Universidad de Valladolid

ECO - UVa

Topic 2

Supply and Demand

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Outline

1. Demand:
   - Factors that change demand.
   - Movements along the curve and shifts of the curve.
   - Price elasticity of demand.

2. Supply:
   - Factors that change supply.
   - Movements along the curve and shifts of the curve.
   - Price elasticity of supply.

3. Market equilibrium:
   - Changes in equilibrium due to shifts of curves.

4. Price controls:
   - Price ceilings and price floors.
   - Taxes.

Demand and Supply

- **Sellers** and **buyers** constitute a market.
- **Market**: a set of sellers and buyers who exchange goods or services for payment.
- Competitive market: a market in which there are many sellers and many buyers of a good or service such that ***no one influences the price*** at which it is sold.
  - Market power: when a buyer or a seller can change the price.

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2. Supply:
   - Factors that change supply.
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4. Price controls:
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The demand curve

- The **quantity of** a good that a consumer wants to buy depends on its **price**.

- The relationship between price and quantity demand is **inverse**: the higher the price, the lower the quantity, and vice versa.

- **Law of demand**: it states that an **increase in the price** of a good or service, ceteris paribus, leads people to a **smaller quantity** of that good or service.

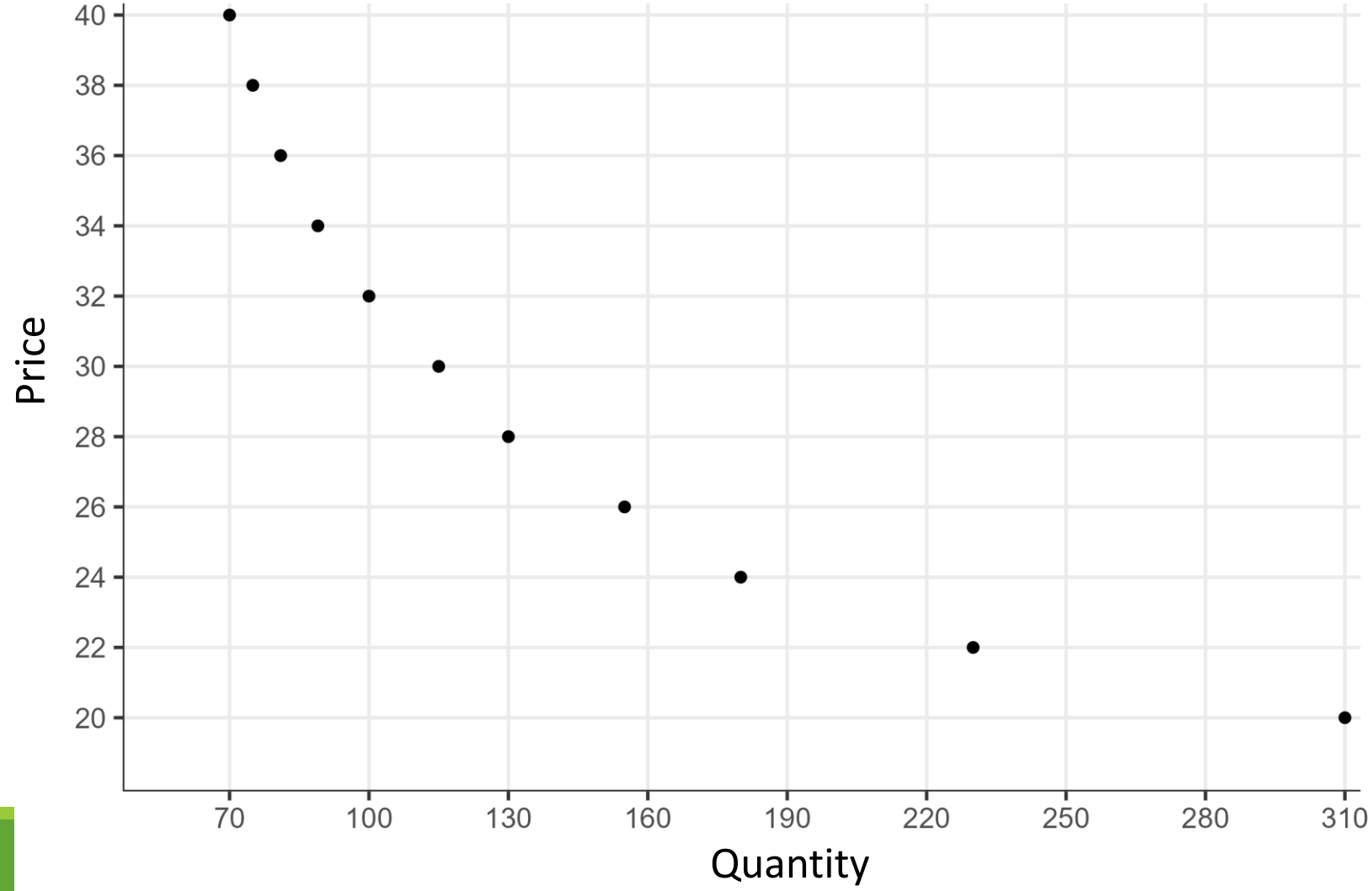
The demand curve

Quantity demanded: the actual amount of a good or service that consumers are willing to buy <u>at some specific price</u>.

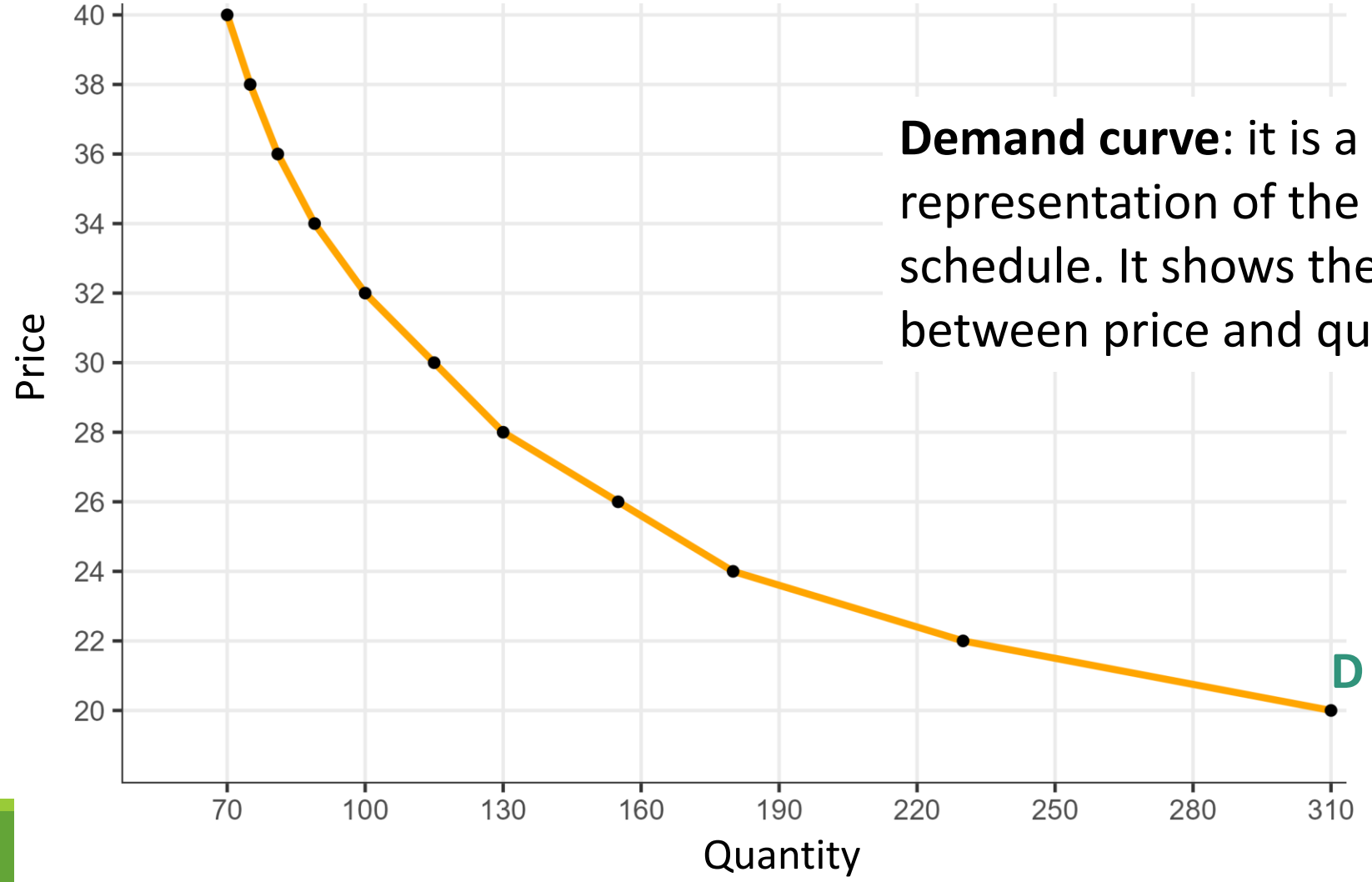
Price	Quantity
40	70
38	75
36	81
34	89
32	100
30	115
28	130
26	155
24	180
22	230
20	310

Demand schedule: Shows how much of a good or service will want to buy at different prices

The demand curve

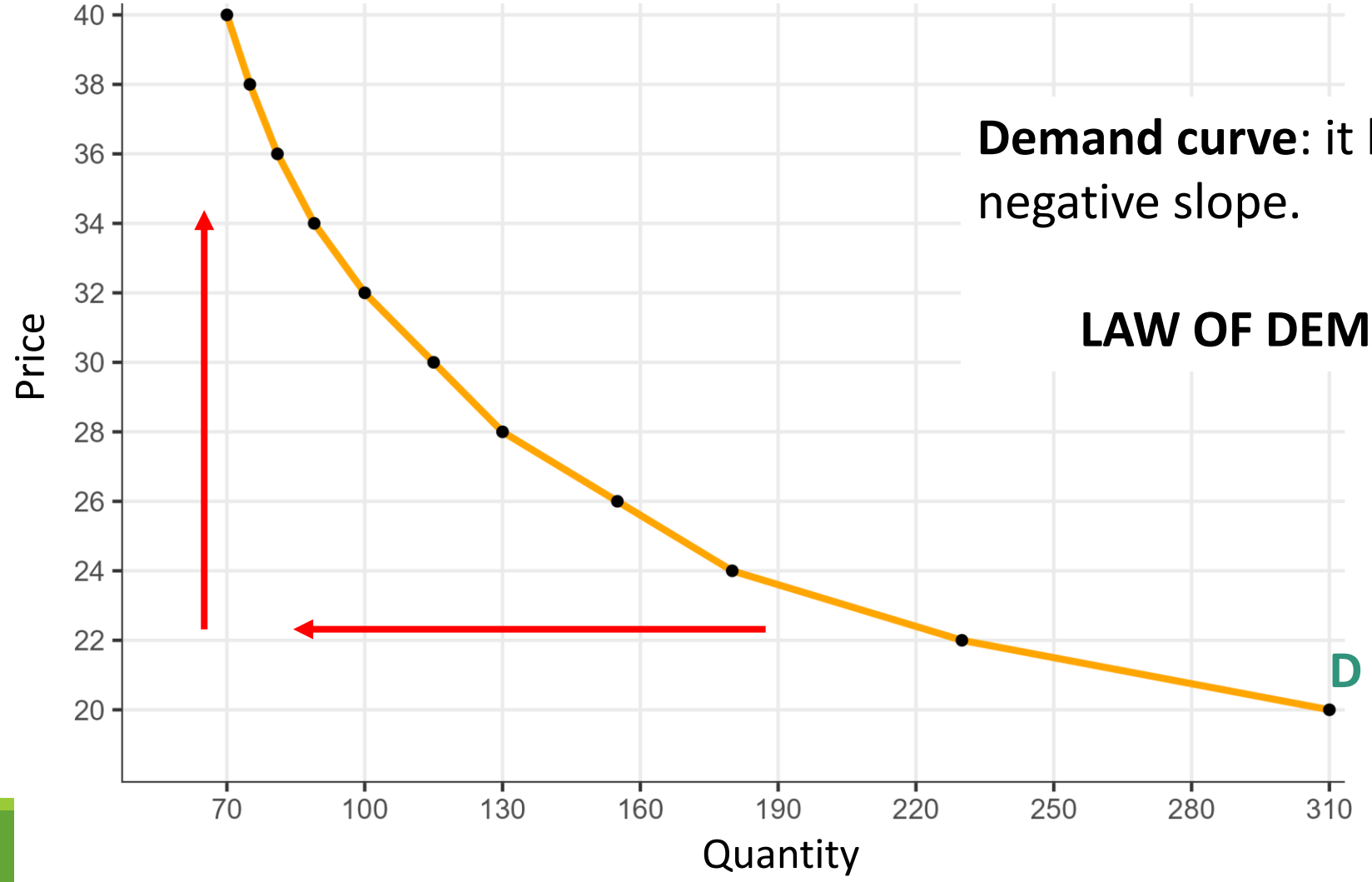


The demand curve



Demand curve: it is a graphical representation of the demand schedule. It shows the relationship between price and quantity demanded.

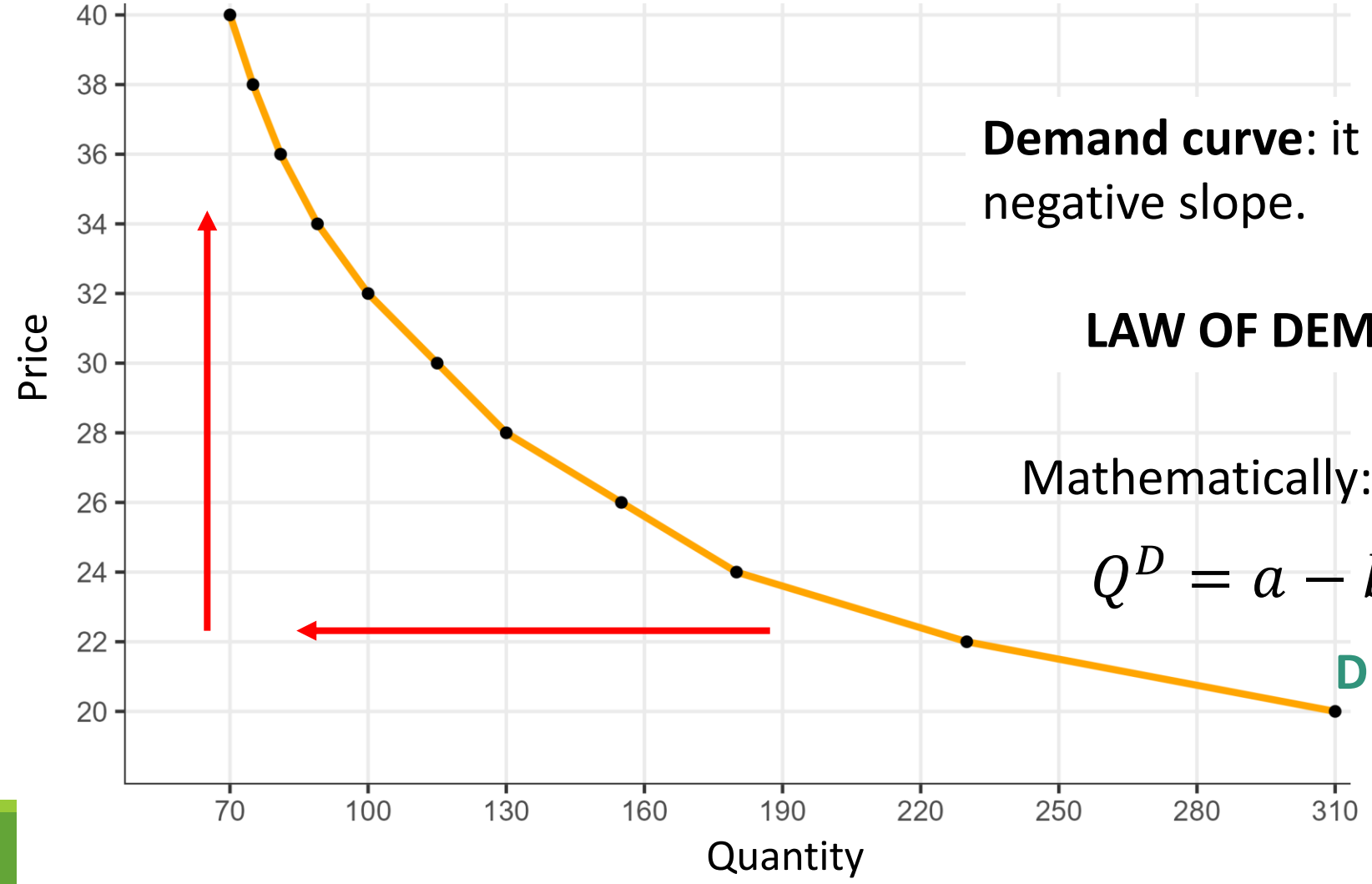
The demand curve



Demand curve: it has a negative slope.

LAW OF DEMAND

The demand curve



Demand curve: it has a negative slope.

LAW OF DEMAND

Mathematically: $\mathbf{Q^D = f(P)}$

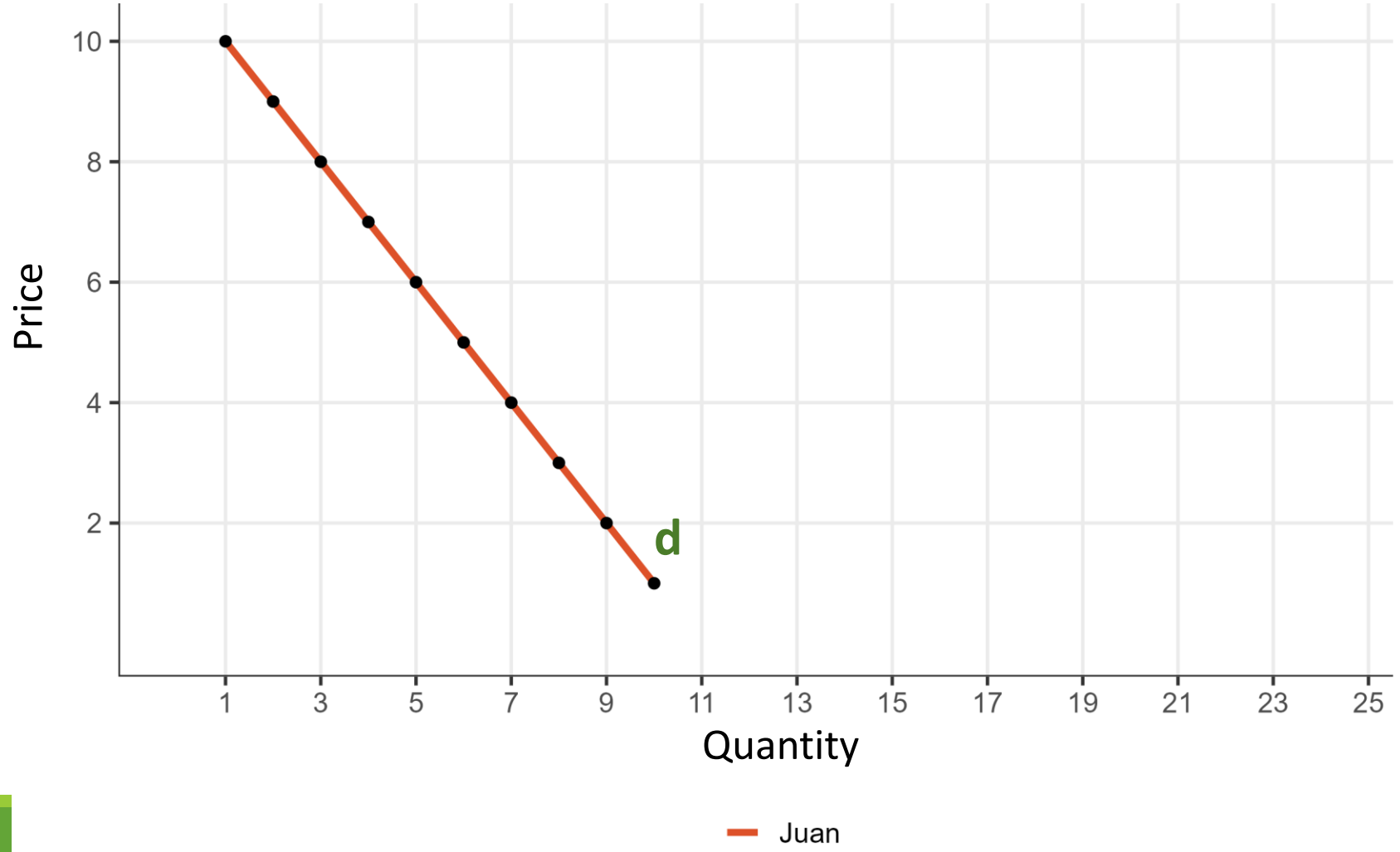
$$Q^D = a - bP$$

Individual and market demand curve

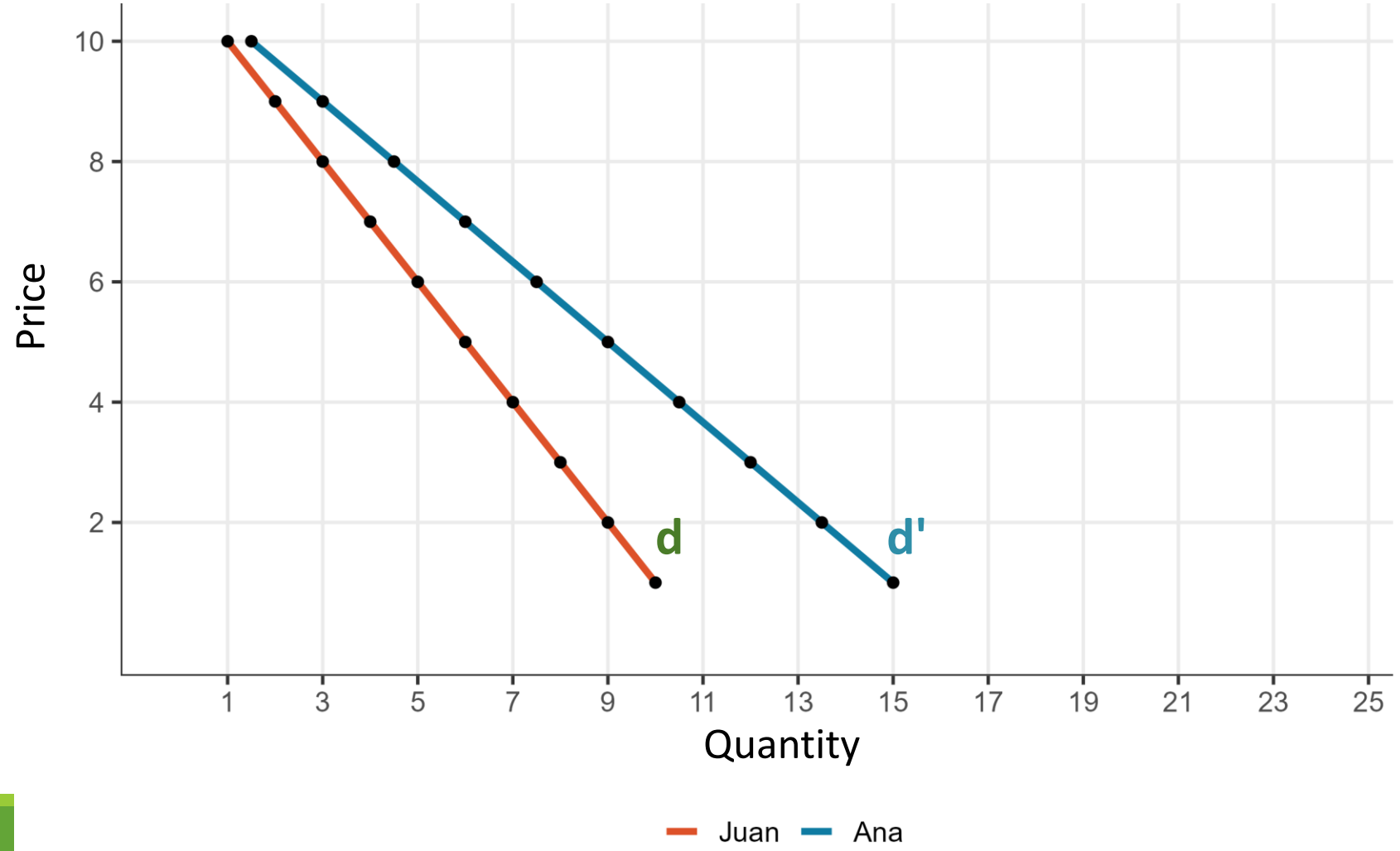
- The **individual demand curve** illustrates the relationship between quantity demanded and price for an individual consumer.

- The **market demand curve** is the sum of the individual demand curves.

