INTRODUCTORY ECONOMICS: LECTURE 2

Market Forces: Demand and Supply

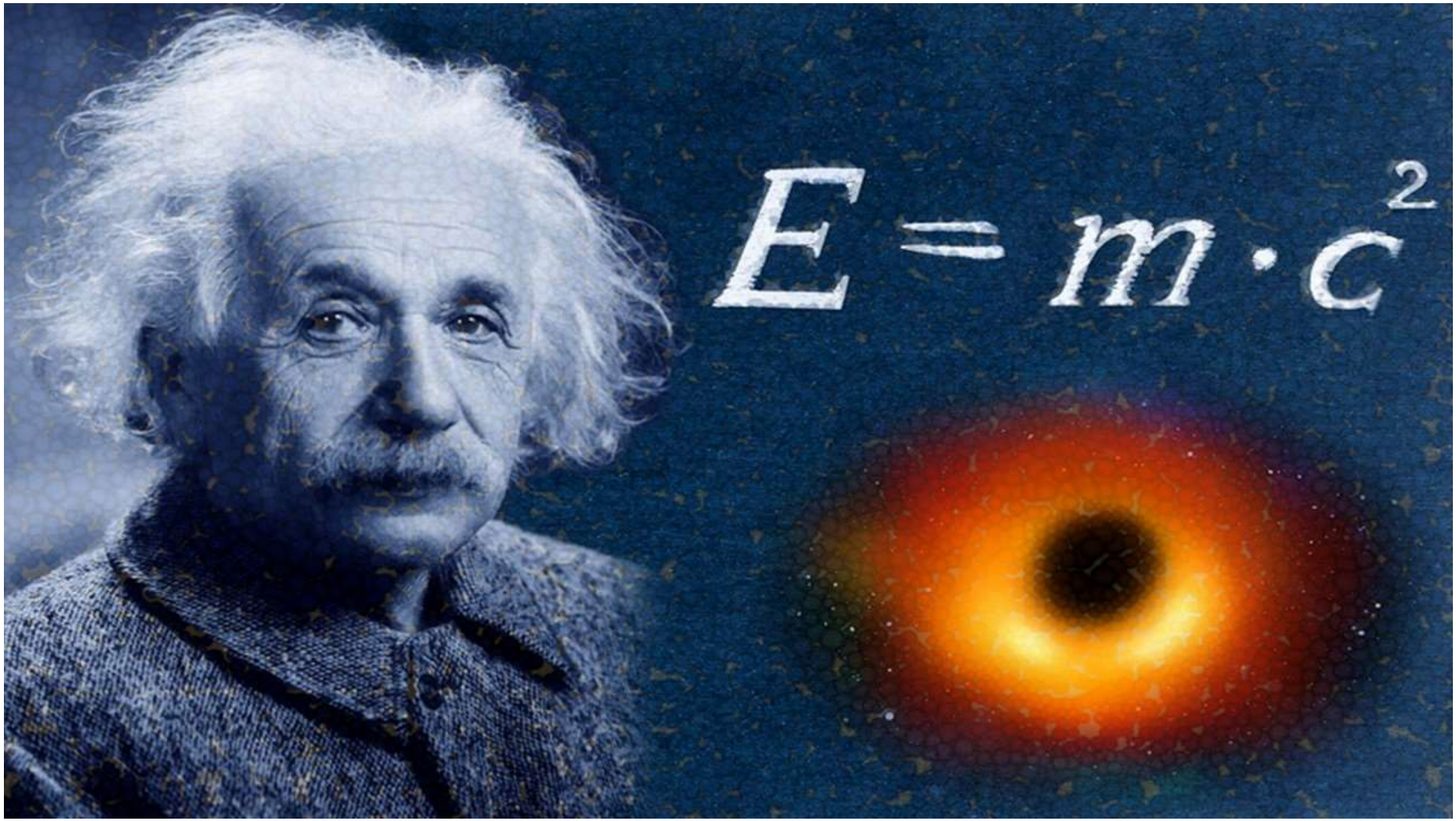
Highlights

- *Demand*
- *Supply*
- *Consumer surplus*
- *Producer surplus*
- *Market equilibrium*
- *Role of government policies*
- *Supply and demand analysis*

Economists use models to study economic issues

- **Model:** a highly simplified representation of a more complicated reality.
- Assumptions simplify the complex world, make it easier to understand.
- Example: To study international trade, assume two countries and two goods.

A model from hard science



First Economic Model: Demand-Supply

- Different from the models from natural science, economics models are not always true, but "pretty" true.

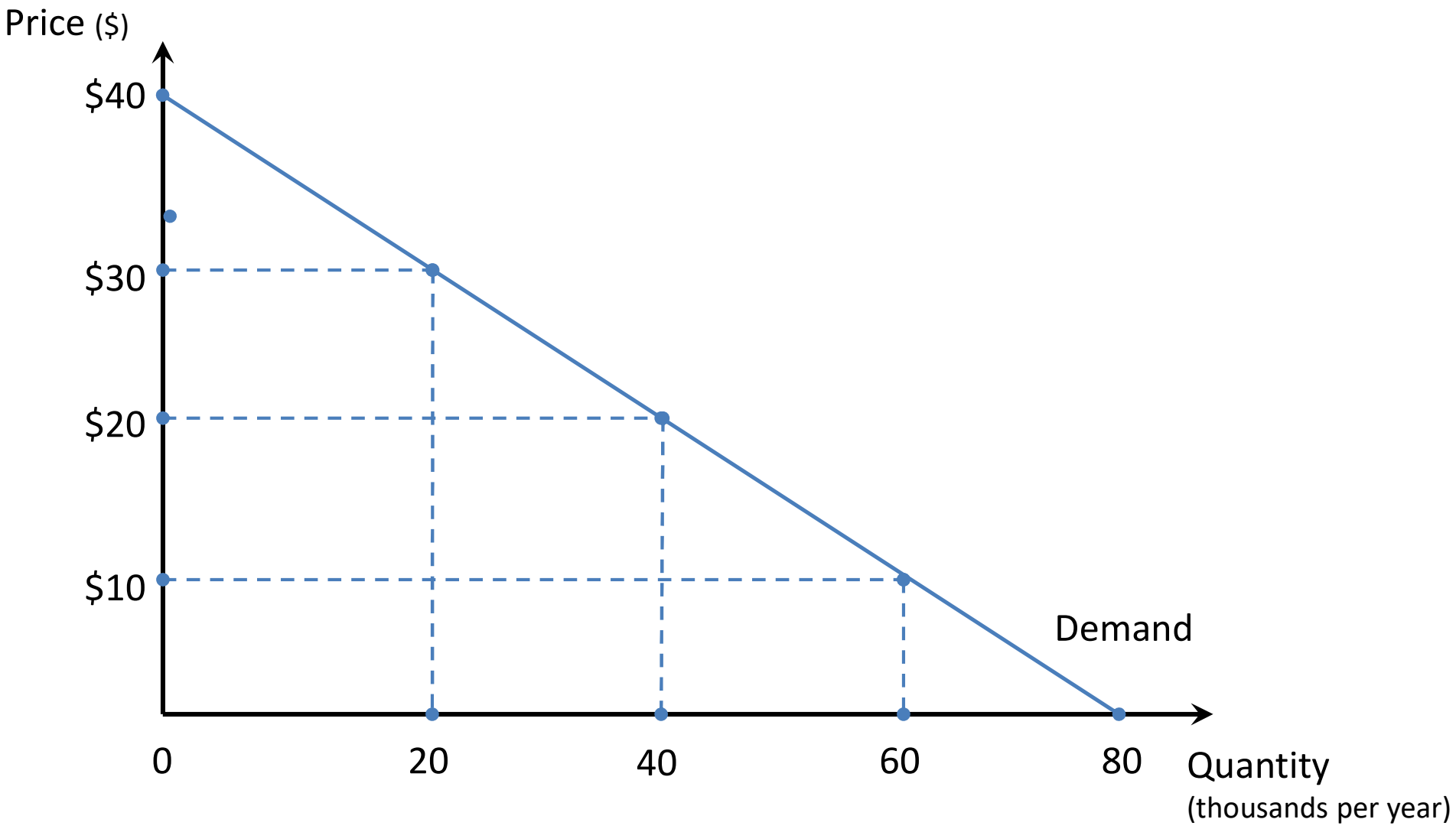
Demand

- **Demand**
  - The quantity demanded of a good is the amount of the good that consumers are willing and able to purchase.
- **Law of demand**
  - The quantity demanded of a good increases (decreases) as the price falls (rises).
  - Price and quantity demanded are inversely related.

Demand

- **Market demand curve**
  - Illustrates the relationship between the total quantity demanded and price of a good, holding other variables constant.

Market Demand Curve



Willingness to Pay (WTP)

- A consumer's **willingness to pay** for a good is the maximum amount the buyer will pay for that good.
- WTP measures how much the buyer values the good.

Example:
4 buyers' WTP
for an iPad

name	*WTP*
Anthony	$250
Chad	175
Flea	300
John	125

WTP and the Demand Curve

Q: If price of iPad is $200, who will buy an iPad, and what is quantity demanded?

name	*WTP*
Anthony	$250
Chad	175
Flea	300
John	125

A: Anthony & Flea will buy an iPad, Chad & John will not.

Hence, $\boldsymbol{Q^d} = 2$
when $\boldsymbol{P} = \$200$.

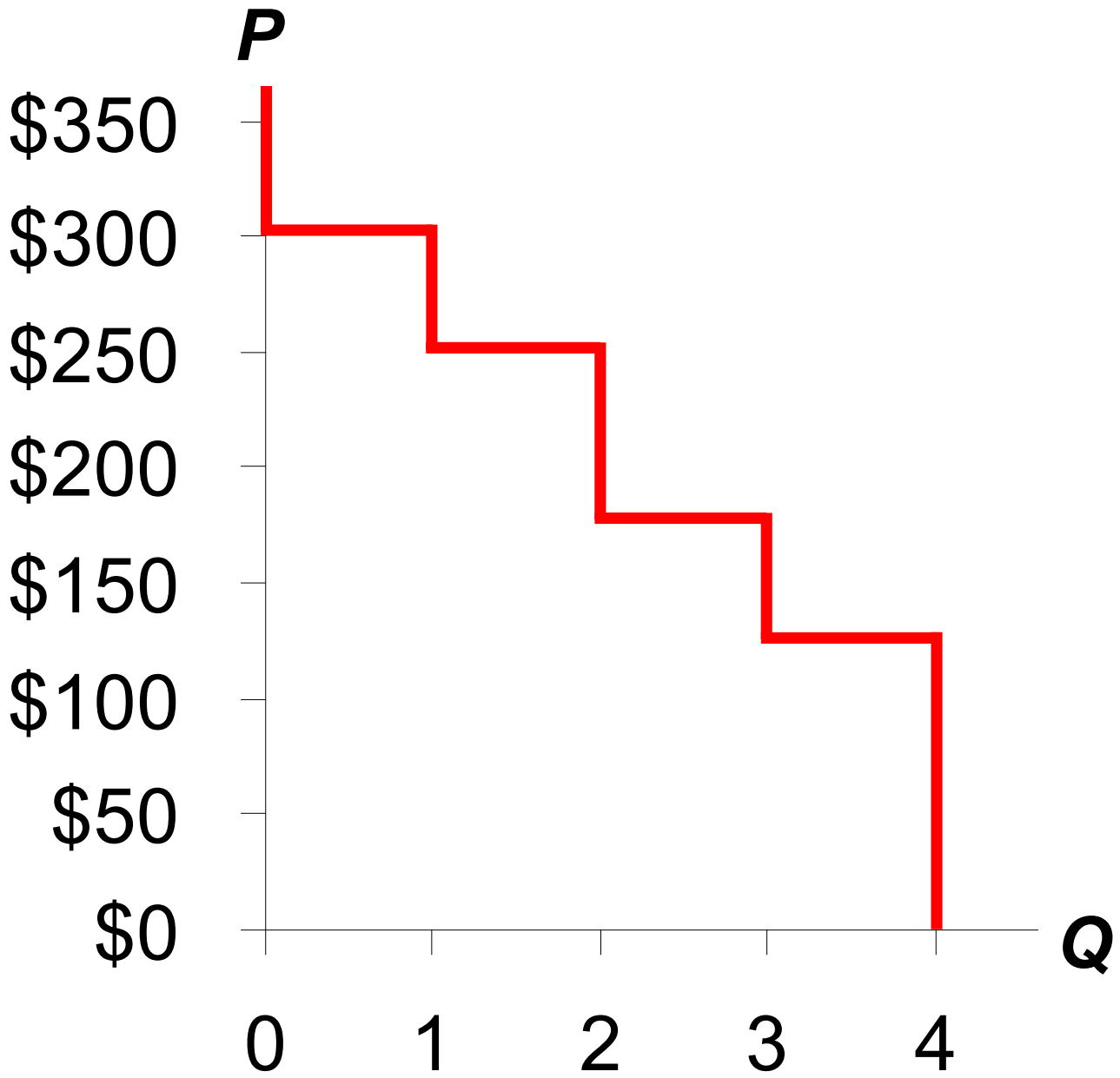
WTP and the Demand Curve

Derive the demand schedule:

name	*WTP*
Anthony	$250
Chad	175
Flea	300
John	125

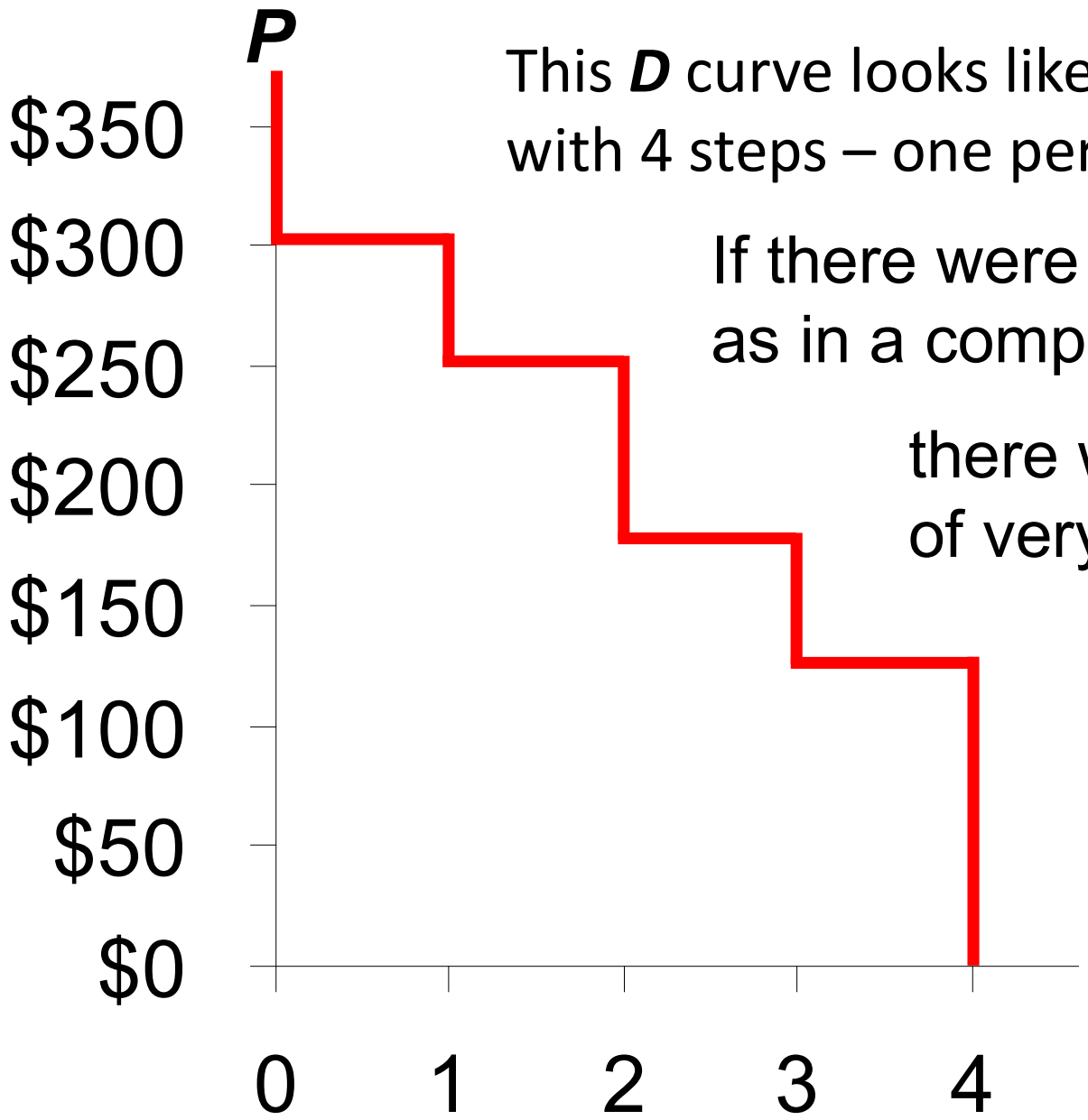
P (price of iPad)	who buys	Q^d
$301 & up	nobody	0
251 – 300	Flea	1
176 – 250	Anthony, Flea	2
126 – 175	Chad, Anthony, Flea	3
0 – 125	John, Chad, Anthony, Flea	4

WTP and the Demand Curve



P		Q^d
$301 & up		0
251 –	300	1
176 –	250	2
126 –	175	3
0 –	125	4

About the Staircase Shape…



This ***D*** curve looks like a staircase with 4 steps – one per buyer.

If there were a huge # of buyers, as in a competitive market,

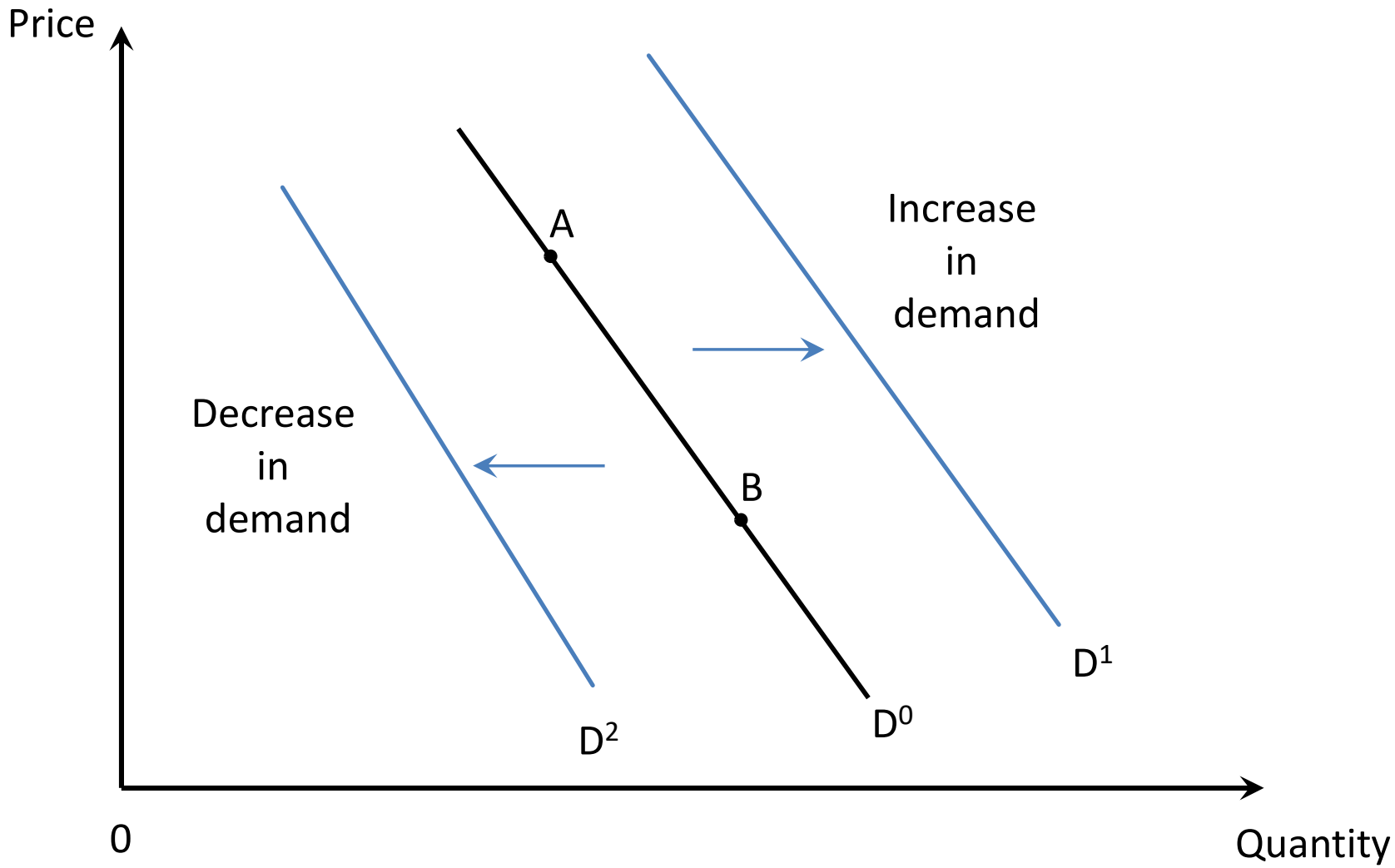
there would be a huge # of very tiny steps,

and it would look more like a smooth curve.

Changes in Demand

- Changing *only* price leads to **changes in *quantity demanded***.
  - This type of change is graphically represented by a movement along a given demand curve, holding other factors that impact demand constant.
- Changing factors other than price lead to ***changes in demand***.
  - These types of changes are graphically represented by a shift of the entire demand curve.

Changes in Demand



Demand Shifters

- Income
  - ***Normal good*:** Demand ↑ as income ↑
    - Very common in reality, e.g., fruits, cloth; electronics..
  - ***Inferior good*:** Demand ↓ as income ↑
    - Examples?

Demand Shifters

- Prices of related goods
  - ***Substitute goods*:** Demand ↑ as price of related good ↑
    - Example: *pizza and hamburgers*; *Coke and Pepsi, laptops and desktop computers*
  - ***Complement goods*:** Demand ↓ as price of related good ↑
    - Example: smartphone and apps; automobile and gasoline

Demand Shifters (cont.)

- Advertising and consumer tastes
- Population
- Consumer expectations
- Other factors

Consumer Surplus (CS)

- **Consumer surplus** is the amount a buyer is willing to pay minus the amount the buyer actually pays:

$$CS = WTP - P$$

name	*WTP*
Anthony	$250
Chad	175
Flea	300
John	125

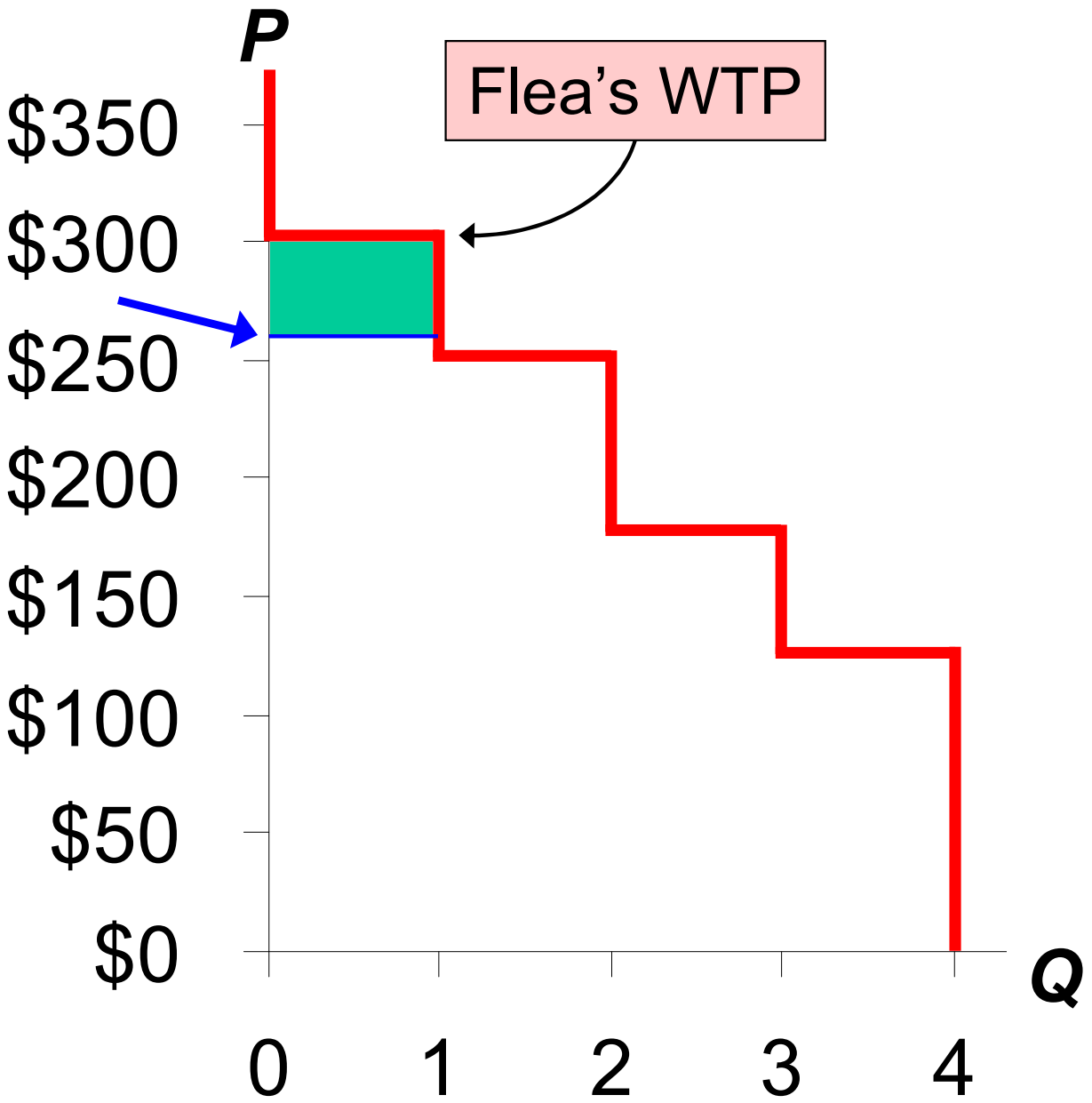
Suppose ***P*** = $260.

Flea's CS = $300 – 260 = $40.

The others get no CS because they do not buy an iPad at this price.

Total CS = $40.

