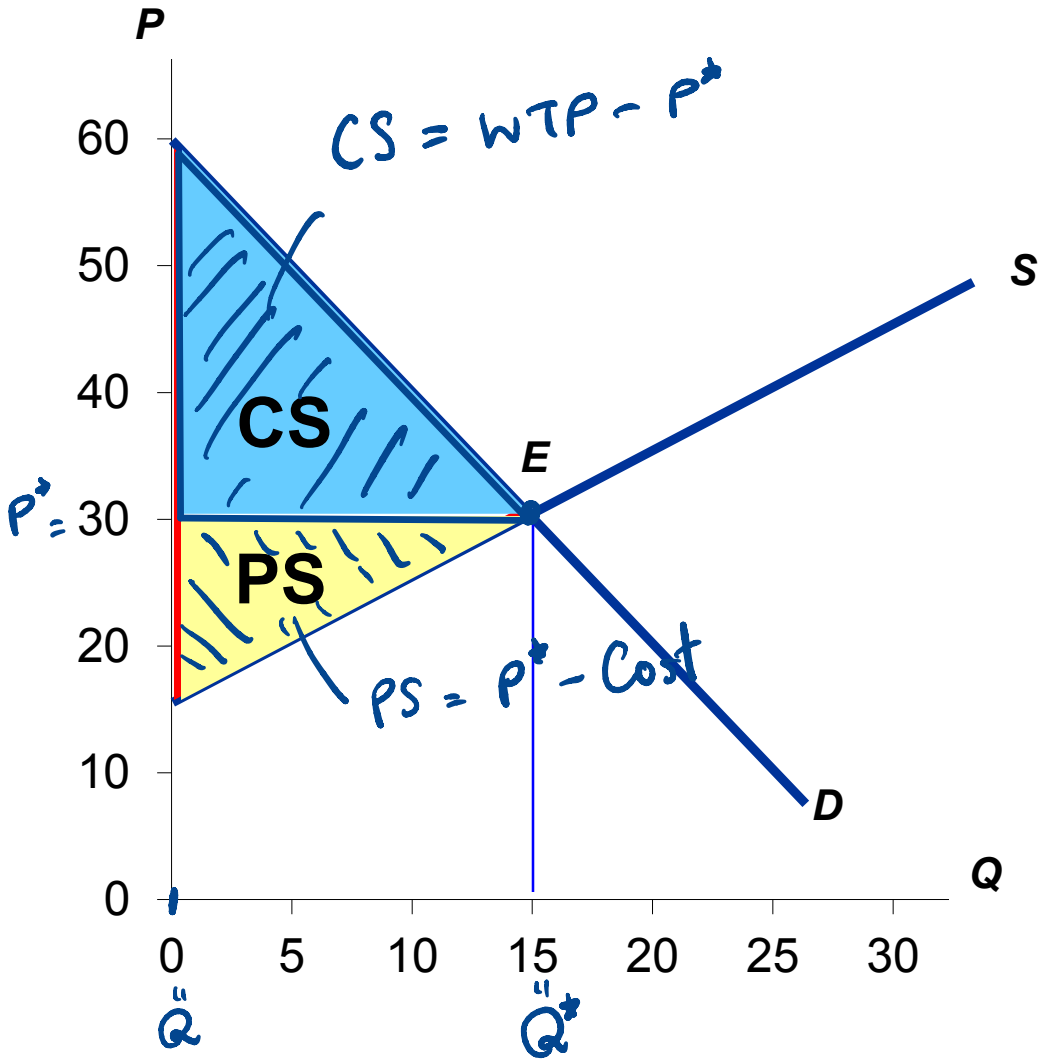
} impacts on social welfare

→ incidence tax & elasticities.

eg. Suppose VAT increases from 7% to 10%, who would be worse off?

→ Price elasticities of demand & supply

Market Equilibrium



- Recall: CS + PS

Total surplus (or social welfare) is maximized at the market equilibrium.

↳ allocative efficiency

Government interventions
↳ market distortion
↳ allocative INefficiency

Price Floors (Minimum Price)

