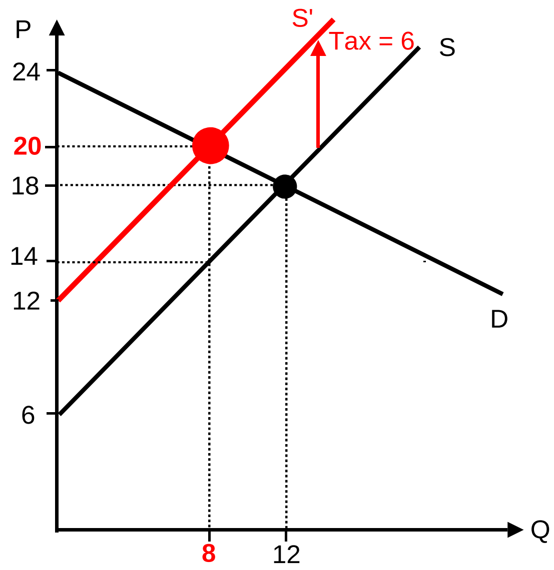
Tax incidence 3: The role of the elasticities

- Abbreviations: S = Supply D = Demand P = Price Q = Quantity
- Calculus is used.

1 Demand, supply, market equilibrium and a tax

Example:

- D: P = 24 - 0.5Q
- S: P = 6 + Q
- Equilibrium if D = S
- 24 - 0.5Q = 6 + Q
- 1.5Q = 18
- Q = 12 and P = 18
- Now a tax of 6 per unit, payable by the seller, is introduced:



- Tax incidence: The buyer bears **2** (the price rises from 18 to 20), the seller bears **4** (because the price of 20 minus the tax of 6 is only 14, whereas the price without tax has been 18). How can this distribution (**1 : 2**) be explained?

2 Price elasticity of demand (e) at point Q = 12 and P = 18

- $e = \frac{dQ}{dP} * \frac{P}{Q}$
- Demand side: P = 24 - 0.5Q → Q = 48 - 2P
- $\frac{dQ}{dP} = -2$
- $\frac{P}{Q} = \frac{18}{12} = 1.5$
- $e = \frac{dQ}{dP} * \frac{P}{Q} = -2 * 1.5 = -3$ → **3** (absolute value)

3 Price elasticity of supply (Se) at point Q = 12 and P = 18

- $Se = \frac{dQ}{dP} * \frac{P}{Q}$
- Supply side: P = 6 + Q → Q = P - 6
- $\frac{dQ}{dP} = 1$
- $\frac{P}{Q} = \frac{18}{12} = 1.5$
- $Se = \frac{dQ}{dP} * \frac{P}{Q} = 1 * 1.5 = \mathbf{1.5}$

4 Relation of elasticities and tax incidence (e as an absolute value)

- e : Se = 3 : 1.5 = 2 : 1
- Tax incidence (Buyer : seller) = 1 : 2

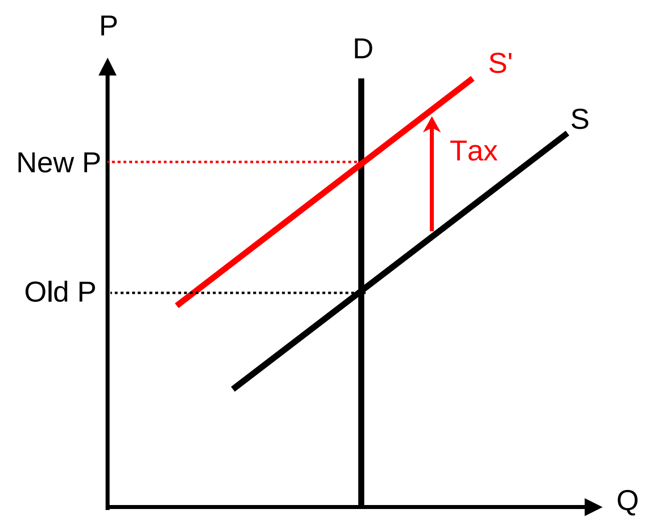
→ The tax incidence is inversely related to the corresponding elasticities.

5 Formulas for tax incidence (e as an absolute value)

- $\text{Buyer} = \frac{\mathbf{Se}}{(e + Se)} = \frac{1.5}{(3 + 1.5)} = \frac{1}{3}$
- $\text{Seller} = \frac{\mathbf{e}}{(e + Se)} = \frac{3}{(3 + 1.5)} = \frac{2}{3}$
- Buyer **:** Seller → $\frac{1}{3} \mathbf{:} \frac{2}{3} = 1 \mathbf{:} 2$

6 Example

- Assumption: Demand is perfectly inelastic (e = 0).



Tax incidence:

- $\text{Buyer} = \frac{Se}{(e + Se)} = \frac{Se}{(0 + Se)} = 1$
- $\text{Seller} = \frac{e}{(e + Se)} = \frac{0}{(0 + Se)} = 0$
- Result:
  The tax is borne completely by the buyer (1), whereas the situation for the seller does not change (0). Situation for the seller: Old price = New price - tax