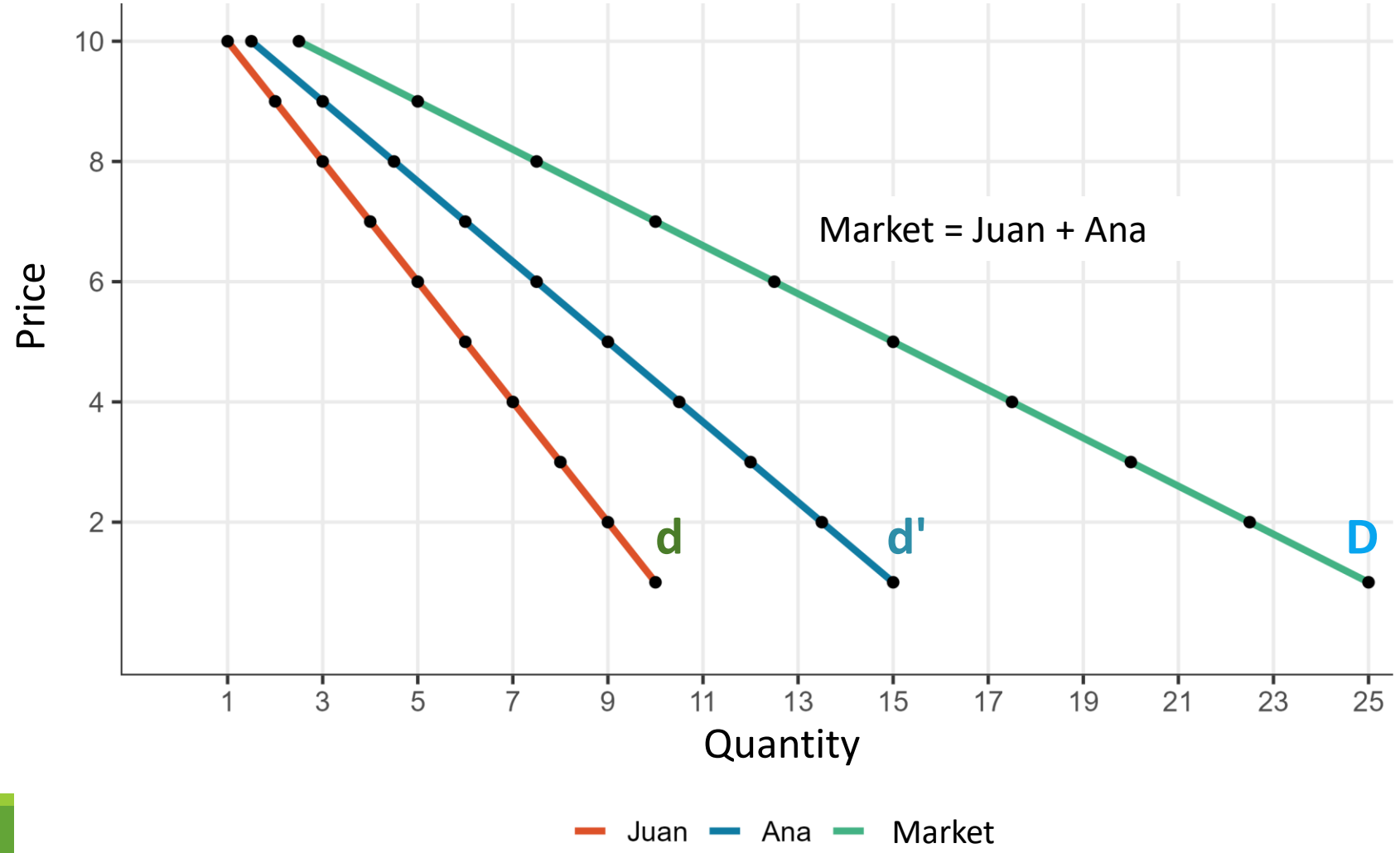
Individual and market demand curve



Individual and market demand curve



Individual and market demand curve



Factors that change demand

1. **Price of the good**: inverse relationship.

2. **Income**:
   - Normal good: Direct relationship: demand increases if income increases.
   - Inferior good: Inverse relationship: demand decreases if income increases (hostel vs. hotel; taxi vs. bus; elvers vs. gulas).

3. **Prices of related goods or services**:
   - Substitutes: Goods that fulfil the same function. There is a direct relationship: a rise in the price of one good leads to an increase in the demand for the other good (olive oil vs. sunflower oil; train vs. bus).
   - Complements: Goods that are consumed simultaneously. There is an inverse relationship: a rise in the price of one good leads to a decrease in the demand for the other good (coffee and sugar; fuel and cars).

Factors that change demand

4. **Tastes and preferences**: fashions, beliefs, cultural changes. Direct relationship. Example: Until the 70s people used to wore hats or suits; mobile phones; type of ice cream when you were a child.

5. **Expectations**: beliefs about what will happen to price or income. Direct relationship. Example: waiting for sales; buying a house if a metro station or park is to be built.

6. **Number of consumers**: Population growth or decline. Direct relationship. Example: migration; war; baby boom.

Factors that change demand

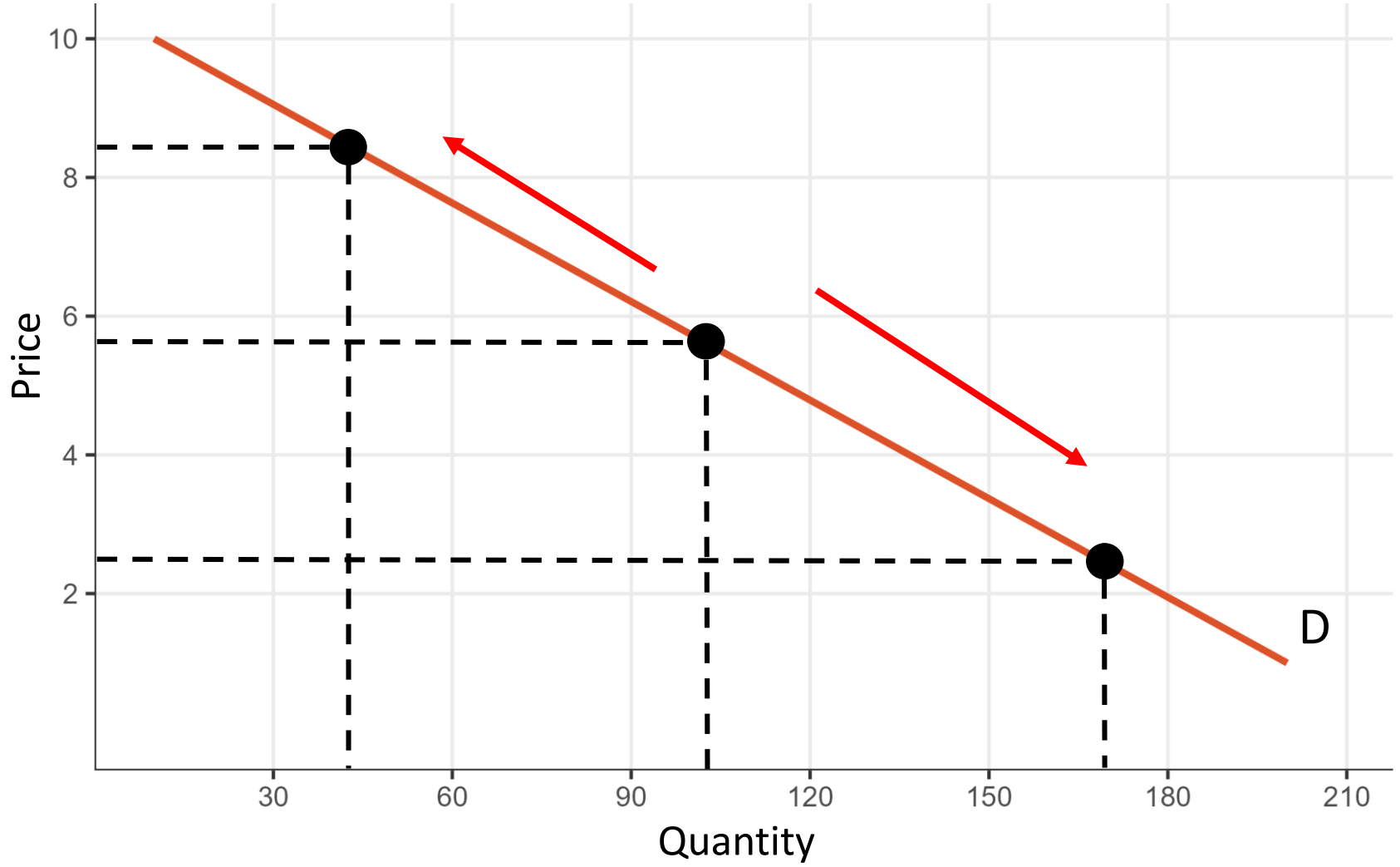
- Demand changes when its factors change.

- A distinction must be made:

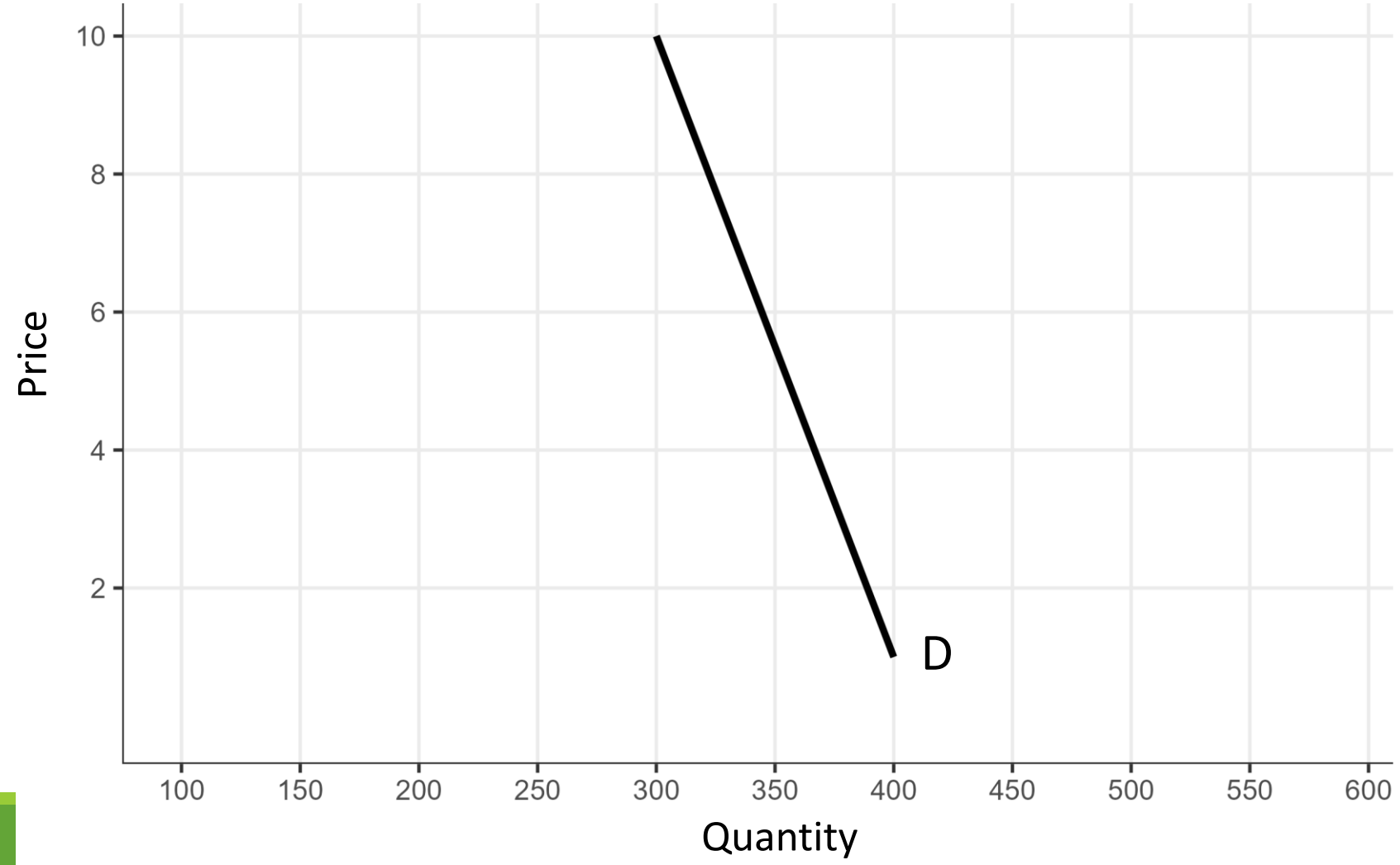
  - **Movements along** the demand curve: Price. *It is the same demand curve*.

  - **Shifts of** the demand curve: Other determinants: income, tastes and preferences, Price of related goods, expectations and number of consumers. *It denotes a new demand curve*.

Movements along the curve



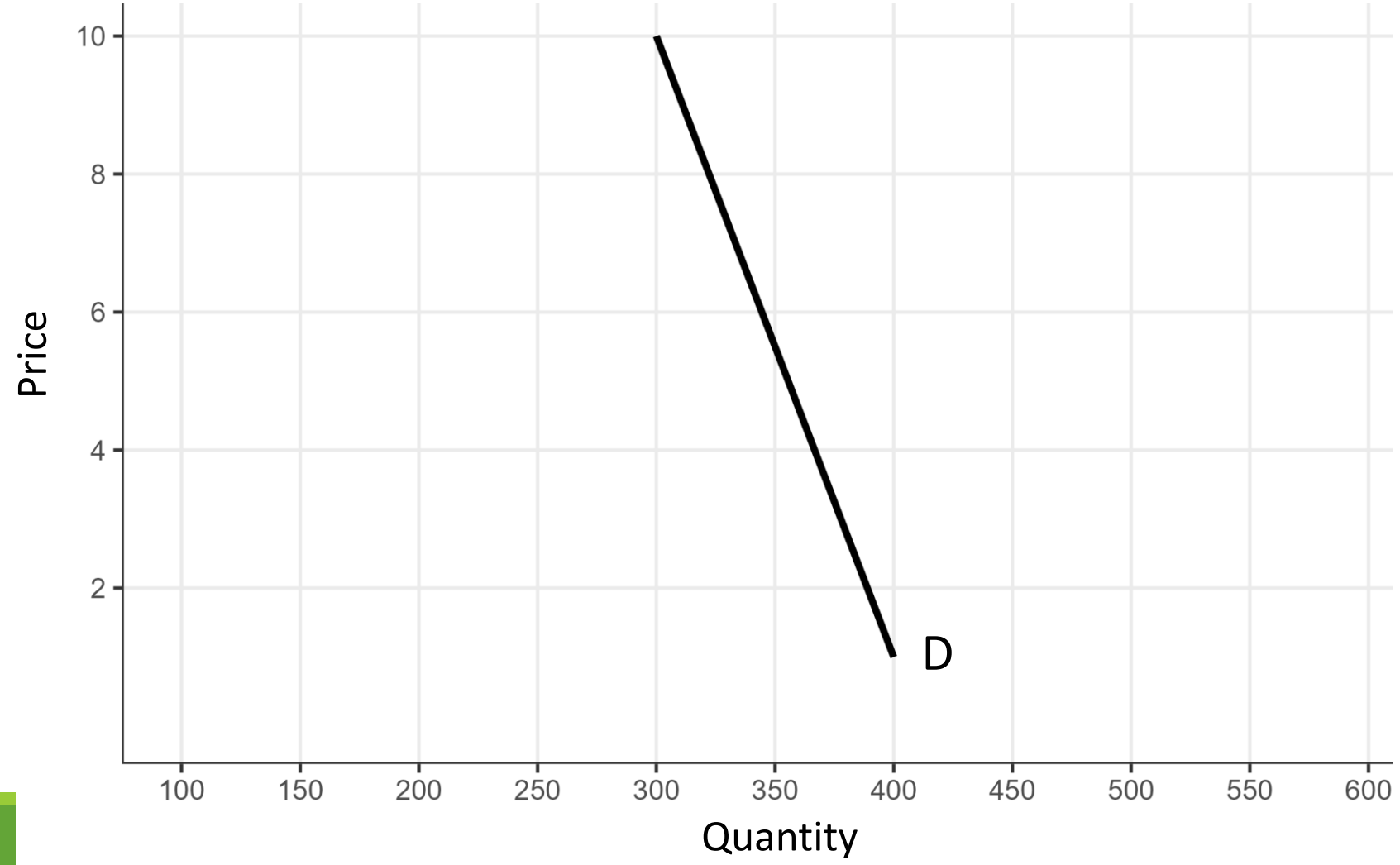
Shifts of the curve



Shifts of the curve

1) Increase in the price of substitutes
2) Decrease in the price of complements
3) Increase in income (if normal)
4) Decrease in income (if inferior)
5) Increase in tastes and preferences
6) Expectation of an increase in the price
7) Increase in the number of consumers

Shifts of the curve



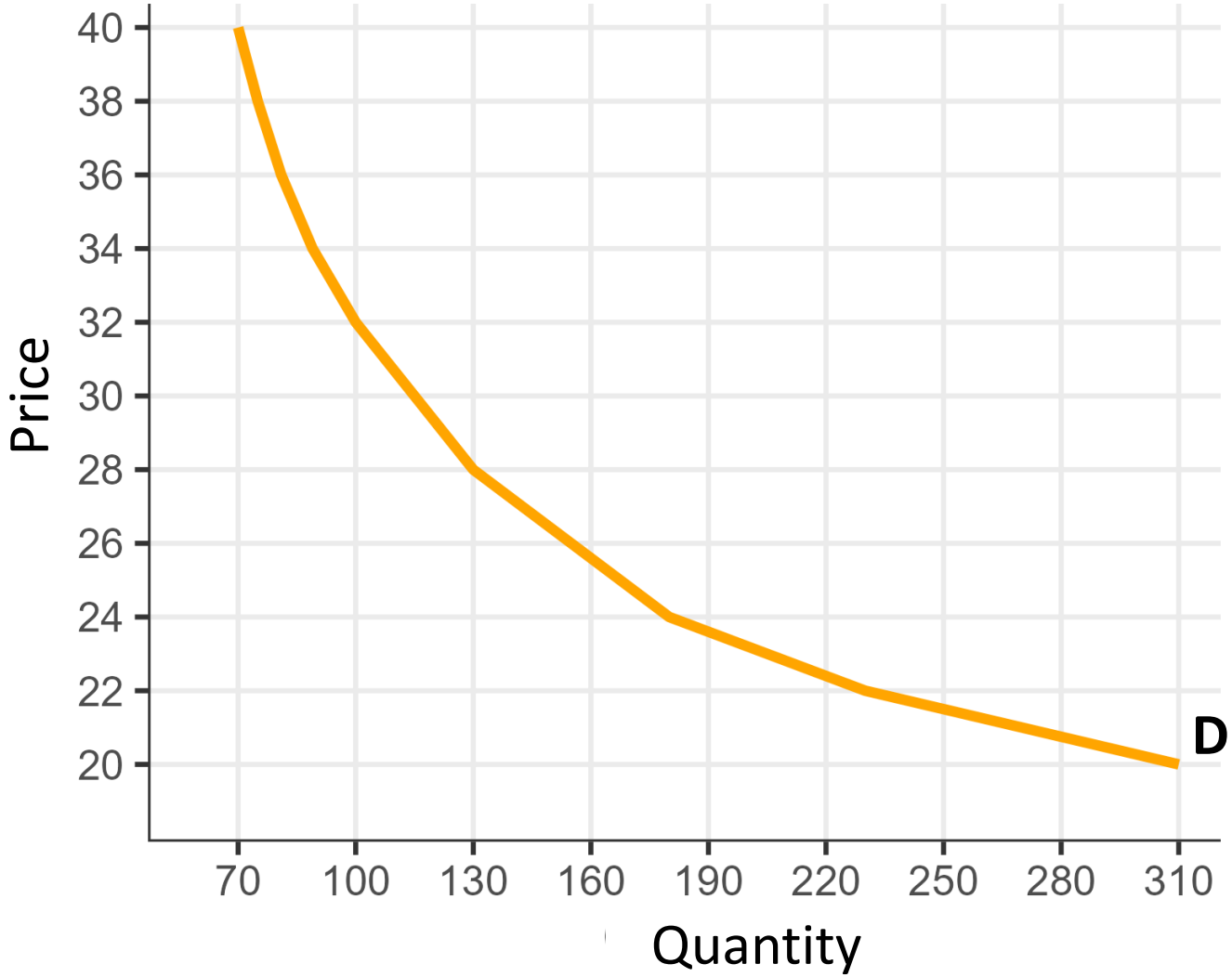
Shifts of the curve

1) Decrease in the price of substitutes
2) Increase in the price of complements
3) Decrease in income (if normal)
4) Increase in income (if inferior)
5) Decline in tastes and preferences
6) Expectation of a decrease in the price
7) Decrease in the number of consumers

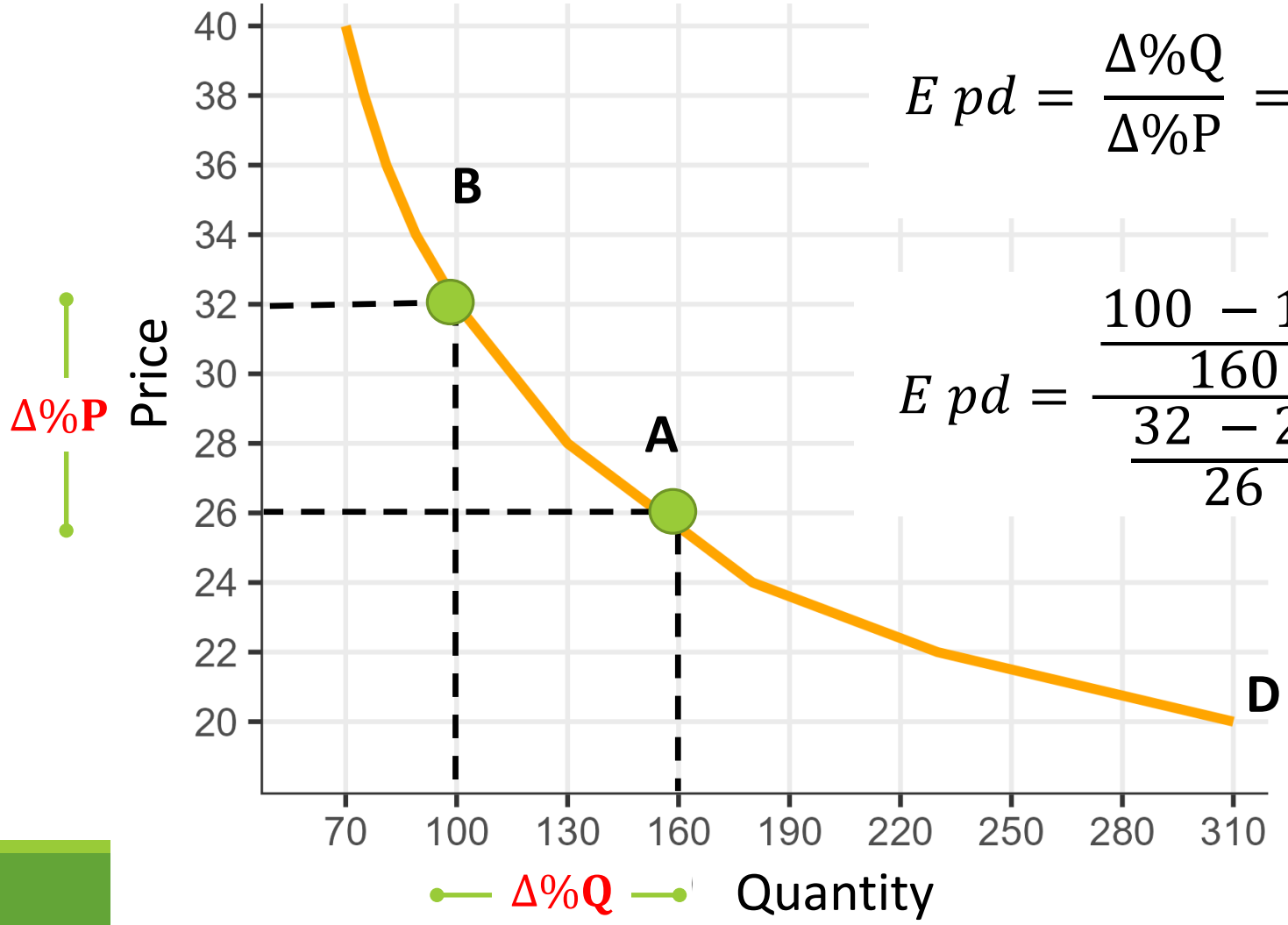
The demand curve: Price elasticity

- We know that the quantity changes when the price changes, but **by how much**?
  - How sensitive is the quantity to changes in P?
- The **elasticity** gives an idea of this **sensitivity**.
- **Price elasticity of demand**: ratio of the percent change in the quantity demanded to the percent change in the price as we move along the demand curve.