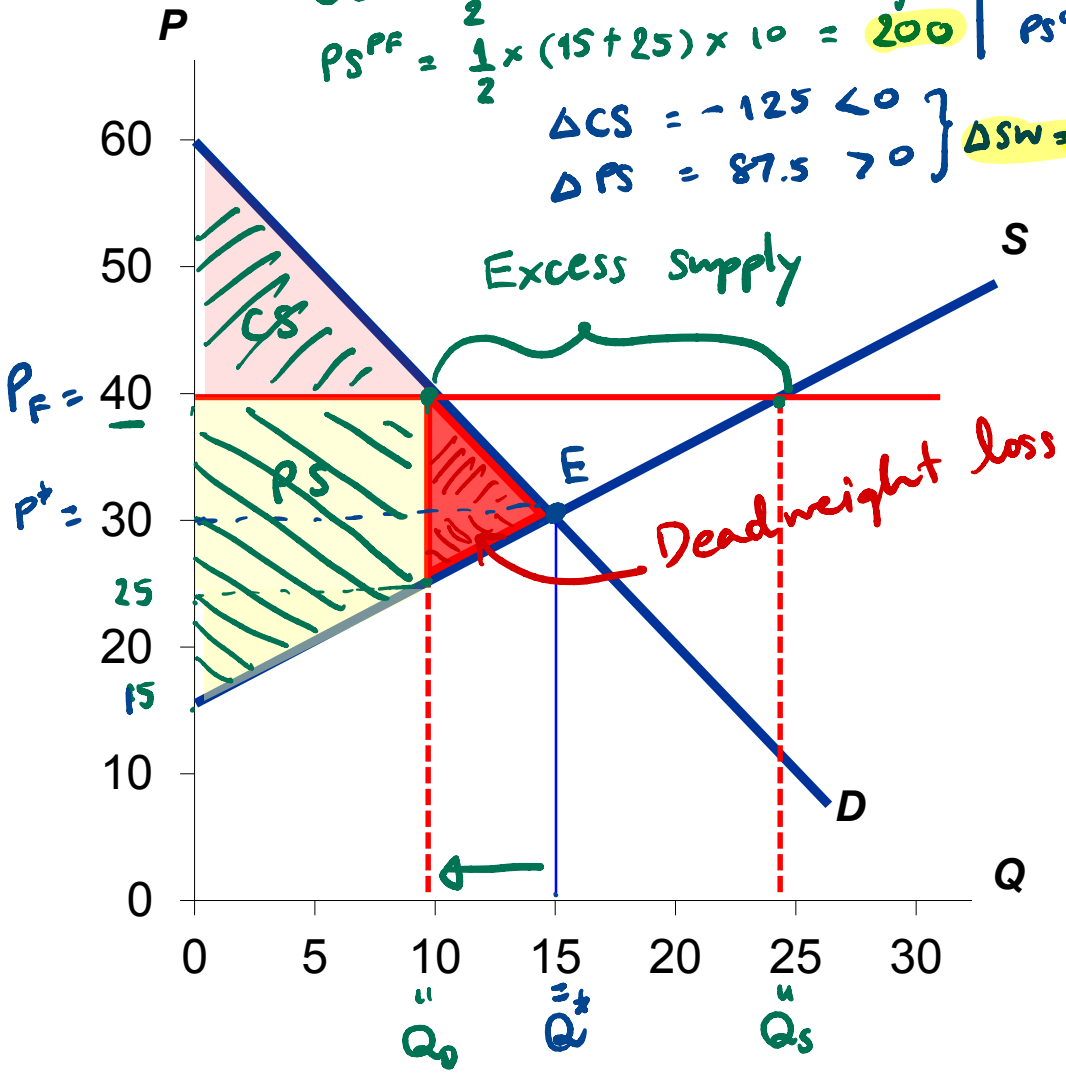
$P_F > P_E$

$CS^{PF} = \frac{1}{2} \times 20 \times 10 = 100$ → 300 | $CS^{0} = \frac{1}{2} \times 15 \times 30 = 225$

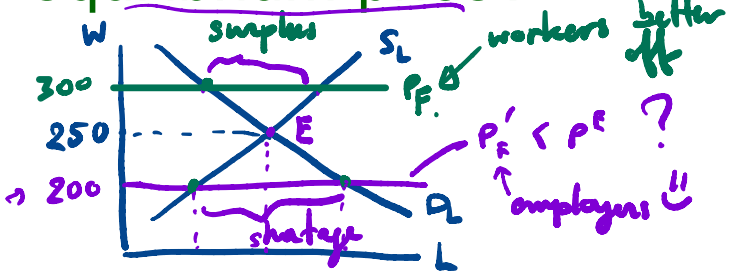
$PS^{PF} = \frac{1}{2} \times (15+25) \times 10 = 200$ | $PS^{0} = \frac{1}{2} \times 15 \times 15 = 112.5$ } $SW = 337.5$

$\Delta CS = -125 < 0$

$\Delta PS = 87.5 > 0$ } $\Delta SW = -37.5$

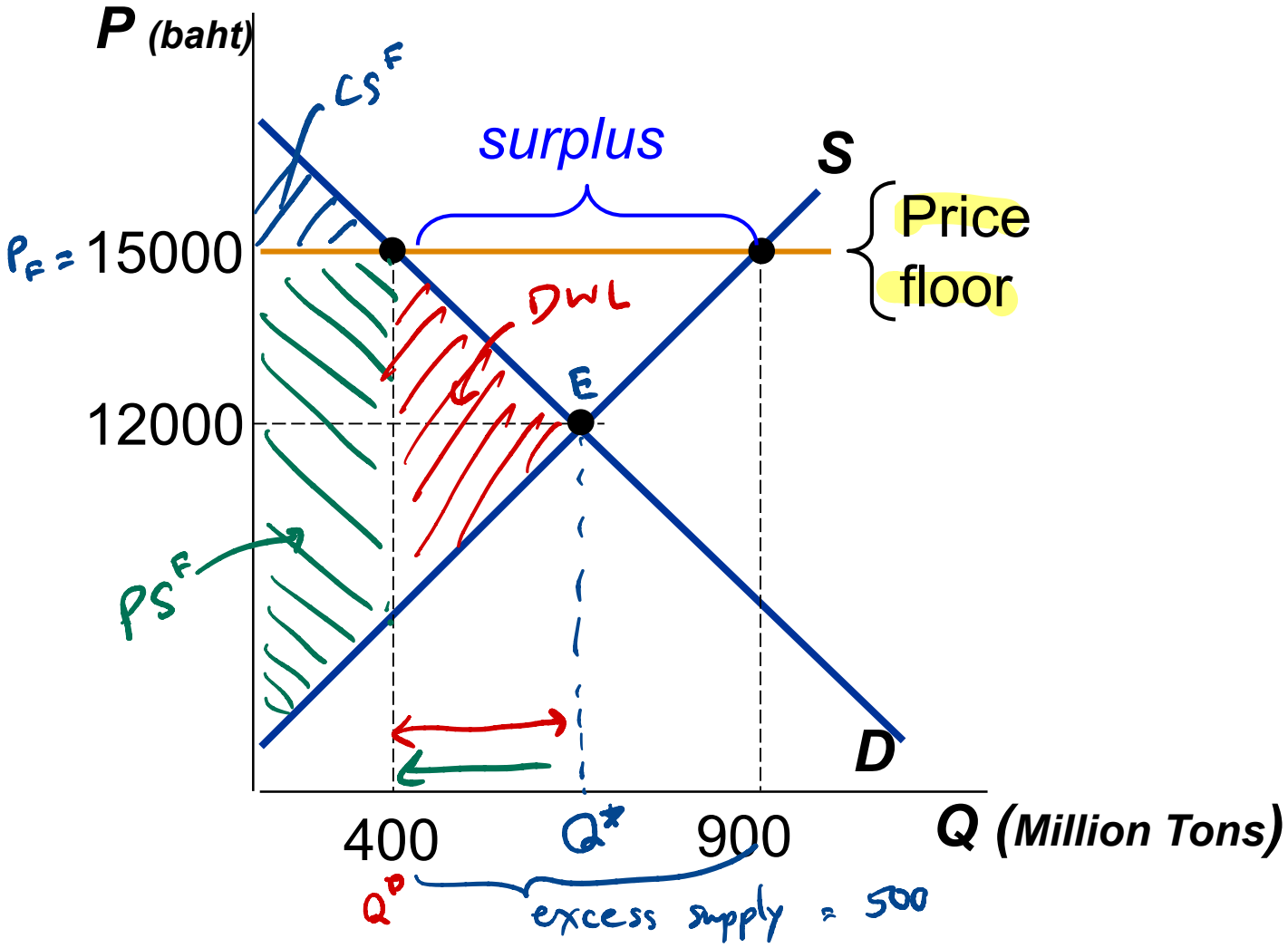


- **Price floor**: a legal minimum on the price of a good or service.
- *Example*: minimum wage ≈ 300 baht, agricultural goods
- Question: Can the government set the price floor below the equilibrium price? No! Less supply

