Equilibrium

- Introduce supply
- Equilibrium
- The effect of taxes
- Who really "pays" a tax?
- The deadweight loss of a tax
- Pareto efficiency

Supply

- Assume firms, as consumers, take the market price for the good they are selling as given and outside of their control: the **market** is **competitive**

- A firm's **supply function** measures the quantity of a good that the firm supplies at a given price:
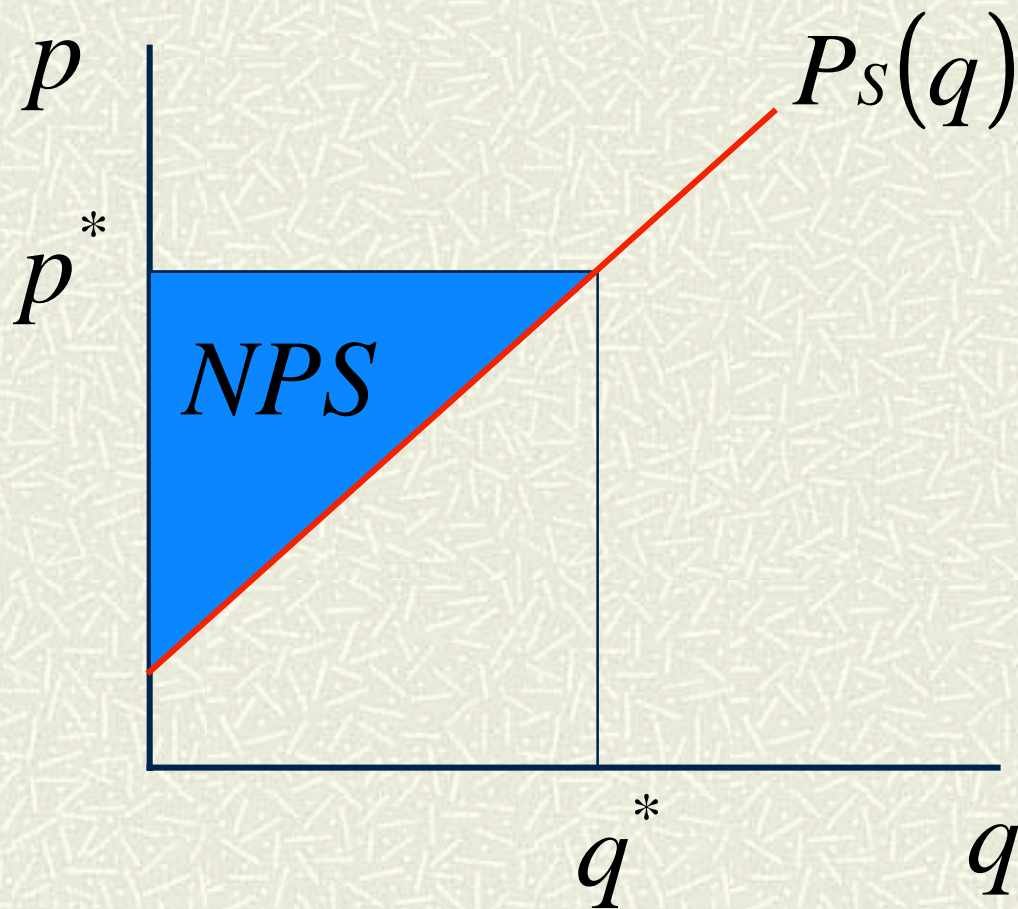
$$q = S(p)$$

Supply

- In general, a firm's supply increases with the good's price:

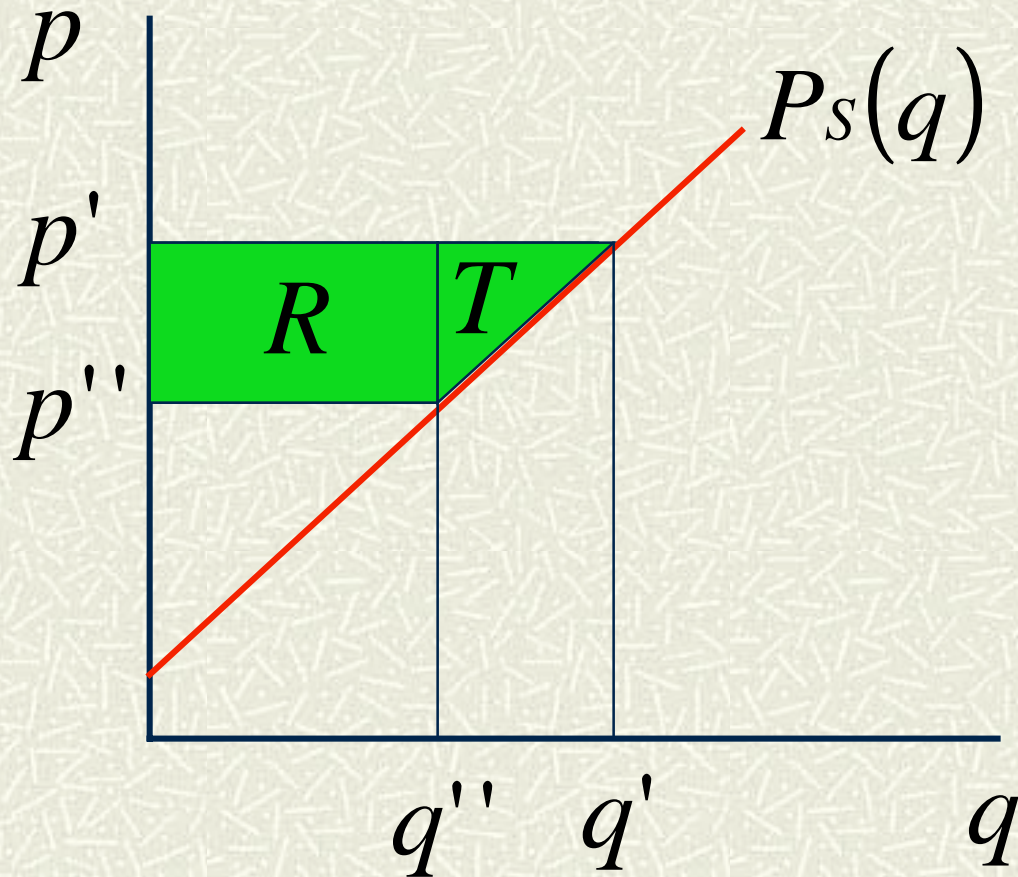$$\frac{\partial S}{\partial p} > 0$$

- An **inverse supply function** tells us what the price would have to be to get the producer to supply q units of the good:
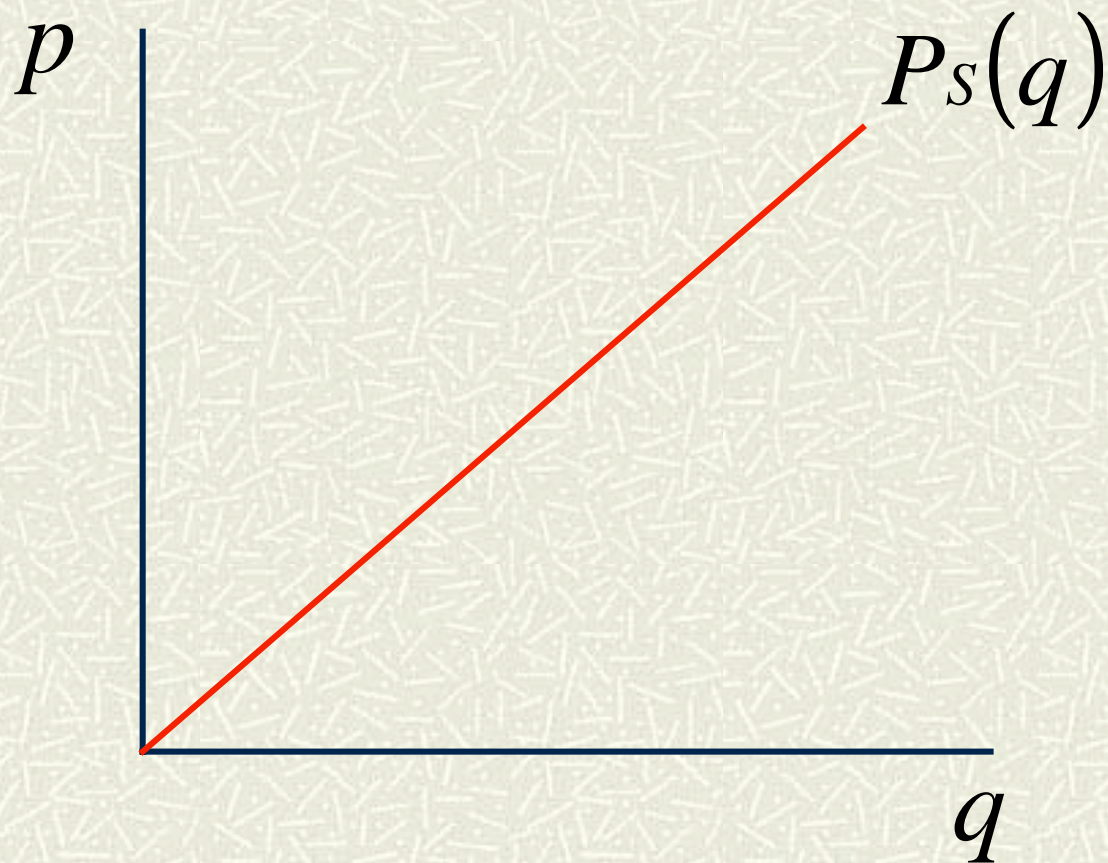
$$p = P_s(q)$$

Net Producer's Surplus

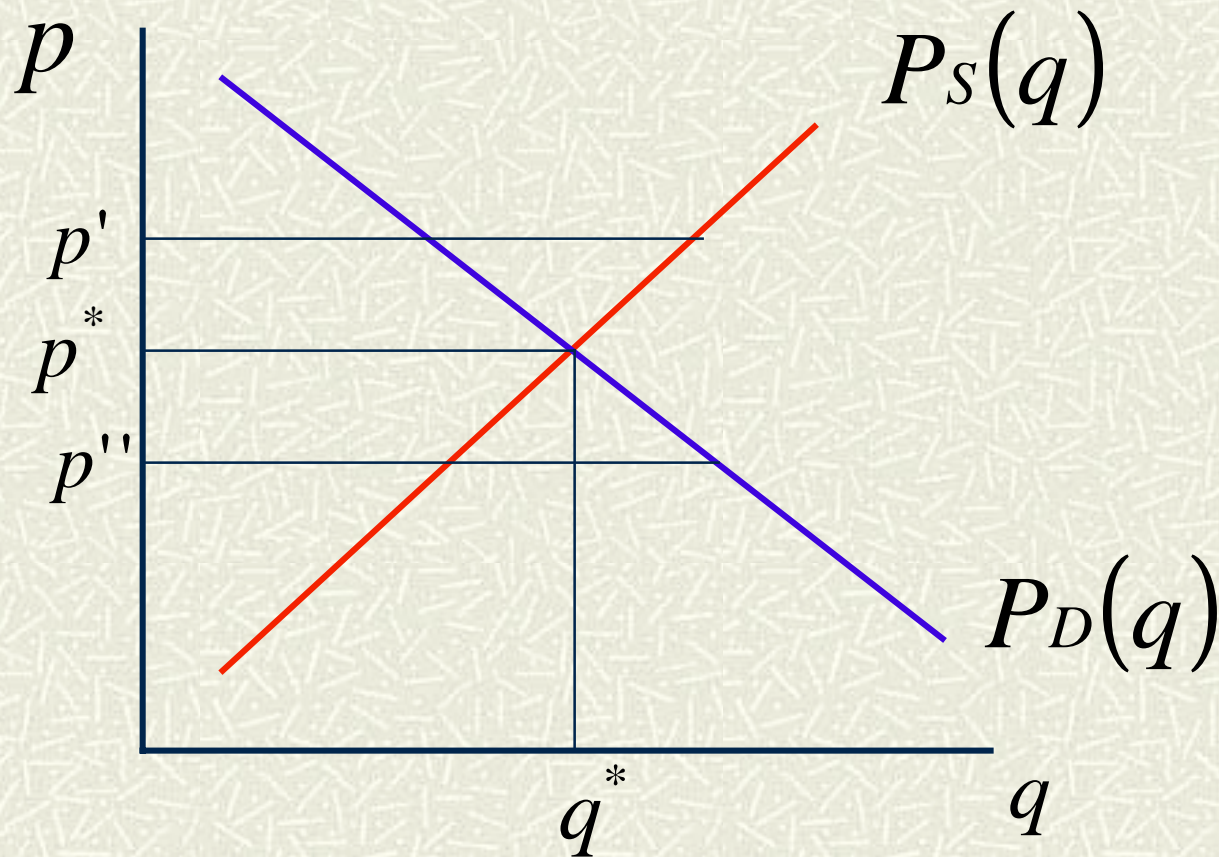# Changes in Net Producer's Surplus

Market Supply Curve

Equilibrium

- Consider the market for a good where **market demand** is $D(p)$ and **market supply** is $S(p)$
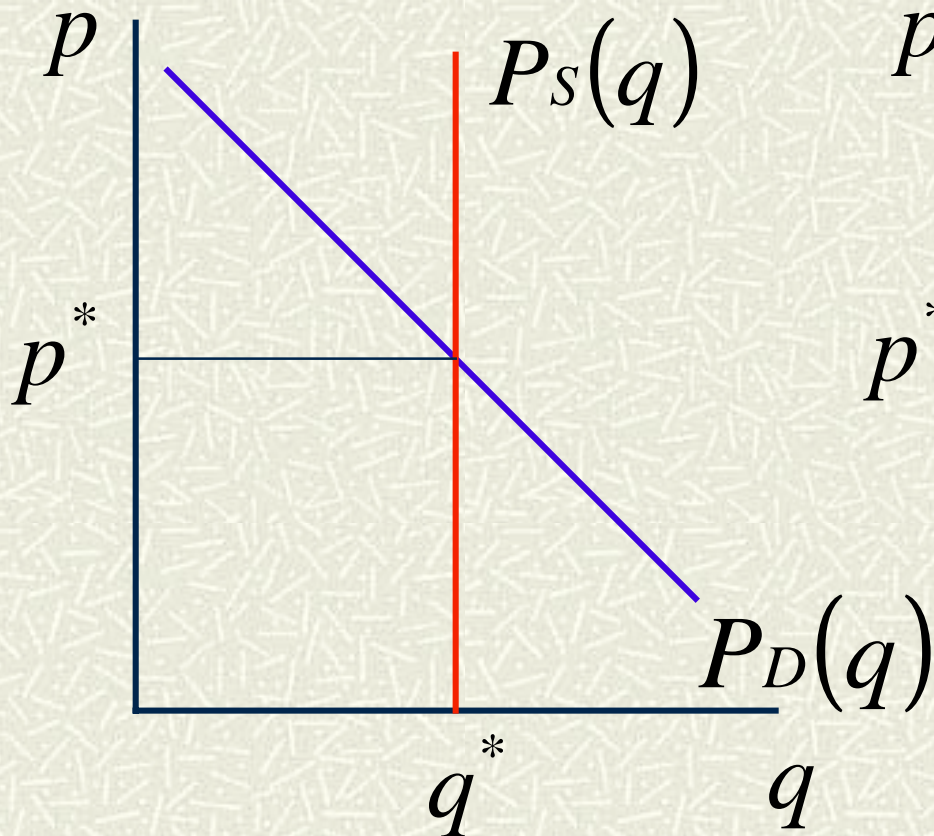
- Equilibrium price is a price p^* such that:

$$D(p^*) = S(p^*)$$

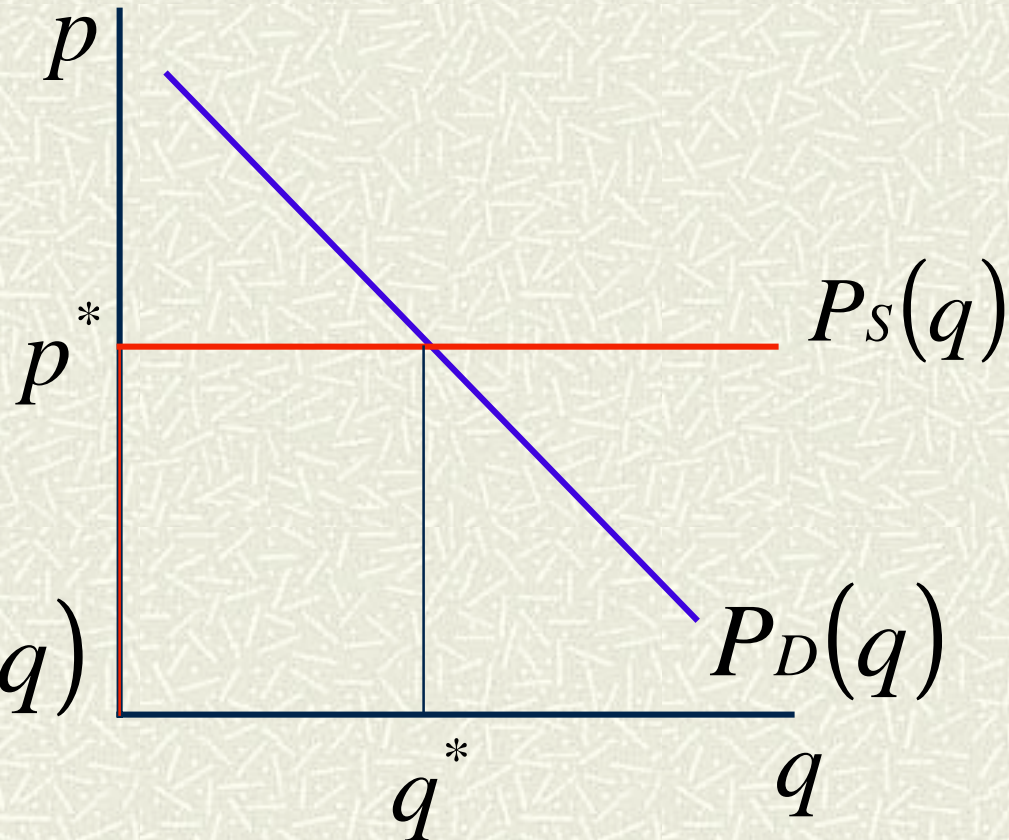# Equilibrium: $D(p^*) = S(p^*)$

Special Cases

Perfectly inelastic supply

Perfectly elastic supply

Solving for Equilibrium: A Linear Example

Suppose that demand and supply functions are linear:

$$S(p) = c + dp$$

$$D(p) = a - bp$$

for some:

$$c > 0, d > 0$$

$$a > 0, b > 0$$
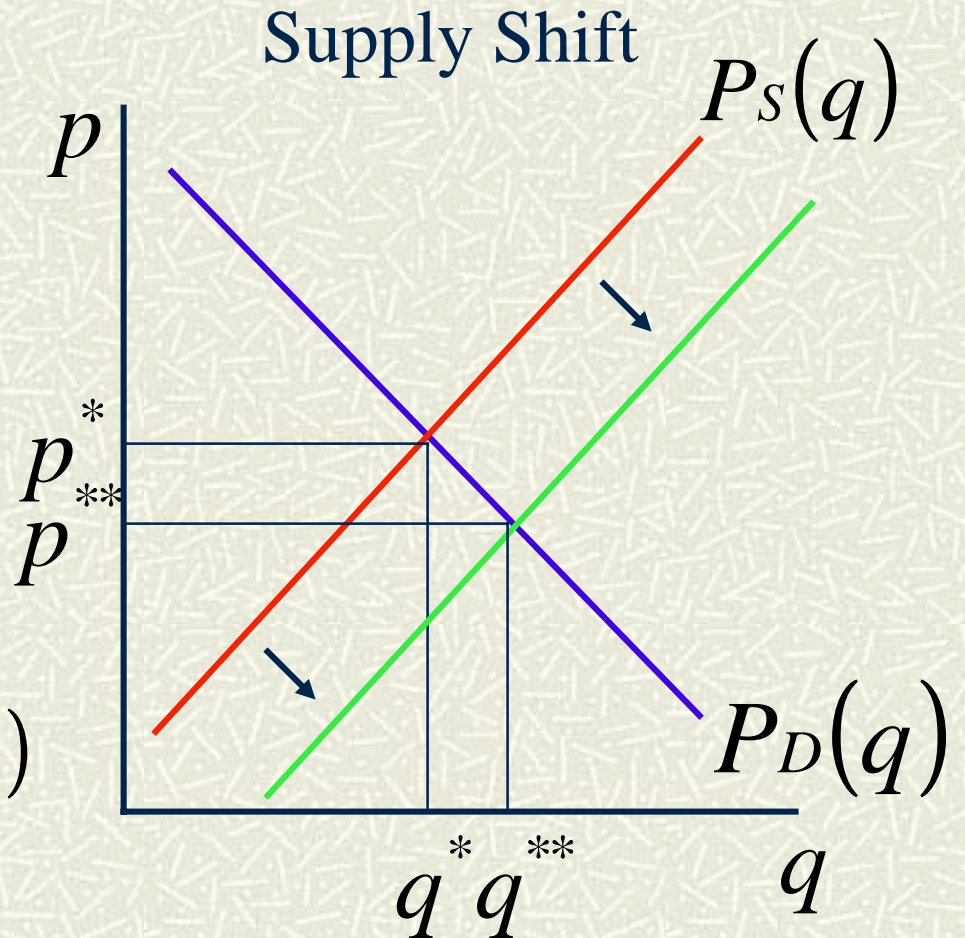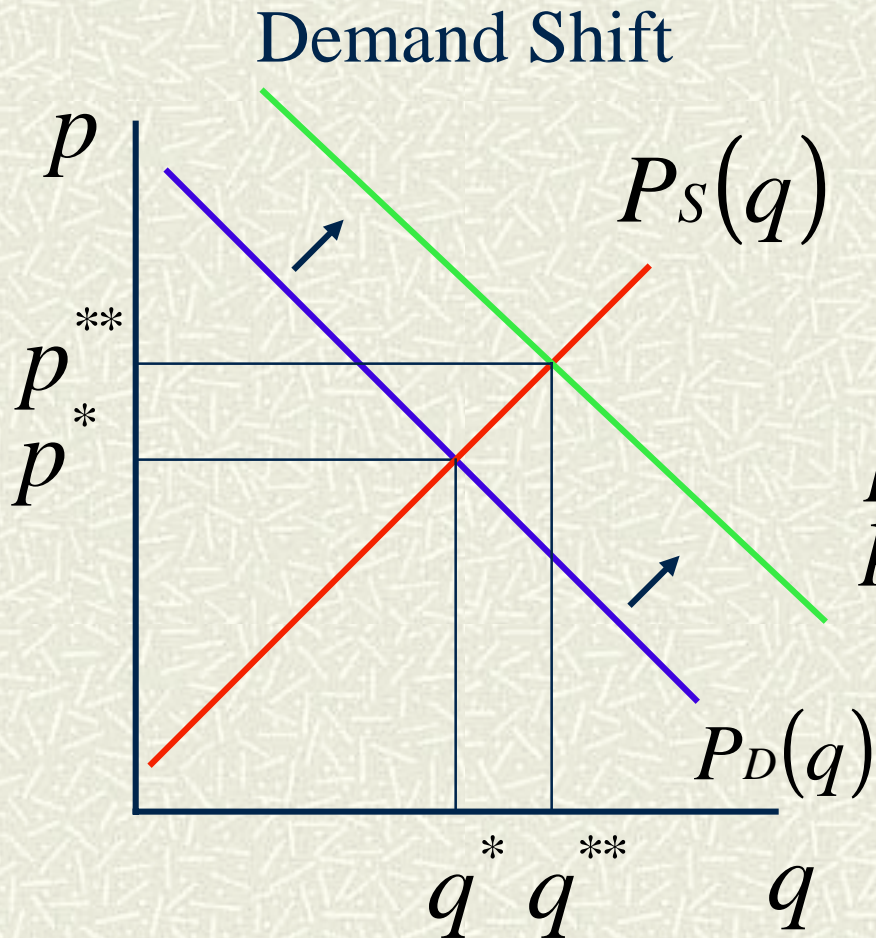
Solving for Equilibrium: A Linear Example