Price elasticity of demand



Price elasticity of demand



$$E\,pd = \frac{\Delta\%\mathrm{Q}}{\Delta\%\mathrm{P}} = \frac{\frac{\mathrm{Qf} - \mathrm{Qi}}{\mathrm{Qi}}}{\frac{\mathrm{Pf} - \mathrm{Pi}}{\mathrm{Pi}}} = \frac{\Delta\mathrm{Q}}{\Delta\mathrm{P}}\frac{\mathrm{P}}{\mathrm{Q}}$$

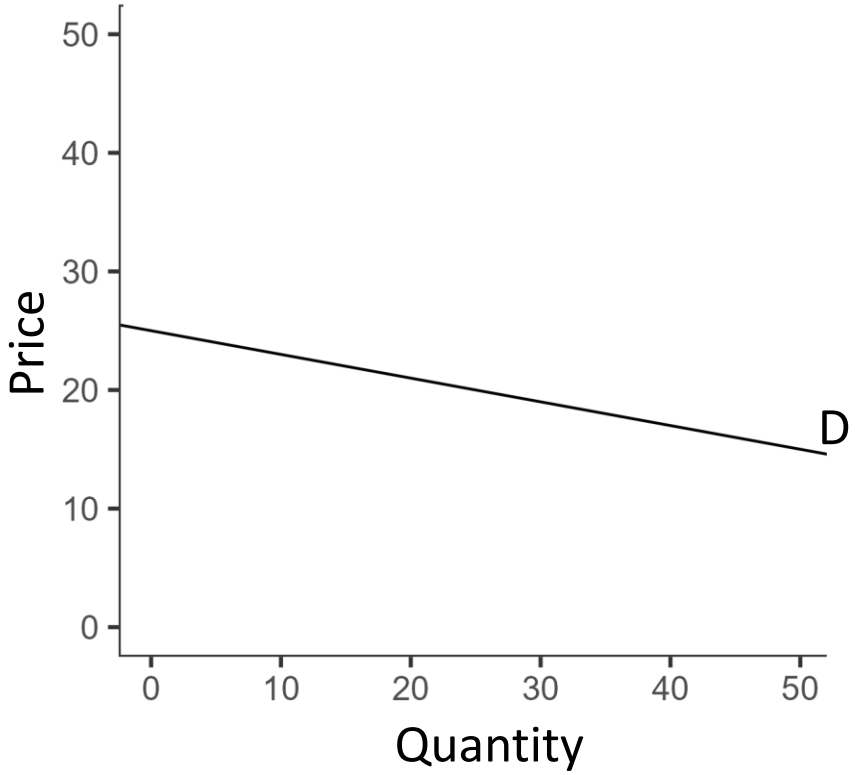
$$E\,pd = \frac{\frac{100 - 160}{160}}{\frac{32 - 26}{26}} = \frac{-0.375}{0.23} = -1.63$$

The demand curve: Price elasticity

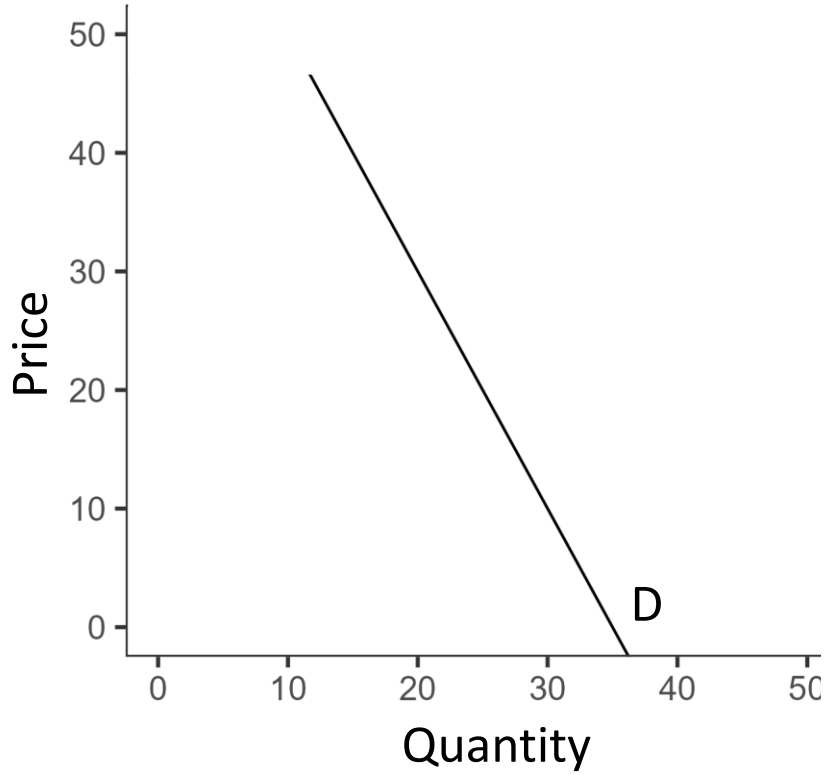
- How is the value of elasticity interpreted?
  - Percent change in quantity from a one percent change in price.
- What does the value of the price elasticity of demand mean?
  - Demand is **elastic** if the absolute value of the price elasticity of demand is **greater than 1**.
  - Demand is **inelastic** if the absolute value of the price elasticity of demand is **less than 1.**
  - Demand is **unit-elastic** if the absolute value of the price elasticity of demand is **exactly 1.**

Price elasticity of demand

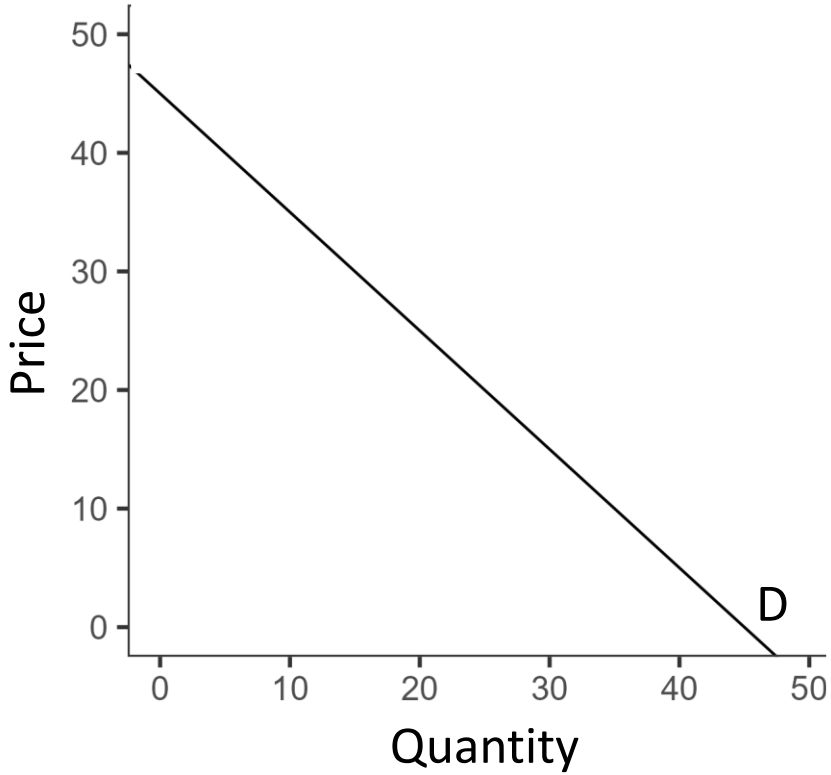
Elastic



Inelastic

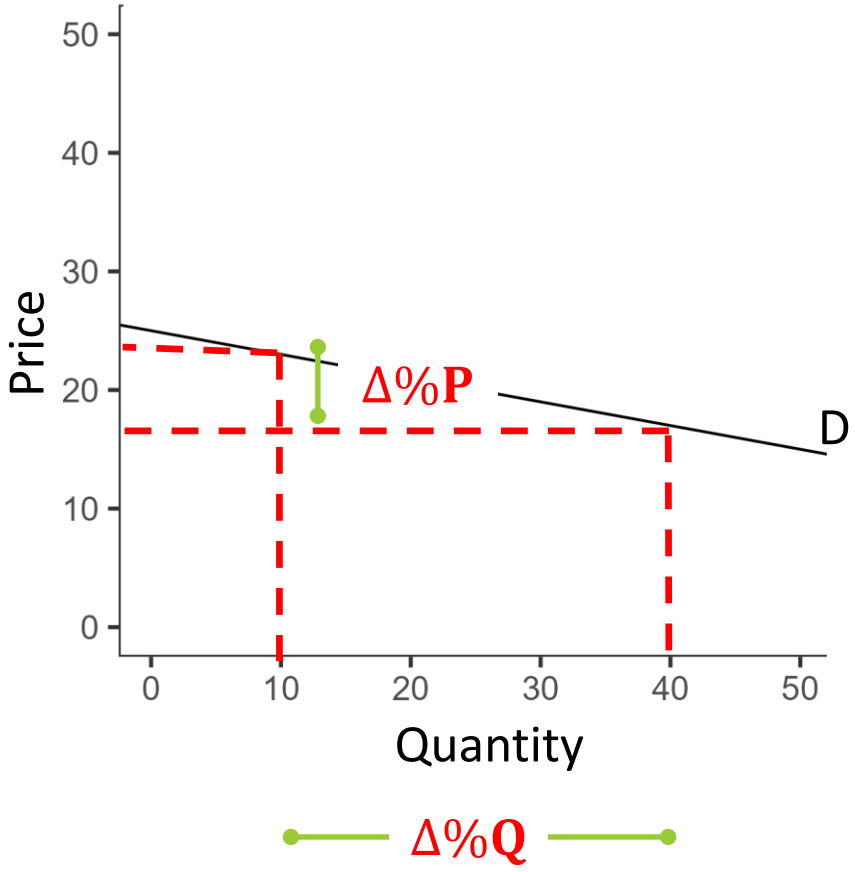


Unit-elastic

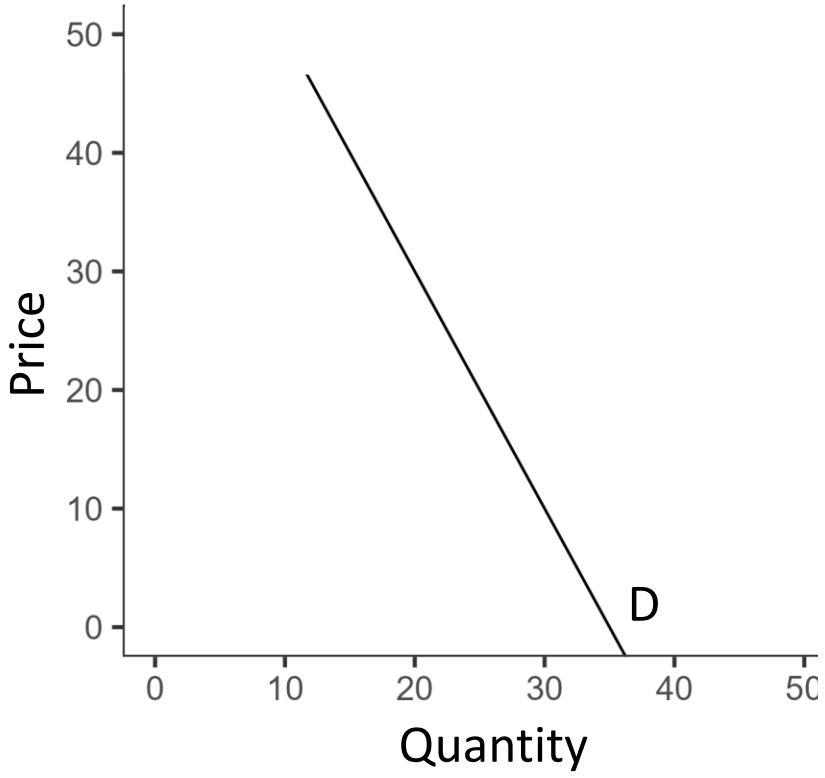


Price elasticity of demand

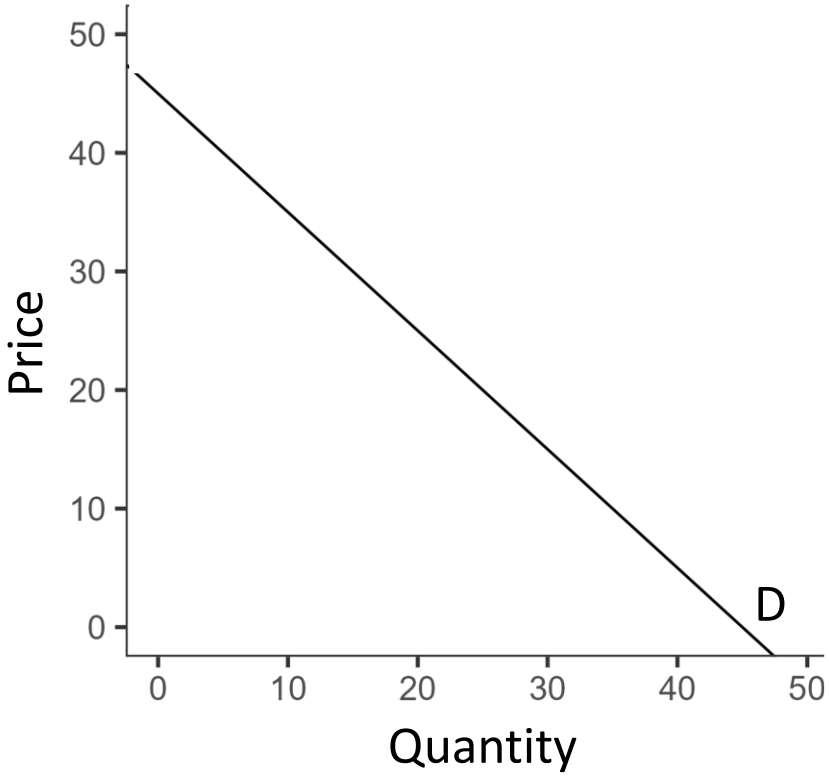
Elastic



Inelastic

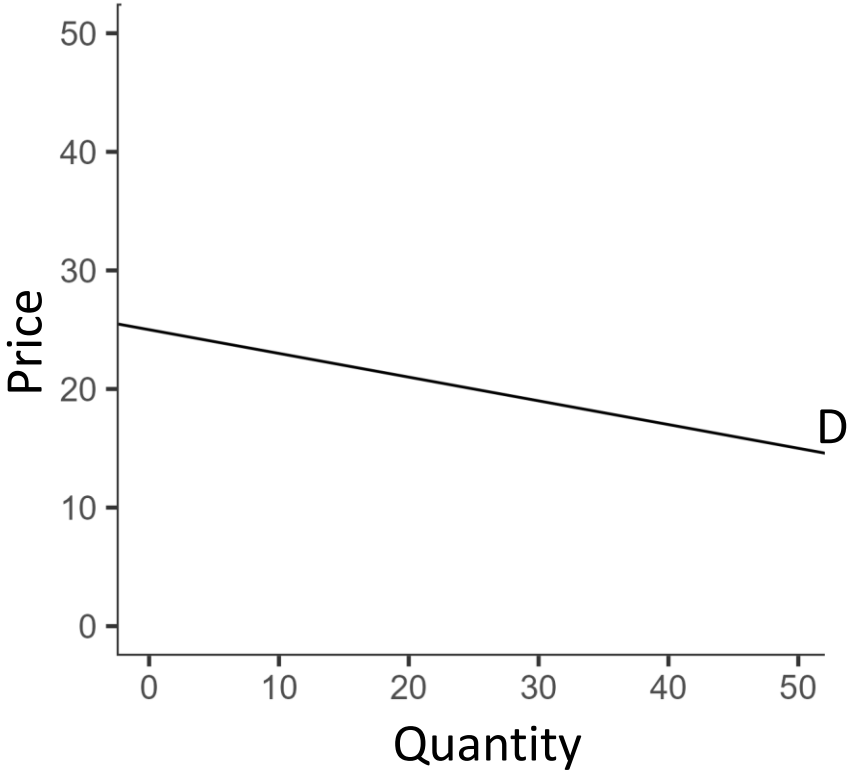


Unit-elastic



Price elasticity of demand

Elastic



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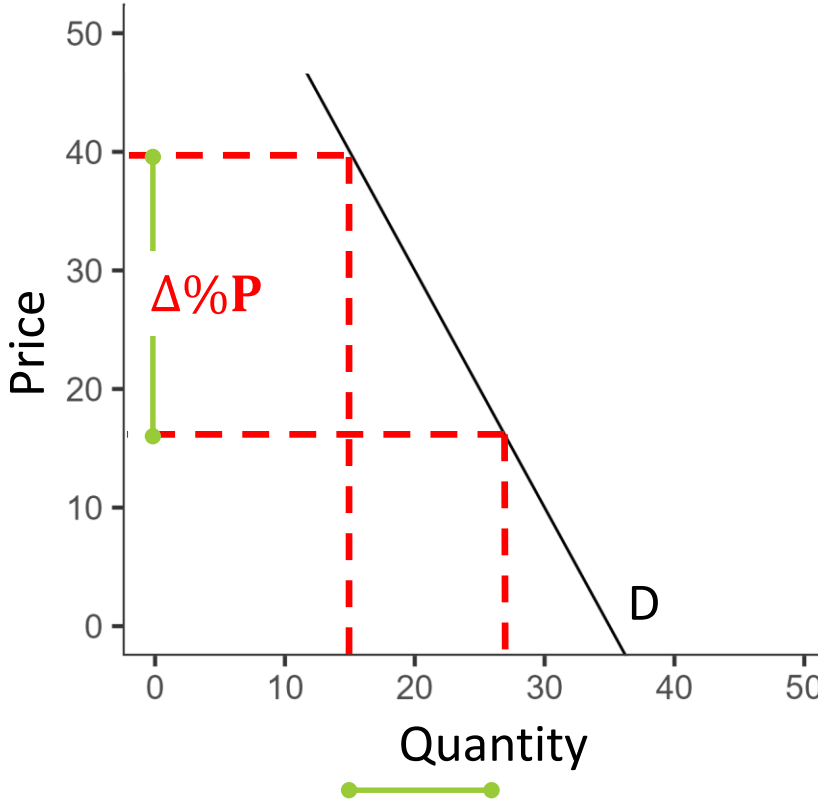
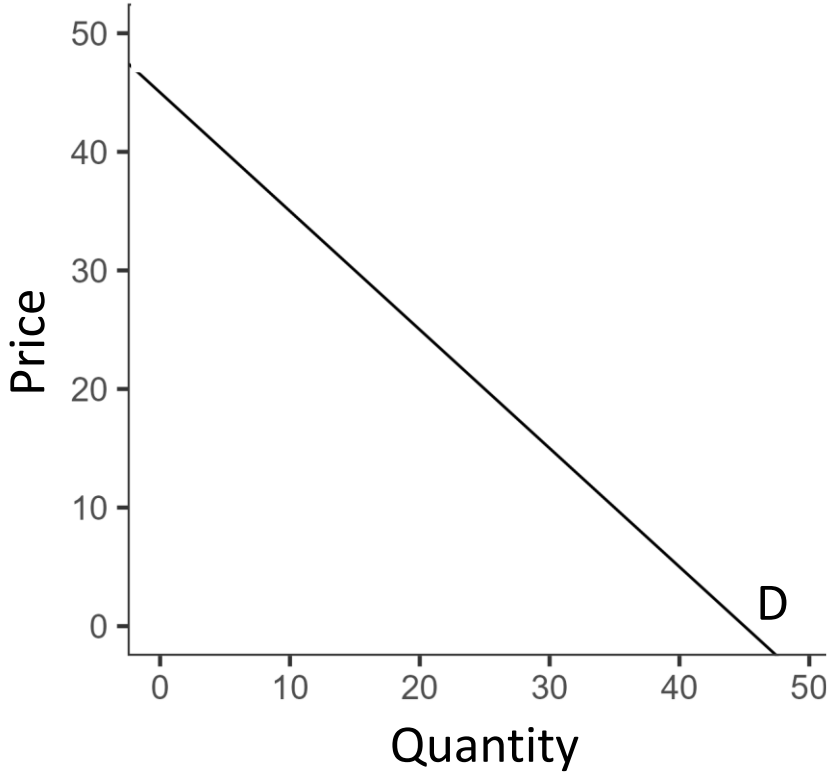
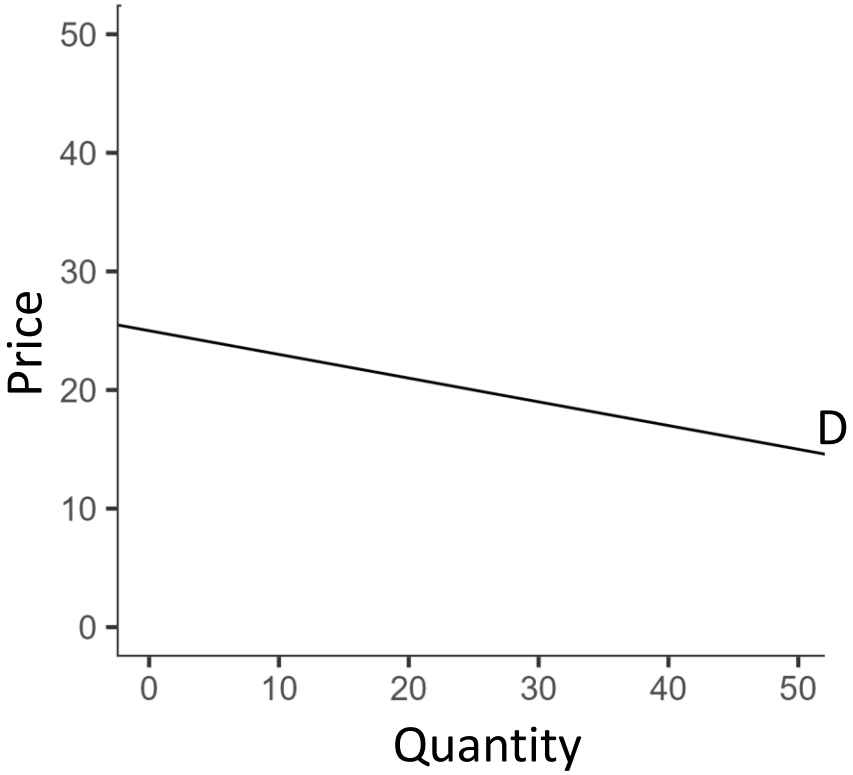


Unit-elastic

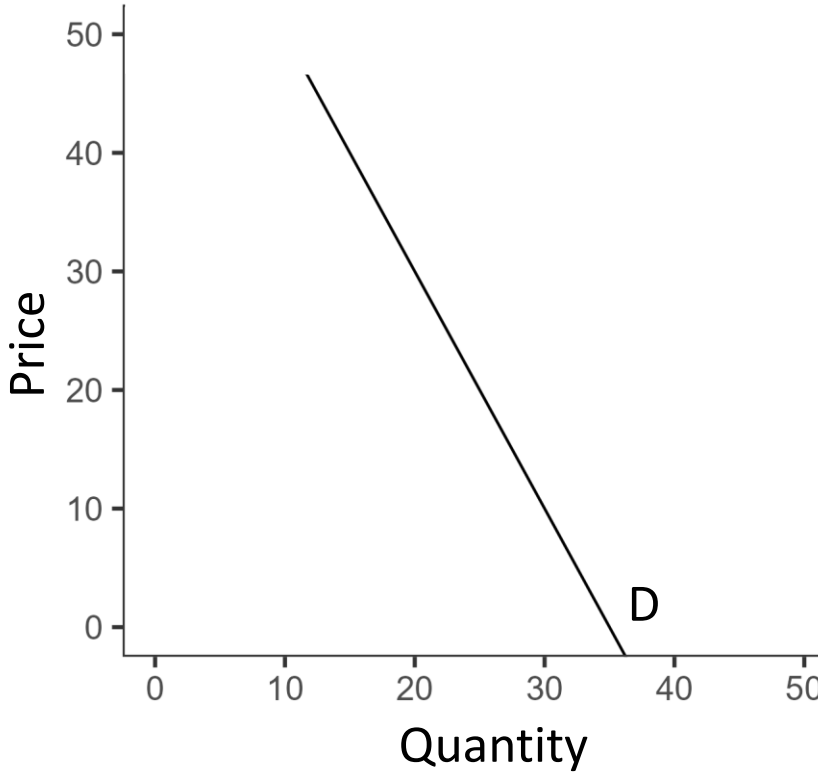


Price elasticity of demand

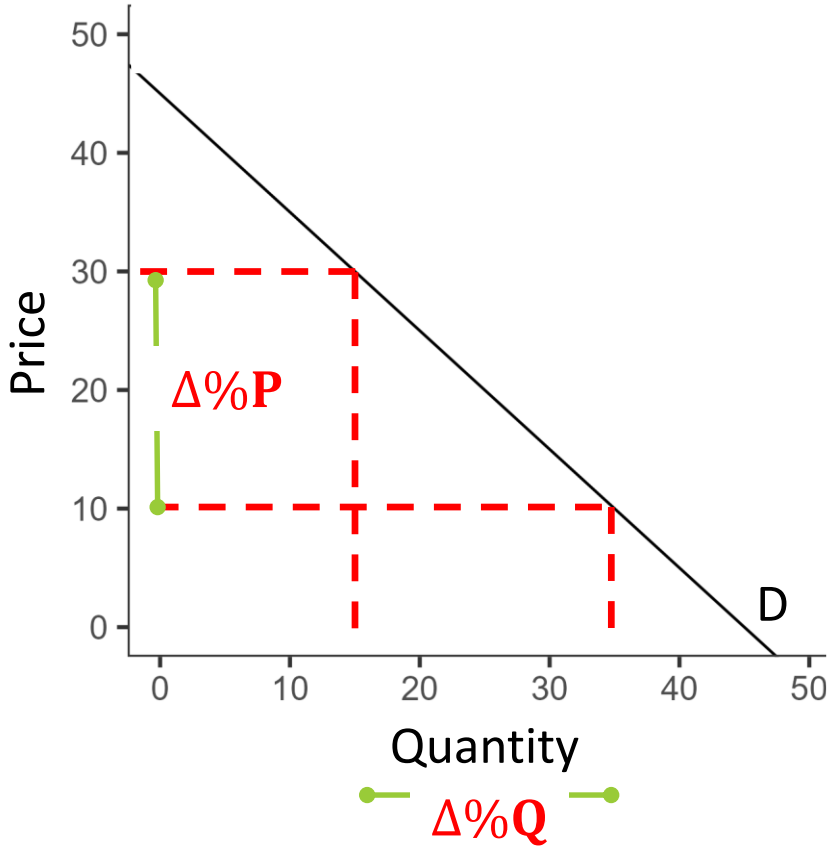
Elastic



Inelastic



Unit-elastic

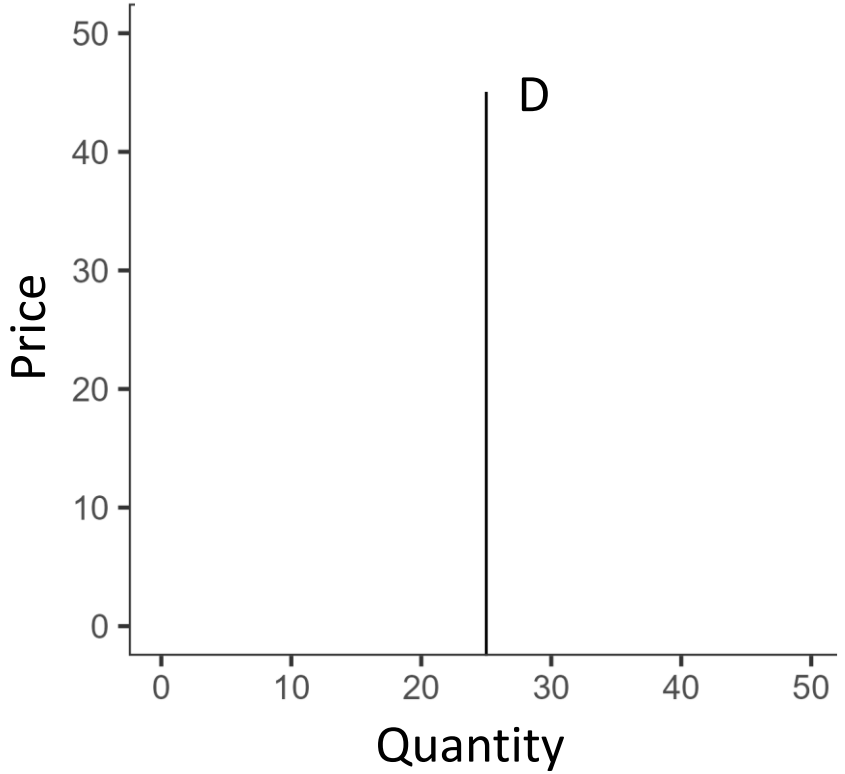


The demand curve: Price elasticity

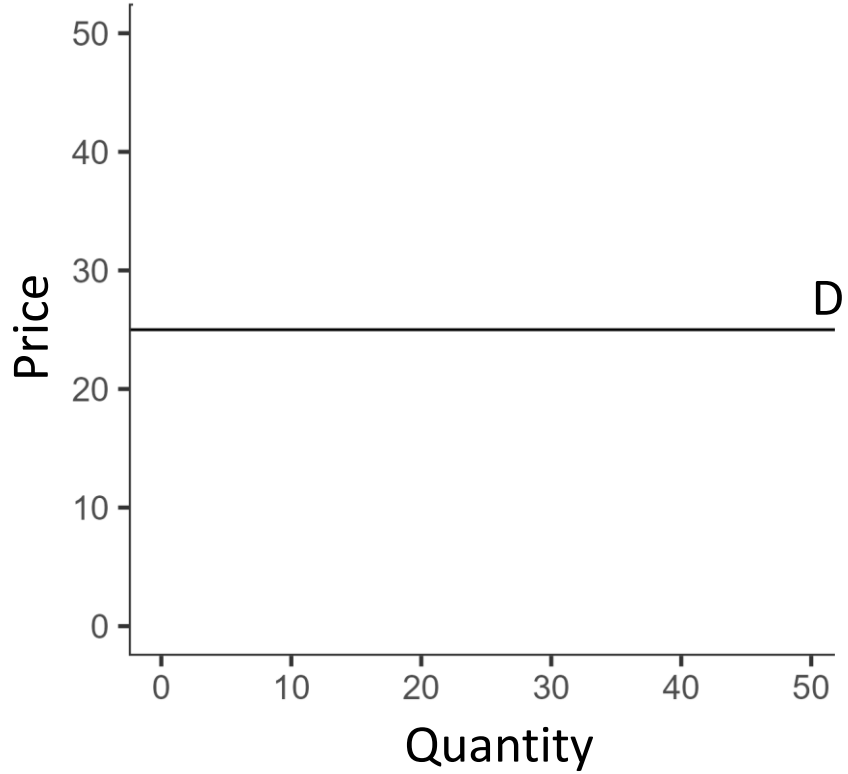
- Extreme cases:
  - Demand is **perfectly inelastic**: when the quantity demanded does not respond at all to changes in the price.
    - The price elasticity of demand is zero.
  - Demand is **perfectly elastic**: when any price increase will cause the quantity demanded to drop to zero.
    - The price elasticity of demand is infinite.