CS and the Demand Curve

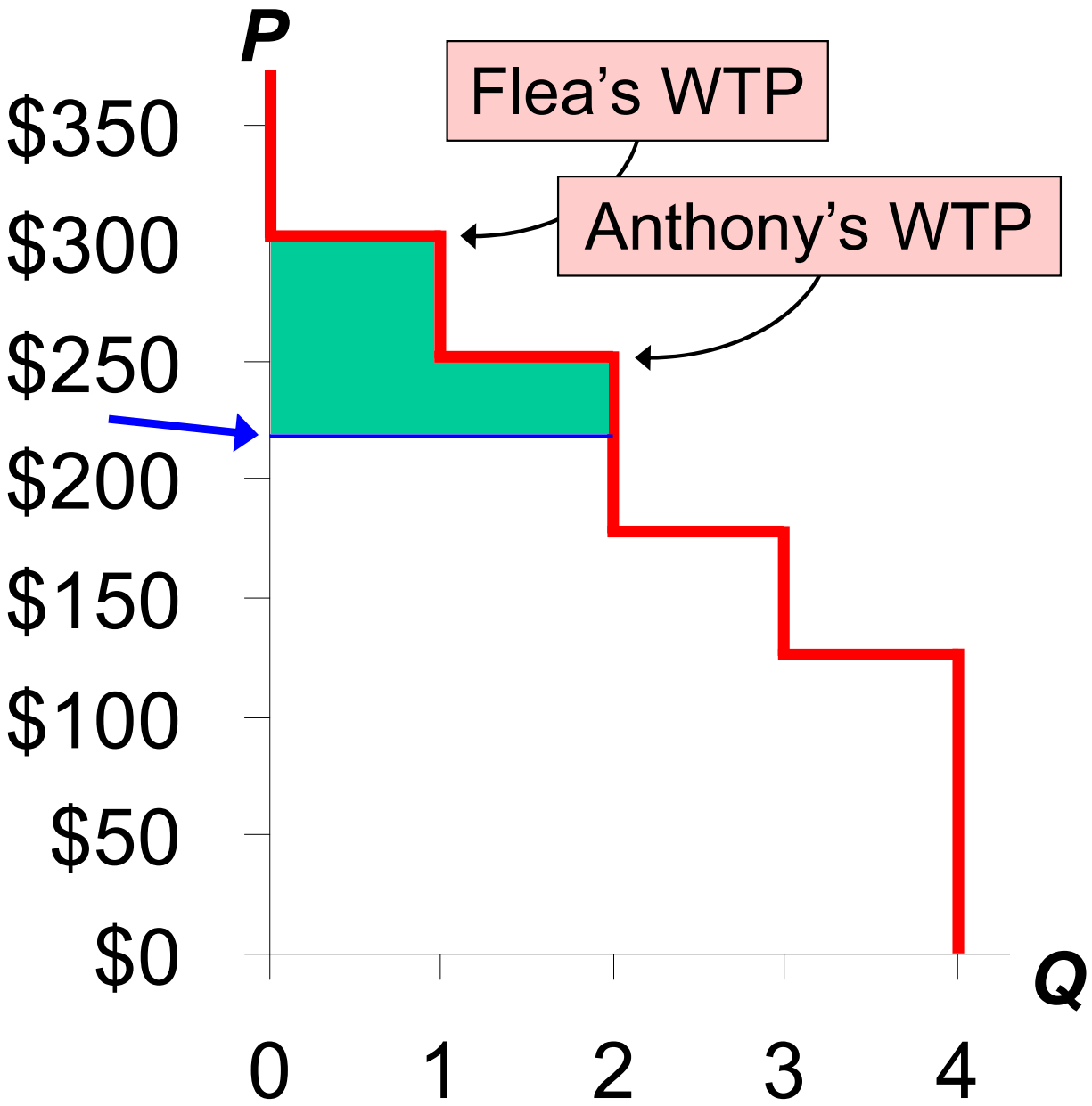


P = $260

Flea's CS =
$300 – 260 = $40

Total CS = $40

CS and the Demand Curve



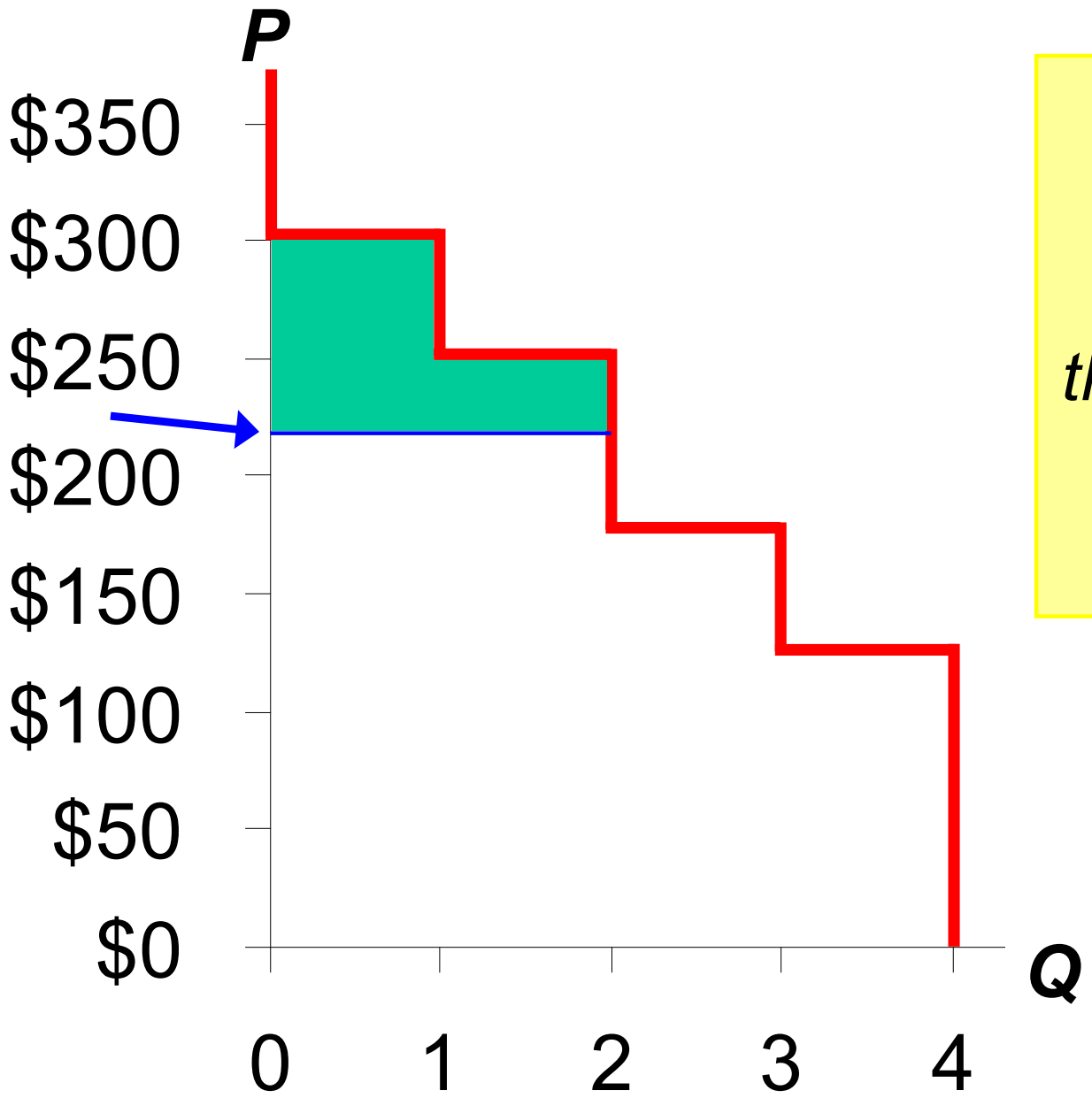
Instead, suppose ***P*** = $220

Flea's CS = $300 – 220 = $80

Anthony's CS = $250 – 220 = $30

Total CS = $110

CS and the Demand Curve



The lesson:

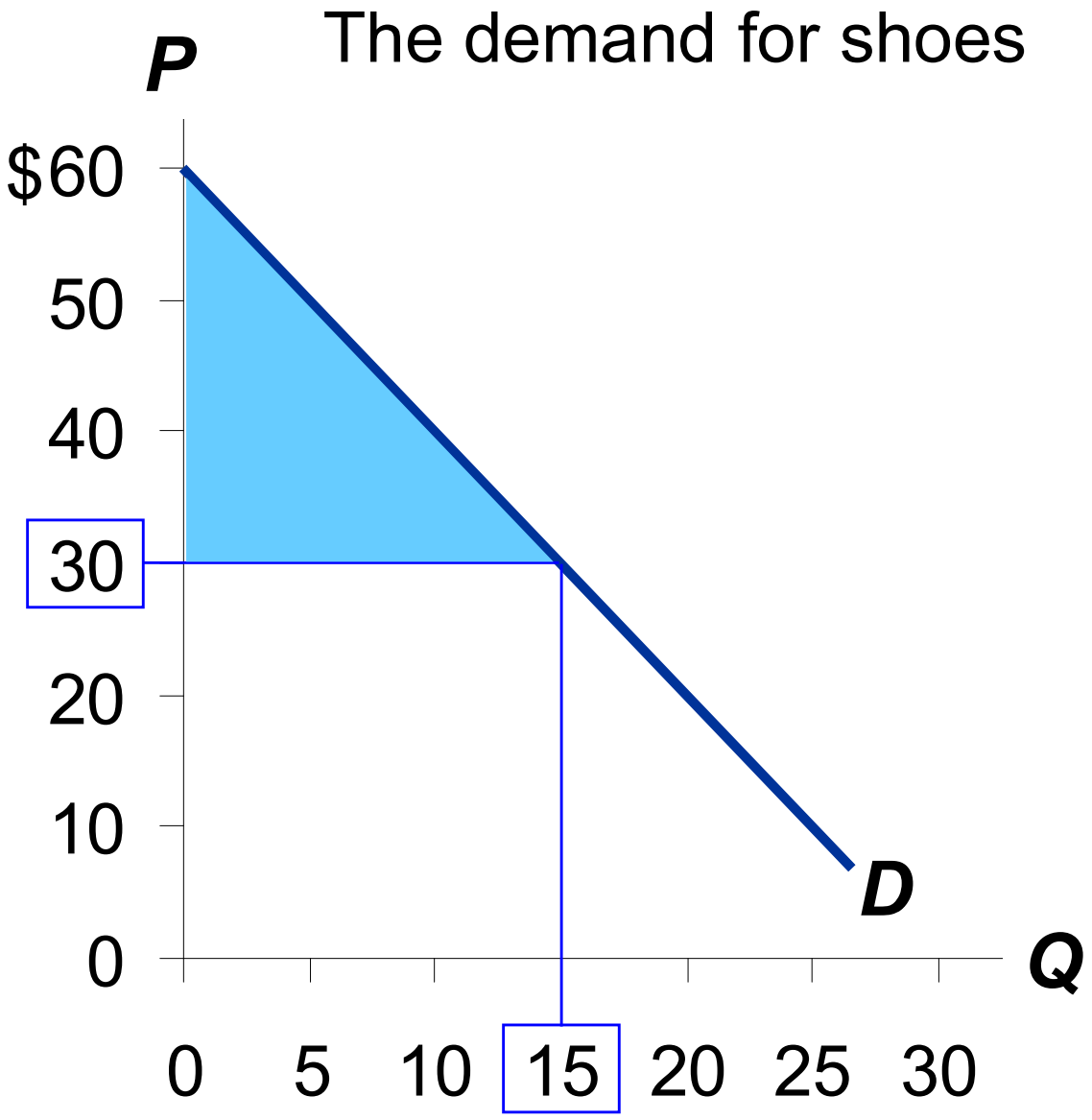
Total CS equals the area under the demand curve above the price, from 0 to ***Q****.*

Consumer Surplus

- Marketing strategies – like value pricing and price discrimination – rely on understanding consumer value for products.
  - ***Total consumer value*** is the sum of the maximum amount consumers are willing to pay at different quantities.
  - ***Total expenditure*** is the per-unit market price times the number of units purchased.
  - ***Consumer surplus*** is essentially the excess value that consumers derive from a good but do not pay extra for.

CS and Demand Curve

- **In this example:**
  - Which area is the total consumer value?
  - Which area is the total expenditure?
  - Which area is consumer surplus?
- Recall: area of a triangle equals ½ x base x height
- CS = ½ x 15 x $30 = $\underline{\$225}$.

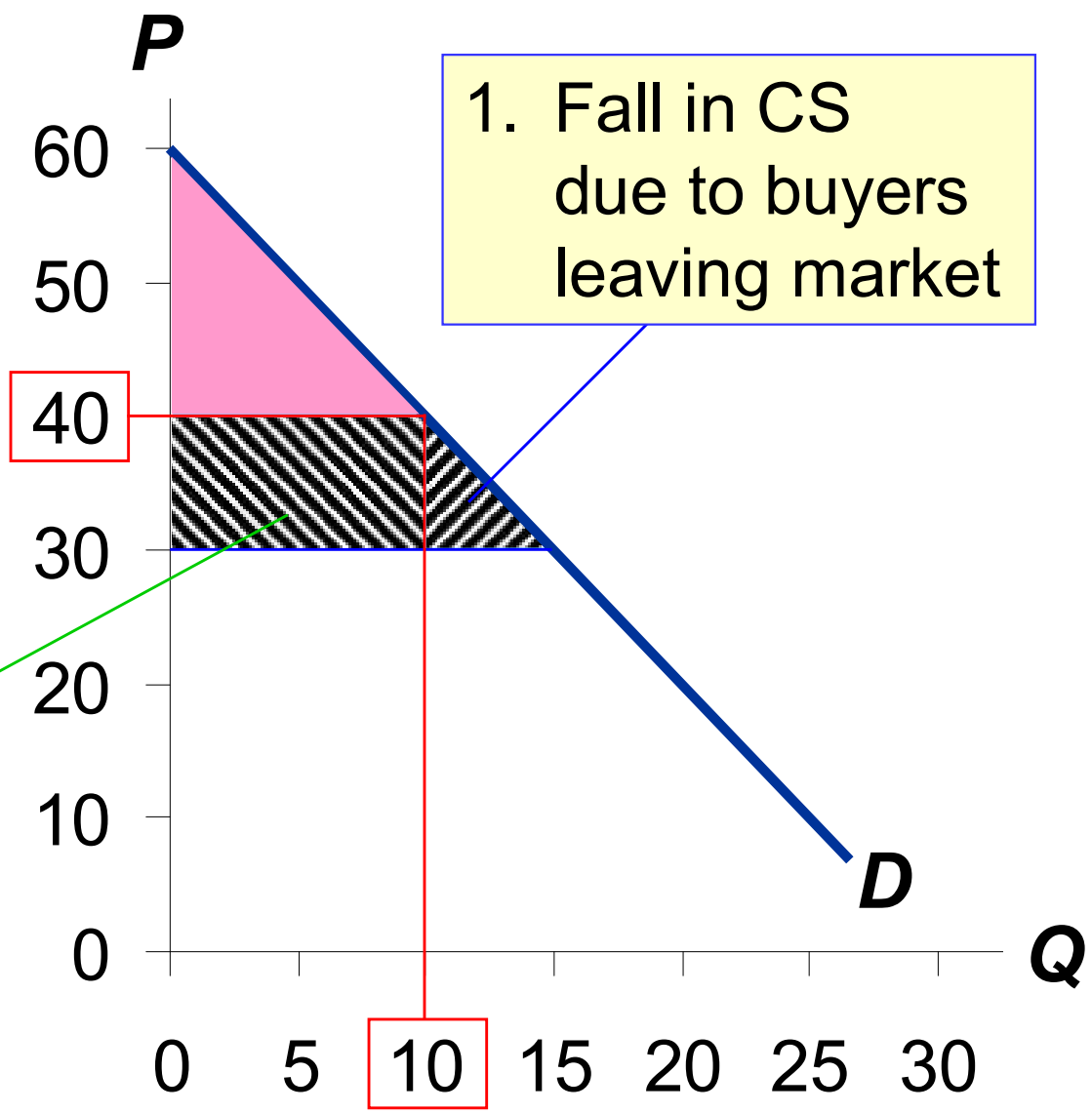


How a Higher Price Reduces CS

If ***P*** rises to \$40,

CS = ½ x 10 x \$20
= \$100.

Two reasons for the fall in CS.