- **Equilibrium:** $D\left(p^*\right) = S\left(p^*\right)$

- Solve this equation for p^*: $a - bp = c + dp$

- Solution: $p^* = \dfrac{a-c}{d+b}$

$$D\left(p^*\right) = a - bp^* = \frac{ad+bc}{b+d} = S\left(p^*\right)$$

Comparative Statics

Demand Shift

Supply Shift

$P_S(q)$

$P_S(q)$

p

p

p^{**}
p^*

p^*
p^{**}

$P_D(q)$

$P_D(q)$

q^* q^{**} q

q^* q^{**} q

Taxes

- Let's consider the gasoline market one more time
- As of today the US government imposes a 15 cents tax per gallon of gasoline
- Thus, there will be two prices on the market:

p_S price that the **supplier** gets

$p_D = p_S + \$0.15$ price that **consume**r pays

Equilibrium with Taxes

- Quantity demanded depends on p_D :

$$D(p_D)$$

- Quantity supplied depends on p_S :

$$S(p_S)$$

Equilibrium with Taxes

- Two equations:
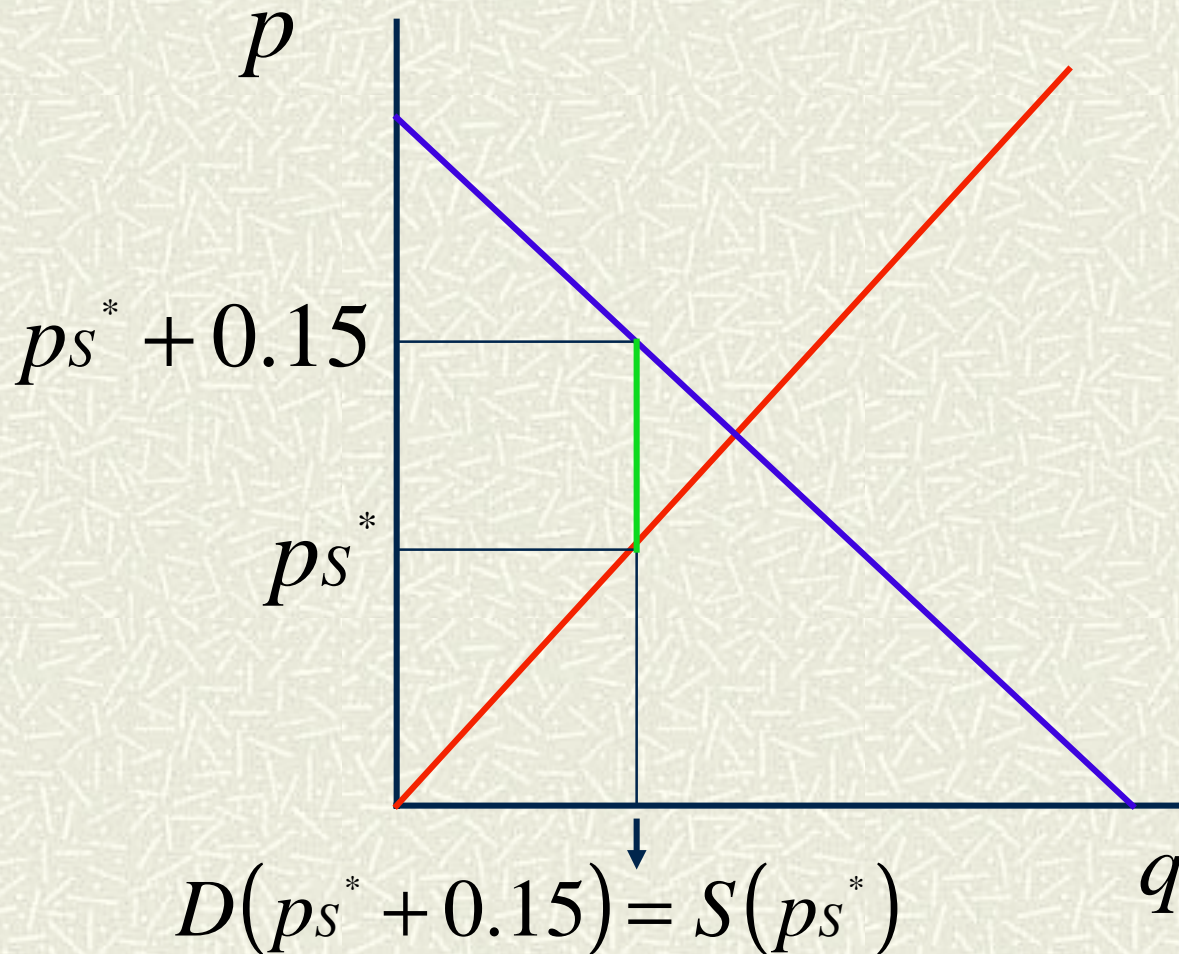$$D(p_D) = S(p_S)$$
$$p_D = p_S + \$0.15$$