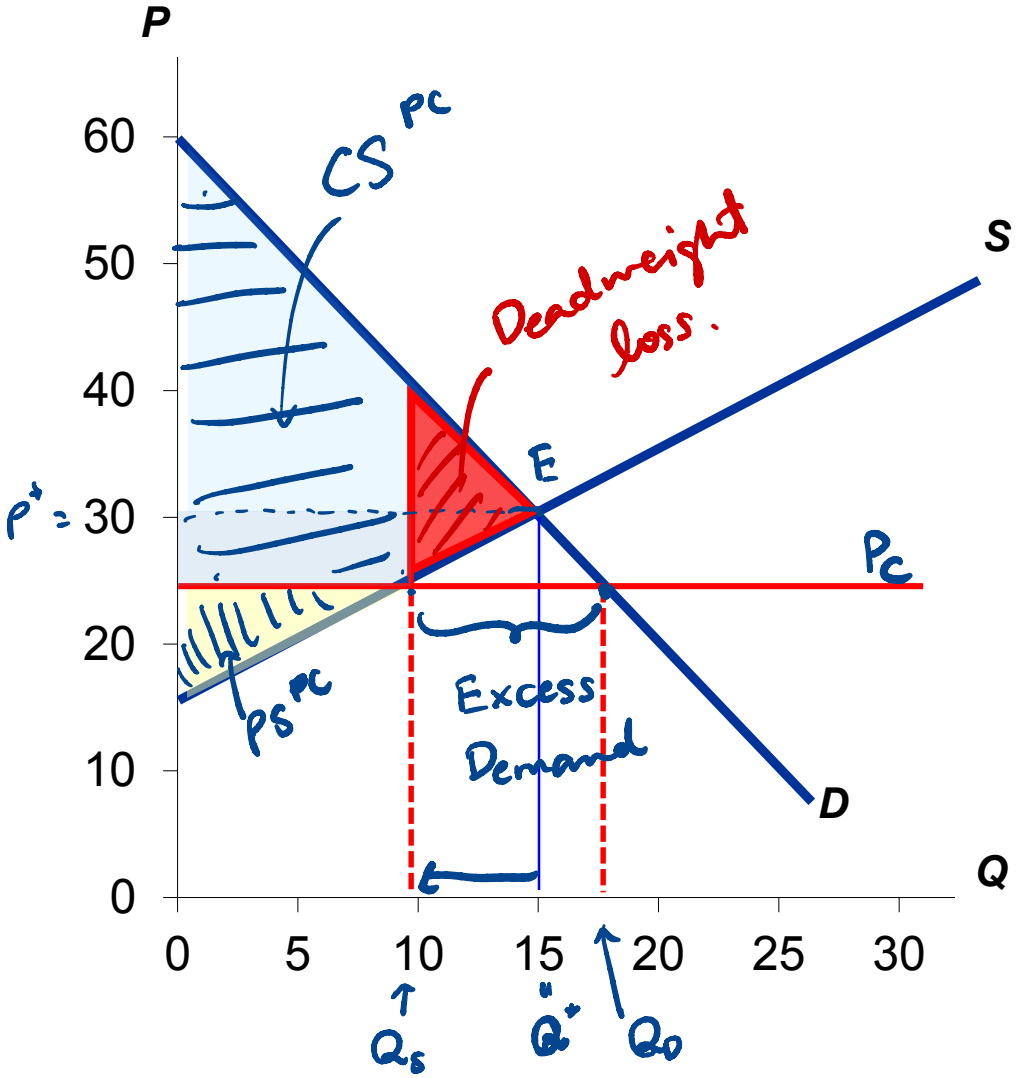


Example: Agriculture Price Guarantee Scheme

Rice Pledging Scheme → 15,000 ฿/ton



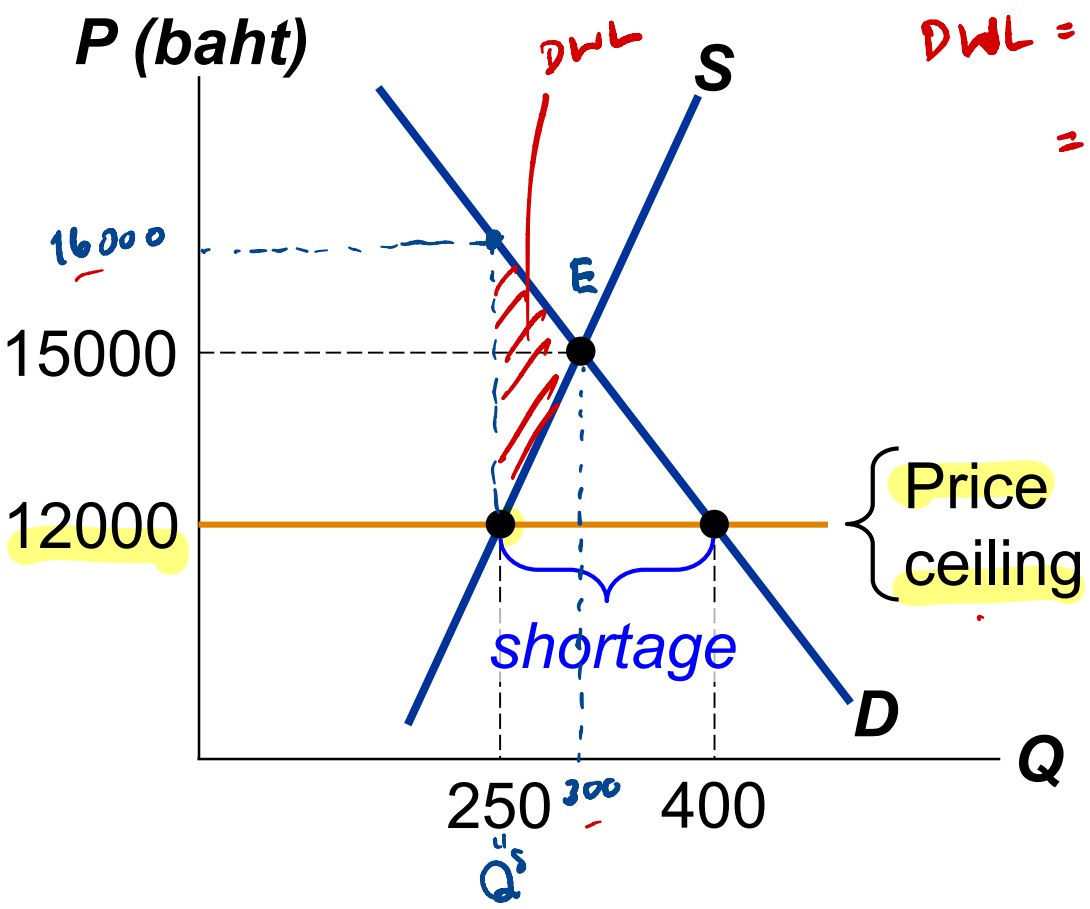
Price Ceilings (Maximum Price) $P_c < P_E^*$