Price elasticity of demand

Perfectly inelastic



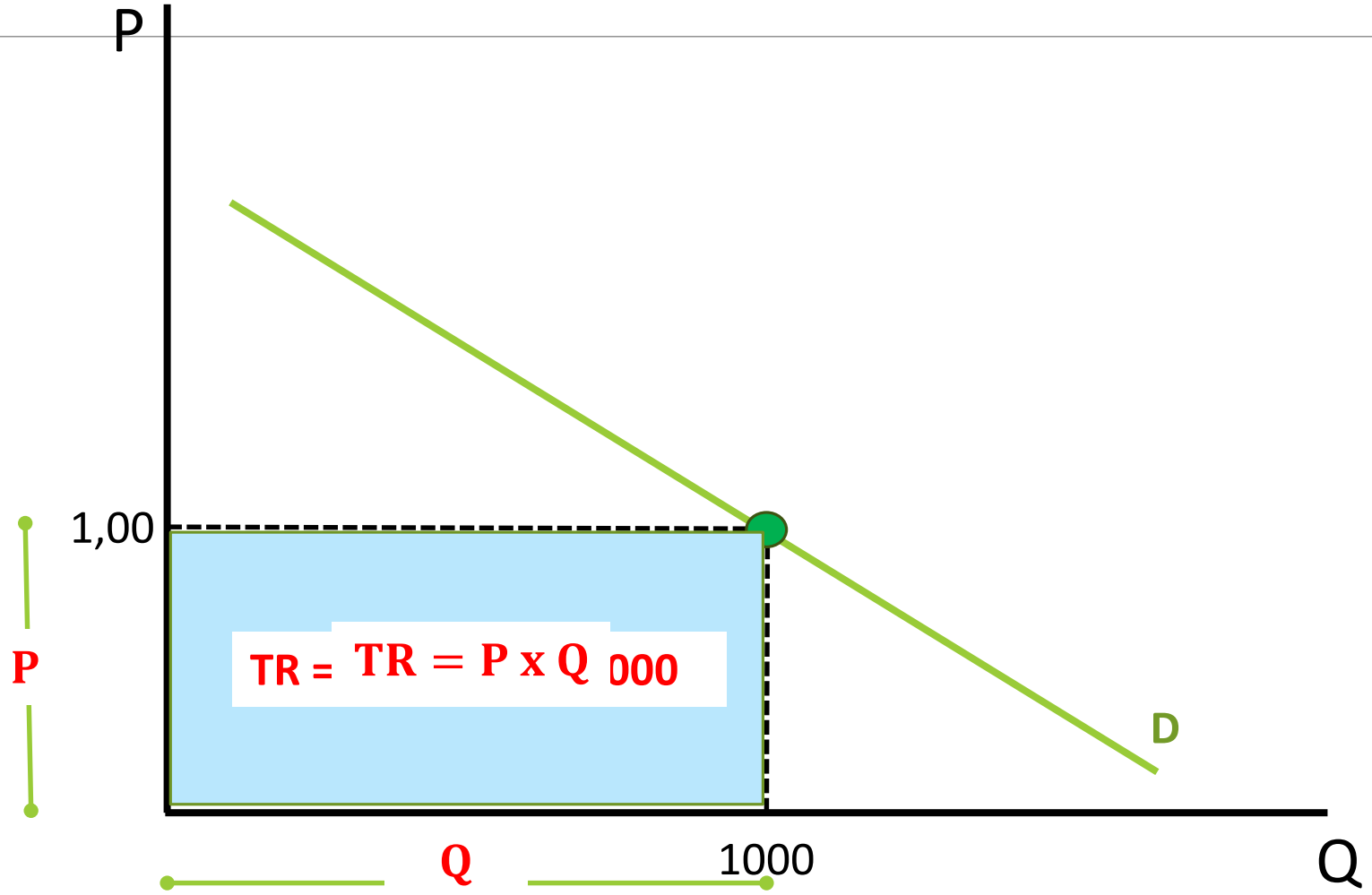
Perfectly elastic



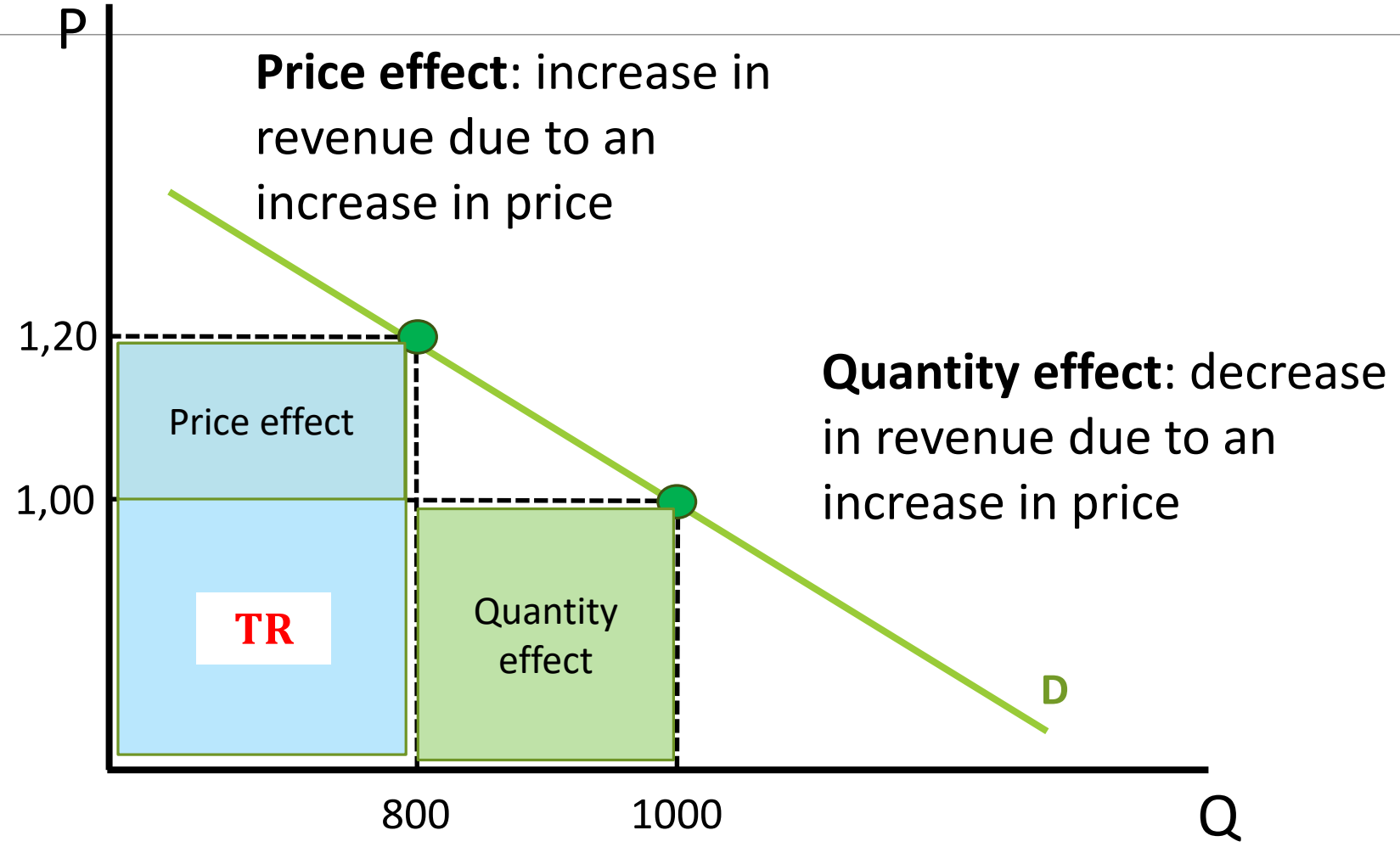
The demand curve: Price elasticity

- If the price elasticity of demand is known, the total revenue can be calculated.
  - **Total revenue**: total value of sales of a good or service.
  - **TR = P x Q**

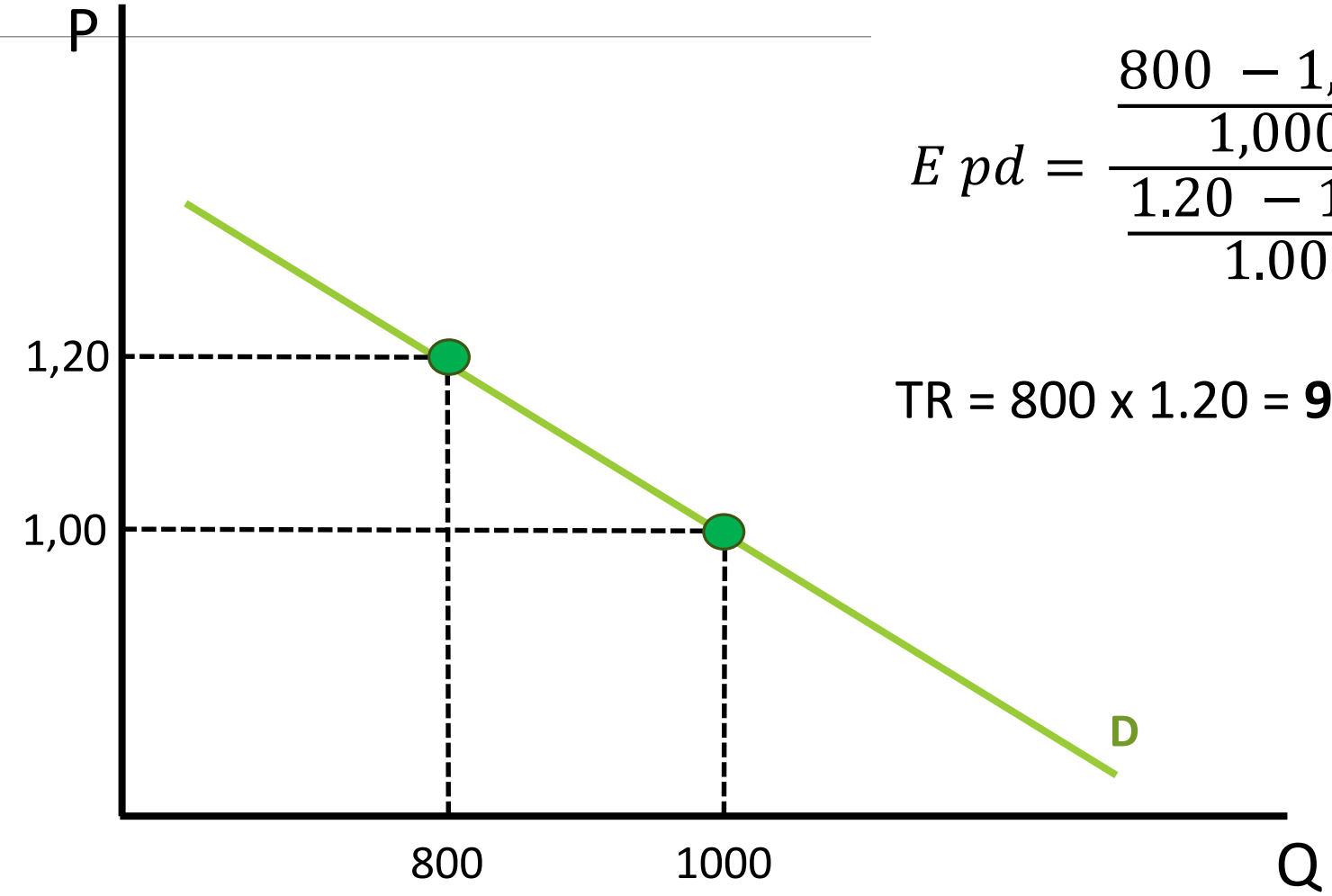
Changes in income due to price elasticity



Changes in income due to price elasticity



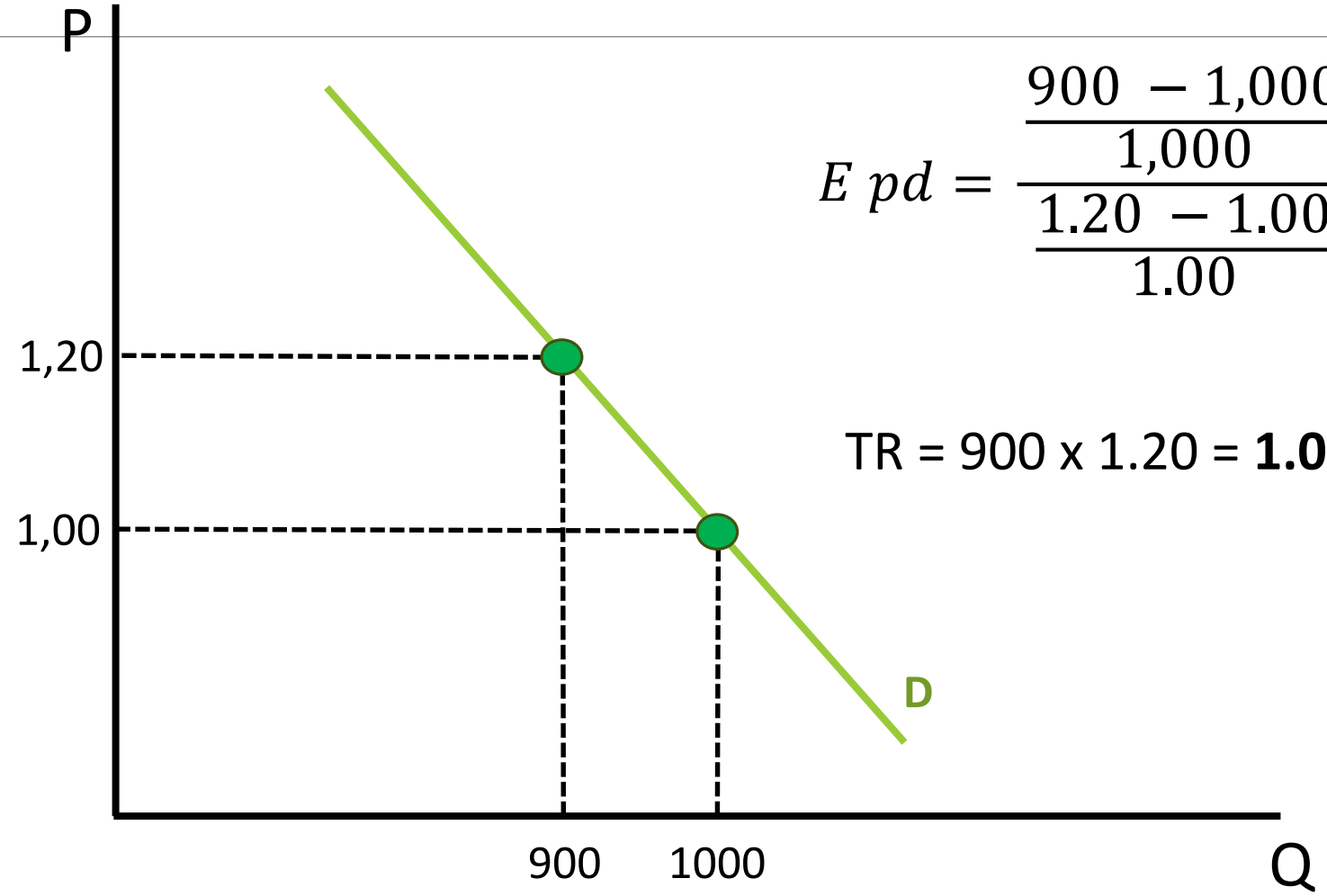
Changes in income due to price elasticity



$$E\,pd = \frac{\frac{800\ -1{,}000}{1{,}000}}{\frac{1.20\ -1.00}{1.00}} = \frac{-0.2}{0.2} = -1$$

TR = 800 x 1.20 = **960**

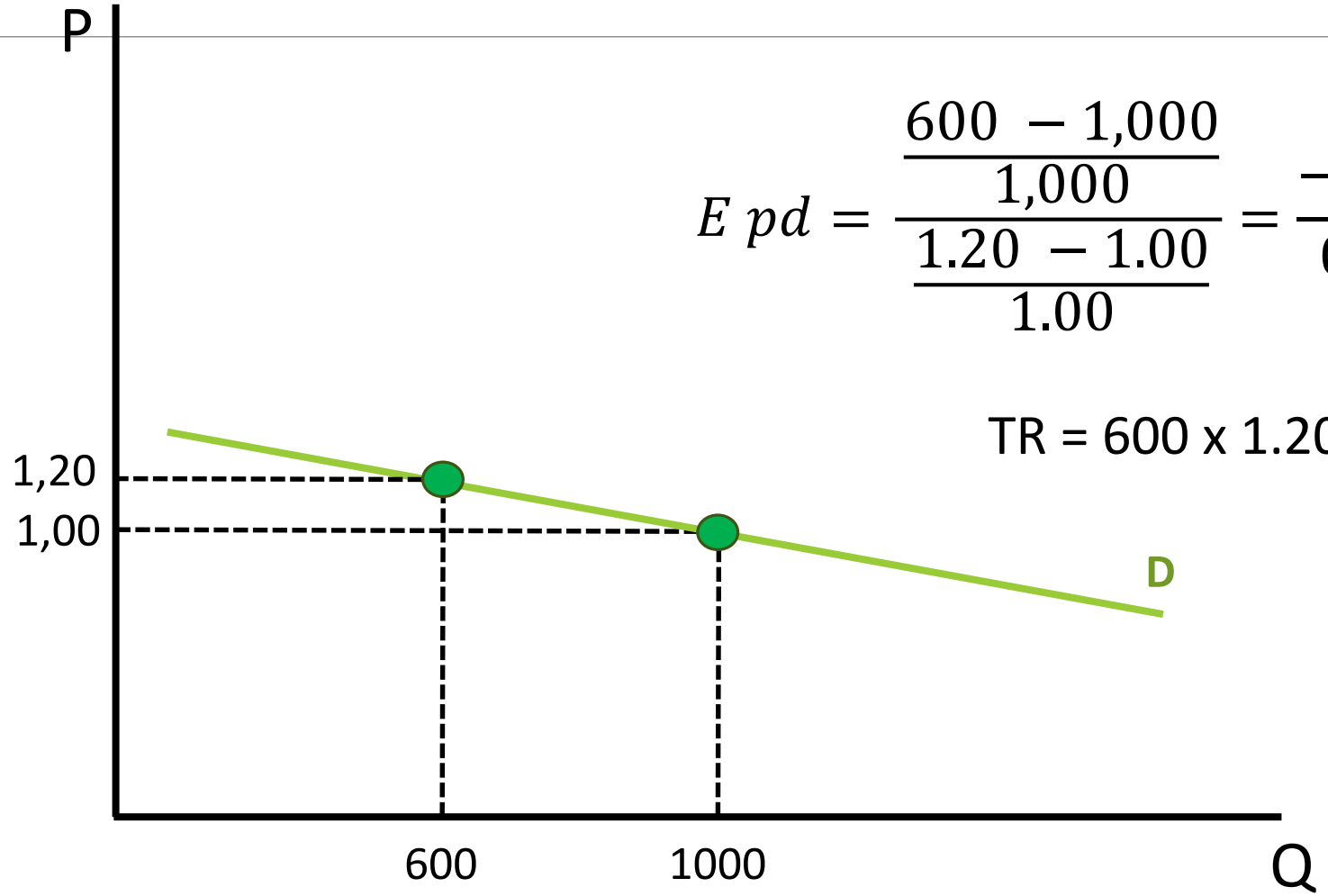
Changes in income due to price elasticity



$$E\,pd = \frac{\frac{900\ -1{,}000}{1{,}000}}{\frac{1.20\ -1.00}{1.00}} = \frac{-0.1}{0.2} = -0.5$$

TR = 900 x 1.20 = **1.080**

Changes in income due to price elasticity



$$E\ pd = \frac{\frac{600\ -1{,}000}{1{,}000}}{\frac{1.20\ -1.00}{1.00}} = \frac{-0.4}{0.2} = -2$$

TR = 600 x 1.20 = **720**

The demand curve: Price elasticity

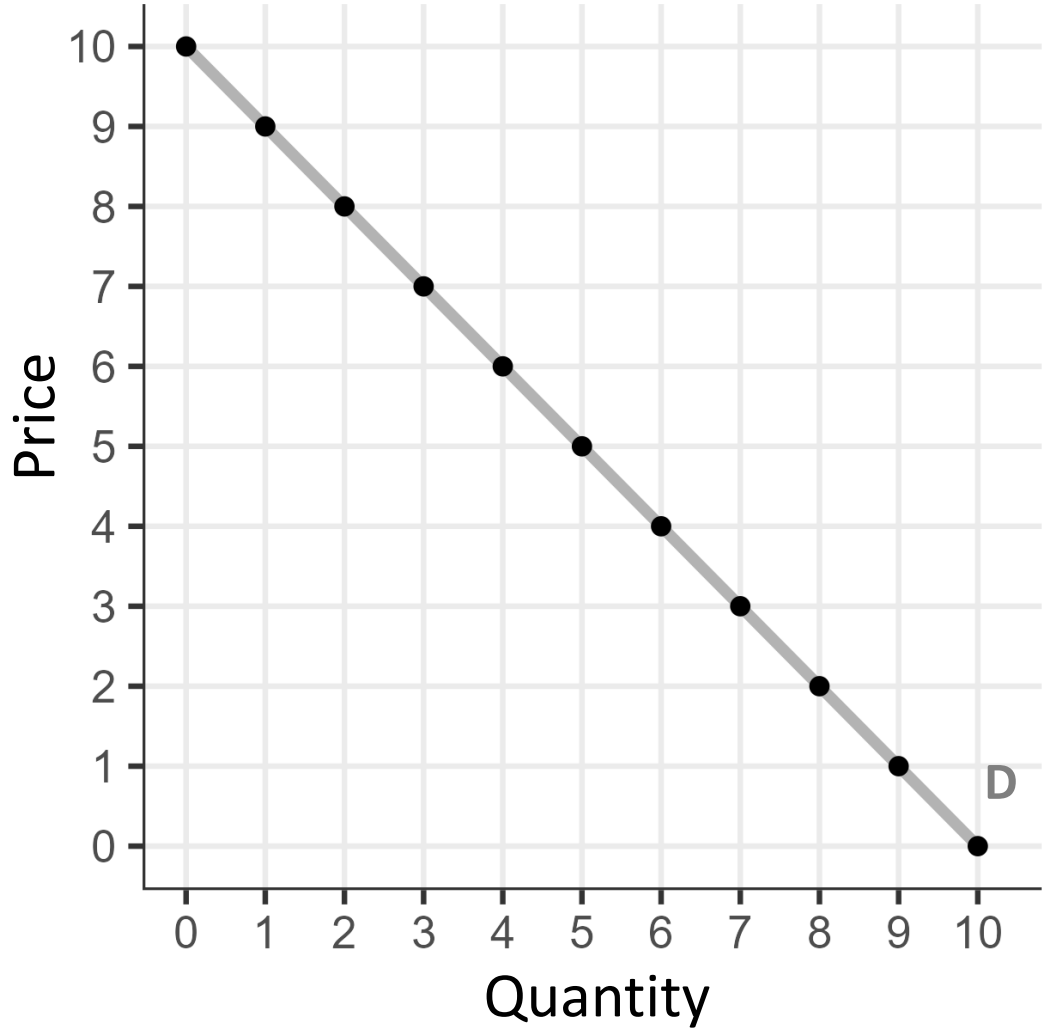
	Price = 1.00	Price = 1.20
Unit-elastic demand		
Quantity demanded	1,000	800
Total revenue	1,000	960 ↓
Elastic demand		
Quantity demanded	1,000	600
Total revenue	1,000	720 ↓
Inelastic demand		
Quantity demanded	1,000	900
Total revenue	1,000	1.080 ↑

Conclusion: Increasing the price, even very little, will not always increase revenue. Even lowering prices can be a good strategy to increase revenue.