in two unknowns: p_D^*, p_S^*

- Combining them:
$$D(p_S^* + 0.15) = S(p_S^*)$$

Equilibrium with Taxes:
$$D(ps^* + 0.15) = S(ps^*)$$

p

$ps^* + 0.15$

ps^*

$D(ps^* + 0.15) = S(ps^*)$

q

Inverse Demand and Supply

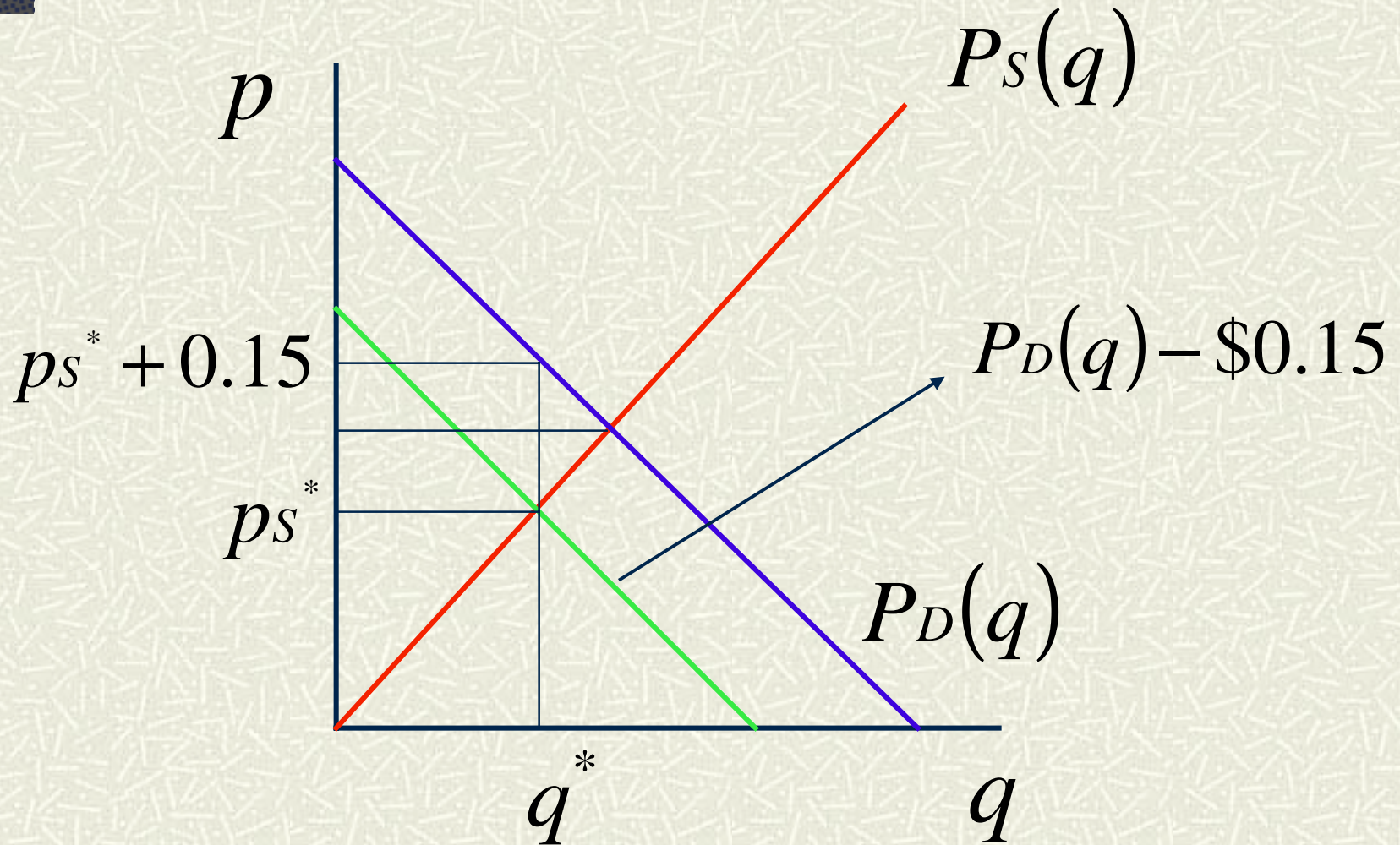- Inverse demand function:

$$p_D = P_D(q)$$

- Inverse supply function:

$$p_S = P_S(q)$$

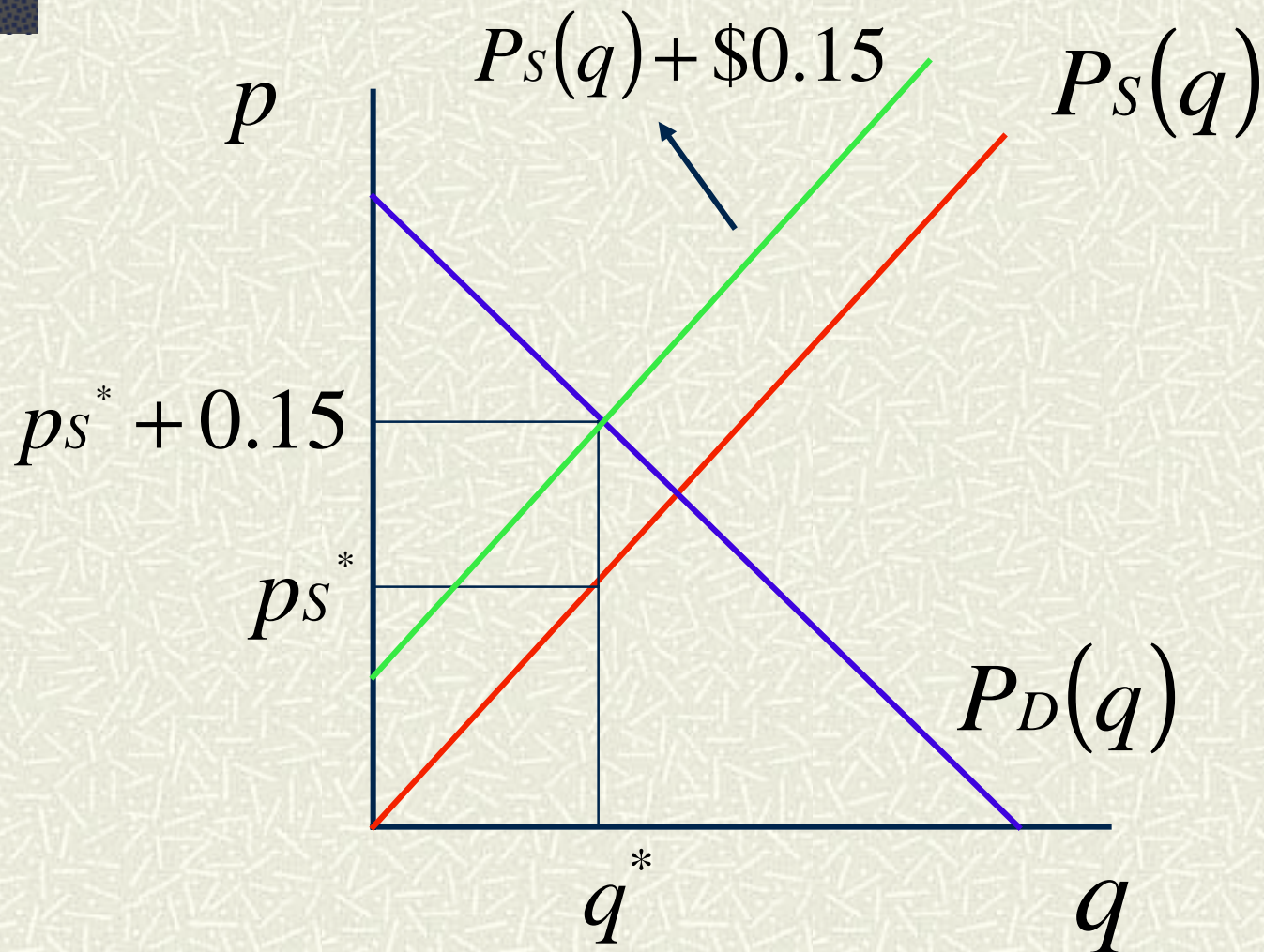- Equilibrium: $P_S(q^*) = P_D(q^*) - \$0.15$
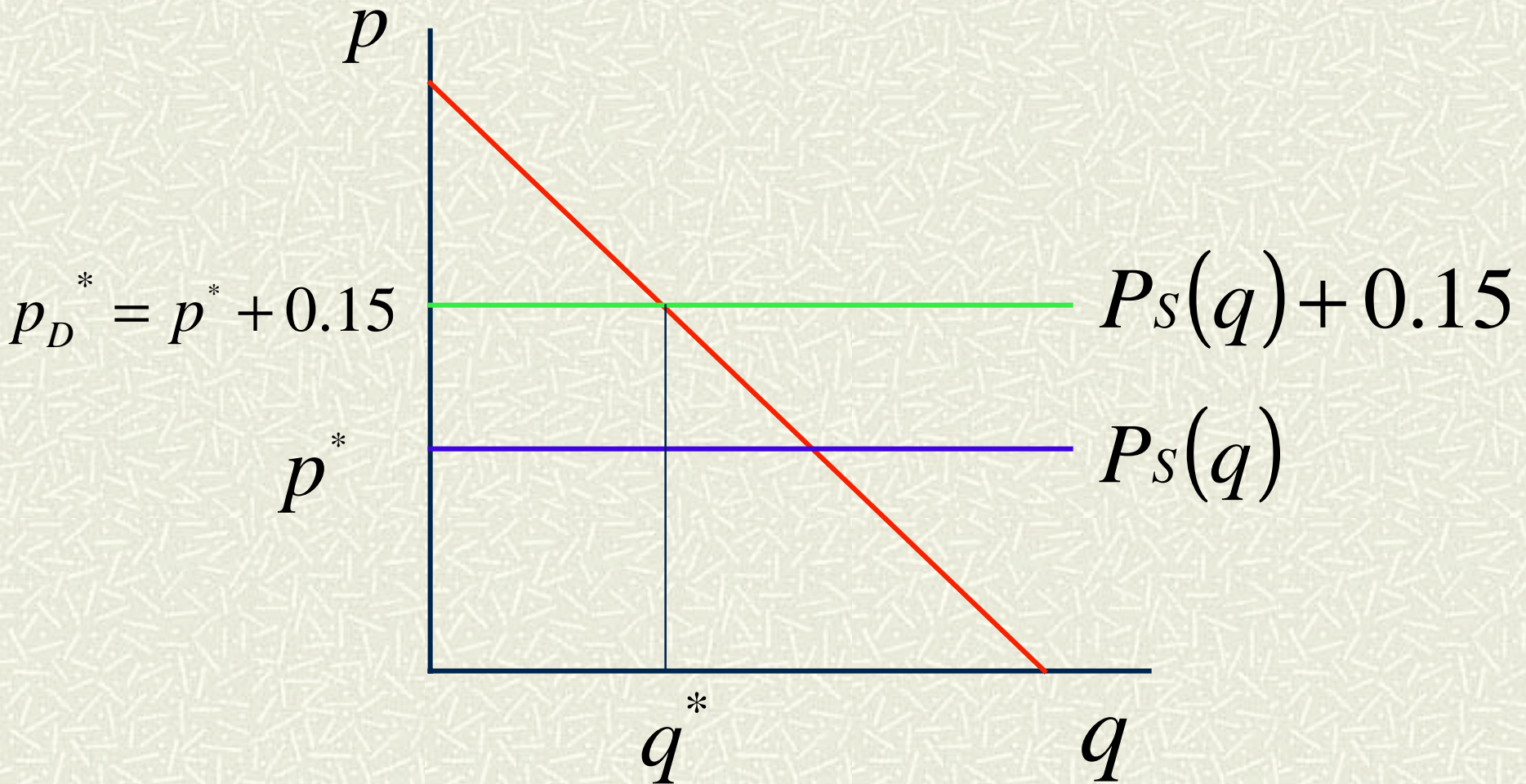
Equilibrium with Taxes:
$$P_S(q^*) = P_D(q^*) - \$0.15$$