- **Price ceiling**: a legal maximum on the price of a good or service.
- *Example: rent control*
- Can the government set the price ceiling above the equilibrium price?

No!

Example: The Market for Apartments



$DWL = \frac{1}{2} \times 50 \times 4000^2$

$= 100{,}000$

Taxes

ภาษีสรรพสามิต.

- In this class, we talk about excise taxes – taxes charged on the purchase of goods and services.
  - **Per-unit (or specific) tax**: a specific amount for each unit sold.
  - Ad-valorem tax: a percentage of the good's price
- The government can impose taxes on either buyers or sellers. We will show that:
  - the outcome (effect on P&Q) is the same in both cases;
  - tax burdens on buyers and on sellers are determined by relative price elasticities.

eg. 50 cents for 1 unit.

tax on tobacco, gasoline

Value-added tax
VAT 7%.

Tax on Consumers

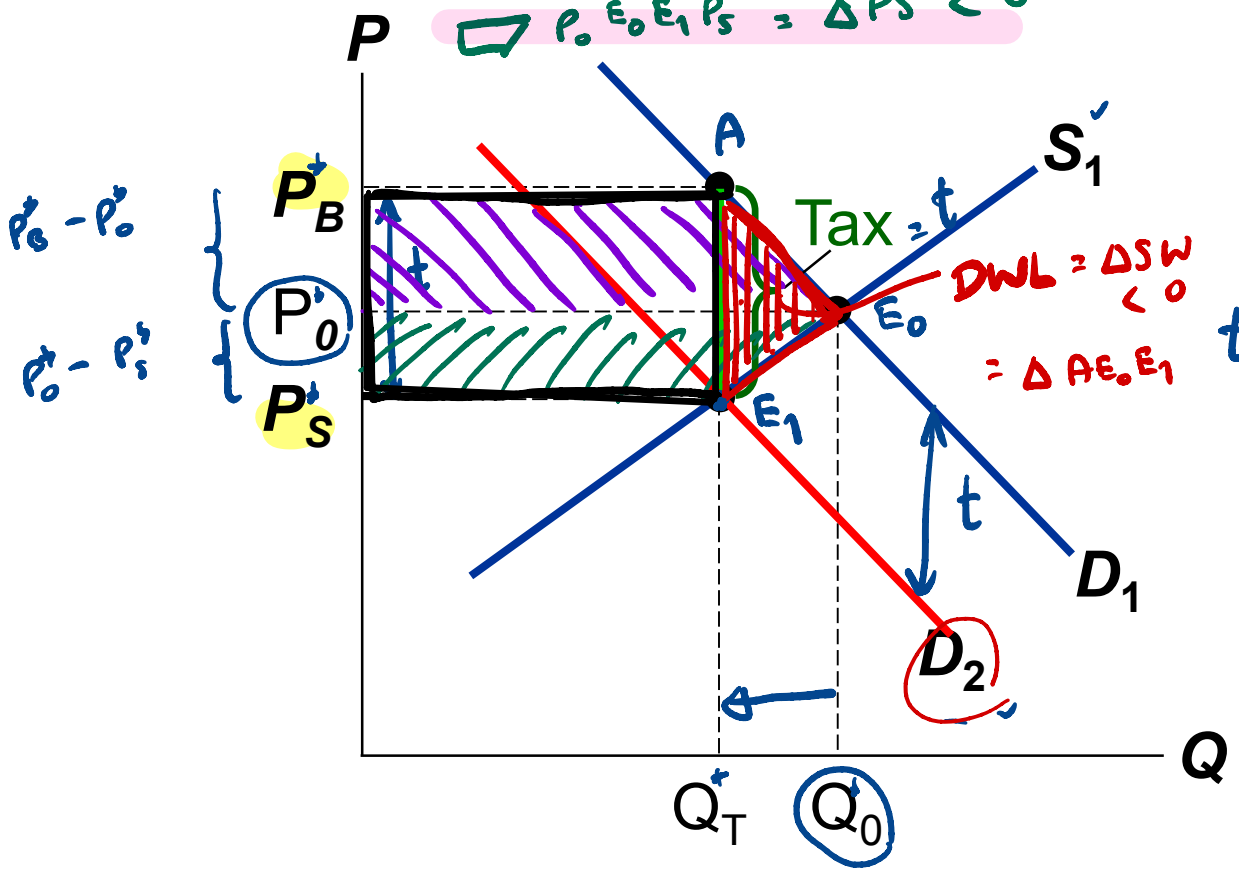
Per-unit tax : t baht/unit

$P_{Buyers} = P_{sellers} + t$

$\square P_B A E_1 P_S$ = total tax

$\square P_B A E_0 P_0 = \Delta CS < 0$

$\square P_0 E_0 E_1 P_S = \Delta PS < 0$



A tax on buyers shifts the ***D*** curve down by the amount of the tax. → $Q_0 \downarrow$ → $Q_T \downarrow$