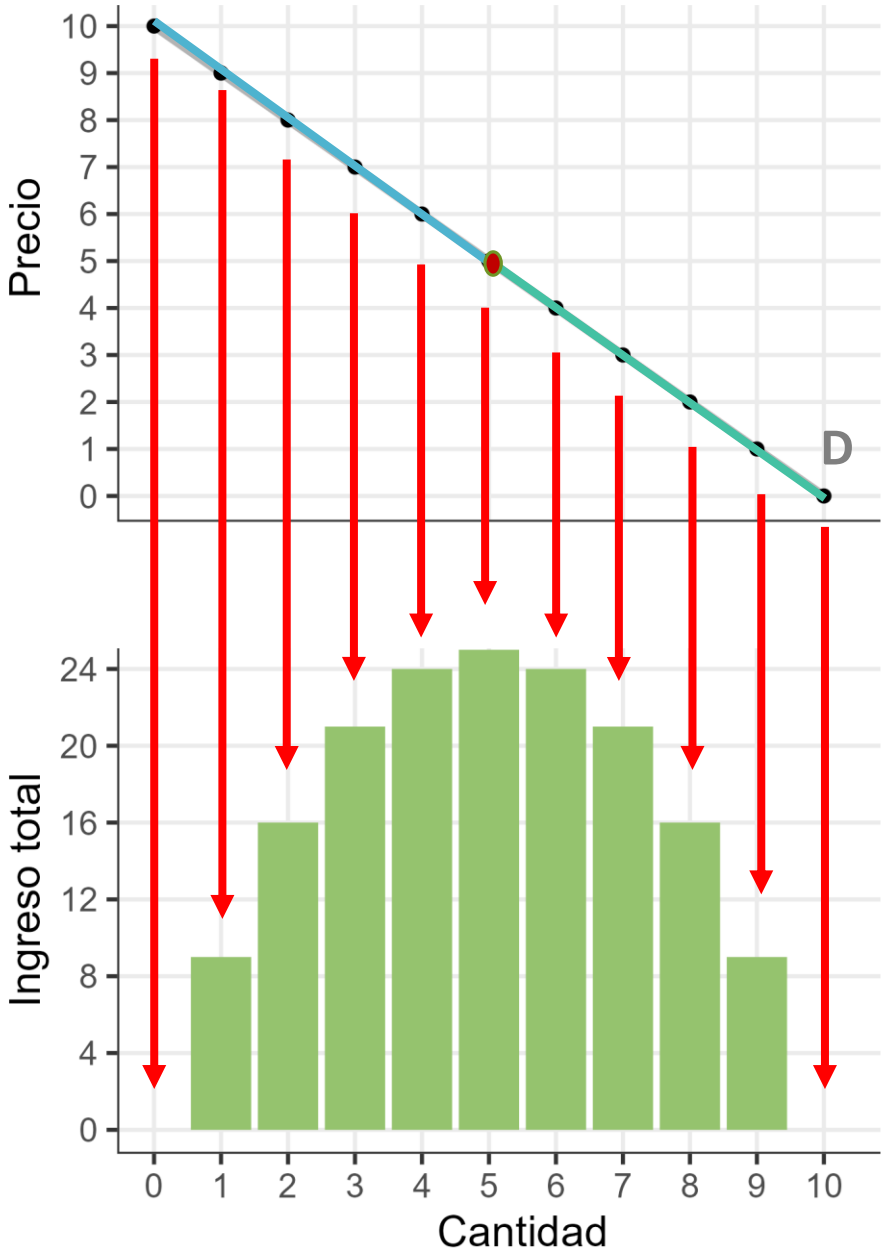
The demand curve: Price elasticity

- Price elasticity along the demand curve:
  - **Elasticity varies** depending on the section of the curve.

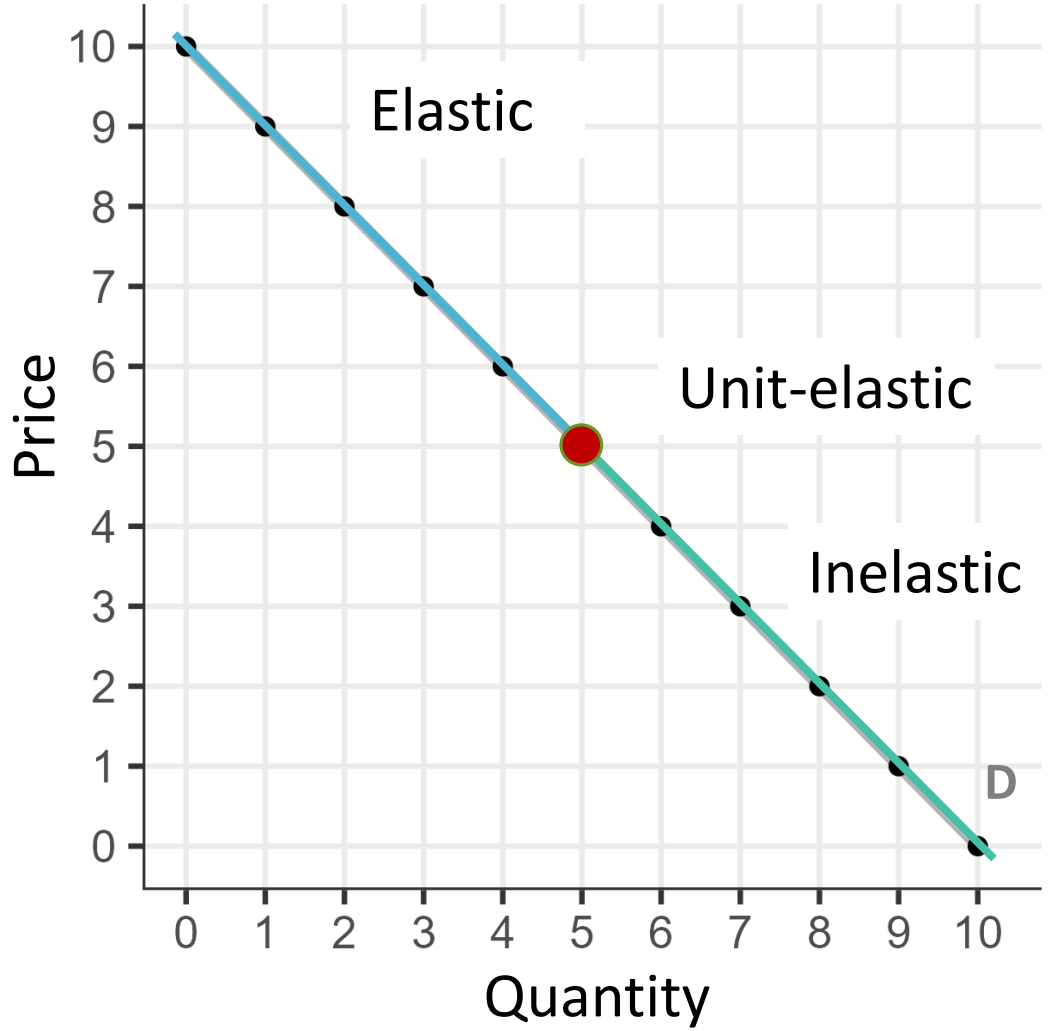
Price elasticity along the demand curve



Price elasticity of demand and total revenue



Price elasticity along the demand curve



The demand curve: Price elasticity

- Factors determining the price elasticity of demand:
  - If it is a **luxury good** or a **necessity**: if it is a luxury good, it is more elastic.
  - Availability of **close substitutes**: if it has many substitutes it is more elastic.
  - **Share of income** spent on the good: if it is a considerable expense it is more elastic. Example: fuel. For heavy car users, an increase in gasoline prices leads to less car usage.
  - **Time elapsed since the price changed**: if there is a long time to adapt to the new price then the good tends to be more elastic. Goods and services tend to be more elastic in the long run.

Outline

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   - Factors that change demand.
   - Movements along the curve and shifts of the curve.
   - Price elasticity of demand.

2. Supply:
   - Factors that change supply.
   - Movements along the curve and shifts of the curve.
   - Price elasticity of supply.

3. Market equilibrium:
   - Changes in equilibrium due to shifts of curves.

4. Price controls:
   - Price ceilings and price floors.
   - Taxes.

The supply curve

- The **amount** that is planned to be **produced**, the **investments** that are made and the **start-up** of enterprises depend on the **price** that is expected to be received in return for the production.

- **The quantity supplied** varies depending on the **price expected to be charged**.

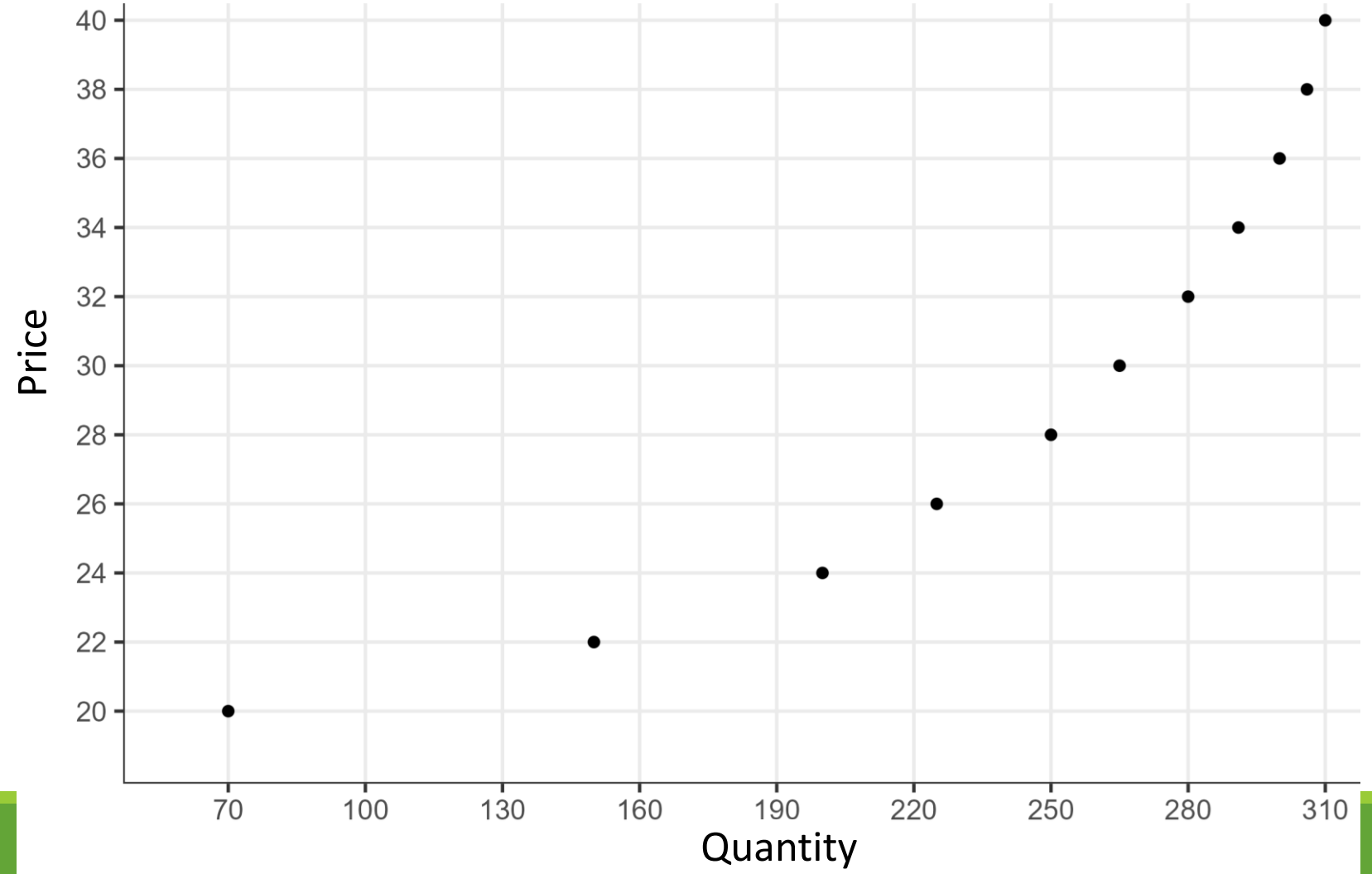
- **Quantity supplied**: actual amount of a good or service people are willing to sell at some specific price.

The supply curve

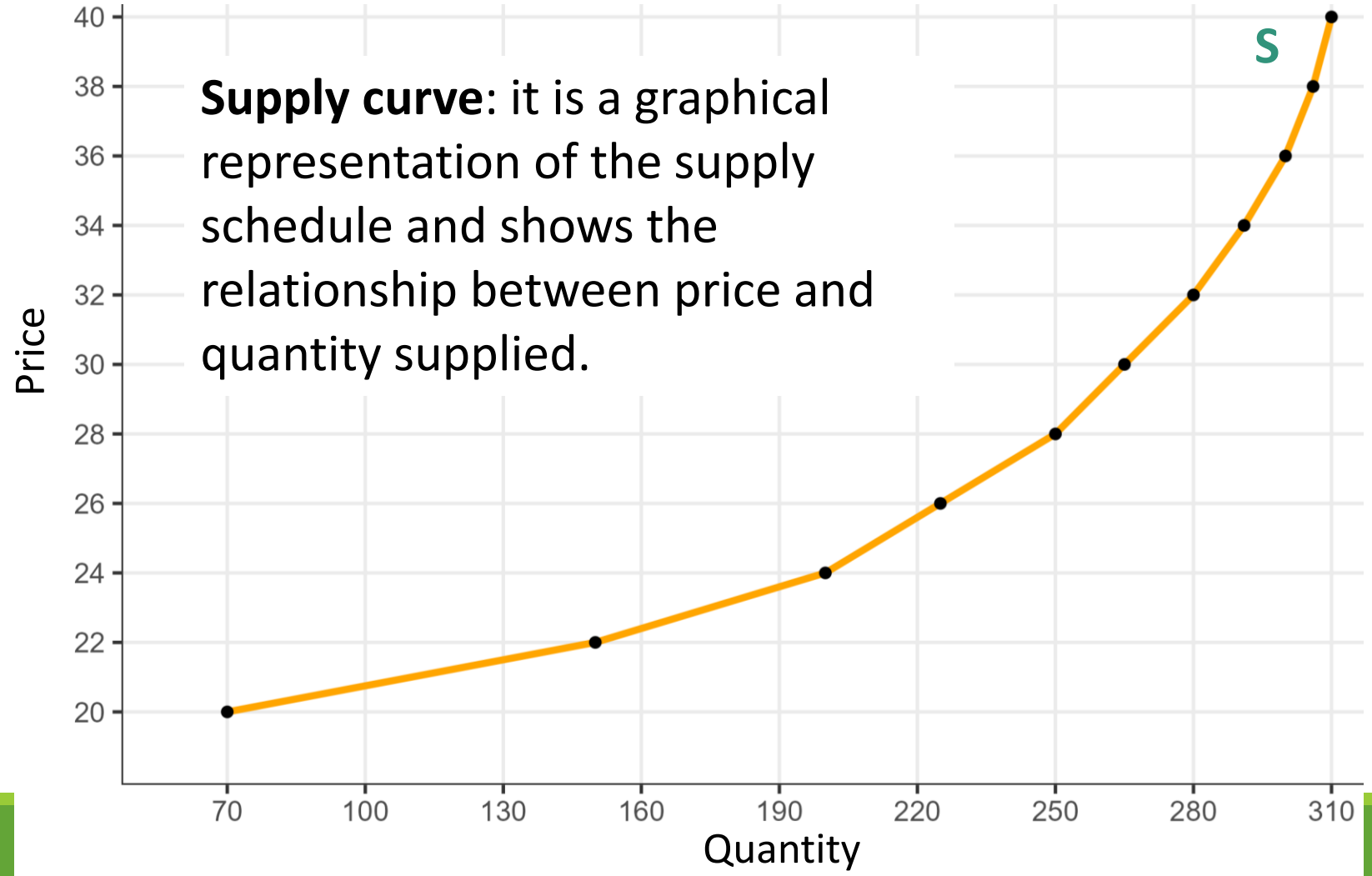
Price	Quantity
20	70
22	150
24	200
26	225
28	250
30	265
32	280
34	291
36	300
38	306
40	310

Supply schedule:
How much of a good or service will be supplied at different prices

The supply curve

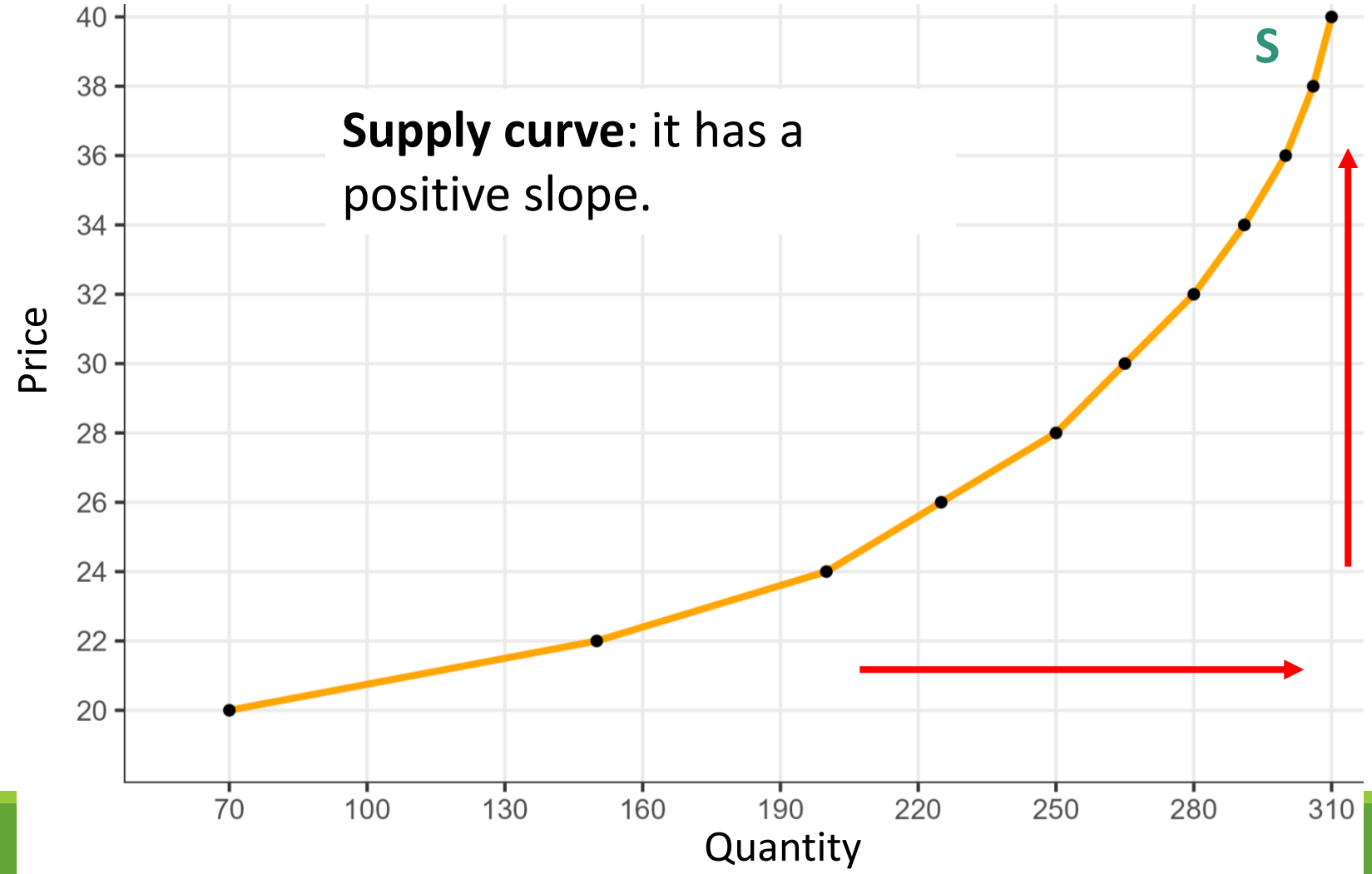


The supply curve

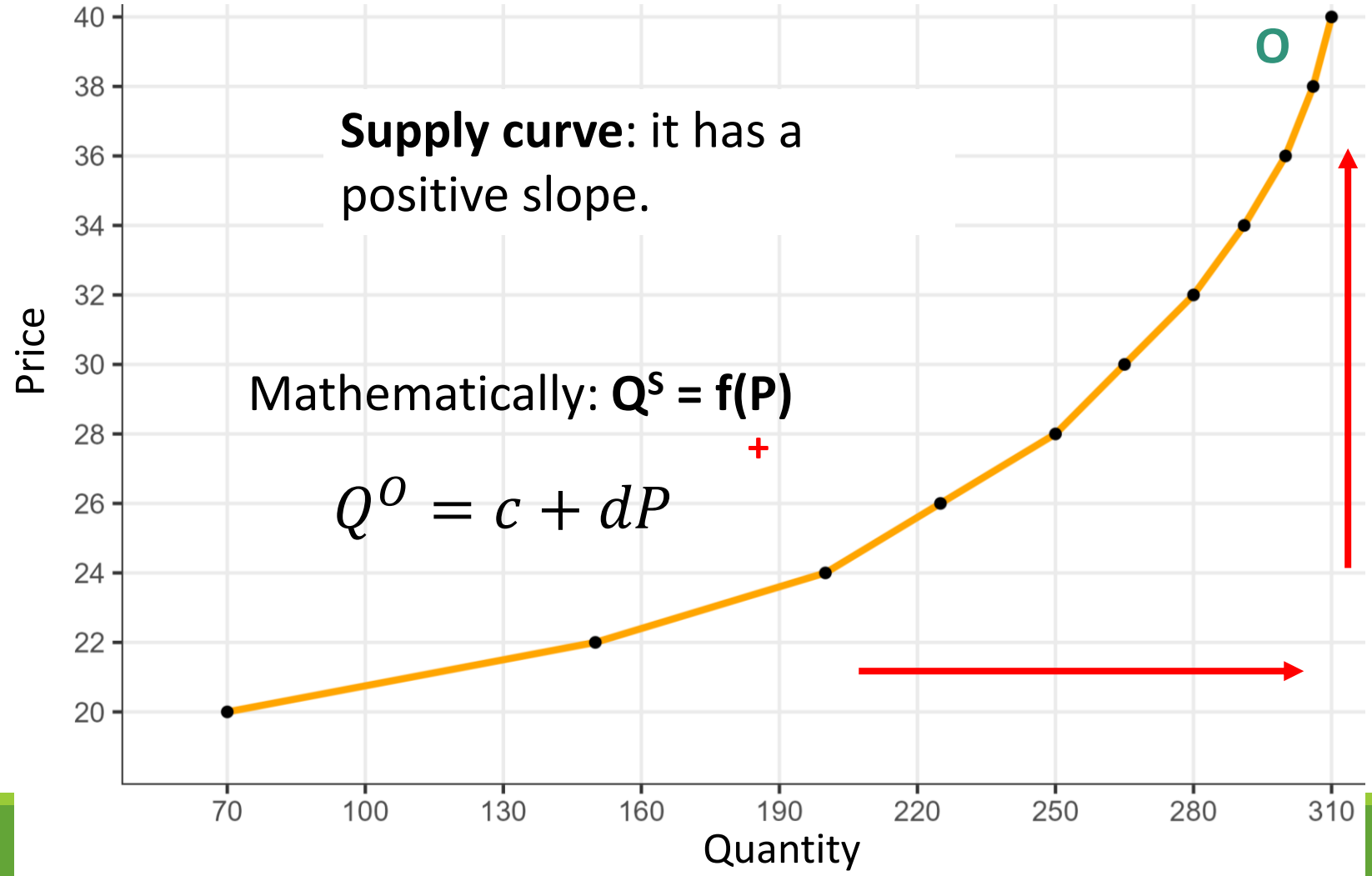


Supply curve: it is a graphical representation of the supply schedule and shows the relationship between price and quantity supplied.

The supply curve



The supply curve

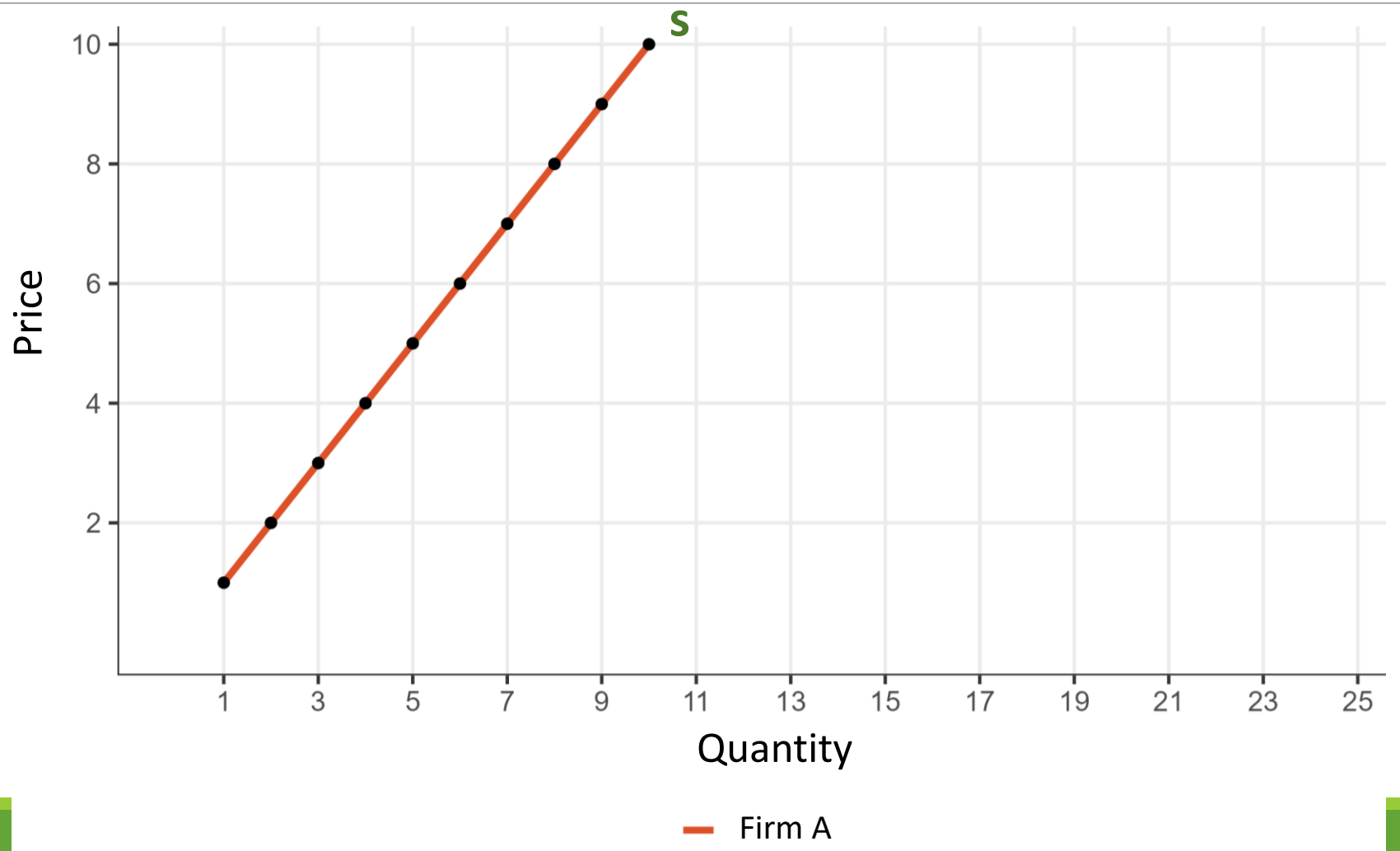


Individual and market supply curve

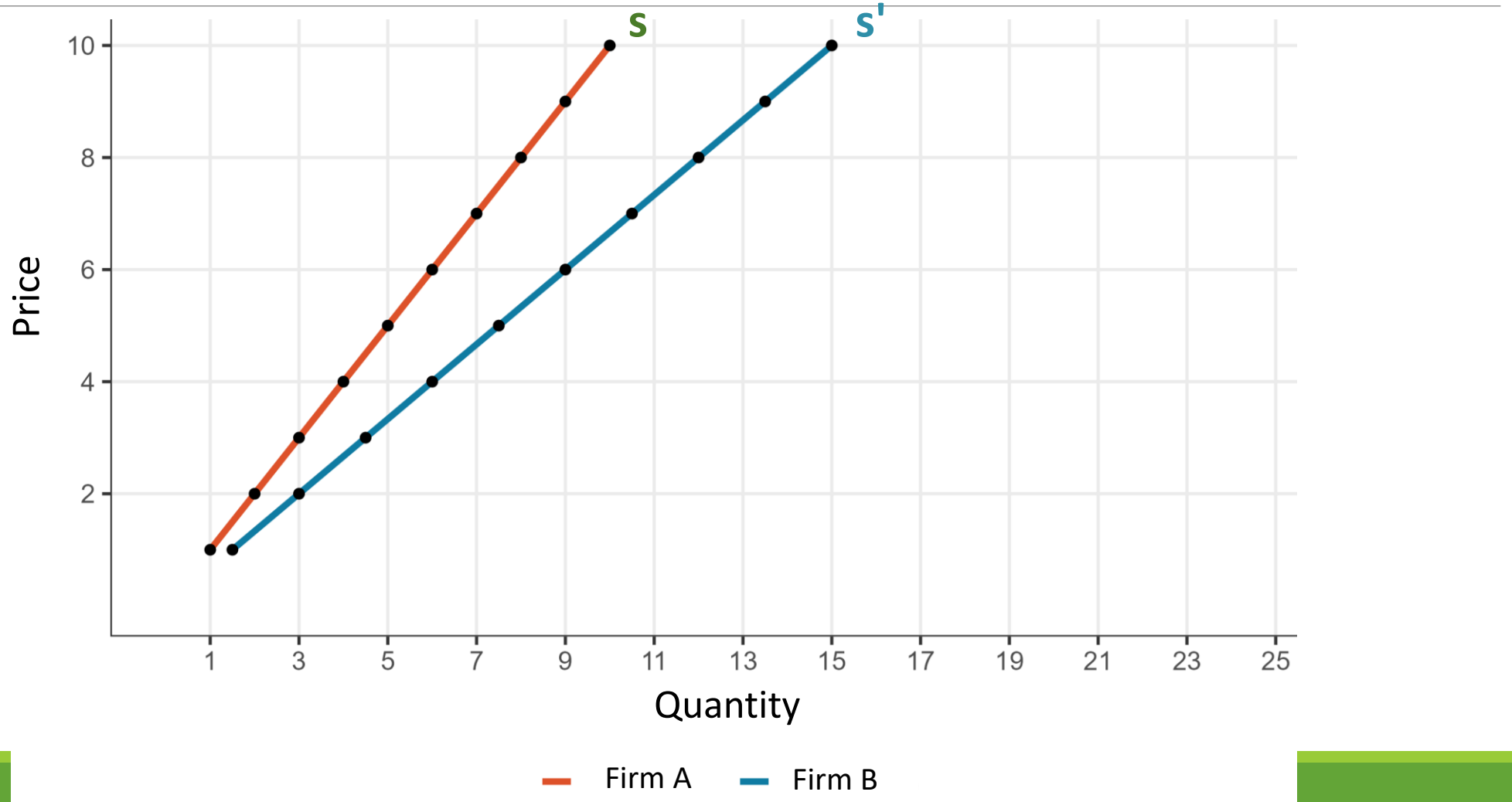
- The **individual supply curve** illustrates the relationship between quantity supplied and price for an individual producer.