Equilibrium with Taxes:
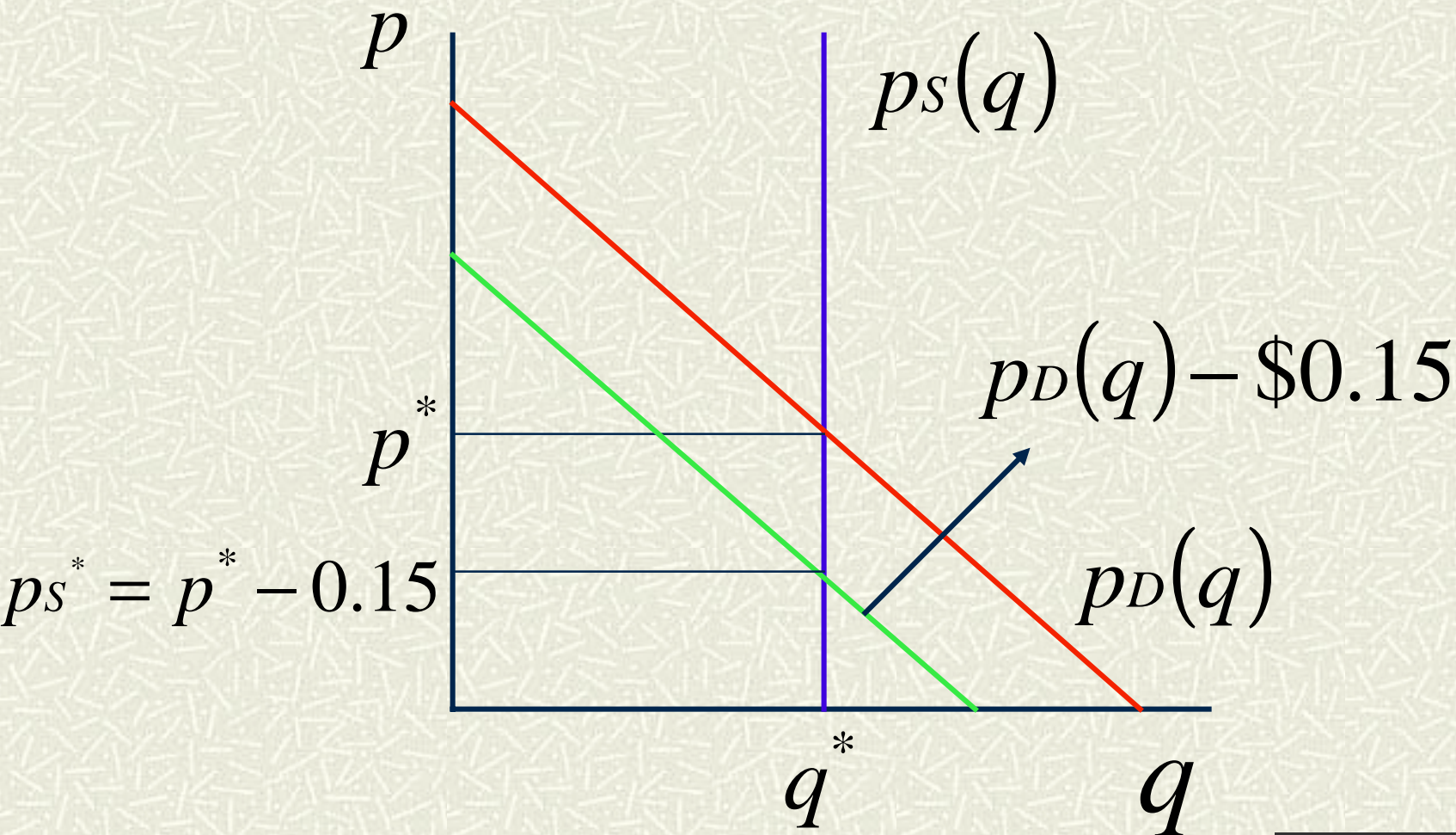$$P_D(q^*) = P_S(q^*) + \$0.15$$