$t = P_B - P_S$

$= (P_B - P_0) + (P_0 - P_S)$

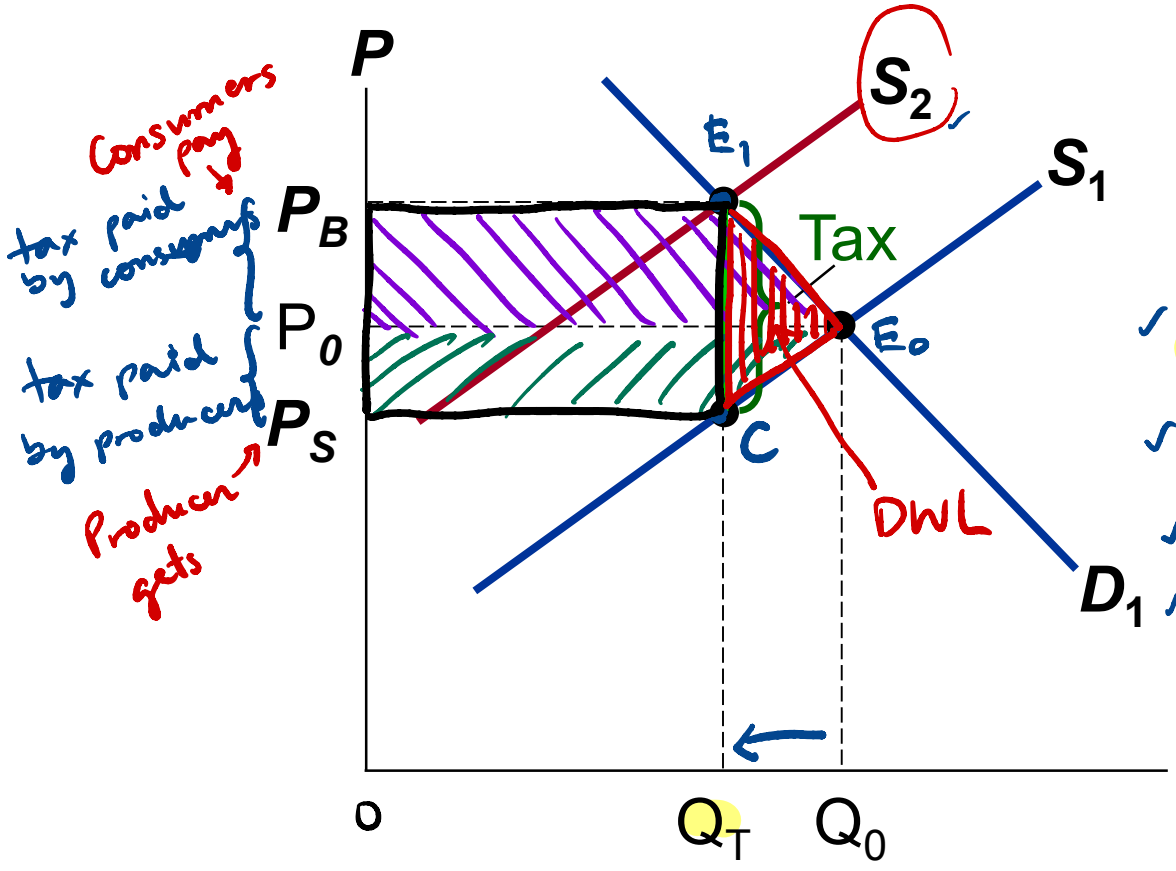
tax borne by consumer

tax borne by producers

Tax on Producers

$P_S = P_B - t \Leftrightarrow P_B = P_S + t$

↖ tax per unit



A tax on sellers shifts the **S** curve up by the amount of the tax.