- The **market supply curve** is the horizontal sum of the individual supply curves.

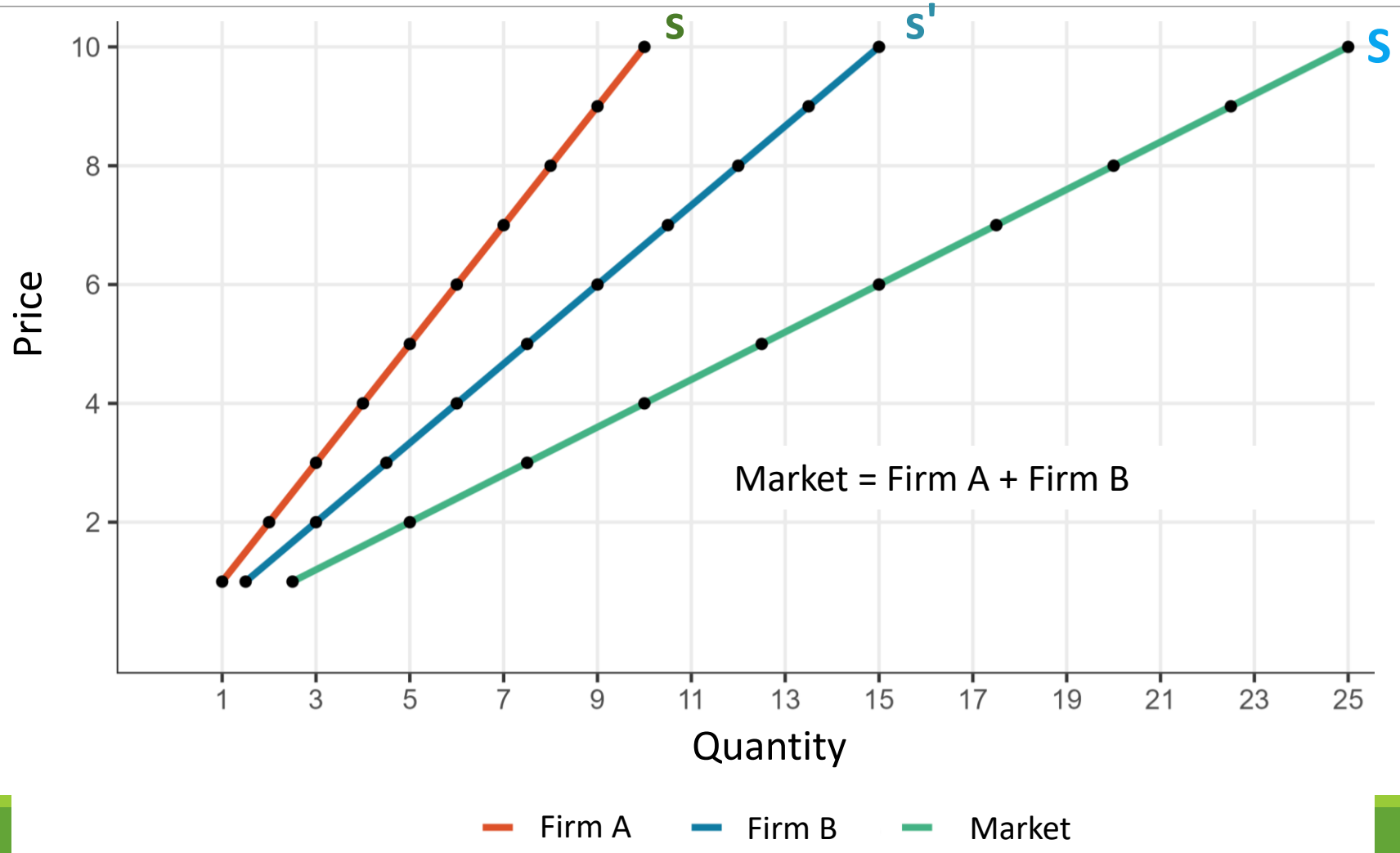
Market supply curve



Market supply curve



Market supply curve



Factors that change supply

- **Input prices**: Inverse relationship. Examples: ice cream cones; flour for bread; fuel and flights.
  - Input is a good or service that is used to produce another good or service.

- **Prices of related goods or services**:
  - Substitutes in production: Less of one good is produced if the price of the other increases. Inverse relationship. Examples: a refinery produces diesel and fuel; a textile mill produces coats and T-shirts (but it is summer!).
  - Complements in production: More of one good is produced if the price of the other increases. Direct relationship. Example: gas and oil; cheese and milk on a farm.

Factors that change supply

- **Technology**: technological improvements lower costs. Direct relationship. Example: mechanical arms in car factories; software for balance sheets.

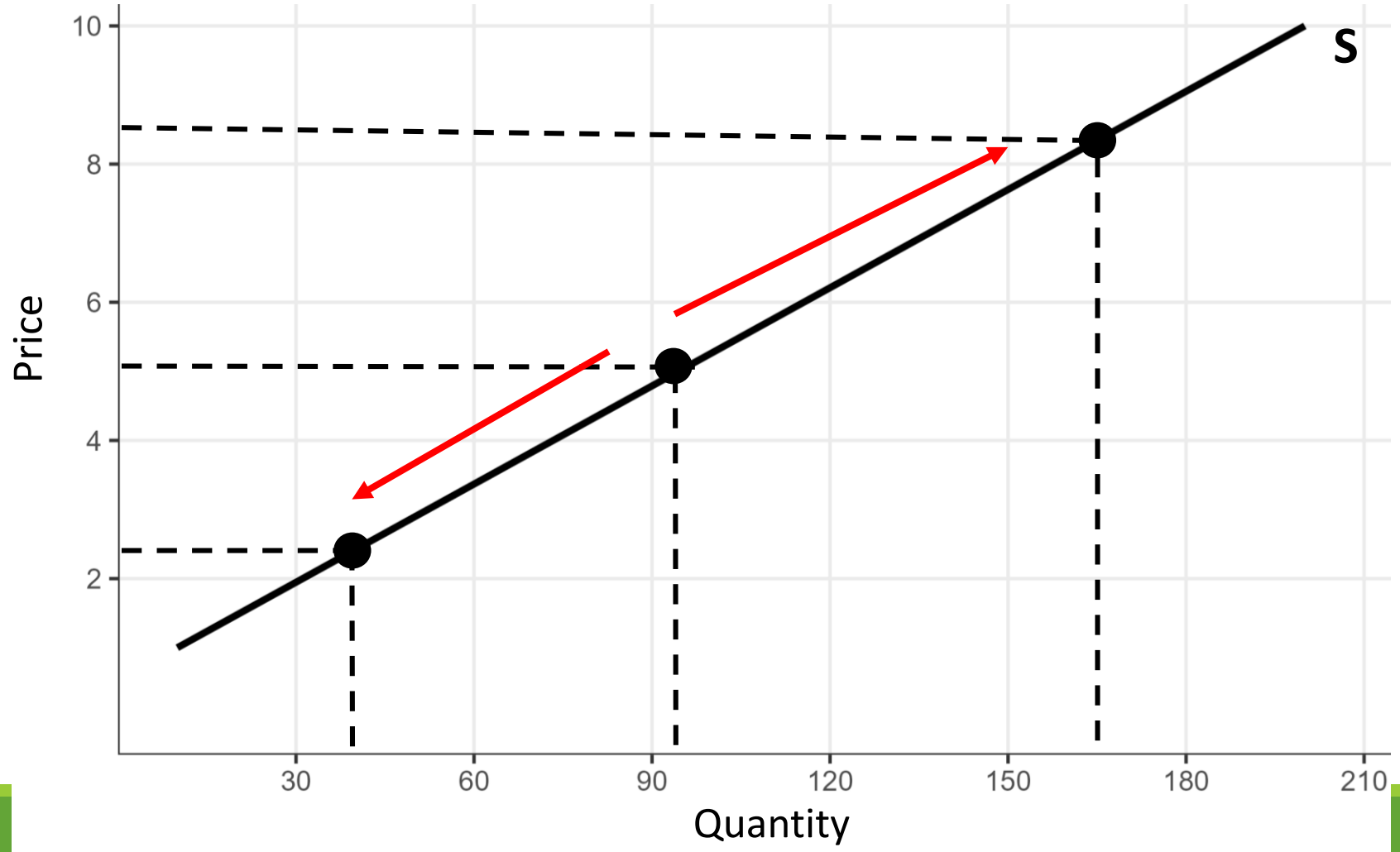
- **Expectations**: If the price is going to be higher in the future, less is sold today. Inverse relationship. Example: seafood at Christmas.

- **Number of producers**: more producers increases the quantity supplied. Direct relationship. Example: student canteens; photocopiers near the university.

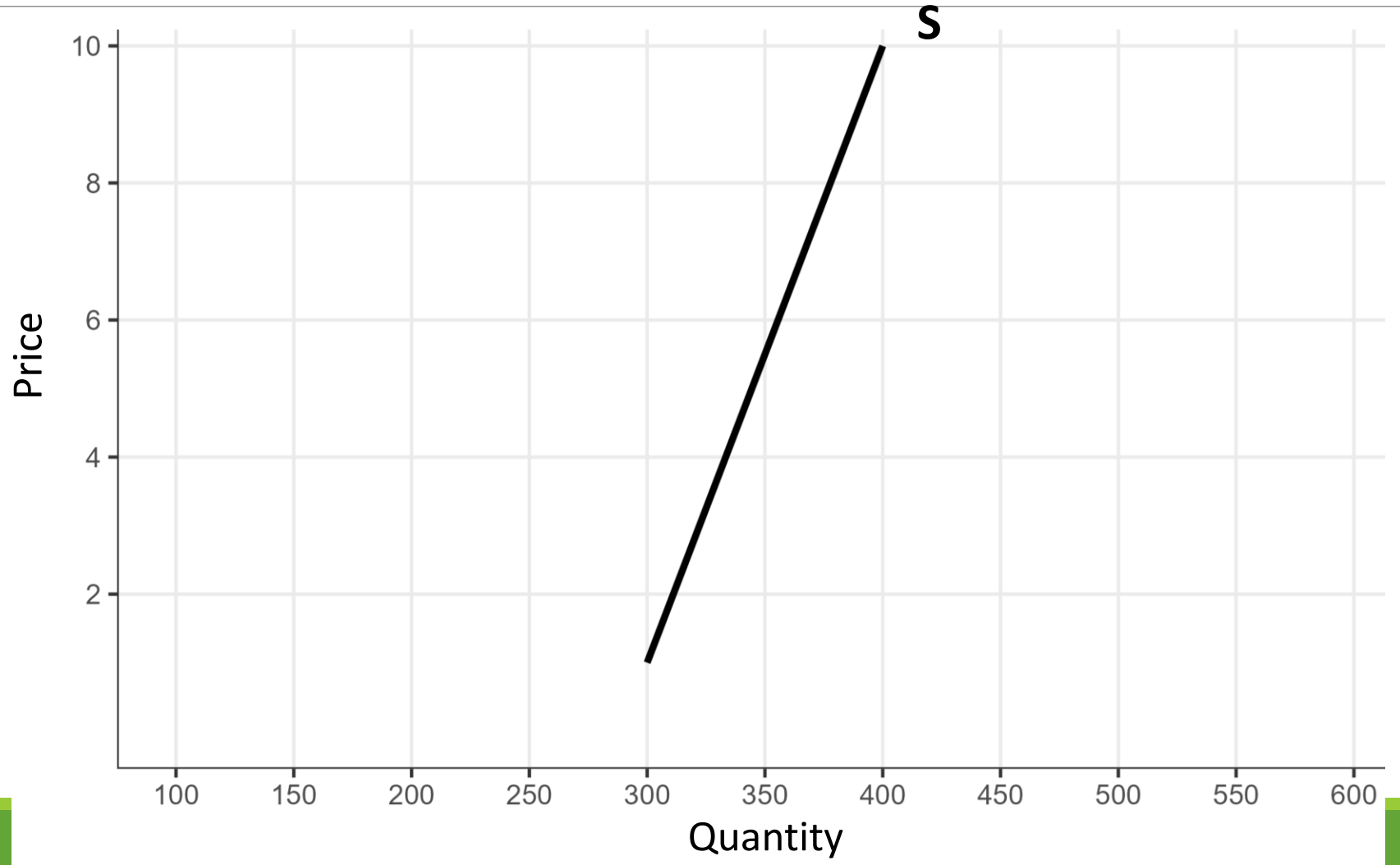
Factors that change supply

- Supply changes when its factors change.
- A distinction must be made:
  - **Movements along** the supply curve: Price. *It is the same supply curve*.
  - **Shifts of** the supply curve: Other determinants: inputs, prices of related goods, technology, expectations and number of producers. *It denotes a new supply curve*.

Movements along the supply curve

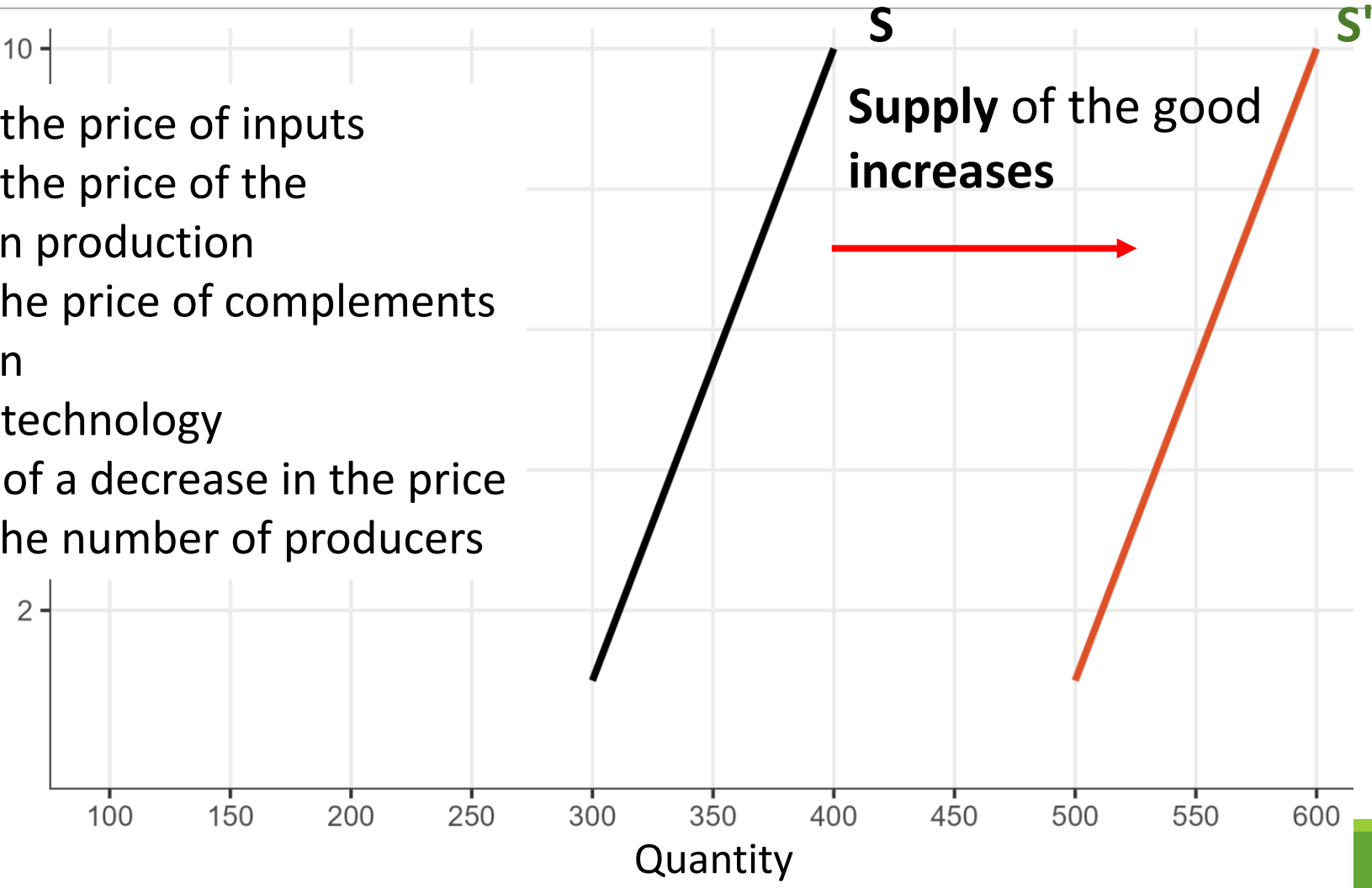


Shifts of the supply curve

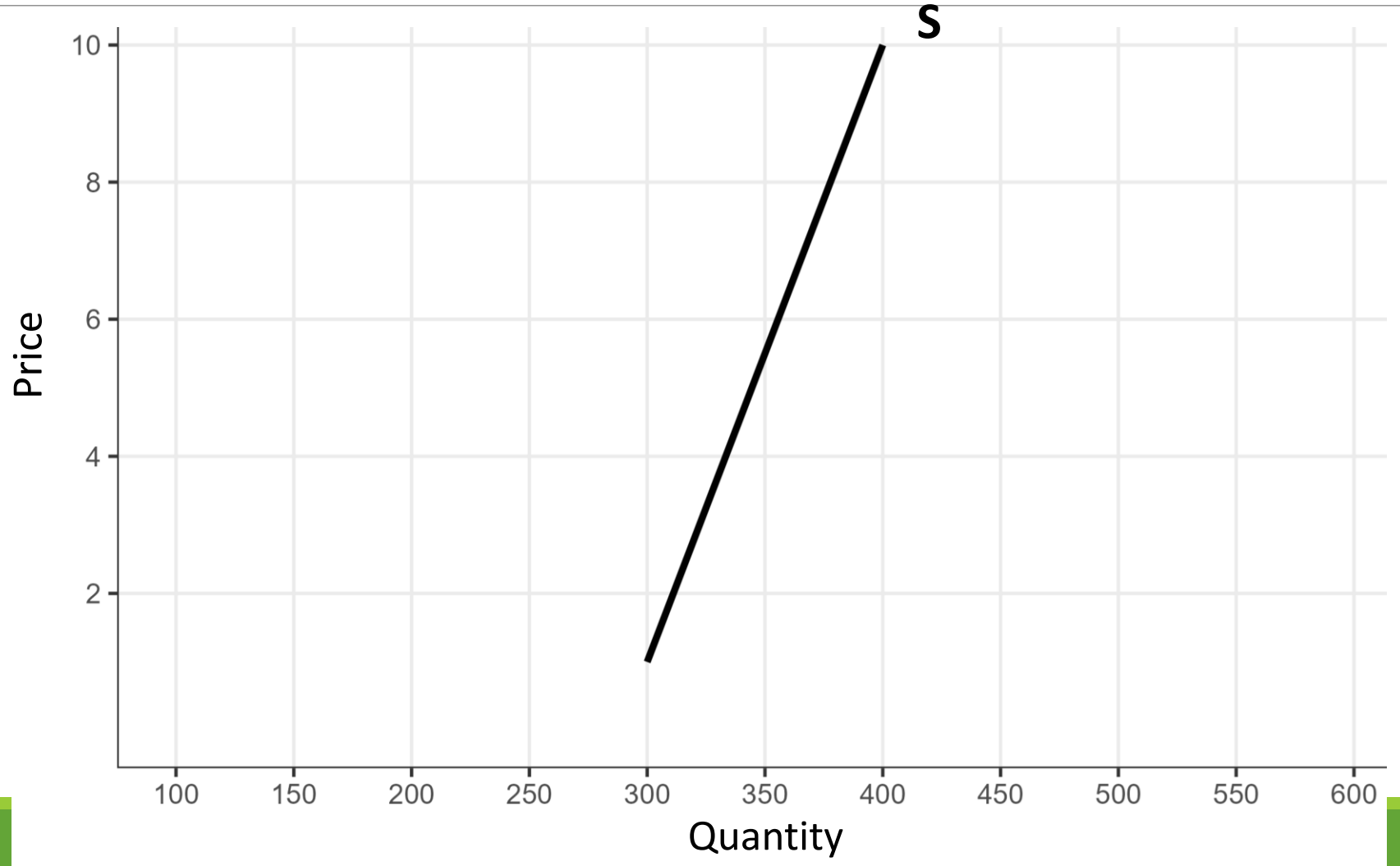


Shifts of the supply curve

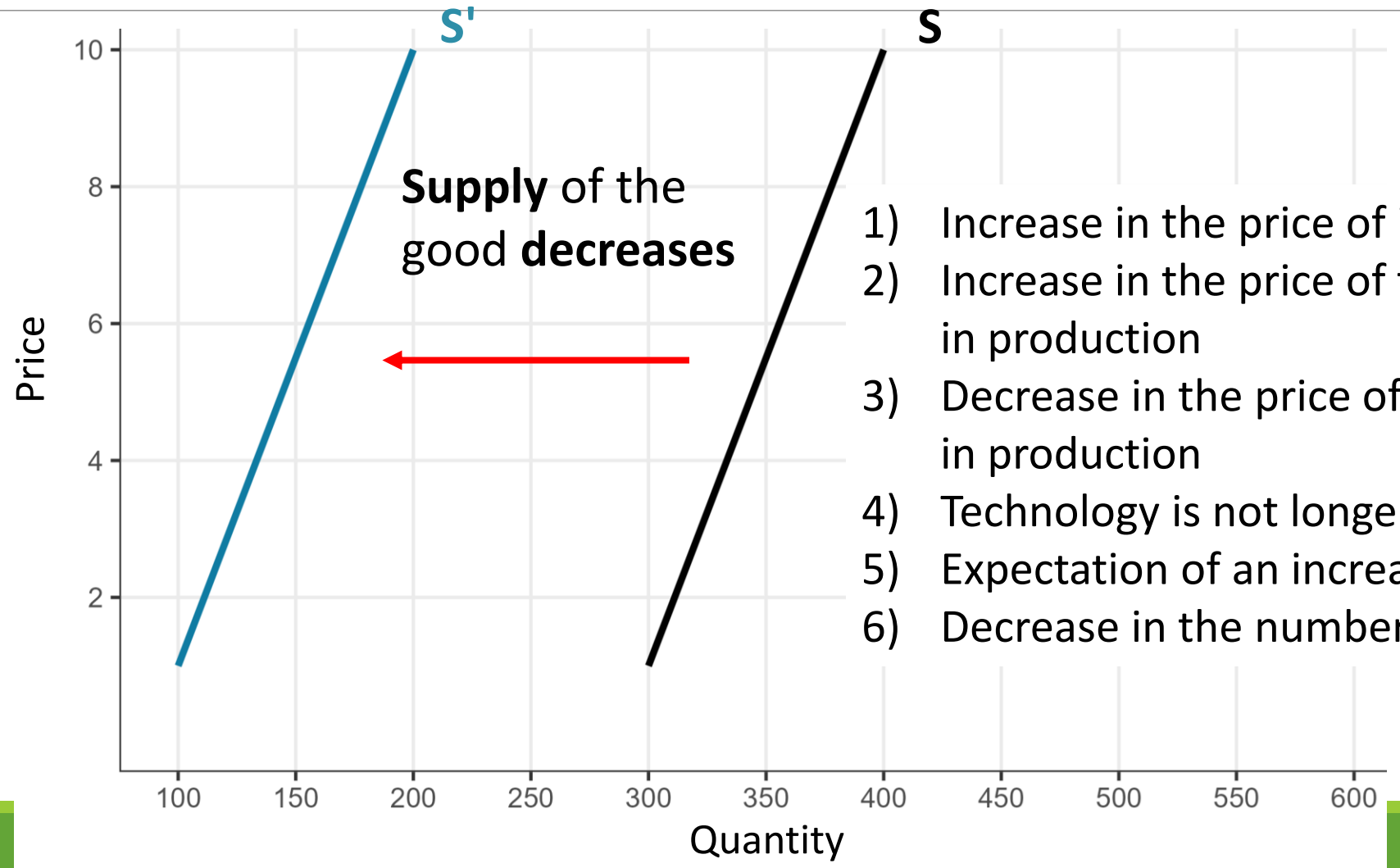
1) Decrease in the price of inputs
2) Decrease in the price of the substitutes in production
3) Increase in the price of complements in production
4) Improves in technology
5) Expectation of a decrease in the price
6) Increase in the number of producers