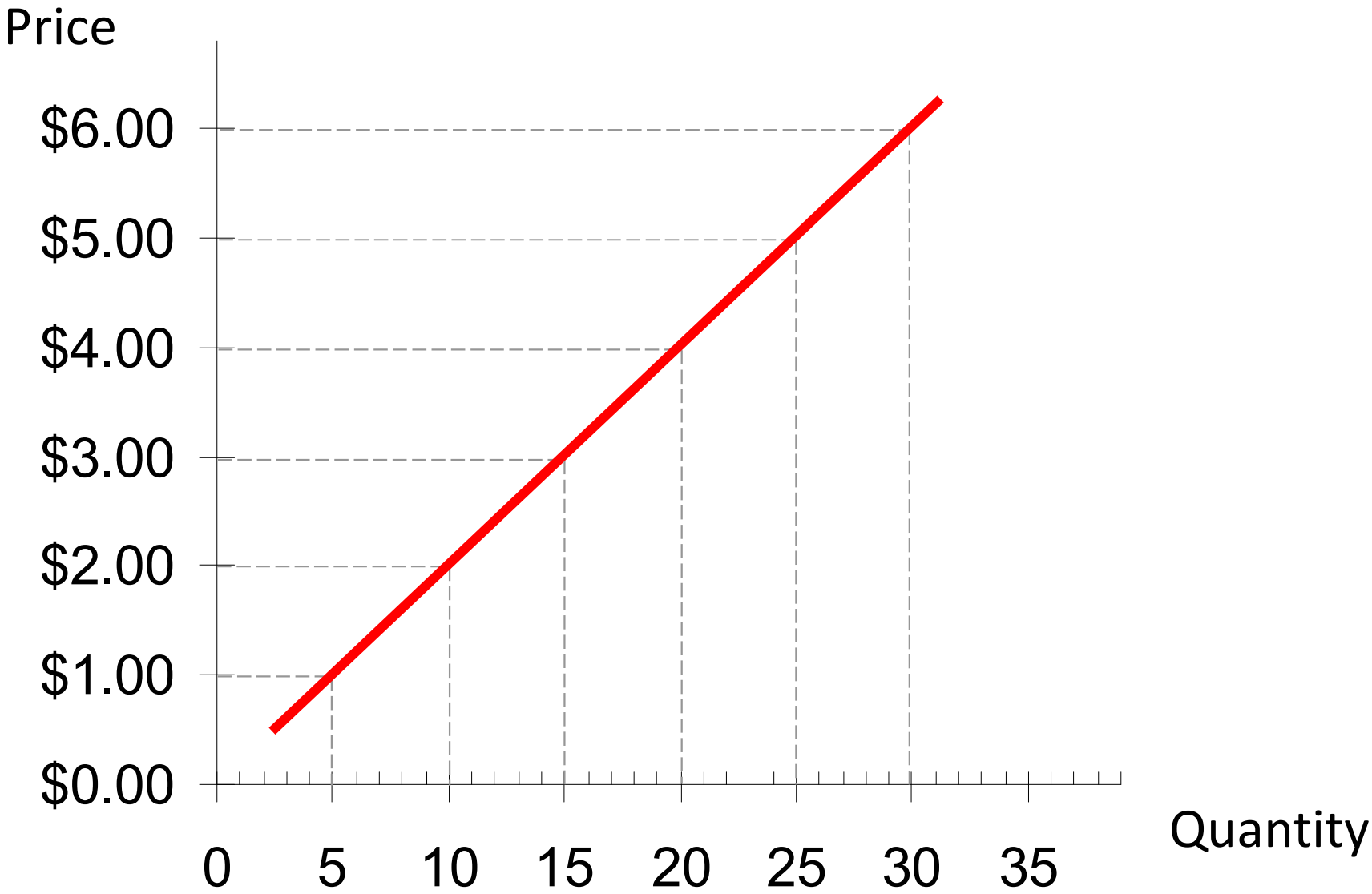
Supply

- **Supply**
  - The **quantity supplied** of any good is the amount that sellers are willing and able to sell.
- **Law of supply**
  - As the price of a good rises (falls), the quantity supplied of the good rises (falls), holding other factors affecting supply constant.

Supply

- **Market supply curve**
  - A curve indicating the total quantity supplied of a good at each price, holding input prices, technology, and other variables affecting supply constant.

Market Supply Curve



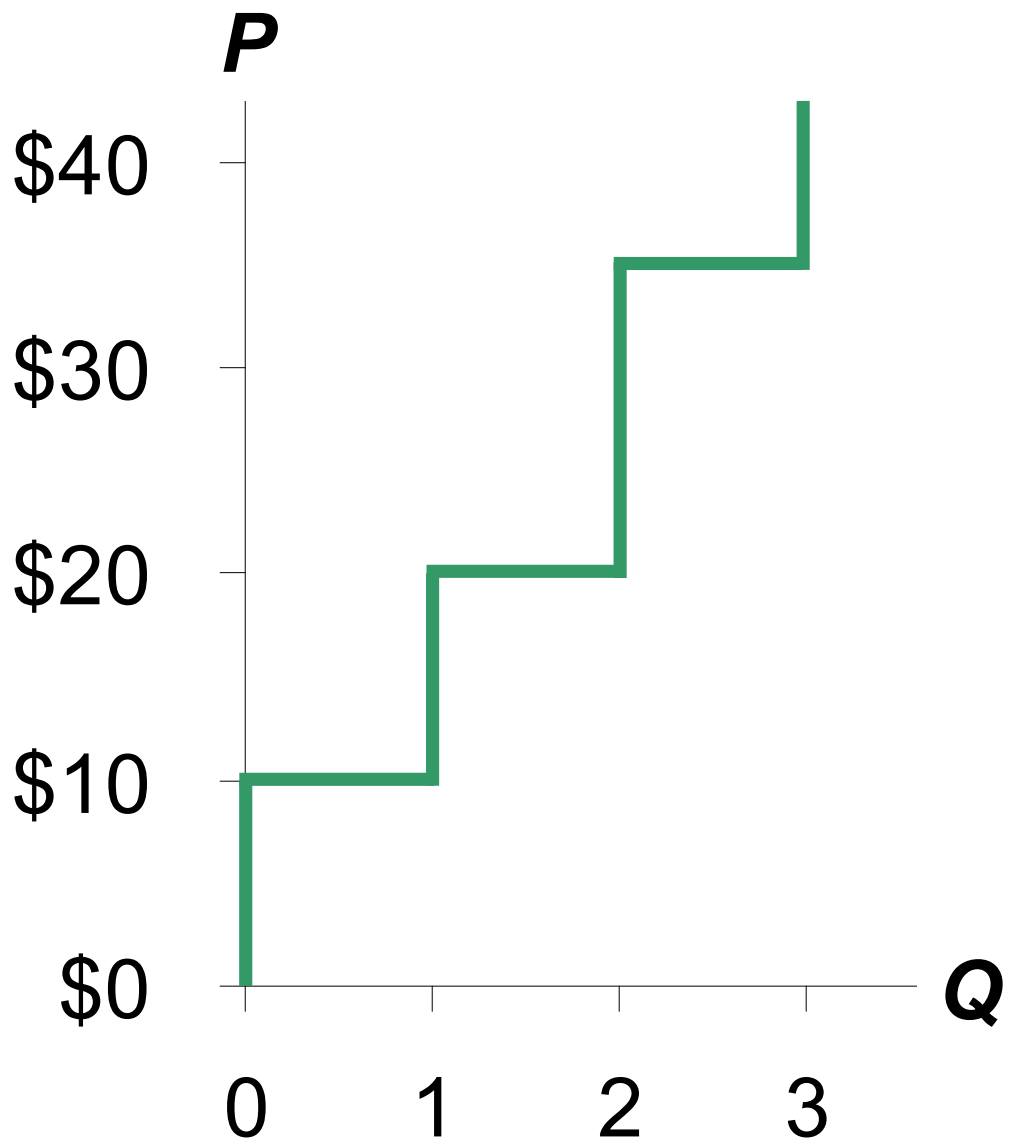
Willingness to Sell and the Supply Curve

Derive the supply schedule from the willingness to sell (cost) data:

Name	*WTS (cost)*
Jack	$10
Janet	20
Chrissy	35

P	***Q*^{s}**
$0 – 9	0
10 – 19	1
20 – 34	2
35 & up	3

Willingness to Sell and the Supply Curve



P	Q^s
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If there were a huge # of sellers, as in a competitive market, there would be a huge # of very tiny steps, and it would look more like a smooth curve.

Changes in Supply

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  - This type of change is graphically represented by a movement along a given supply curve, holding other factors that impact supply constant.
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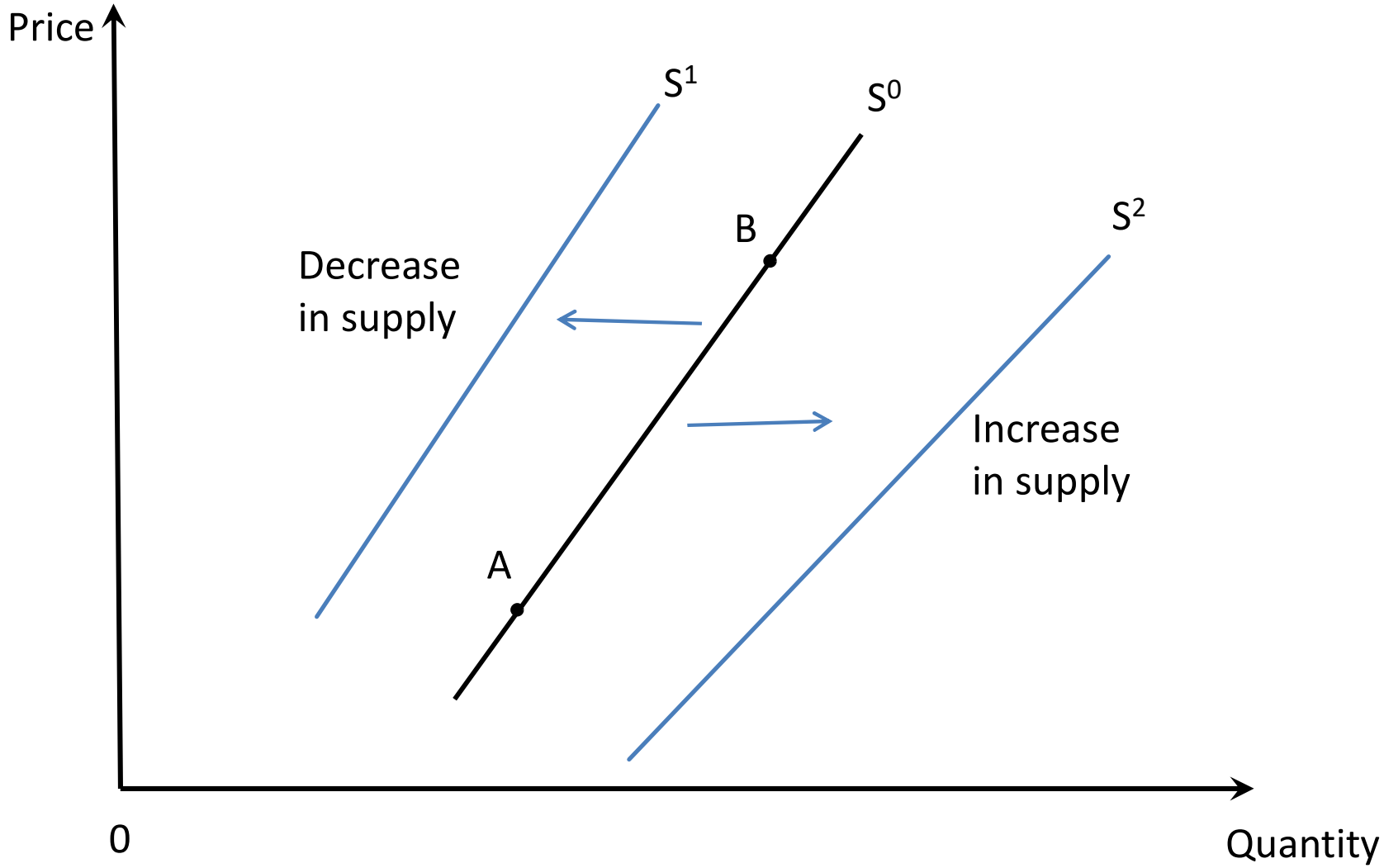
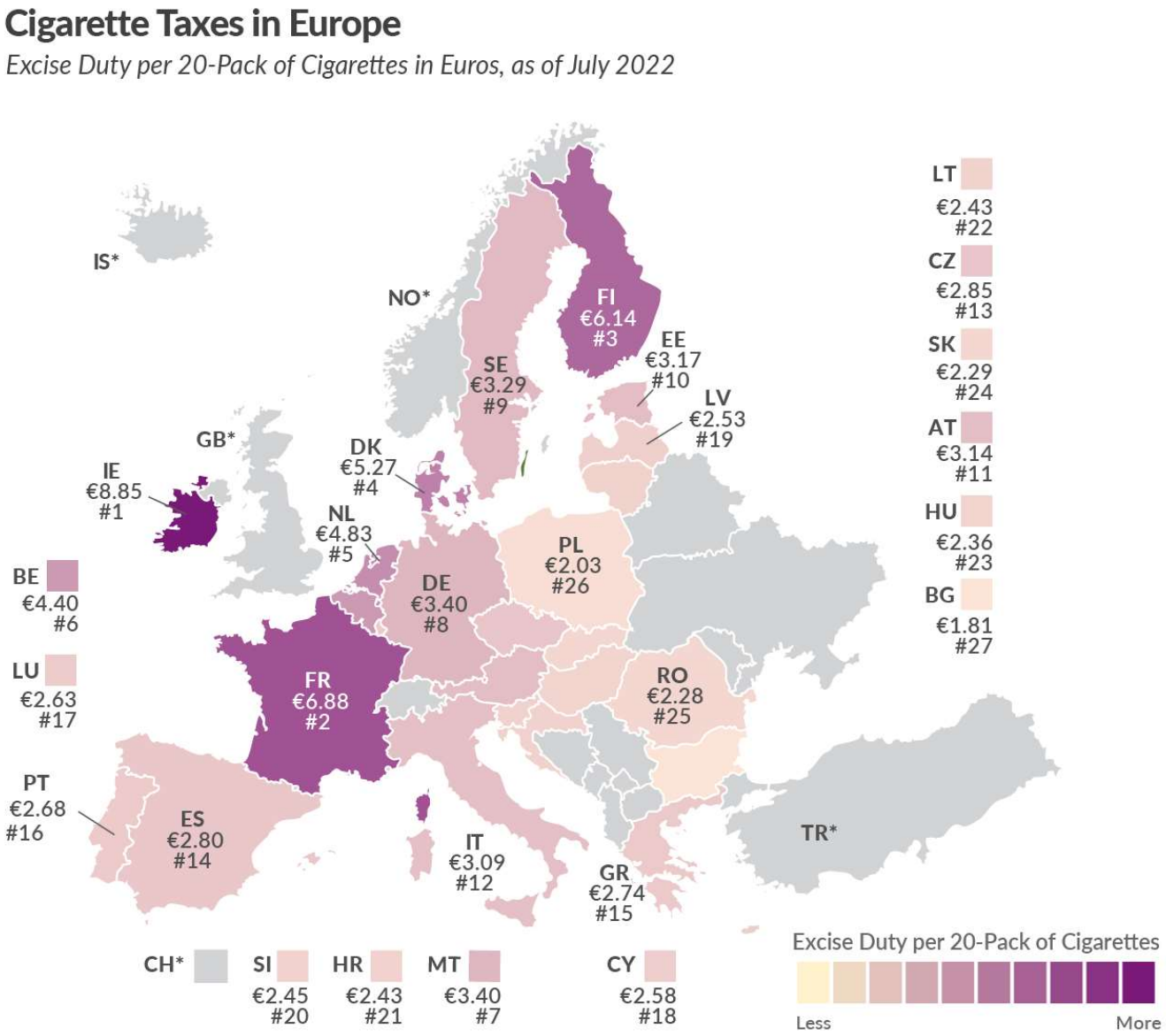
Changes in Supply