✓ ΔCS = $P_B E_1 E_0 P_0 < 0$

✓ ΔPS = $P_0 E_0 C P_S < 0$

✓ Total tax = $T = t \times Q_T$

$= \square P_B E_1 C P_S > 0$

→ Net change in SW

$= \Delta E_1 E_0 C_0 < 0$

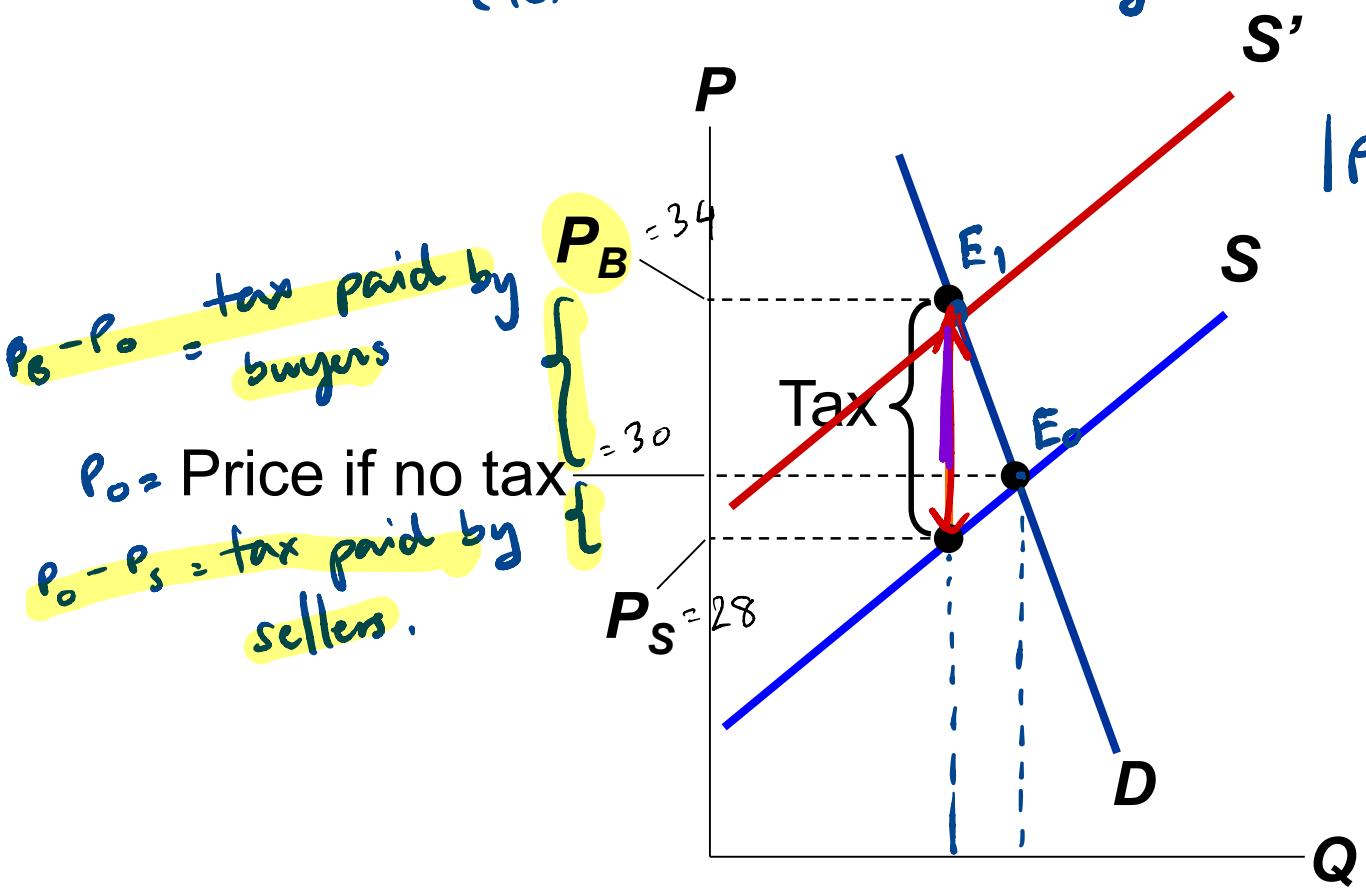
$= \Delta CS + \Delta PS + T$

$= DWL$

Tax Incidence and Elasticity: (tax imposed on producers).

Case 1: Supply is more elastic than demand.

(ie. Demand is relatively more INelastic.)



$P_B - P_0$ = tax paid by buyers

$P_0 - P_S$ = tax paid by sellers.

$|P_B - P_0| > |P_0 - P_S|$ when $|\varepsilon_S| > |\varepsilon_D|$

Numerical Example

$Q = f(P)$

$Q_d = 0.2Q_d = 50 - P$

$Q_d = 250 - 5P$

- Let $P = 50 - 0.2Q_d$ and $P = 20 + 0.1Q_s$. Suppose a \$6 per-unit tax is imposed on producers. Determine the equilibrium after tax. $(P_B^*, P_S^*, Q_T^*) = ?$

Eqm before tax: P_0^*, Q_0^*

At eqm, $50 - 0.2Q_D = 20 + 0.1Q_S$

$\therefore Q_D = Q_S$

Q_0^*

$30 = 0.3Q_0^*$

$Q_0^* = 100$

$P_0^* = 30$

After tax, $P_B^* = P_S^* + t = P_S^* + 6$

D: $P_B = 50 - 0.2Q_D$ } Q_T

S: $P_S = 20 + 0.1Q_S$ $= P_B$

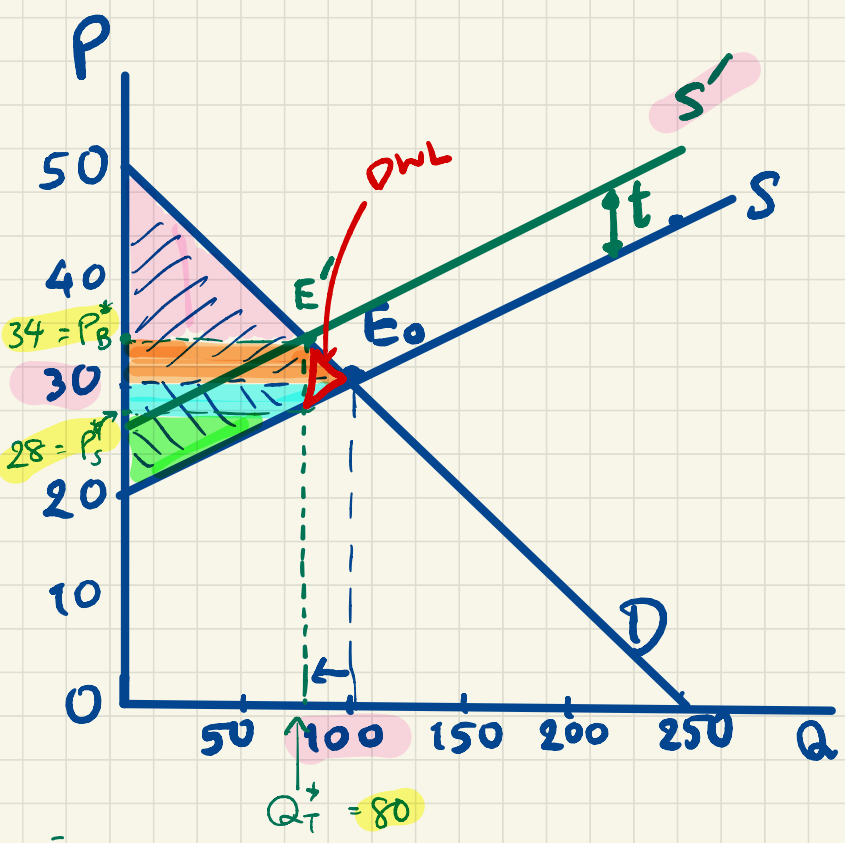
At eqm, $P_S^* + 6 = 50 - 0.2Q_T$

$20 + 0.1Q_T + 6 = 50 - 0.2Q_T$

$0.3Q_T = 50 - 26 = 24$

$Q_T^* = 80$

$P_B^* = 34$, $P_S^* = 28$



Before tax: $P_0^* = 30$, $Q_0^* = 100$

$CS_0 = \frac{1}{2} \times \$20 \times 100 = \$1{,}000$

$PS_0 = \frac{1}{2} \times \$10 \times 100 = \$500$

Total surplus = $1500.

After tax: $Q_T^* = 80$, $P_B^* = 34$

$P_S^* = 28$

∴ Per-unit tax paid by consumer = $P_B^* - P_0^* = \$4$

Per-unit tax paid by seller = $P_0^* - P_S^* = \$2$.

