

# Principles of Economics

## Discussion Session 3: Government Intervention

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# Price Controls

- **Price ceiling:** illegal to sell above the specified price.
  - Rent controls, anti price-gouging laws
  - Creates a gap in quantity demanded and quantity supplied (shortage):  $Q^D > Q^S$ .
- **Price floor:** illegal to sell below the specified price.
  - Minimum wage
  - Also creates a gap in quantity demanded and supplied (surplus):  $Q^D < Q^S$ .
- If the original equilibrium is already in compliance with the price control, then we say the price control is **non-binding** – it has no effect.

## Exercise 1: Price Controls

Consider the orange juice market:

- Demand:  $Q^D = 50 - P$
  - Supply:  $Q^S = 4P$
- 1 Without government intervention, what are the equilibrium price and quantity?
  - 2 Suppose now the government imposes rent controls (a price ceiling) of \$8 to this market. Will there be a shortage or surplus? Calculate the shortage/surplus if it exists.
  - 3 Suppose the price ceiling is \$12. Will there be a shortage or surplus? Calculate the shortage/surplus if it exists.

## Exercise 1: Price Controls

Solution:

- ① In equilibrium, quantity demanded equals quantity supplied at the equilibrium price:  $Q^D(P) = Q^S(P)$ . This gives us:

$$50 - P = 4P$$

$$Q = 40, P = 10$$

- ② Under the price ceiling,  $Q^D = 50 - 8 = 42$ ,  $Q^S = 4 \times 8 = 32$ . Since the quantity demanded is larger than the quantity supplied, we have a shortage of  $42 - 32 = 10$ .
- ③ No shortage or surplus since the price ceiling is not binding.

# Taxes

- Creates a gap between the price paid by the buyer  $P^D$ , and the price received by the seller  $P^S$ .
- Suppose the government imposes a tax of size  $t$  on buyers.  
 $\implies$  Condition 1:  $P^D = P^S + t$
- To find new equilibrium, we set

$$\begin{aligned}Q^D(P^D) &= Q^S(P^S) \\ Q^D(P^S + t) &= Q^S(P^S)\end{aligned}$$

- Suppose the government instead imposes a tax of size  $t$  on sellers.  
 $\implies$  Condition 2:  $P^S = P^D - t$
- But this is equivalent to Condition 1! So we can find the new equilibrium using the same setup:

$$\begin{aligned}Q^D(P^D) &= Q^S(P^S) \\ Q^D(P^S + t) &= Q^S(P^S)\end{aligned}$$

**Punchline:** The resulting equilibrium prices and quantity are the same whether the tax is imposed on buyers or sellers.

## Exercise 2: Tax

Consider the yogurt market:

- Demand:  $Q^D = 400 - 10P$
- Supply:  $Q^S = 30P - 800$

- 1 Without government intervention, what are the equilibrium price and quantity?
- 2 Suppose now the government imposes a tax of \$4 per unit to the buyers. What are the new equilibrium prices and quantity?
- 3 How is the tax split between buyers and sellers? What role does elasticity play in this?

## Exercise 2: Tax

Solution:

- ① In equilibrium, quantity demanded equals quantity supplied at the equilibrium price:  $Q^D(P) = Q^S(P)$ . This gives us:

$$400 - 10P = 30P - 800$$

$$Q = 100, P = 30$$

- ② The price paid by buyers is  $P^D = P^S + 4$ , and the price received by sellers is  $P^S$ . In equilibrium, quantity demanded at the price paid by buyers equals to quantity supplied at the price received by sellers. This gives us:

$$Q^D(P^D) = Q^S(P^S)$$

$$Q^D(P^S + 4) = Q^S(P^S)$$

$$400 - 10(P^S + 4) = 30P^S - 800$$

$$P^S = 29, P^D = 33, Q = 70$$

- ③ Compared to the market without tax, the price paid by buyers increases from \$30 to \$33, so the tax shared by buyers is \$3. Similarly, the price received by sellers decreases from \$30 to \$29, and the tax shared by sellers is \$1. The agent with the more elastic (flatter) curve will pay less of the tax.

- The opposite of a tax: for every unit sold, the government *contributes* money rather than takes it.
- Consider a subsidy to buyers of size  $\sigma$ .  
 $\implies$  Condition 3:  $P^D = P^S - \sigma$
- Likewise, a subsidy to sellers of size  $\sigma$ .  
 $\implies$  Condition 4:  $P^S = P^D + \sigma$ .
- As before, the two conditions are equivalent, so **the resulting prices and quantity are the same either way.**
- To solve, set

$$\begin{aligned}Q^D(P^D) &= Q^S(P^S) \\ Q^D(P^S - \sigma) &= Q^S(P^S)\end{aligned}$$



## Exercise 3: Subsidy

Consider the market for corn:

- $Q^D = 152 - 7P$
- $Q^S = P - 8$

- 1 What are the original equilibrium price and quantity?
- 2 Suppose the government offers a subsidy of \$8 per unit to the sellers. What are the new equilibrium prices and quantity?
- 3 How are the benefits of the subsidy split between buyers and sellers? What role does elasticity play here?

## Exercise 3: Subsidy

Solution:

- ① In equilibrium,

$$Q^D(P) = Q^S(P)$$

$$152 - 7P = P - 8$$

$$P = 20, Q = 12$$

- ② With a subsidy  $\sigma = 8$  to sellers, we know  $P^S = P^D + 8$ . So set

$$Q^D(P^D) = Q^S(P^S)$$

$$Q^D(P^D) = Q^S(P^D + 8)$$

$$152 - 7P^D = (P^D + 8) - 8$$

$$P^D = 19, P^S = 27, Q = 19$$

- ③ Compared the the original equilibrium, consumers pay \$1 less, and sellers receive \$7 more. The agent with the more elastic (flatter) curve will receive less of the subsidy.