Supply Shifters

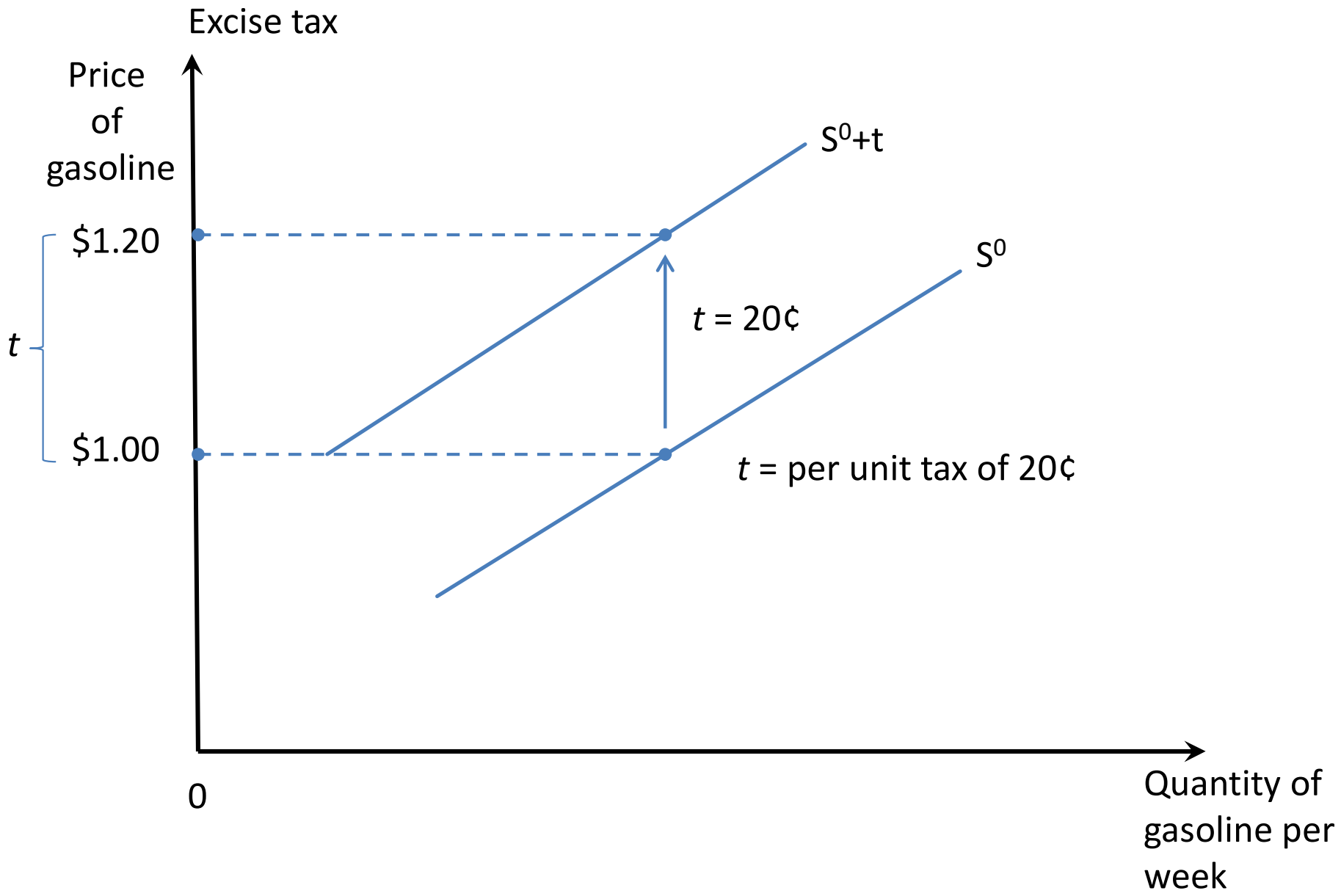
- Input prices
- Technology or government regulation
- Number of firms
  - Entry
  - Exit
- Taxes
  - ***Excise tax***: a tax on each unit of output sold, where tax revenue is collected from the supplier
  - ***Ad valorem tax***: percentage tax
- Producer expectations

A Per Unit (Excise) Tax

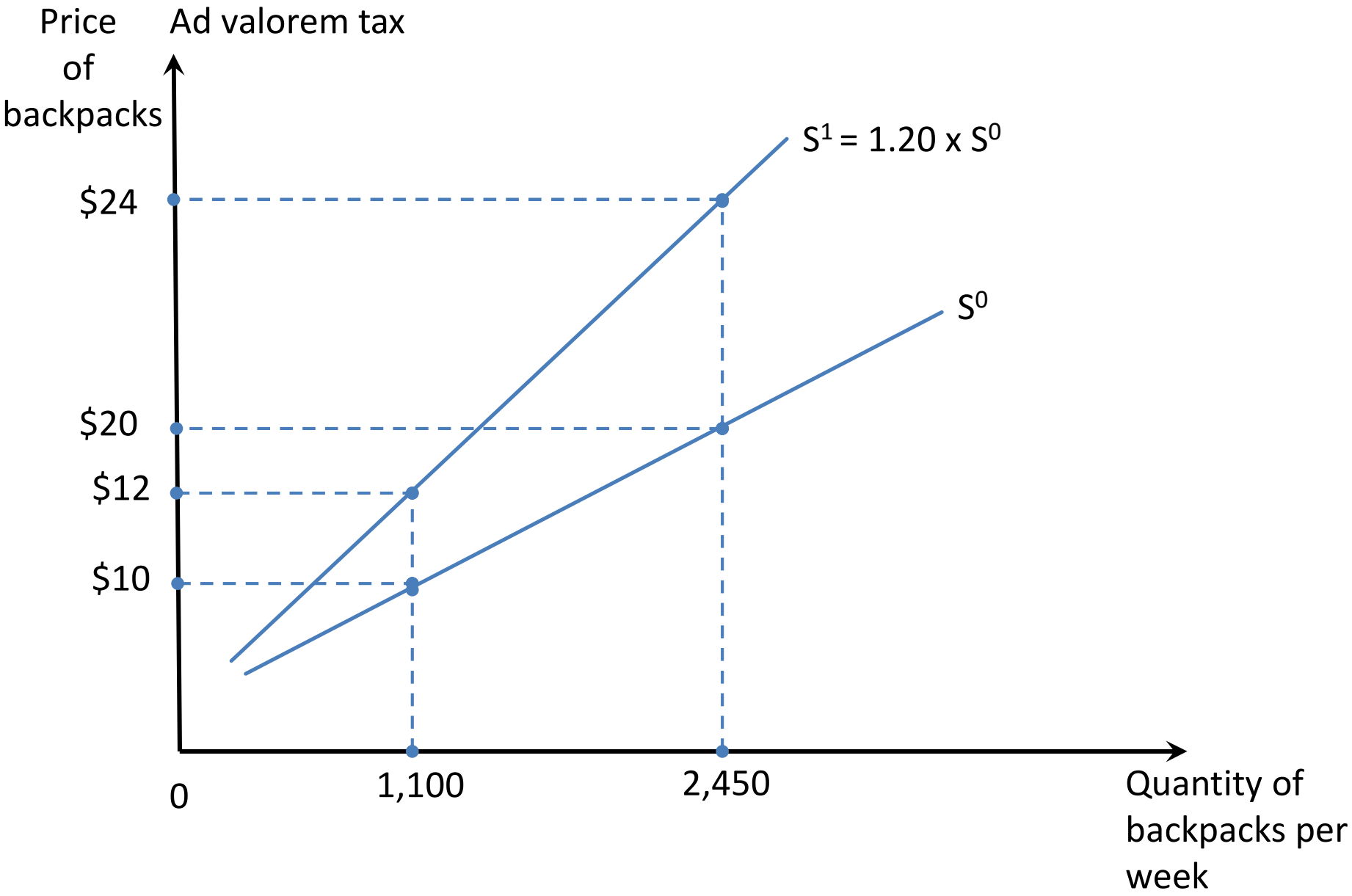


Note *Iceland, Norway, Switzerland, Turkey, and the United Kingdom are not part of the European Union (EU).
Source: European Commission, "Taxes in Europe Database."

A Per Unit (Excise) Tax



An Ad Valorem Tax



Producer Surplus (PS)

- **Producer surplus**: the amount producers receive in excess of the amount necessary to induce them to produce the good.
- Producer surplus equals the area above the supply curve under the price, from 0 to **Q**.

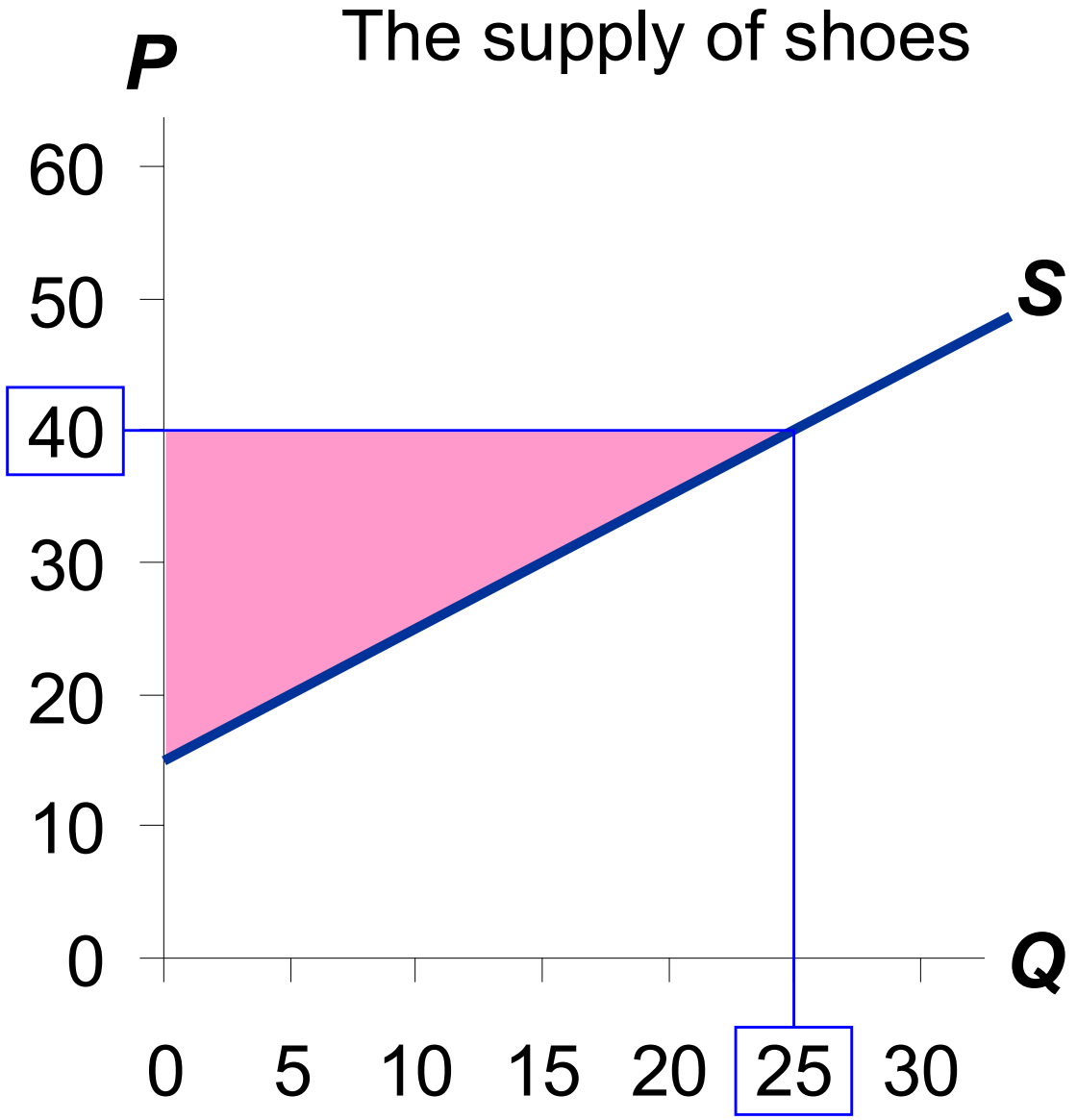
PS and Supply Curve

- PS is the area between ***P*** and the ***S*** curve, from 0 to ***Q***.
- The height of this triangle is $40 – 15 = $25.
- So,