$CS_T = \frac{1}{2} \times \$16 \times 80 = \$640$

$PS_T = \frac{1}{2} \times \$8 \times 80 = \$320$

$\Delta CS = \$640 - \$1000 = -\$360$

$\Delta PS = \$320 - \$500 = -\$180$

Total tax: $T = \$6 \times 80 = \$480$

Total change in SW = $-\$60$

Buyers $\$4 \times 80 = 320$

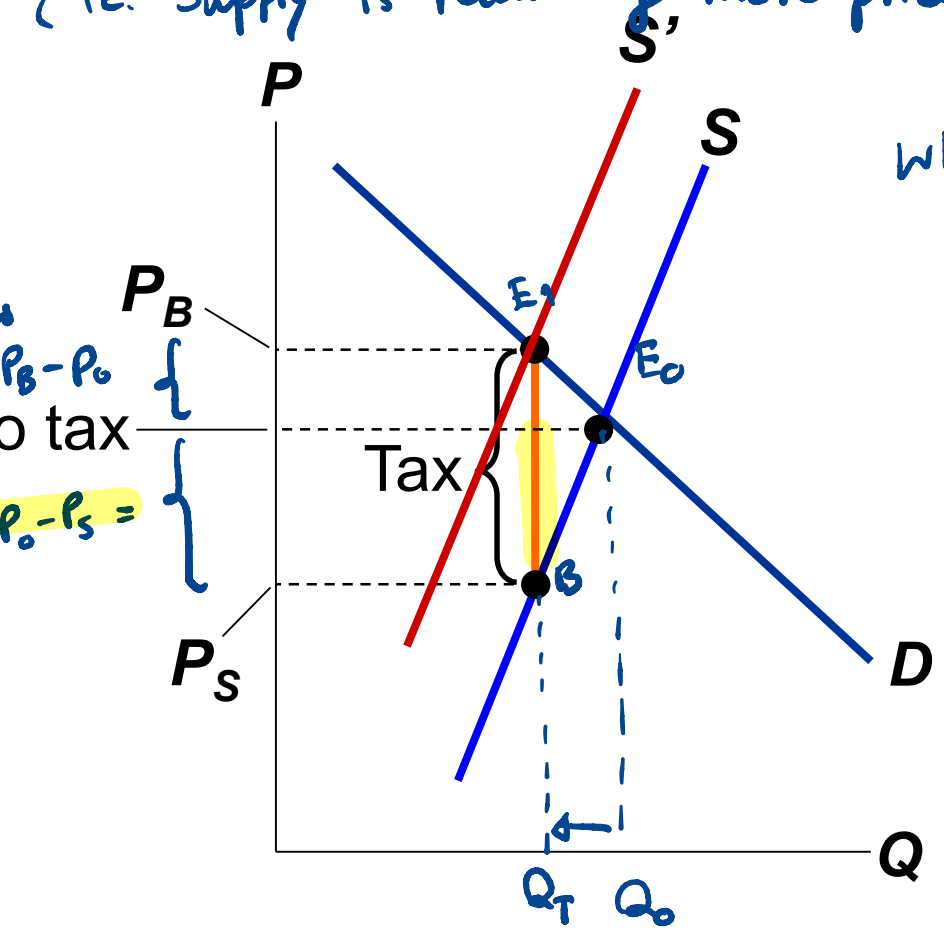
Seller $\$2 \times 80 = 160$

Tax Incidence and Elasticity:

(tax imposed on producers.)

Case 2: Demand is more elastic than supply.

(ie. Supply is relatively more price inelastic.)



tax paid by buyers = $P_B - P_0$

P_0 = Price if no tax

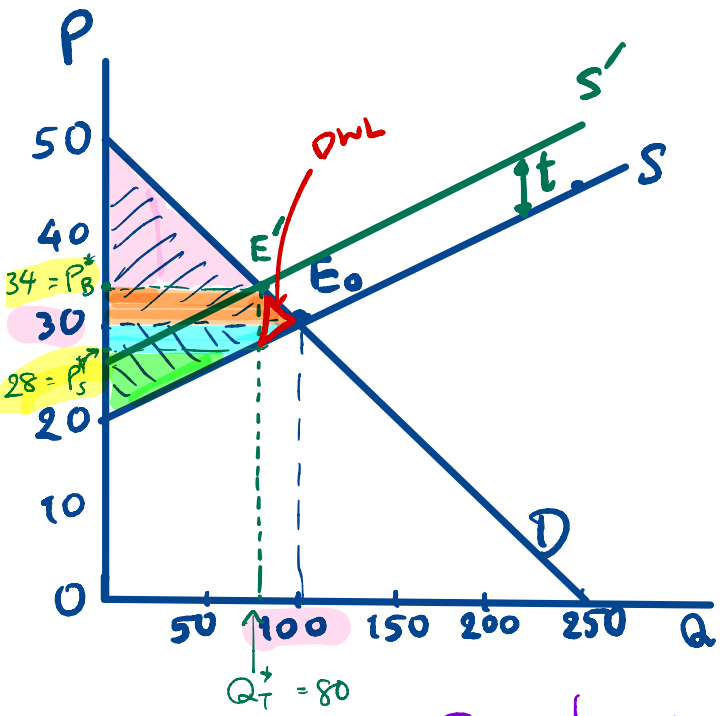
tax paid by sellers $P_0 - P_S$ =

when $|\varepsilon_D| > |\varepsilon_S|$,

$|P_B - P_0| < |P_0 - P_S|$.

Numerical Example

- Continue with the example on slide #12,
  - Calculate the point elasticities of demand and supply at the before-tax equilibrium.
  - Calculate the tax burden for both consumer and producer.



Before tax eqm, $P^* = 30$, $Q^* = 100$

D: $P = 50 - 0.2Q_d$ $\Rightarrow \frac{\Delta P}{\Delta Q_d} = -0.2$

S: $P = 20 + 0.1Q_s$ $\Rightarrow \frac{\Delta P}{\Delta Q_s} = 0.1$

$|\varepsilon_d| = 1.5$

$\Rightarrow \varepsilon_D = \frac{\%\Delta Q_d}{\%\Delta P} = \frac{\Delta Q_d}{\Delta P} \times \frac{P^*}{Q^*} = \frac{-1}{0.2} \times \frac{30}{100} = -1.5$

$|\varepsilon_s| = 3$

$\varepsilon_S = \frac{\%\Delta Q_s}{\%\Delta P} = \frac{\Delta Q_s}{\Delta P} \times \frac{P^*}{Q^*} = \frac{1}{0.1} \times \frac{30}{100} = 3$

$\therefore$ Supply is relatively more price elastic than demand.

From the above calculation, $(P^* = 30, Q^* = 100)$

at the initial eqm, $|\varepsilon_D| = 1.5$ and $|\varepsilon_S| = 3$.

- As a result of tax, $Q_T^* = 80$, $P_B^* = 34$, $P_S^* = 28$.

  $T_B = 320$

  ⇒ Per-unit tax burden for consumer: $\$34 - \$30 = \$4$

  " " seller $= \$30 - \$28 = \$2$. $= 160$

- Change in welfare: $\Delta CS = -\$360$ and $\Delta PS = -\$180$.