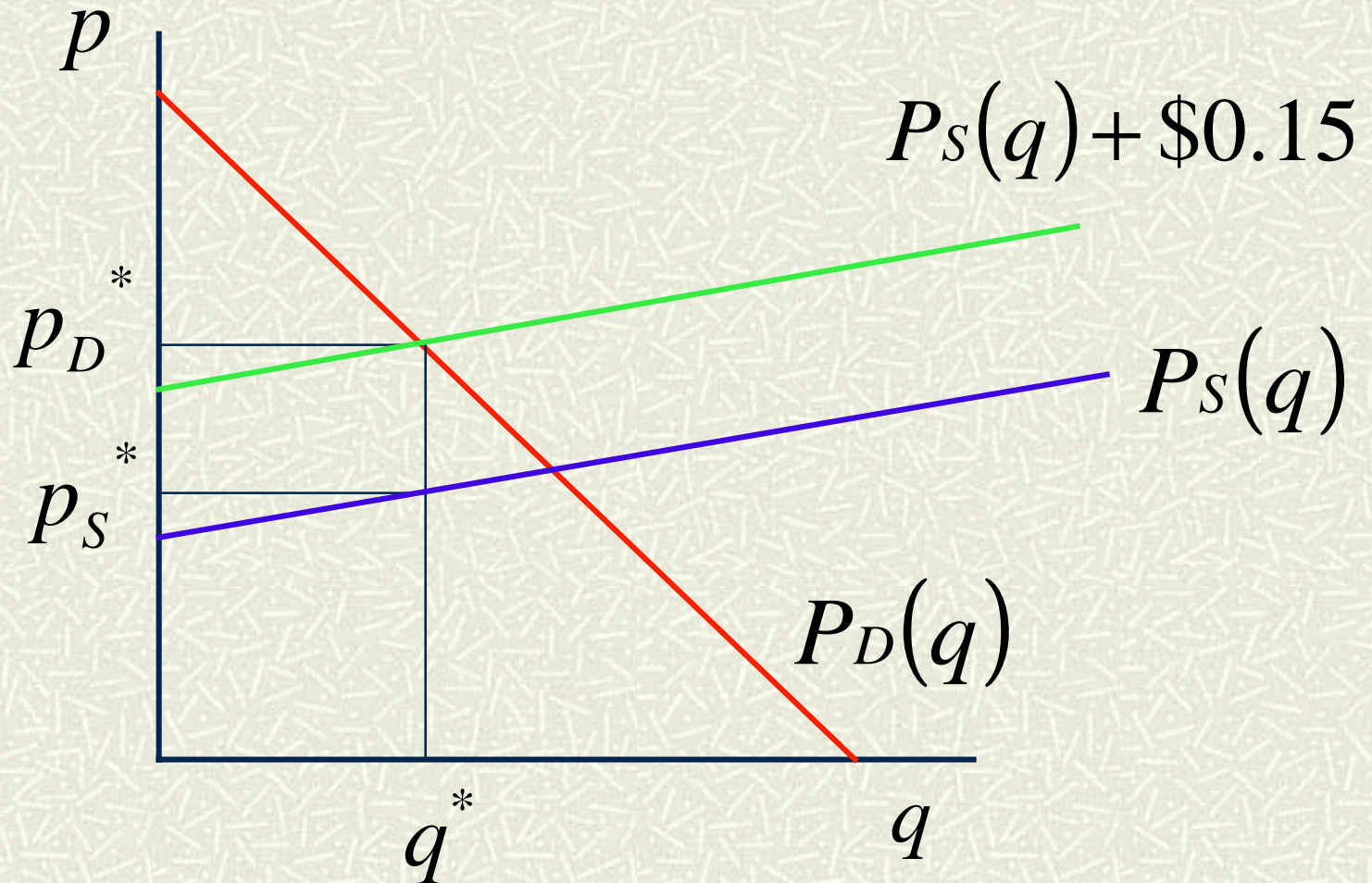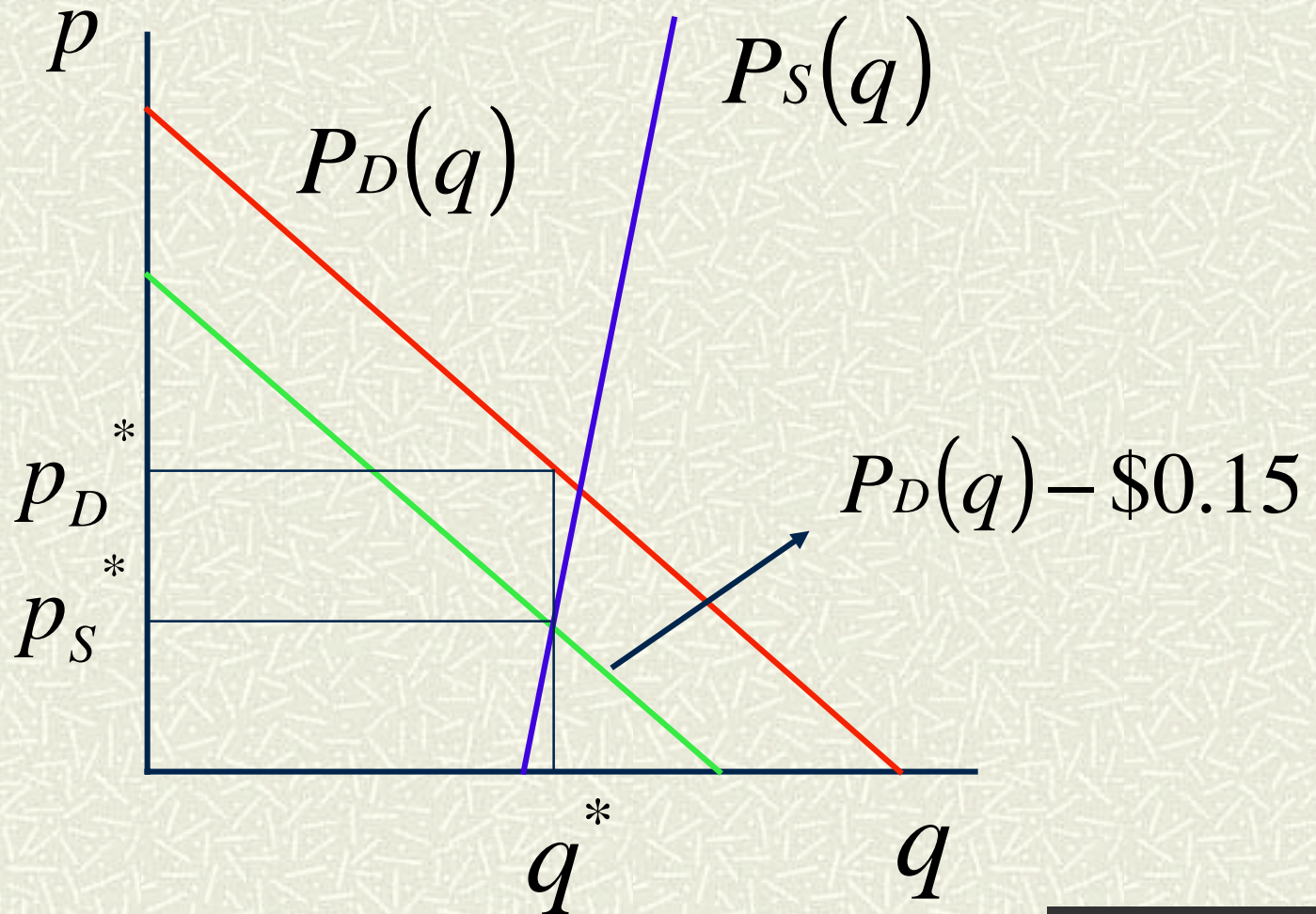# Passing Along a Tax: Consumers Pay the Tax: $P_S(q^*) + \$0.15 = P_D(q^*)$