Shifts of the supply curve



Shifts of the supply curve



1) Increase in the price of inputs
2) Increase in the price of the substitutes in production
3) Decrease in the price of complements in production
4) Technology is not longer available
5) Expectation of an increase in the price
6) Decrease in the number of producers

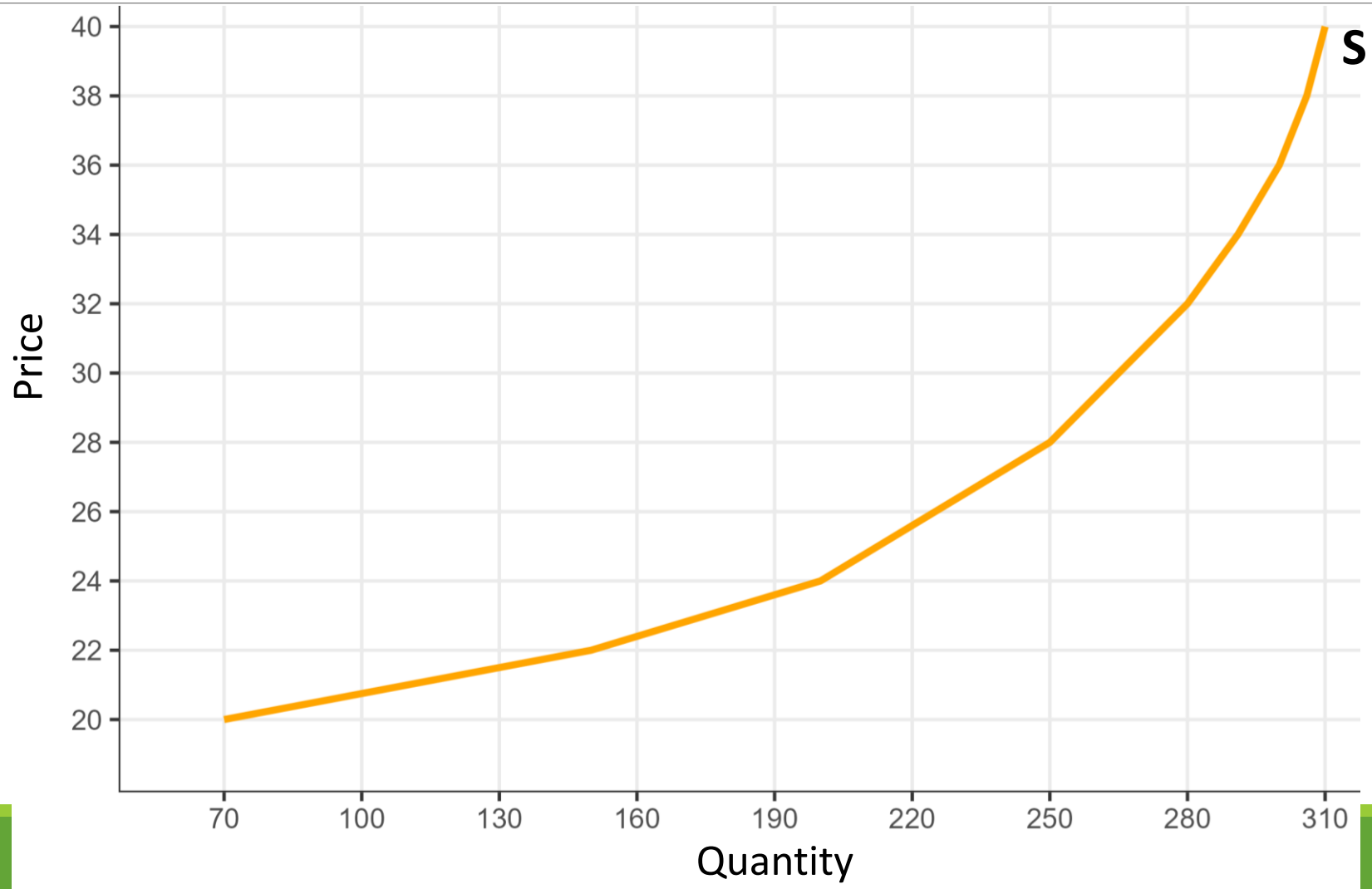
The supply curve: Price elasticity

- On the supply side, **elasticity** measures the sensitivity of producers to price changes.

- It is analogous to the price elasticity of demand, but in this case, it **is always positive.**

- **Price elasticity of supply** is a measure of the ***responsiveness*** of the quantity of a good supplied to the price of that good. It is the ratio of the percent change in the quantity supplied to the percent change in the price as we move along the supply curve.

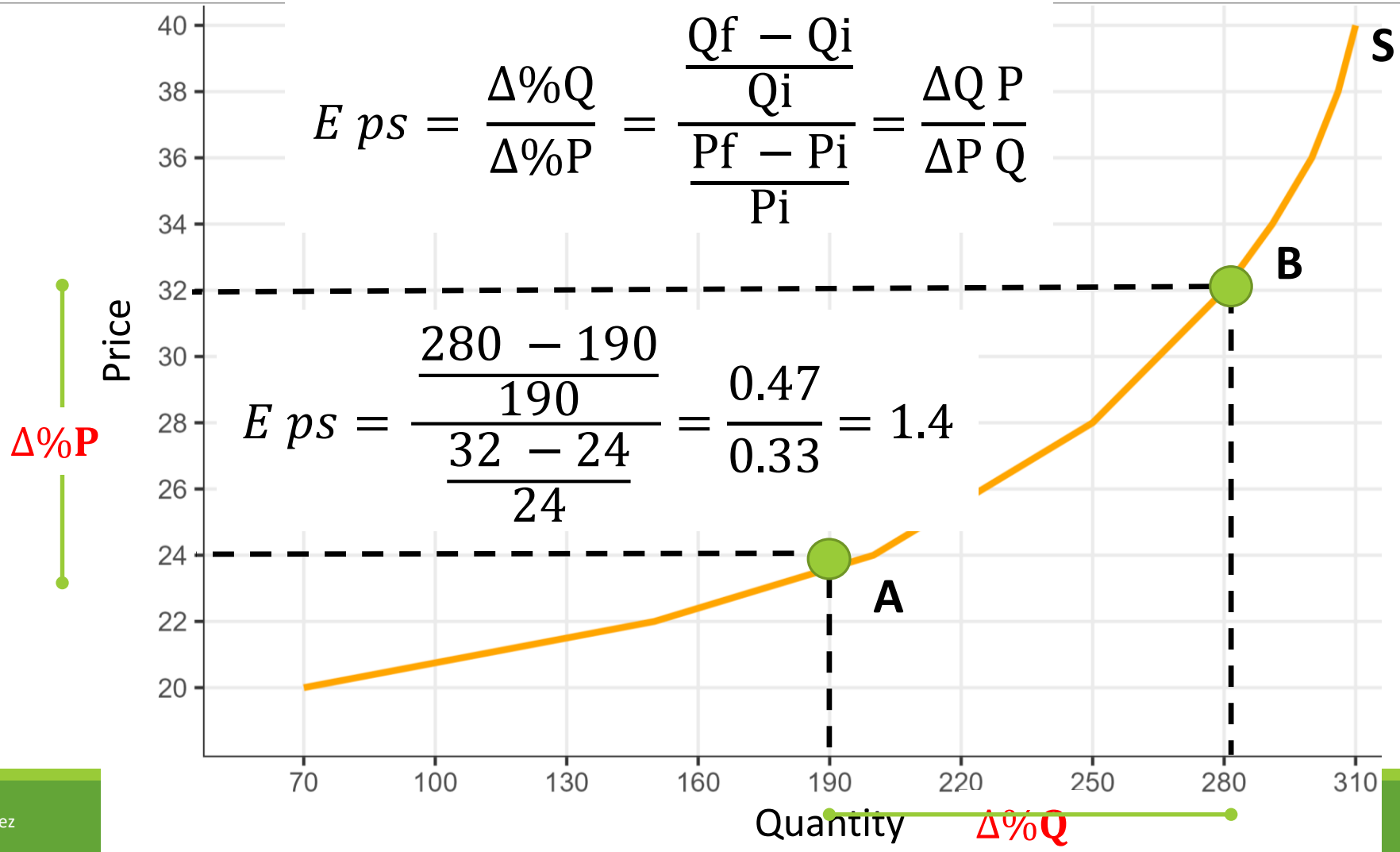
Price elasticity of supply



Price elasticity of supply

$$E\,ps = \frac{\Delta\%Q}{\Delta\%P} = \frac{\frac{Qf - Qi}{Qi}}{\frac{Pf - Pi}{Pi}} = \frac{\Delta Q}{\Delta P}\frac{P}{Q}$$

$$E\,ps = \frac{\frac{280 - 190}{190}}{\frac{32 - 24}{24}} = \frac{0.47}{0.33} = 1.4$$



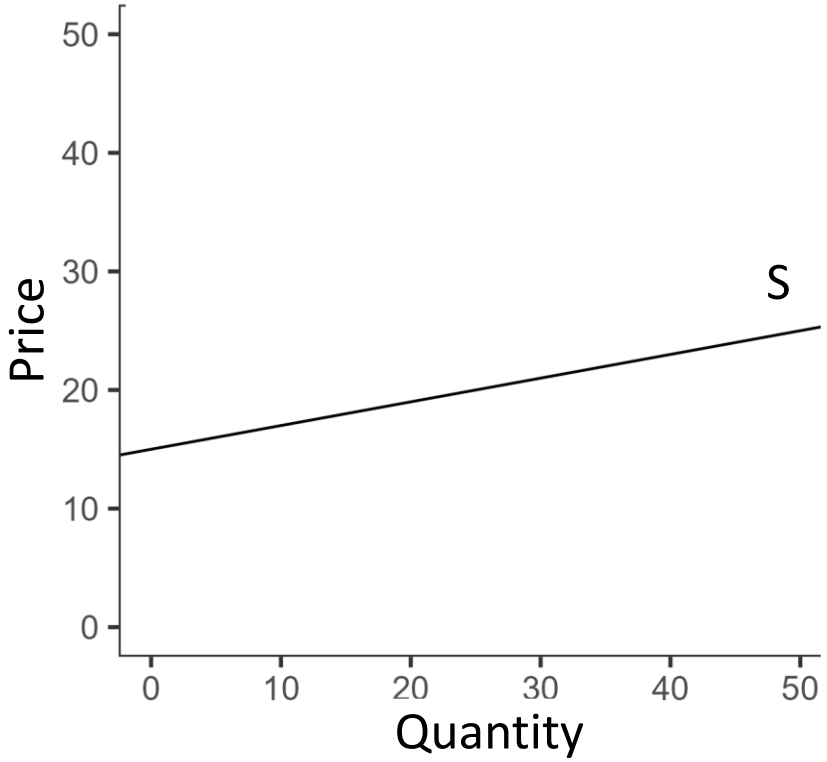
The supply curve: Price elasticity

- How is the value of elasticity interpreted?
  - Percent change in quantity from a one percent change in price.

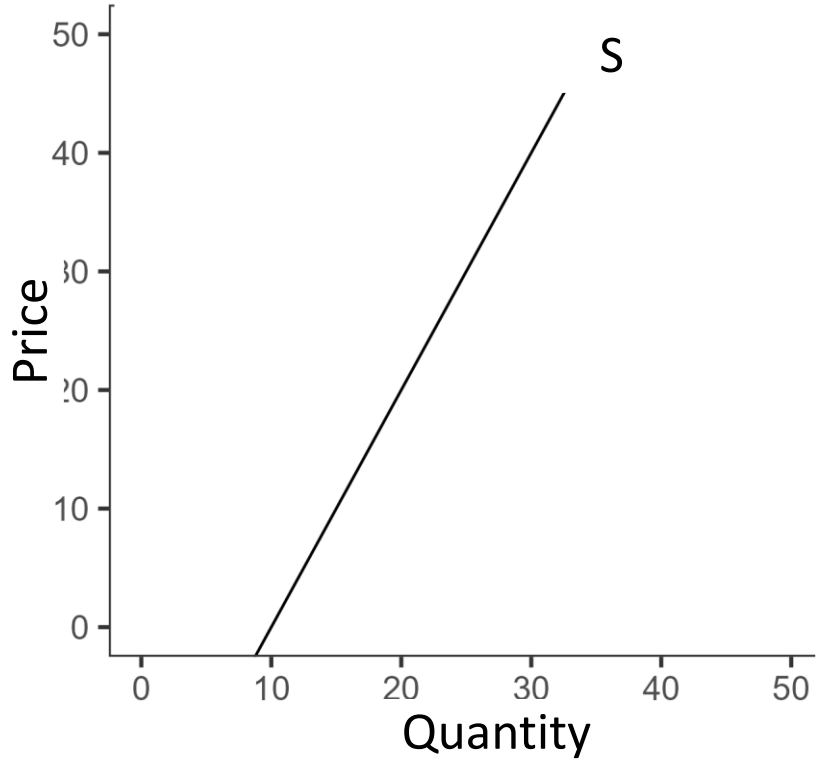
- What does the value of the price elasticity of supply mean?
  - Supply is **elastic** if the price elasticity of supply is **greater than 1**.
  - Supply is **inelastic** if the price elasticity of supply is **less than 1.**
  - Supply is **unit-elastic** if the price elasticity of supply is **exactly 1.**