  PS = ½ x *b* x *h*

  = ½ x 25 x $25

  = $312.50



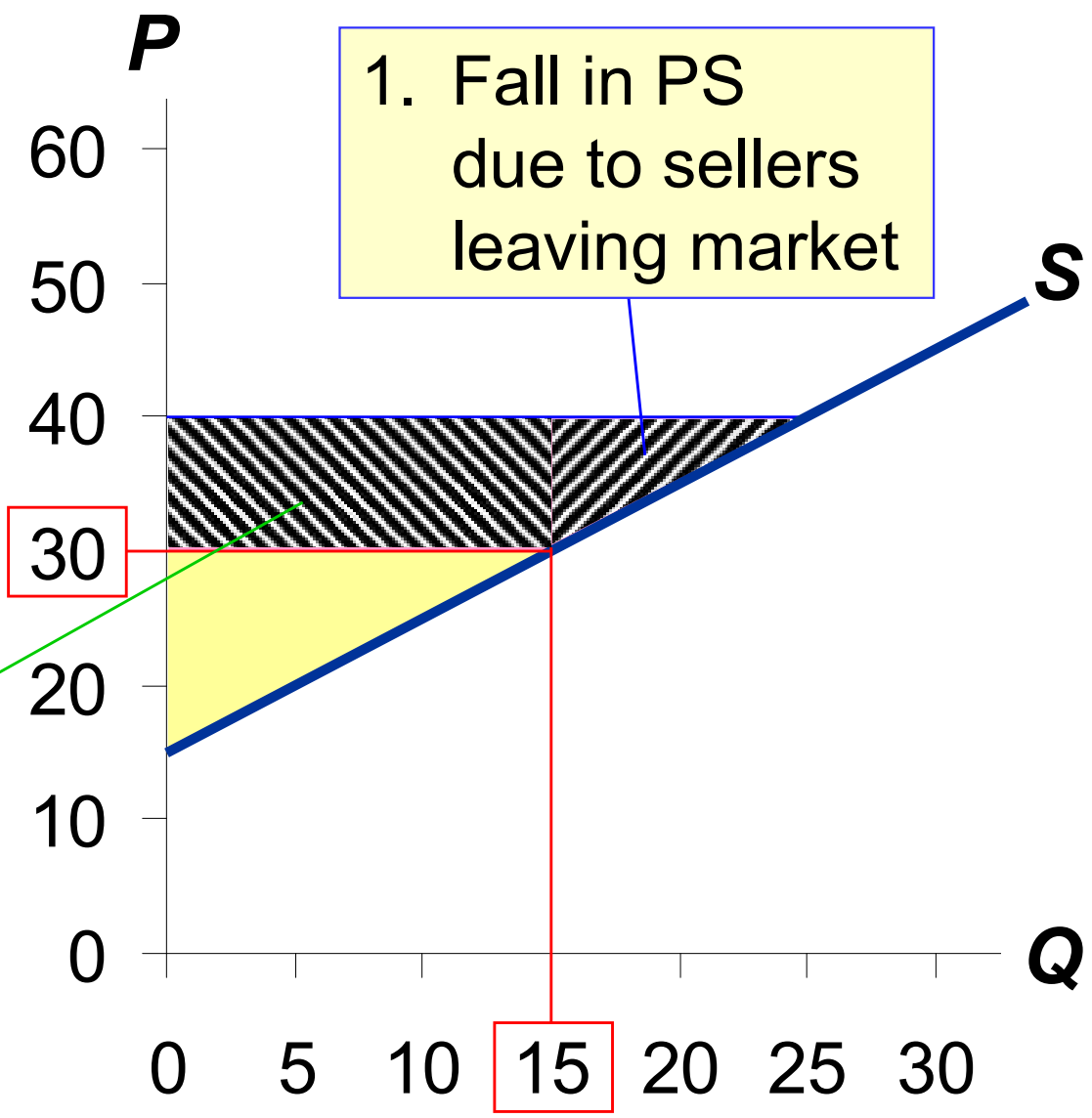
How a Lower Price Reduces PS

If ***P*** falls to \$30,

PS = ½ x 15 x \$15

= \$112.50

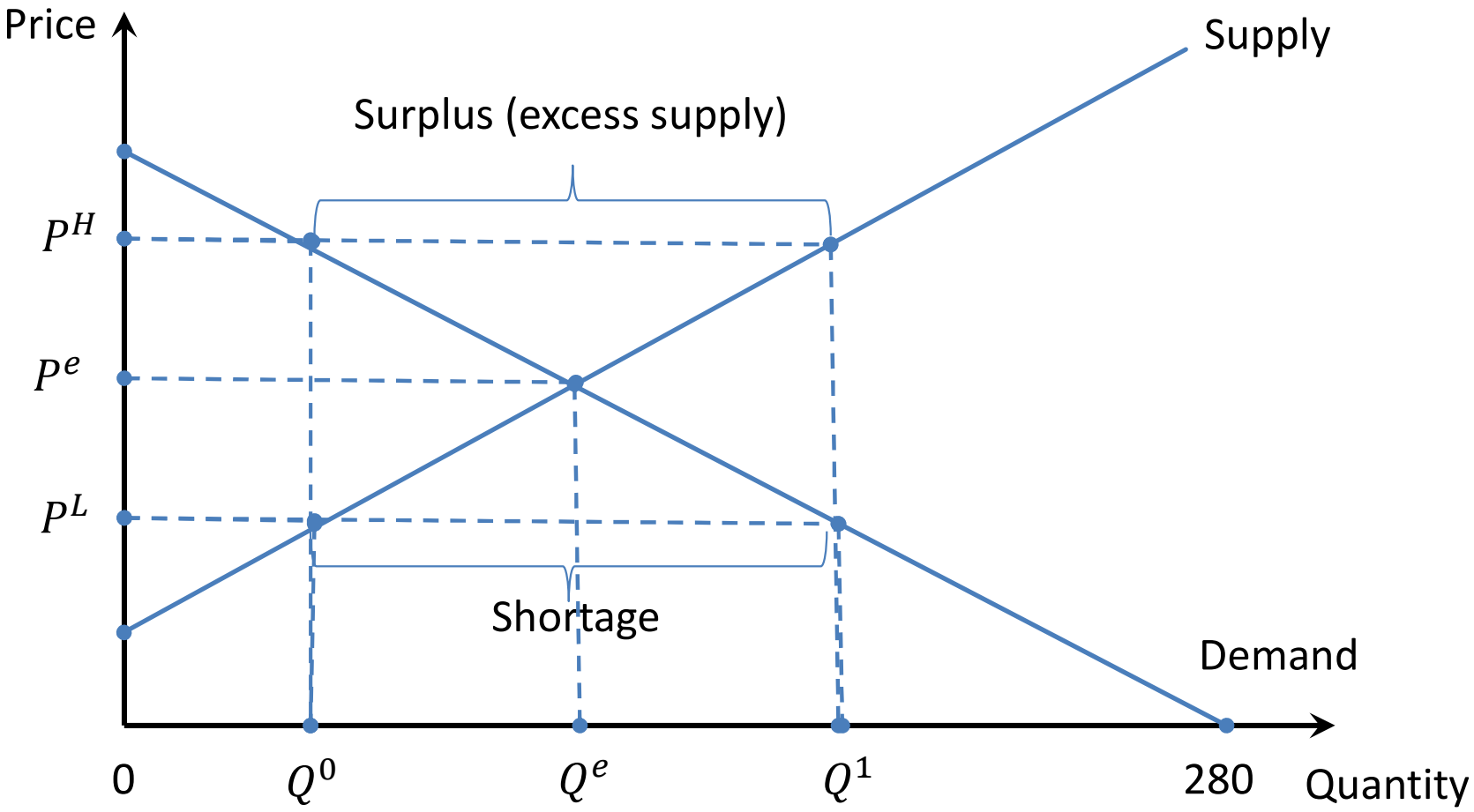
Two reasons for the fall in PS.



Market Equilibrium

- **Competitive Market Equilibrium**
  - Determined by the intersection of the market demand and market supply curves.
  - A price and quantity such that there is no shortage or surplus (excess supply) in the market.
  - Forces that drive market demand and market supply are balanced, and there is no pressure on prices or quantities to change.
  - The equilibrium price is the price that equates quantity demanded with quantity supplied

Market Equilibrium



Market Equilibrium in Action

- Consider a market with demand and supply functions, respectively, as

$$Q^d = 10 - 2P \text{ and } Q^s = 2 + 2P$$

- A competitive market equilibrium exists at a price, P^e, such that $Q^d(P^e) = Q^s(P^e)$. That is,

$$10 - 2P = 2 + 2P$$

$$8 = 4P$$

$$P^e = \$2$$

$$Q^e = 10 - 2(\$2) = 6 \text{ and } Q^e = 2 + 2(\$2) = 6$$

$$Q^e = 6 \text{ units}$$

Total Surplus

Recall:

CS = (value to buyers) – (amount paid by buyers)

= buyers' gains from participating in the market

PS = (amount received by sellers) – (cost to sellers)

= sellers' gains from participating in the market

Total surplus = CS + PS

= total gains from trade in a market

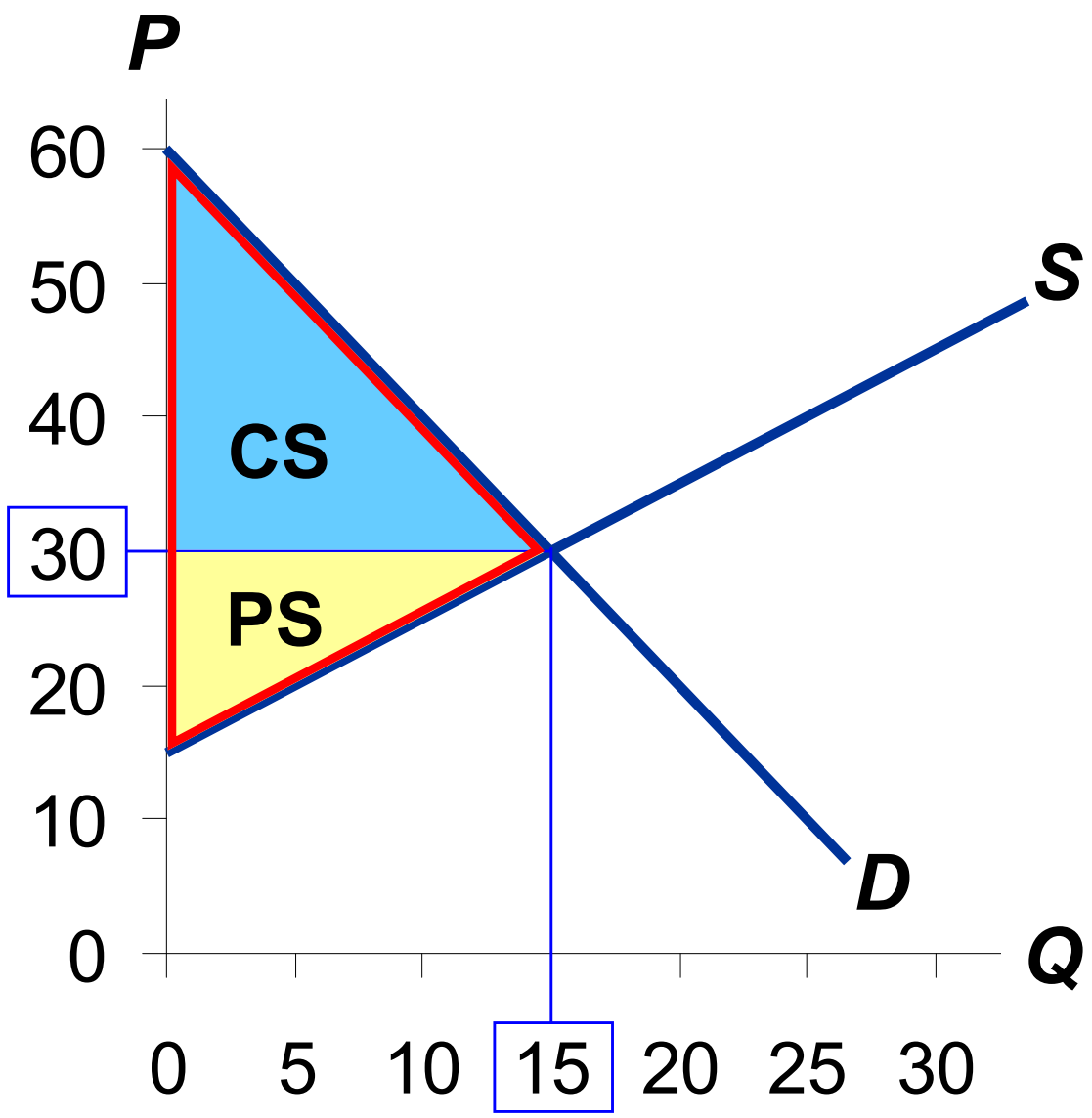
= (value to buyers) – (cost to sellers)

Efficient Allocation of Resources

- We use total surplus as a measure of society's well-being (social welfare), and we consider whether the market's allocation is *efficient* (maximizes total surplus).
- Policymakers also care about *equality*, though the focus here is on efficiency.

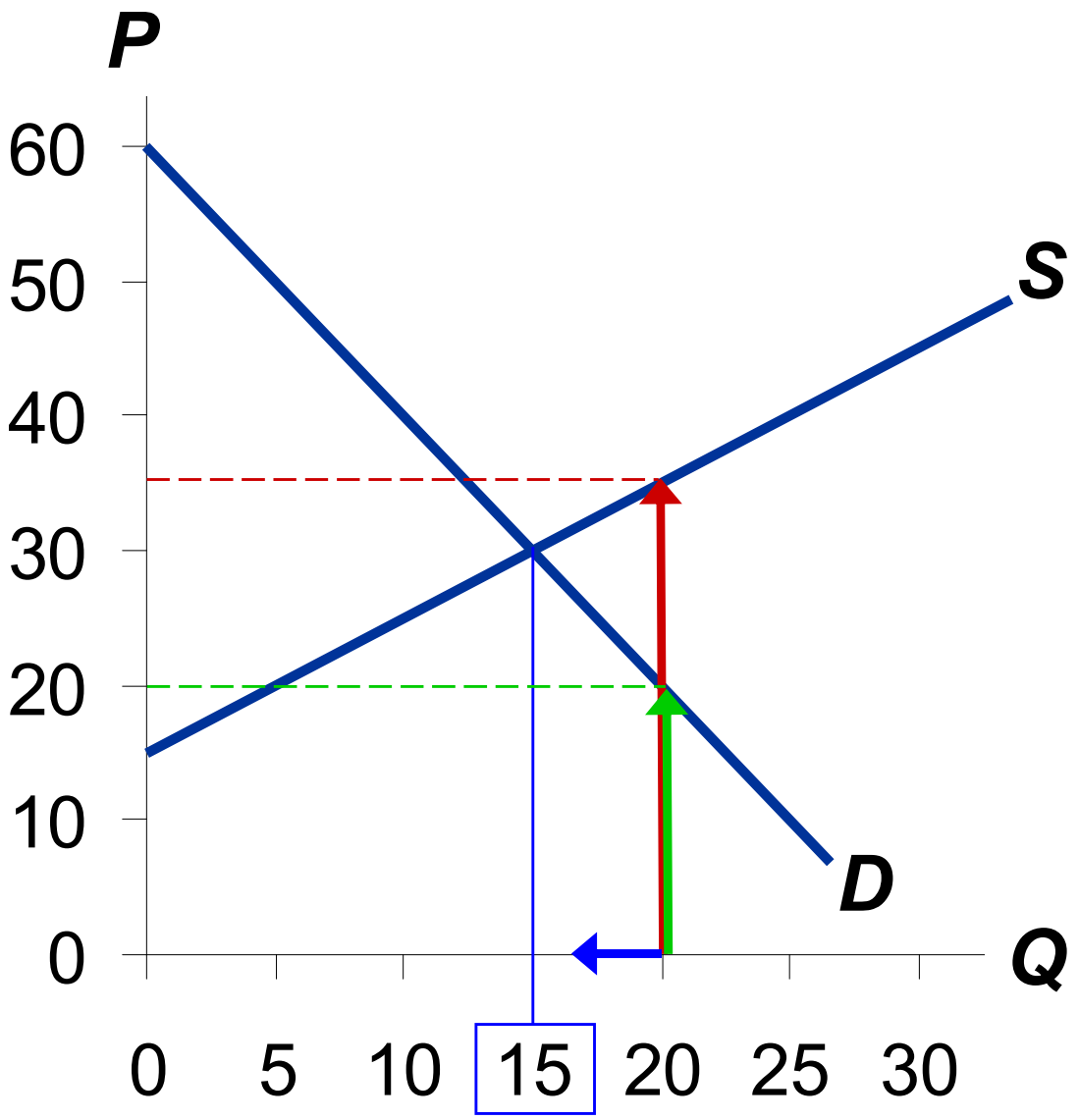
Evaluating the Market Equilibrium

- Market equilibrium:
  P = \$30
  Q = 15
- Total surplus
  = CS + PS
- Is the market equilibrium efficient?