p

$p_D{}^* = p^* + 0.15$

$P_S(q) + 0.15$

p^*

$P_S(q)$

q^*

q

Passing Along a Tax: Producers Pay the Tax: $P_S(q^*) = P_D(q^*) - \$0.15$

p

$p_S(q)$

$p_D(q) - \$0.15$

p^*

$p_D(q)$

$ps^* = p^* - 0.15$

q^*

q

Passing Along a Tax: Consumers Pay Almost All the Tax

Passing Along a Tax: Producers Pay Almost All the Tax

p

$P_S(q)$

$P_D(q)$

p_D^*

p_S^*
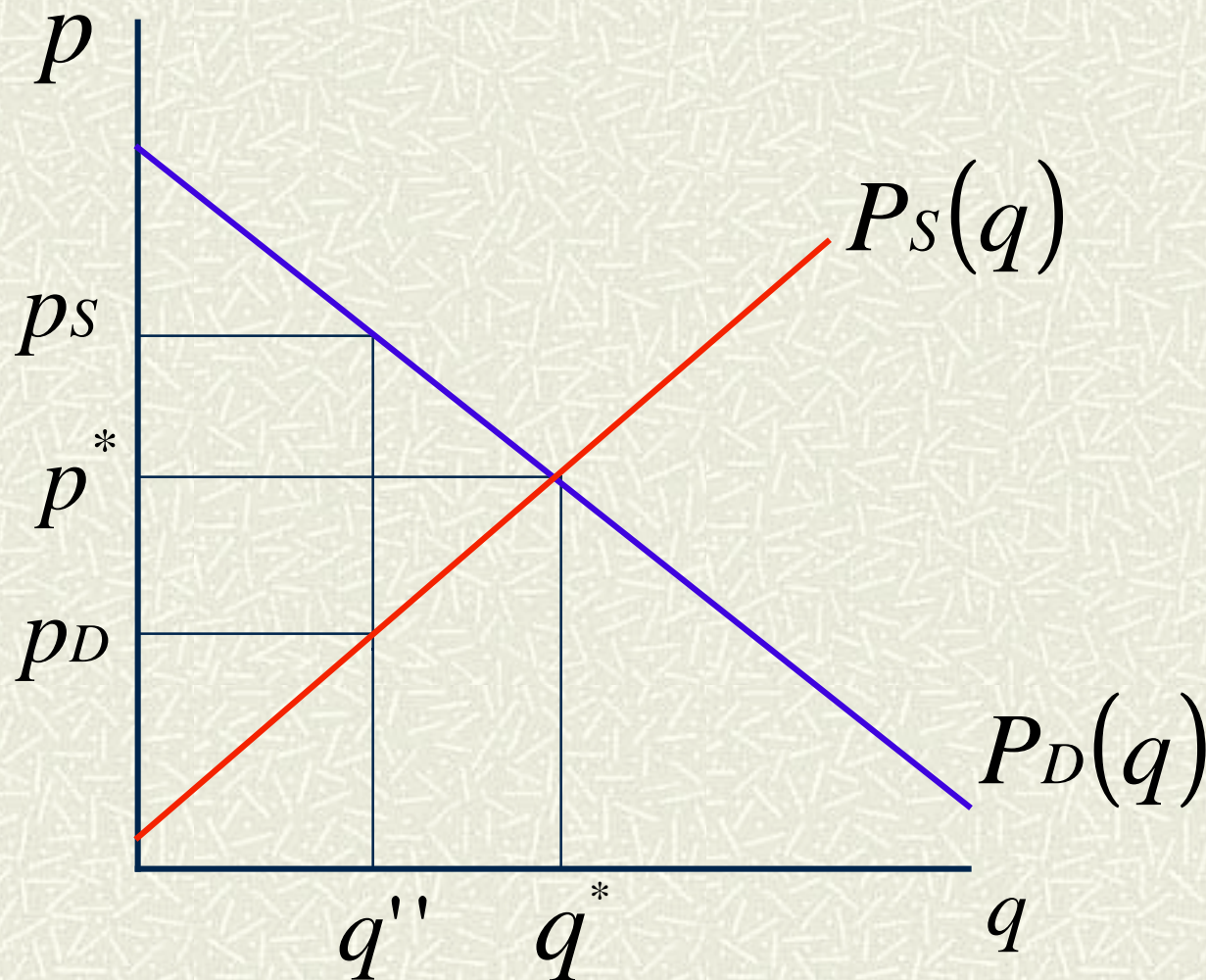
$P_D(q) - \$0.15$

q^*

q

Deadweight Loss of a Tax: B+D
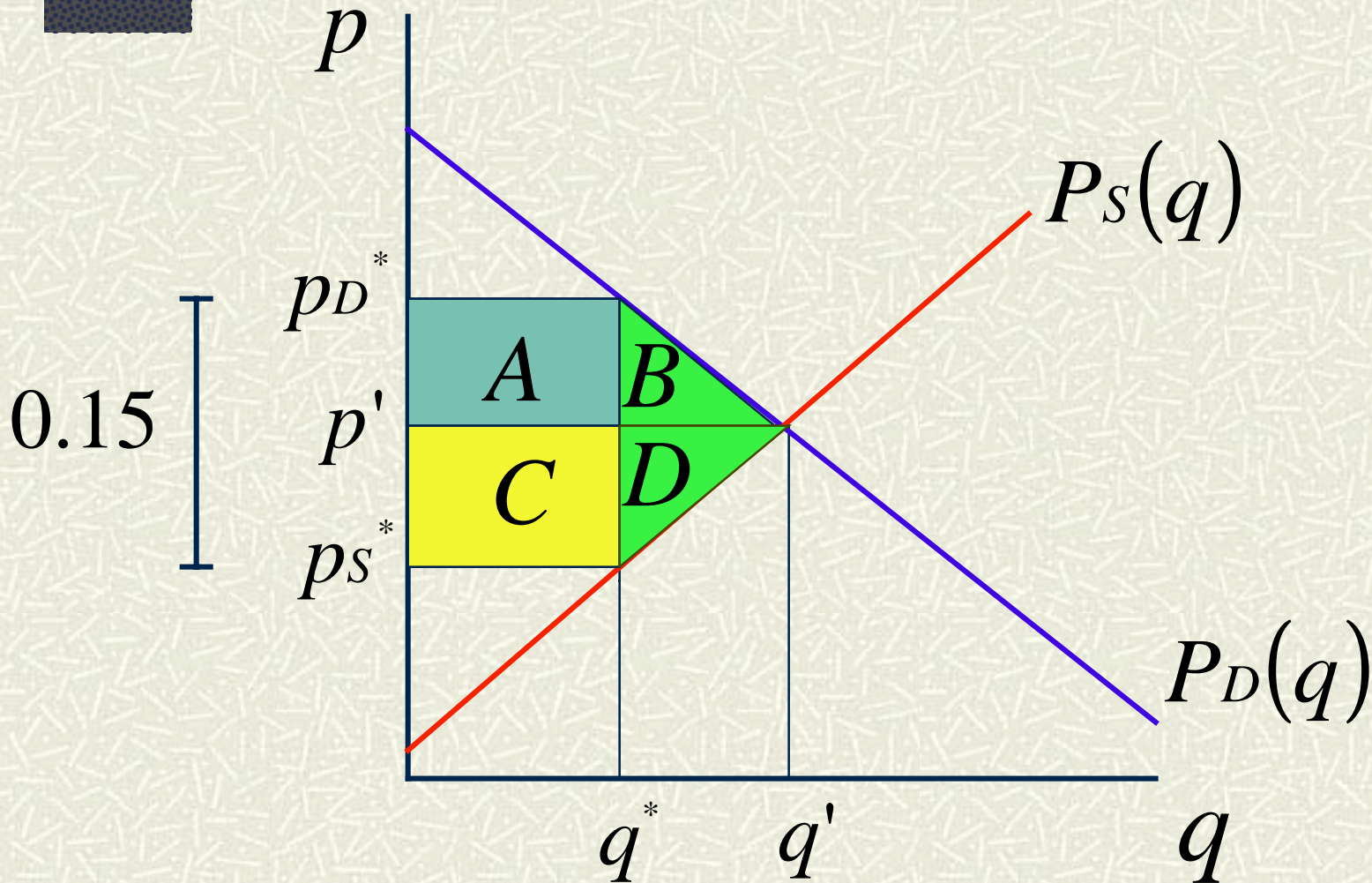
Pareto Efficiency

- An economic situation is **Pareto efficient** when there is no way to make any person better off without hurting anybody else.

- Pareto efficiency and **income distribution**.

- Is a **competitive market Pareto efficient**?

Competitive Market and Pareto Efficiency

Values Taxes

Equilibrium:

$$D(p_D) = S(p_S)$$

$$p_D = (1 + t) p_S$$

Inverse demand and supply:

$$(1 + t) P_S(q^*) = P_D(q^*)$$