  Total tax: $T = 80 \times \$6 = \$480$. $(320 + 160)$ (buyers + sellers)

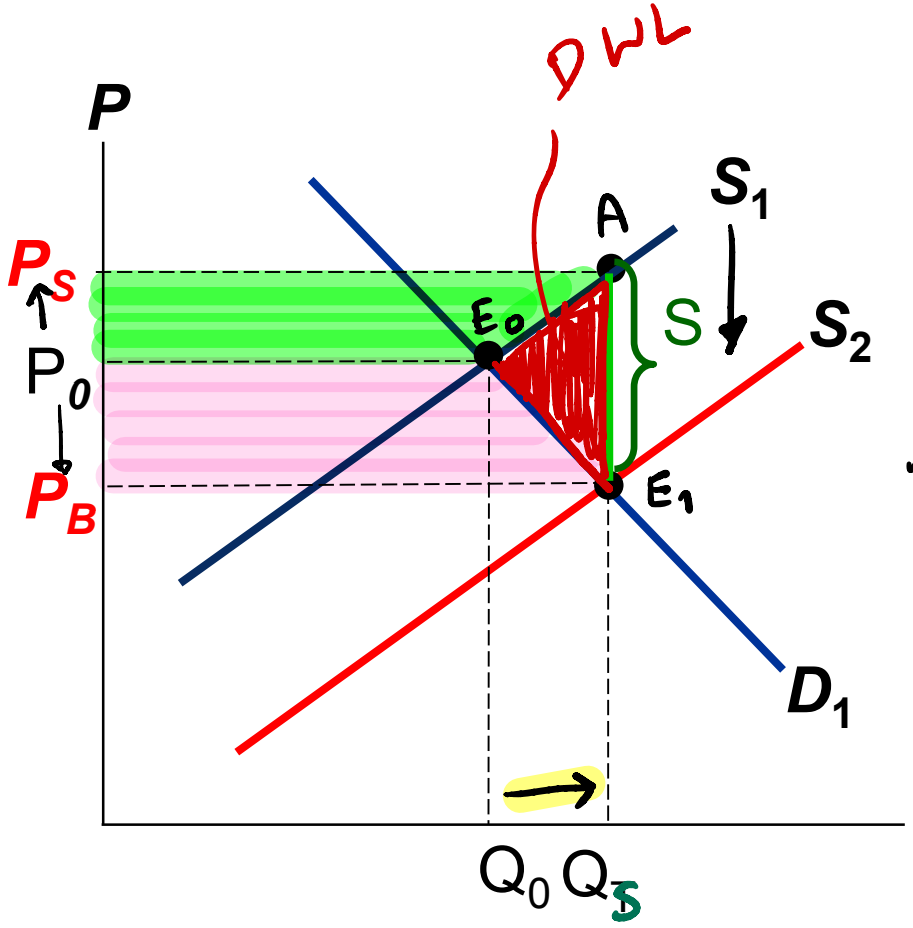
∴ Total welfare change $= \Delta SW = -360 - 180 + 480$

$= -\$60$

~ -tax + subsidy

Subsidy (on Producers)

$P_S = P_B + S$



A subsidy on sellers shifts the **S** curve down by the amount of the subsidy.

✓ Total subsidy = $\square P_S A E_1 P_B$ < 0

✓ $\Delta CS = \square P_0 E_0 E_1 P_B > 0$

✓ $\Delta PS = \square P_S A E_0 P_0 > 0$

$\therefore$ Net $\Delta SW = \triangle E_0 A E_1 < 0$

Question: Is there any welfare loss from a subsidy? → Yes!

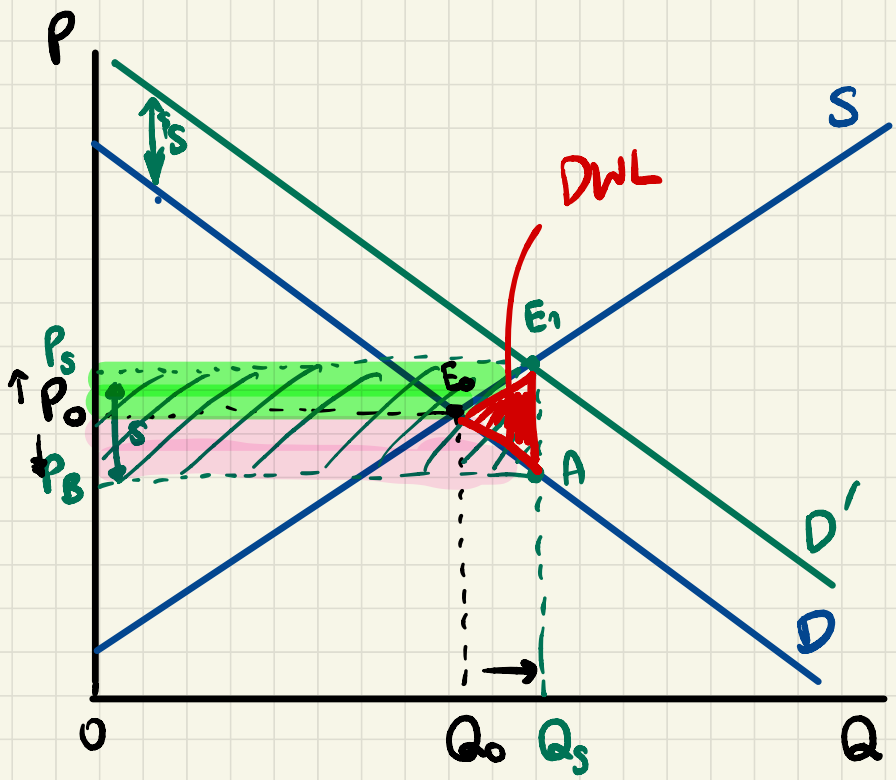
(Per-unit)

Subsidy imposed on consumers

subsidy

$P_S = P_B + S$

$P_B = P_S - S$



✓ Total amount of subsidy

$= Q_S \times S$

$= \square P_S E_1 A P_B < 0$

✓ $\Delta CS = \square P_0 E_0 A P_B > 0$

✓ $\Delta PS = \square P_S E_1 E_0 P_0 > 0$

$\Delta SW = \triangle E_0 E_1 A < 0$

Government interventions (eg. price ceiling / floor, tax, subsidy).

↳ needed b/c of market failures (eg. tax cigarette cons ⇑ → -ve externalities
subsidize vaccine → +ve externalities)

↳ create welfare loss / market distortions

↳ DWL
↳ ΔCS
↳ ΔPS
} sensitivity to price change (ε_s, ε_d)