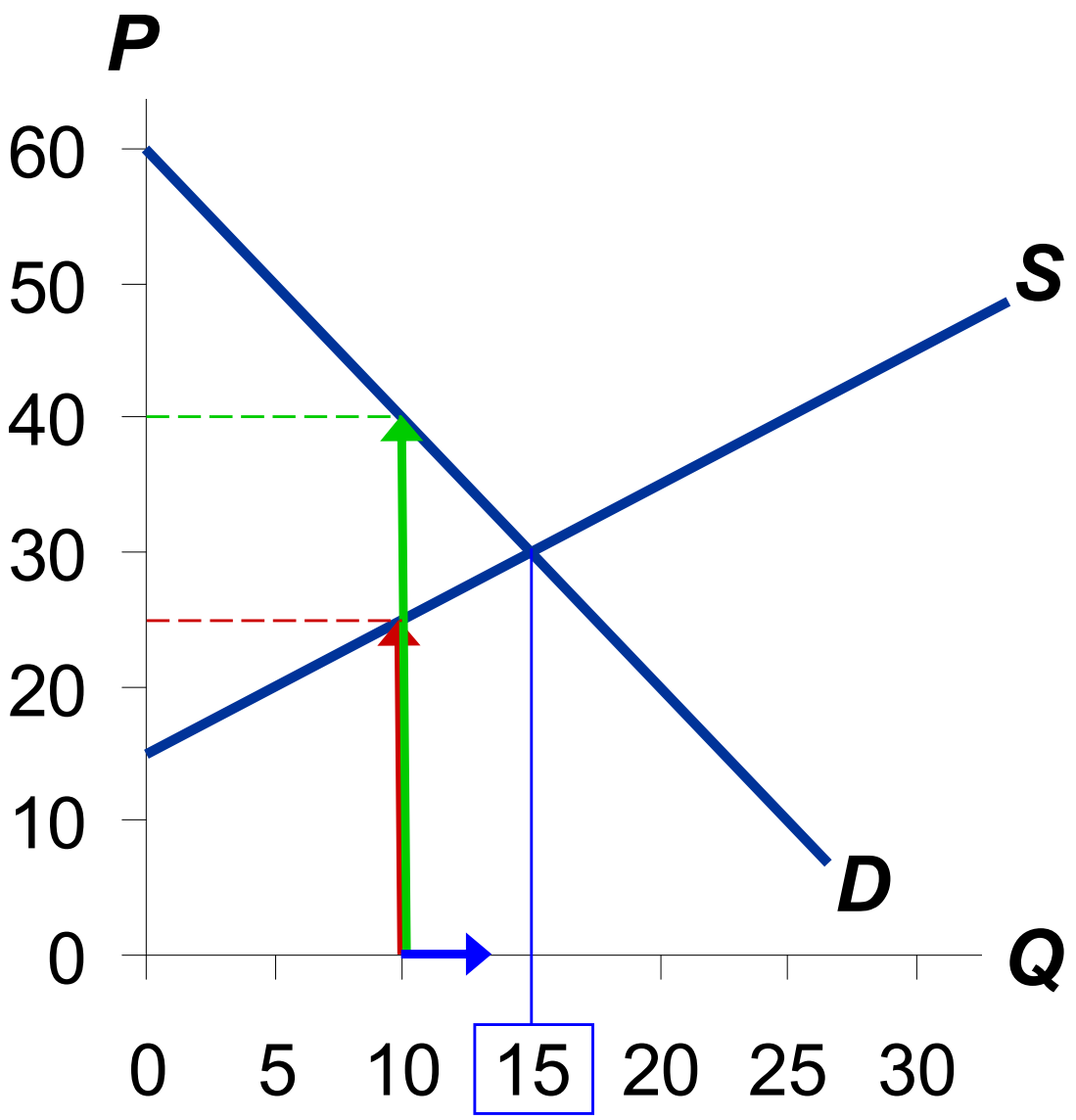
Does Equilibrium Maximize Total Surplus?

- At ***Q*** = 20, cost of producing the marginal unit is $35
- value to consumers of the marginal unit is only $20
- Hence, can increase total surplus by reducing ***Q***.
- *This is true at any **Q** greater than 15.*



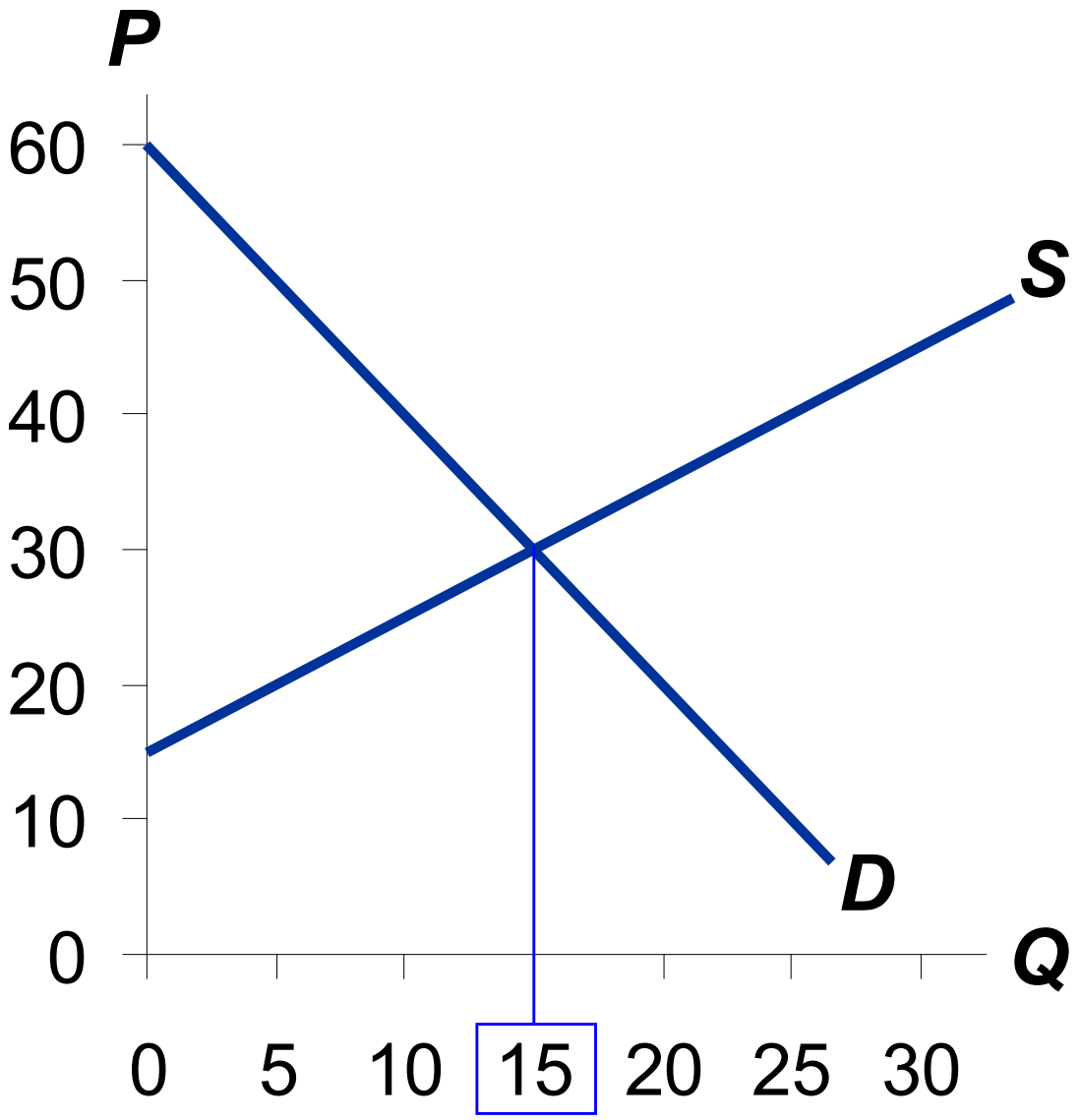
Does Equilibrium Maximize Total Surplus?

- At ***Q*** = 10, cost of producing the marginal unit is $25
- value to consumers of the marginal unit is $40
- Hence, can increase total surplus by increasing ***Q***.
- *This is true at any **Q** less than 15.*



Does Equilibrium Maximize Total Surplus?

- **The market equilibrium quantity maximizes total surplus.**
- At any other quantity, can increase total surplus by moving toward the market equilibrium quantity.



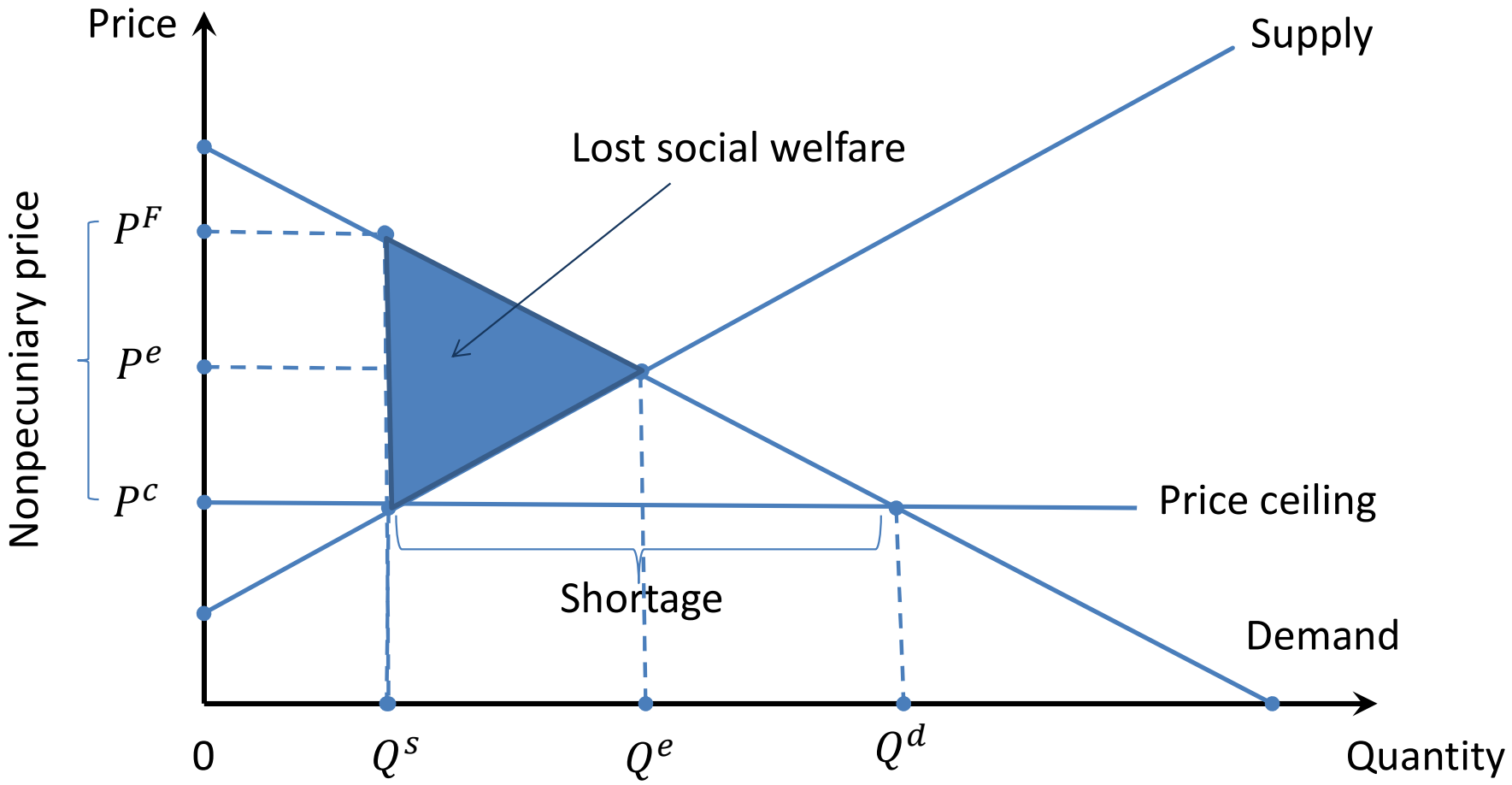
The Free Market vs. Central Planning

- The market equilibrium is efficient. No other outcome achieves higher total surplus.
  - Adam Smith and the Invisible Hand (The Wealth of Nations, 1776)
- Suppose resources were allocated not by the market, but by a central planner who cares about society's well-being.
- To allocate resources efficiently and maximize total surplus, the planner would need to know every seller's cost and every buyer's WTP for every good in the entire economy.
- This is impossible, and why centrally-planned economies are never very efficient.

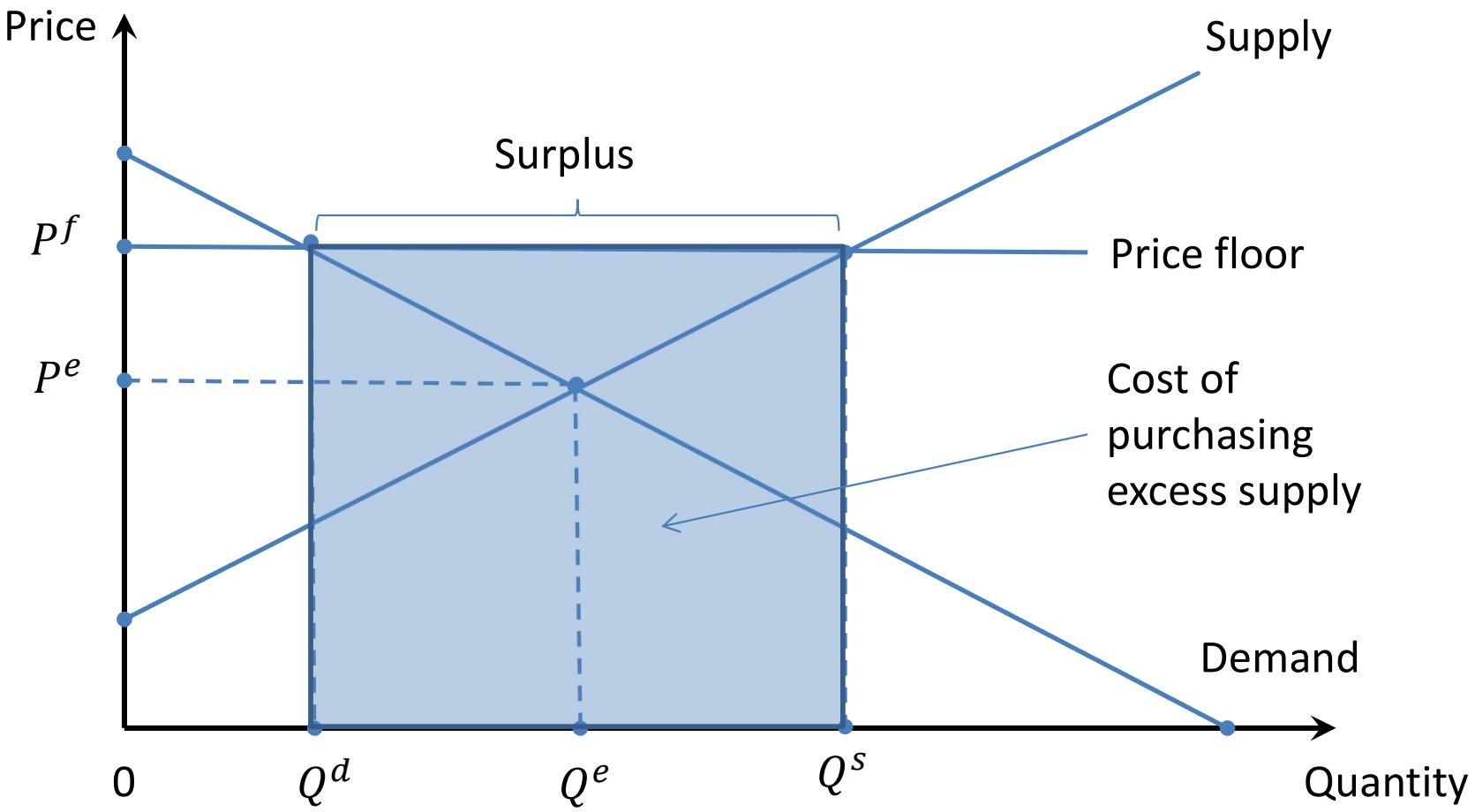
Price Restrictions and Market Equilibrium

- In a competitive market equilibrium, price and quantity freely adjust to the forces of demand and supply.
- Sometime government restricts how much prices are permitted to rise or fall.
  - Price ceiling
  - Price floor

A Price Ceiling



A Price Floor



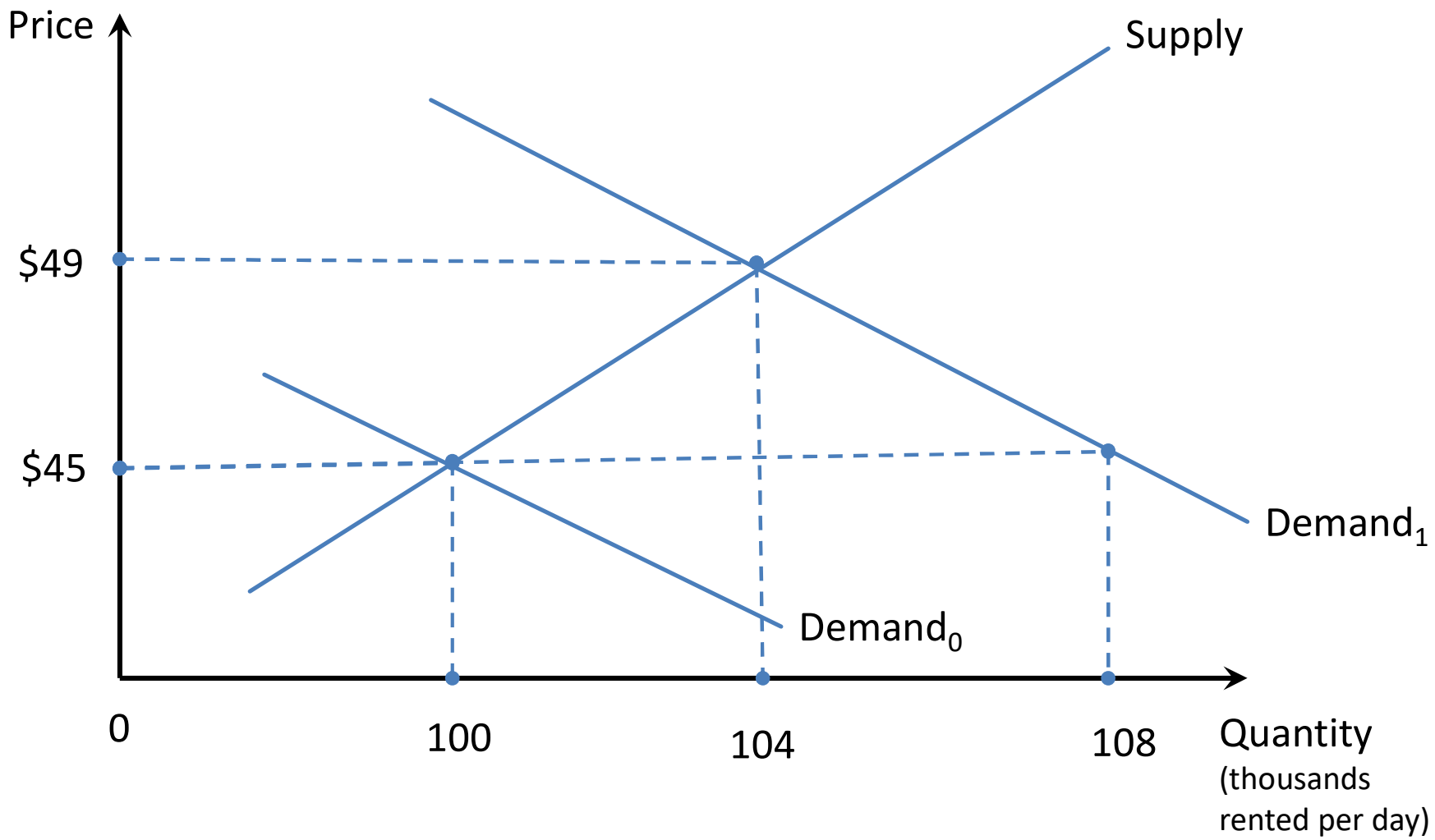
Comparative Statics

- ***Comparative static analysis***
  - The study of the movement from one equilibrium to another.
- Competitive markets, operating free of price restraints, will be analyzed when:
  - Demand changes
  - Supply changes
  - Demand and supply simultaneously change

Changes in Demand

- Increase in demand only
  - Increase equilibrium price
  - Increase equilibrium quantity
- Decrease in demand only
  - Decrease equilibrium price
  - Decrease equilibrium quantity
- Example of change in demand
  - Suppose that consumer incomes are projected to increase 2.5% and the number of individuals over 25 years of age will reach an all time high by the end of next year. What is the impact on the rental car market?

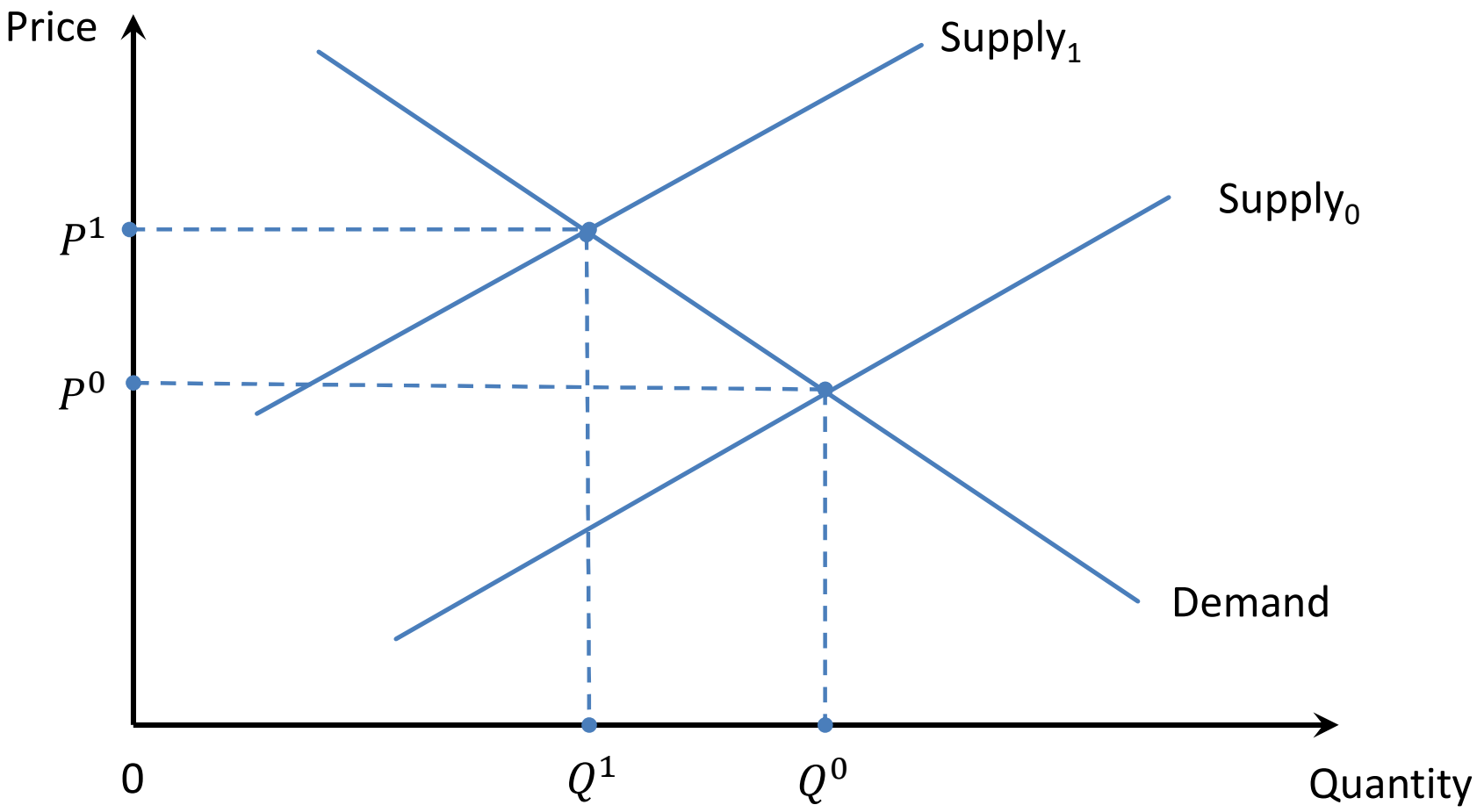
Effect of a Change in Demand for Rental Cars



Changes in Supply

- Increase in supply only
  - Decrease equilibrium price
  - Increase equilibrium quantity
- Decrease in supply only
  - Increase equilibrium price
  - Decrease equilibrium quantity
- Example of change in supply
  - Suppose that a bill before Congress would require all employers to provide health care to their workers. What is the impact on retail markets?

Effect of a Change in Supply



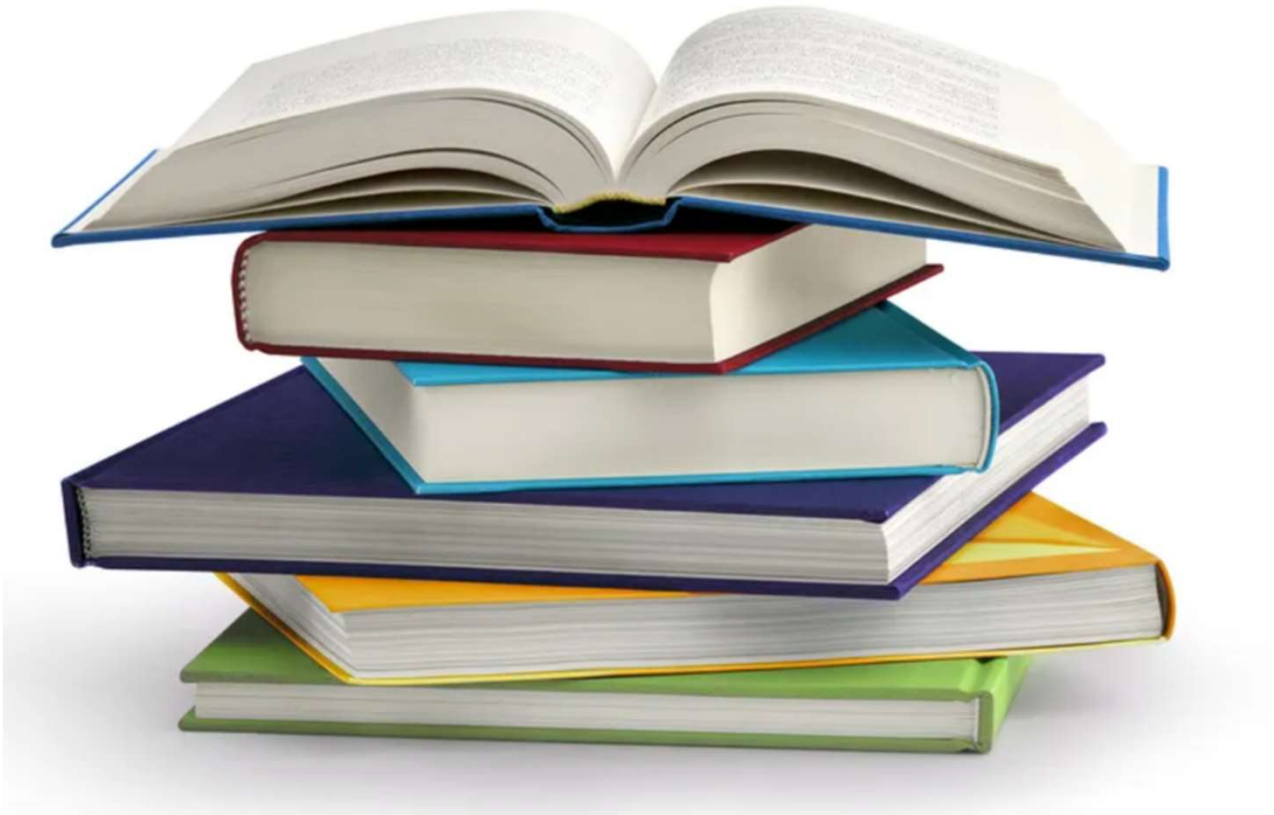
Simultaneous Shifts in Supply and Demand

- Suppose that simultaneously the following events occur:
  - An earthquake hit Kobe, Japan and decreased the supply of fermented rice used to make sake wine.
  - The stress caused by the earthquake led many to increase their demand for sake, and other alcoholic beverages.
- What is the combined impact on Japan's sake market?

Simultaneous Shifts in Supply and Demand in Action

Class Experiment

- The demand and supply of an old math textbook



Take-home messages

- **A competitive market** has many buyers and sellers, each of whom has little or no influence on the market price.
- Economists use the **supply and demand model** to analyze competitive markets.
- The downward-sloping demand curve reflects the **Law of Demand**.
- The upward-sloping supply curve reflects the **Law of Supply**.

Take-home messages

- **Consumer surplus** is the difference between what buyers are willing to pay for a good and what they actually pay.
- **Producer surplus** is the difference between what sellers receive for a good and their cost of producing it.
- The intersection of demand and supply curves determines the **market equilibrium**.
- For a competitive market, the **market equilibrium is efficient and maximizes total surplus.**