Price elasticity of supply

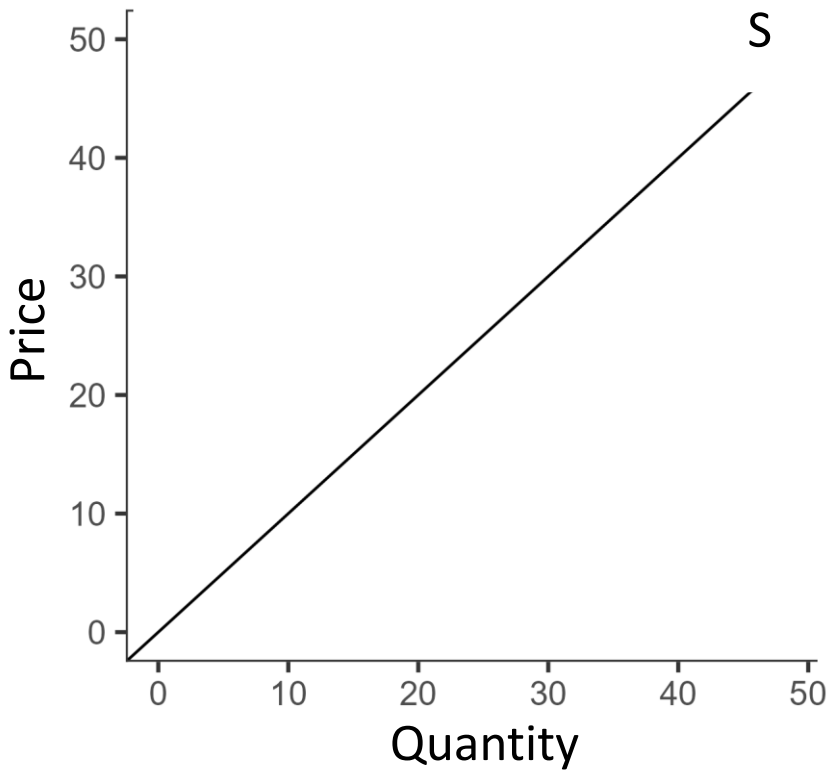
Elastic



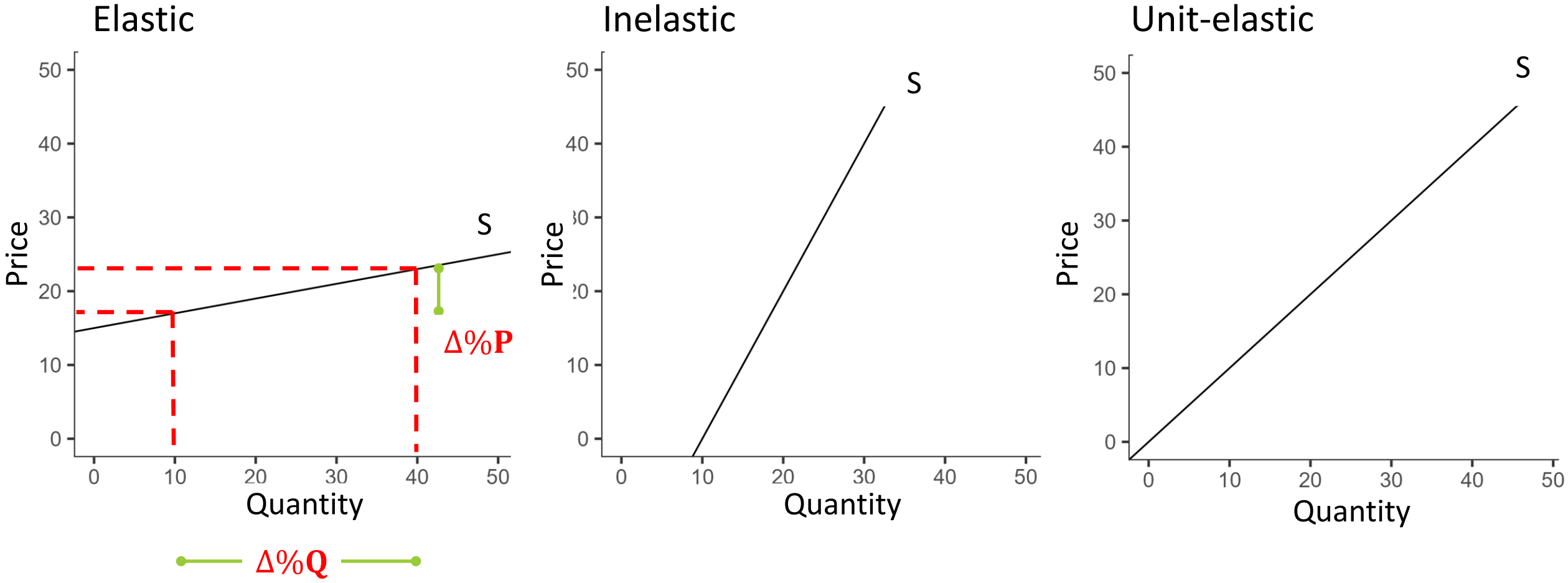
Inelastic



Unit-elastic

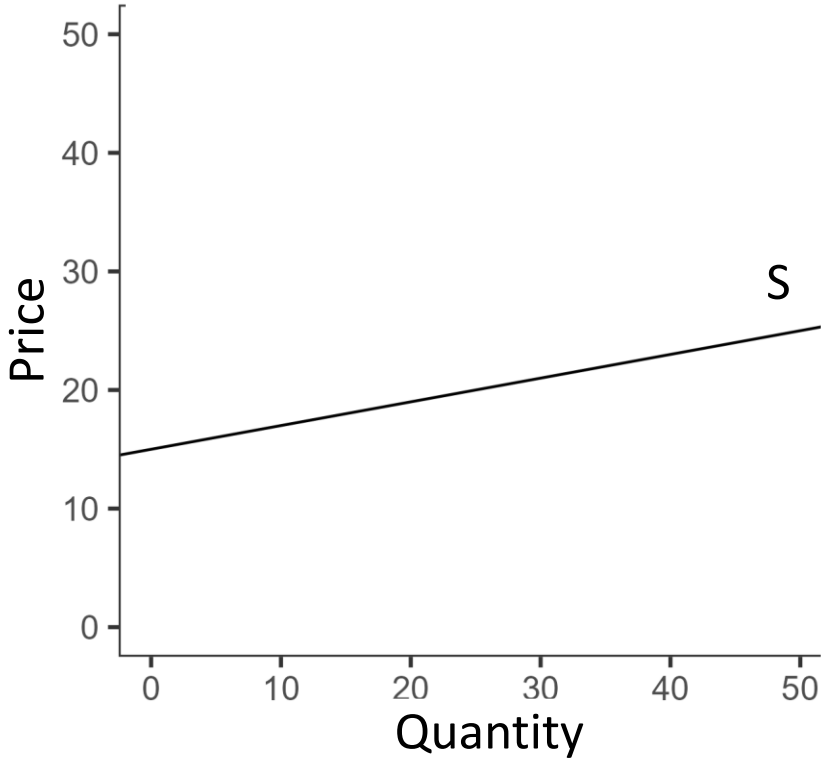


Price elasticity of supply

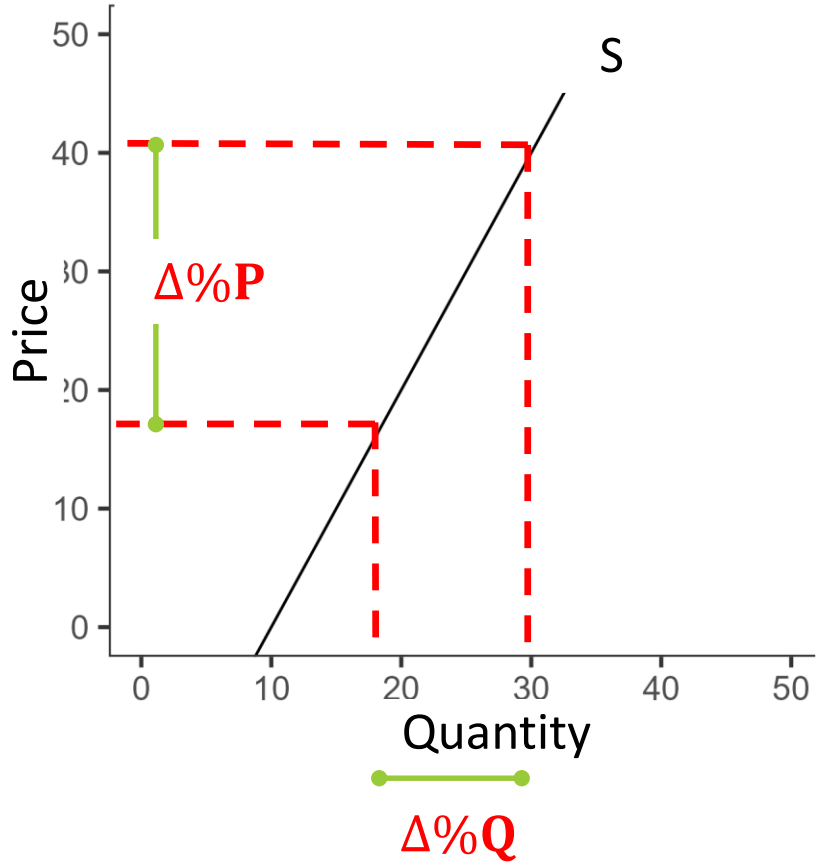


Price elasticity of supply

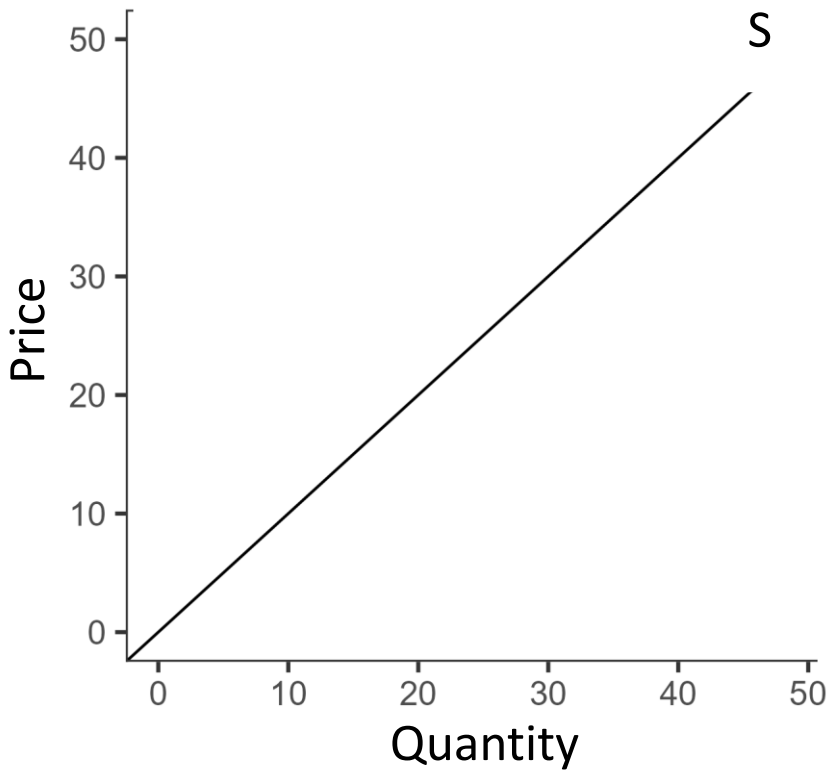
Elastic



Inelastic

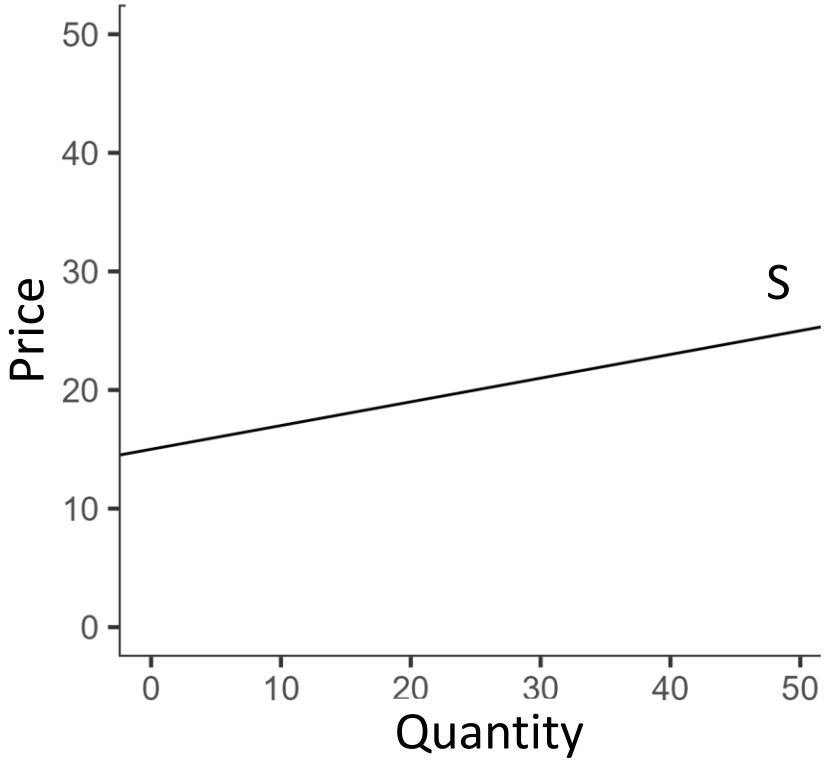


Unit-elastic

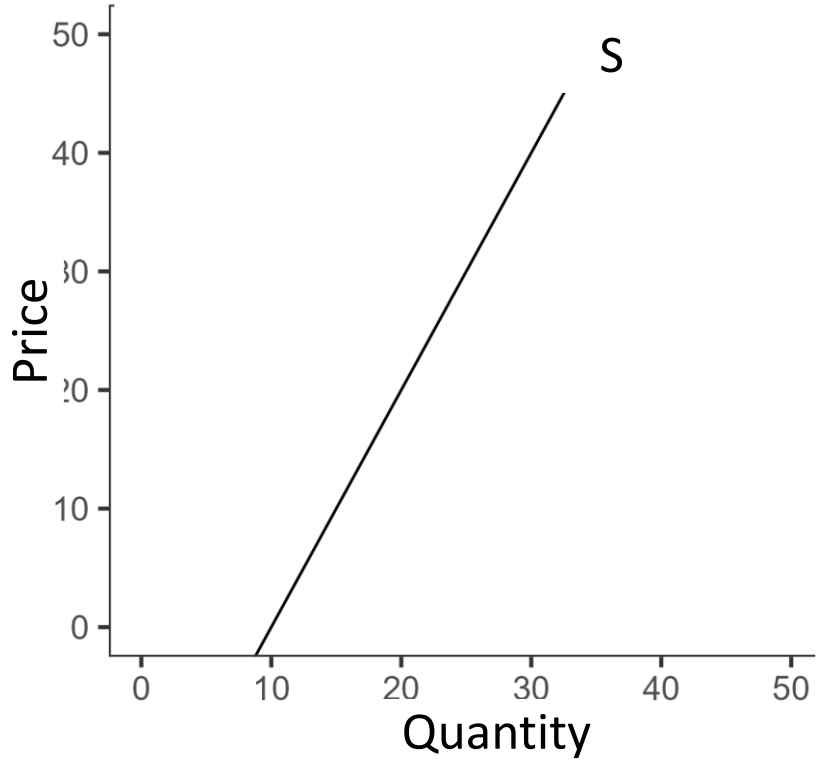


Price elasticity of supply

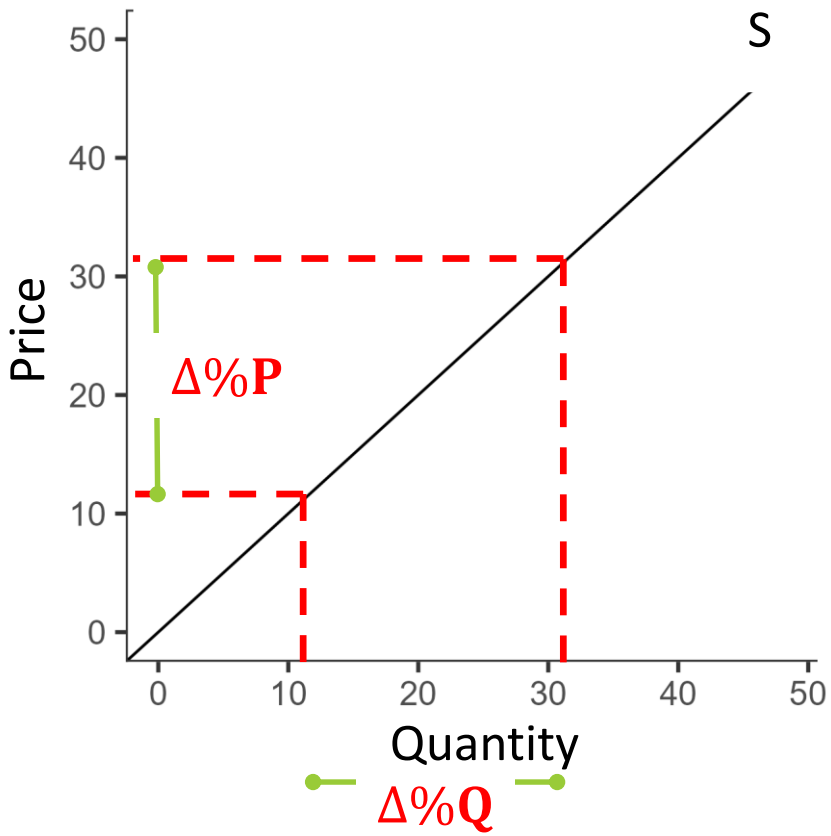
Elastic



Inelastic



Unit-elastic

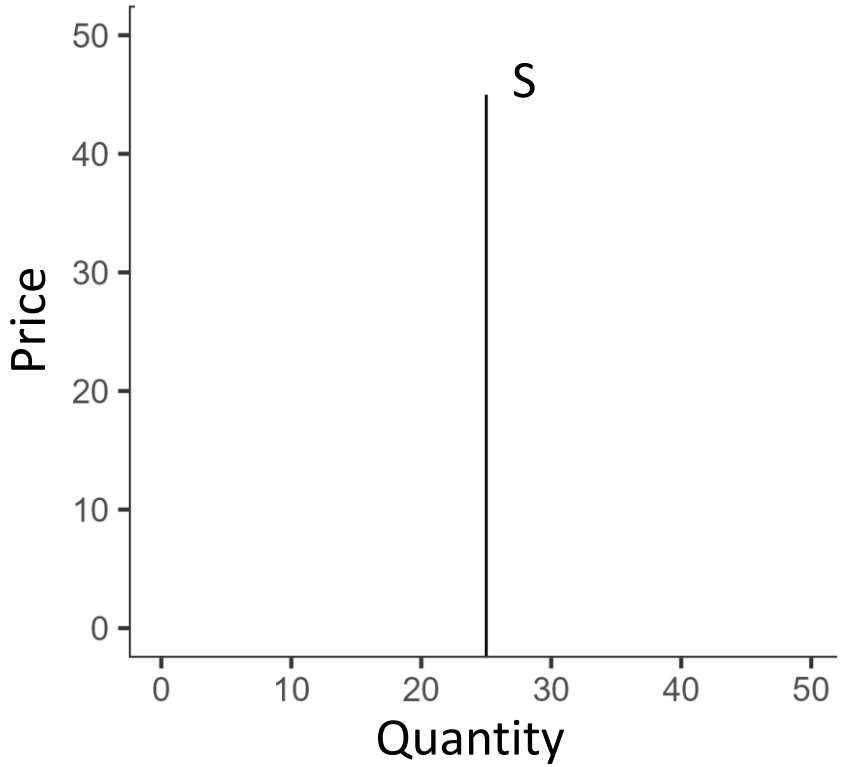


The supply curve: Price elasticity

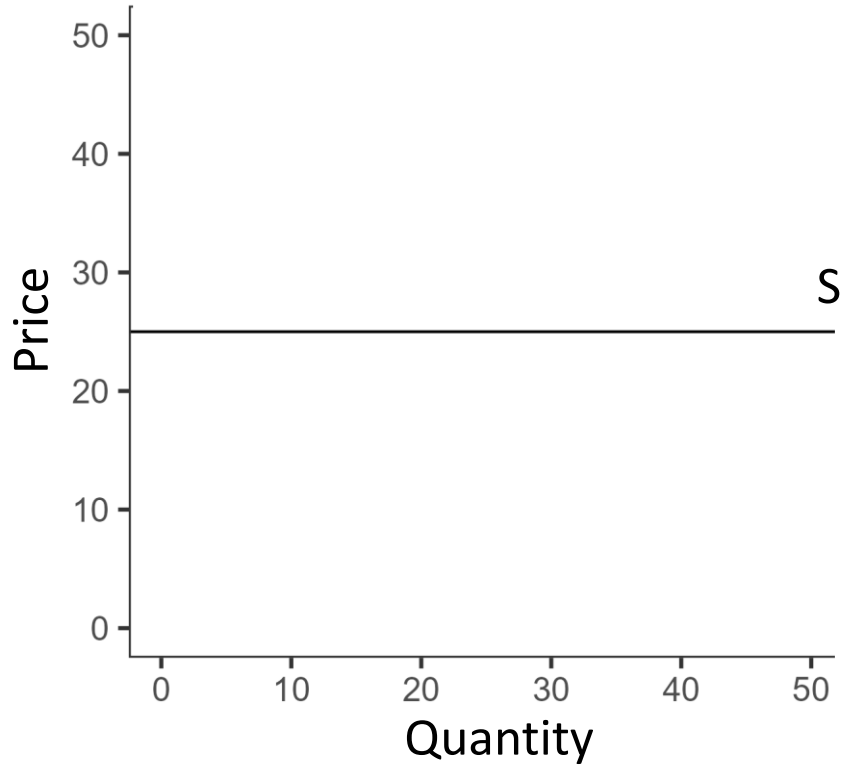
- Extreme cases:
  - Supply is **perfectly inelastic**: when the quantity supplied does not respond at all to changes in the price.
    - The price elasticity of supply is zero.
  - Supply is **perfectly elastic**: when any change in price will lead to very large changes in the quantity supplied.
    - The price elasticity of supply is infinite.

Price elasticity of supply

Perfectly inelastic



Perfectly elastic



The supply curve: Price elasticity

- Factors determining the price elasticity of supply:
  - **Availability of inputs**: a good tends to be **more elastic** when **inputs are readily available** or if **it costs relatively little** to increase or decrease the quantity used in production. Example: pizzas.
  - **Time**: elasticity tends to be higher if the producer has more time to respond to price changes. Price elasticity of supply is higher in the long run than in the short run. Examples: fisheries (there is time to offer more by planning fish stock growth and avoiding overfishing), crops.

Outline

1. Demand:
   - Factors that change demand.
   - Movements along the curve and shifts of the curve.
   - Price elasticity of demand.

2. Supply:
   - Factors that change supply.
   - Movements along the curve and shifts of the curve.
   - Price elasticity of supply.

3. Market equilibrium:
   - Changes in equilibrium due to shifts of curves.

4. Price controls:
   - Price ceilings and price floors.
   - Taxes.

Market equilibrium

- Remember: **markets tend to equilibrium**.
- In a **competitive market**: **Equilibrium** exists when prices has moved to a level at which the ***quantity*** of a good or service ***demanded equals*** the ***quantity*** of a good or service ***supplied***:

$$\mathbf{Q^D = Q^S}$$

- At that price, **no seller could be better off** selling more or less quantity and **no buyer could be better off** buying more or less quantity.
- The **price at which $Q^D = Q^S$** is the **equilibrium price** or the **market-clearing price** (P*).

Market equilibrium

- To find **P*** it is necessary to analyse **D** and **S** simultaneously.

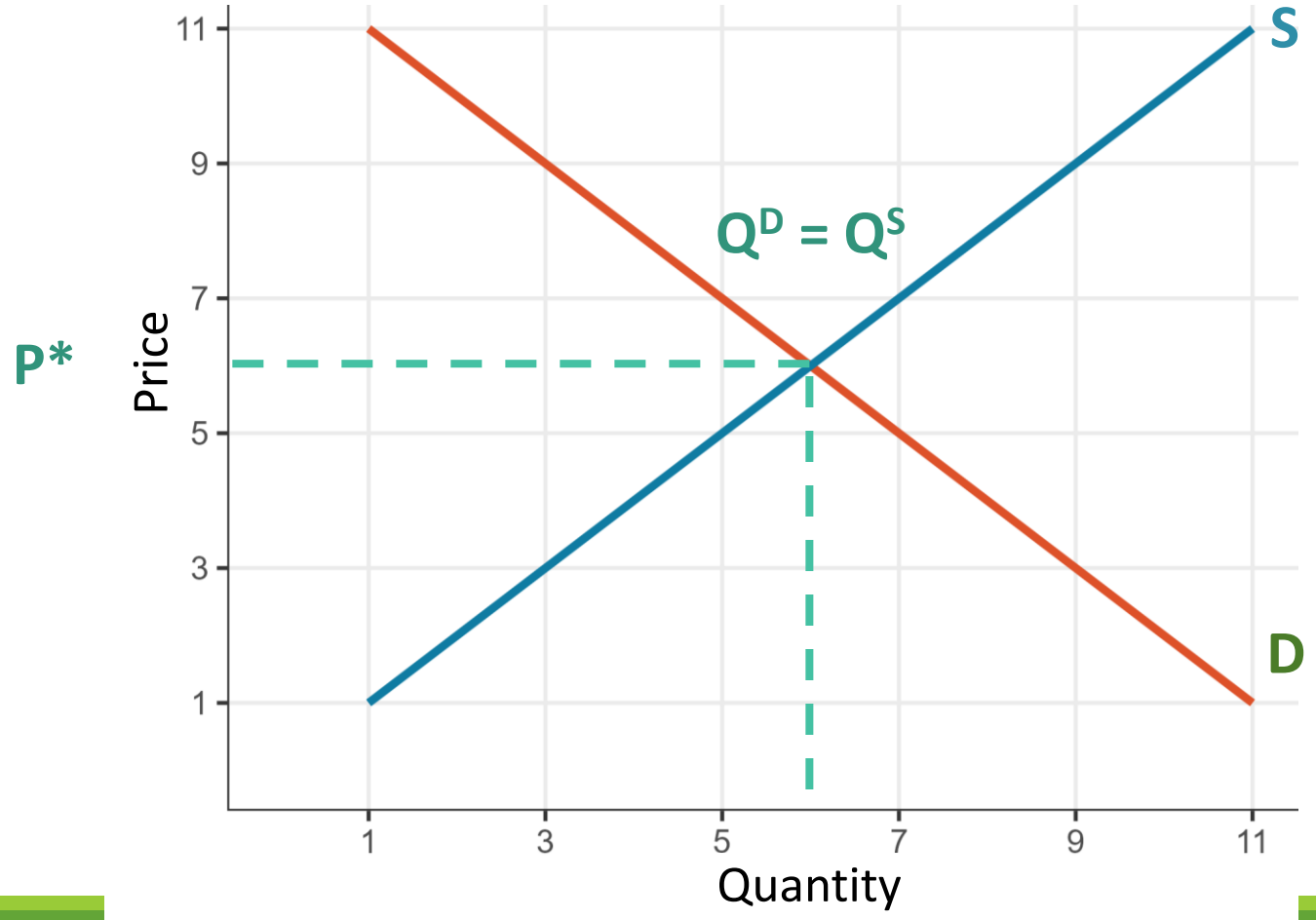
- The P at which D and S are equal is **P*** and therefore $\mathbf{Q^D = Q^S}$

$$Q^D = Q^S$$

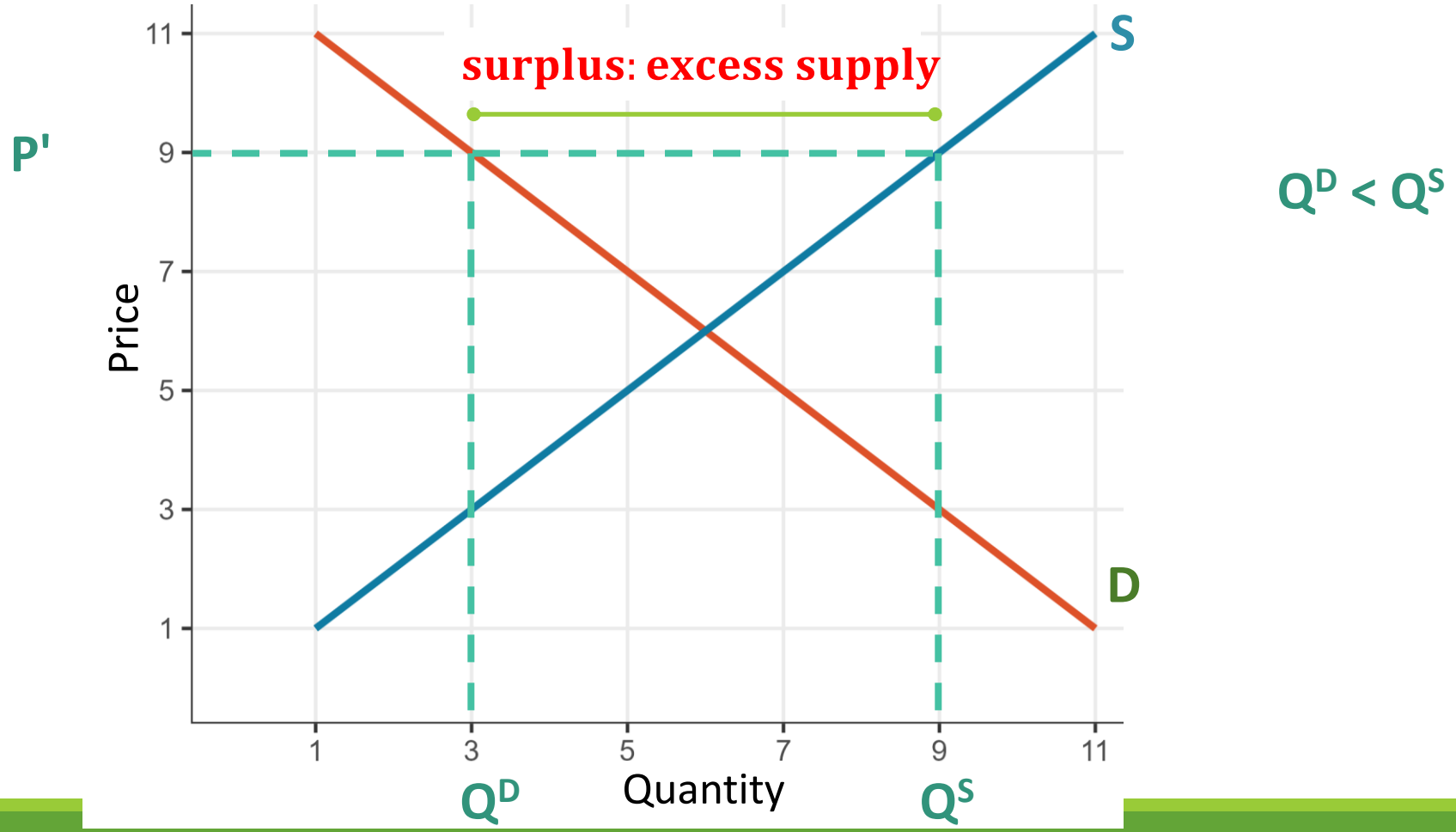
$$a - bP = c + dP$$

$$P = \frac{a - c}{b + d}$$

Market equilibrium

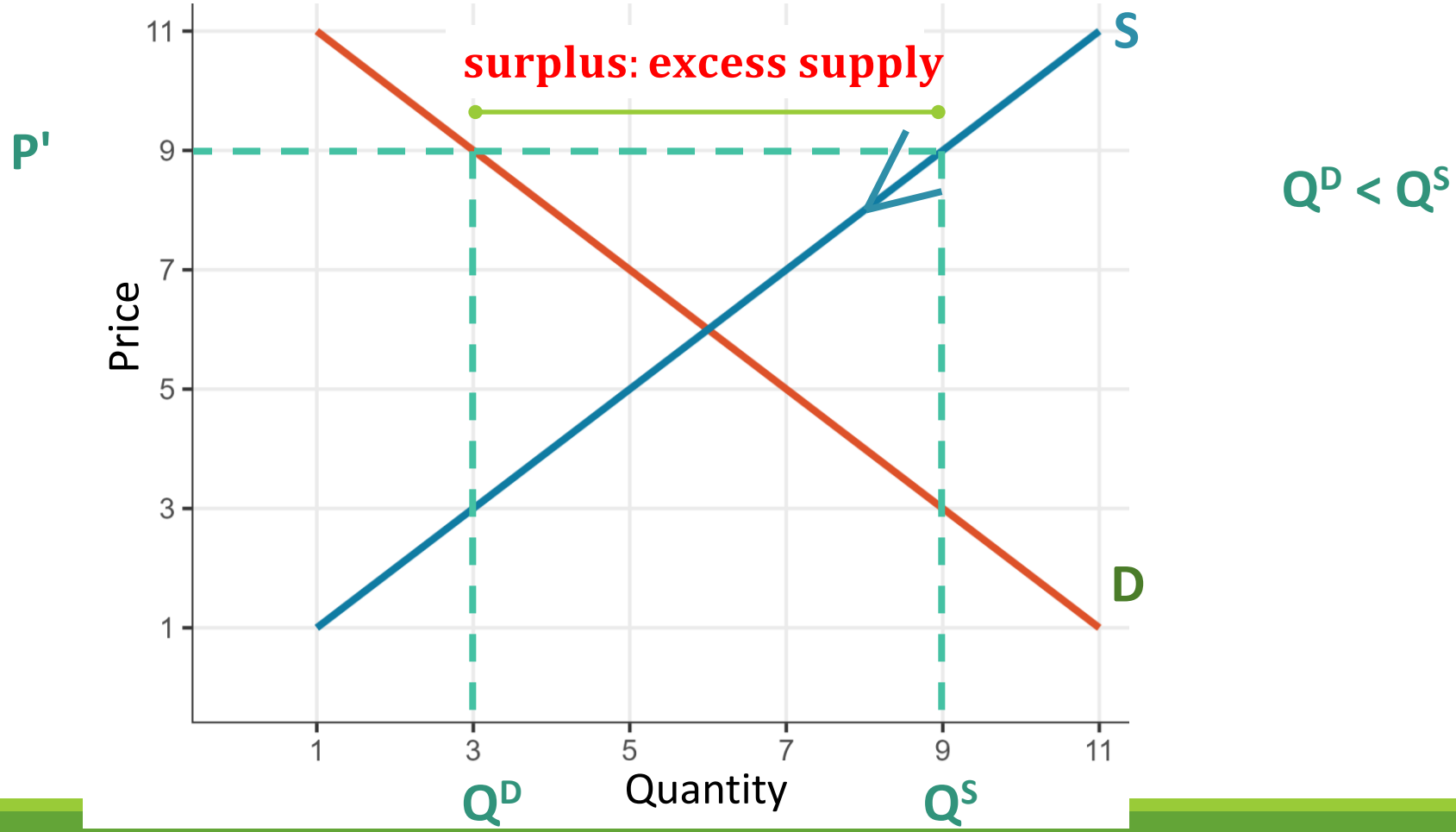


Market equilibrium

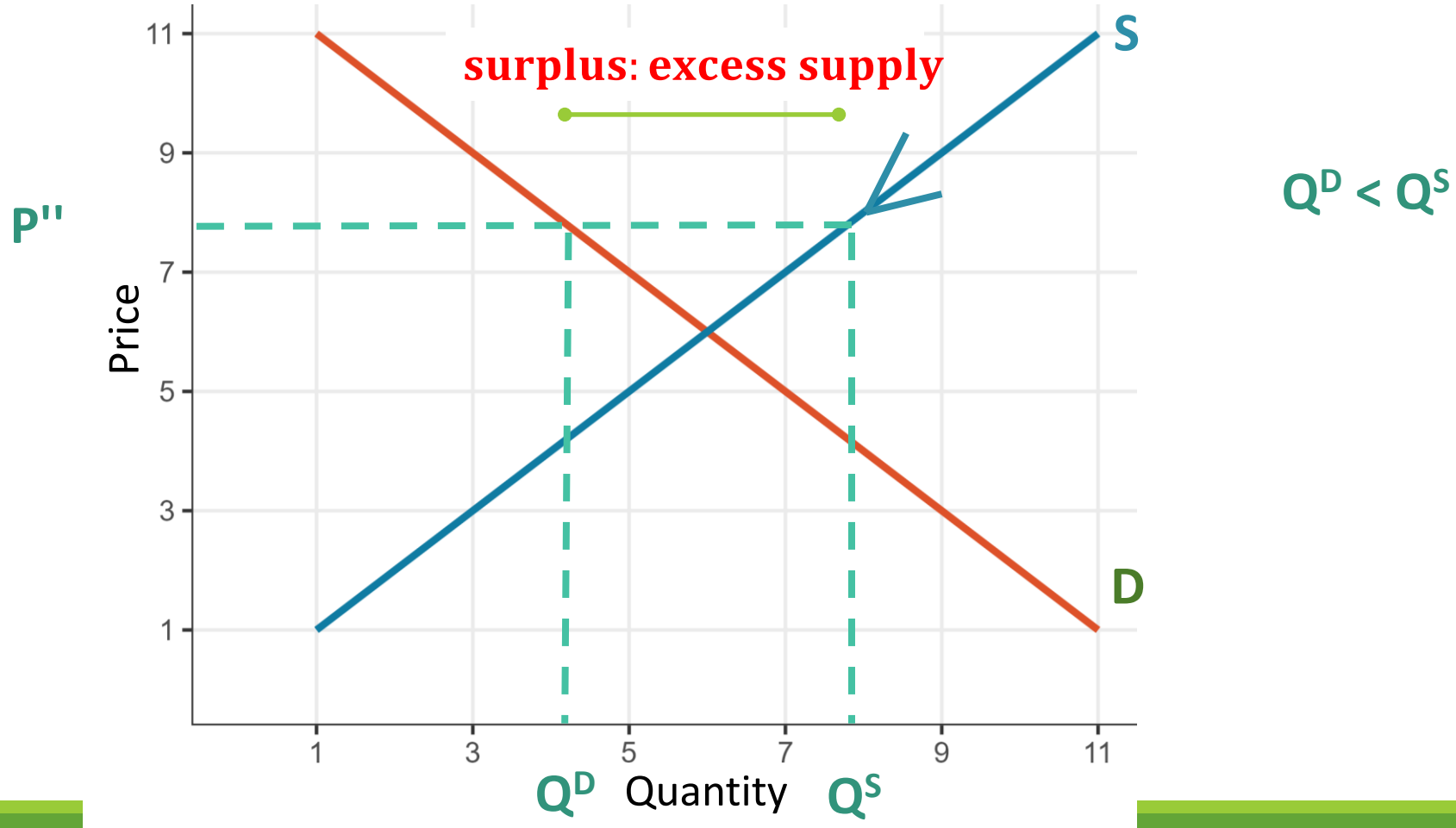


$Q^D < Q^S$

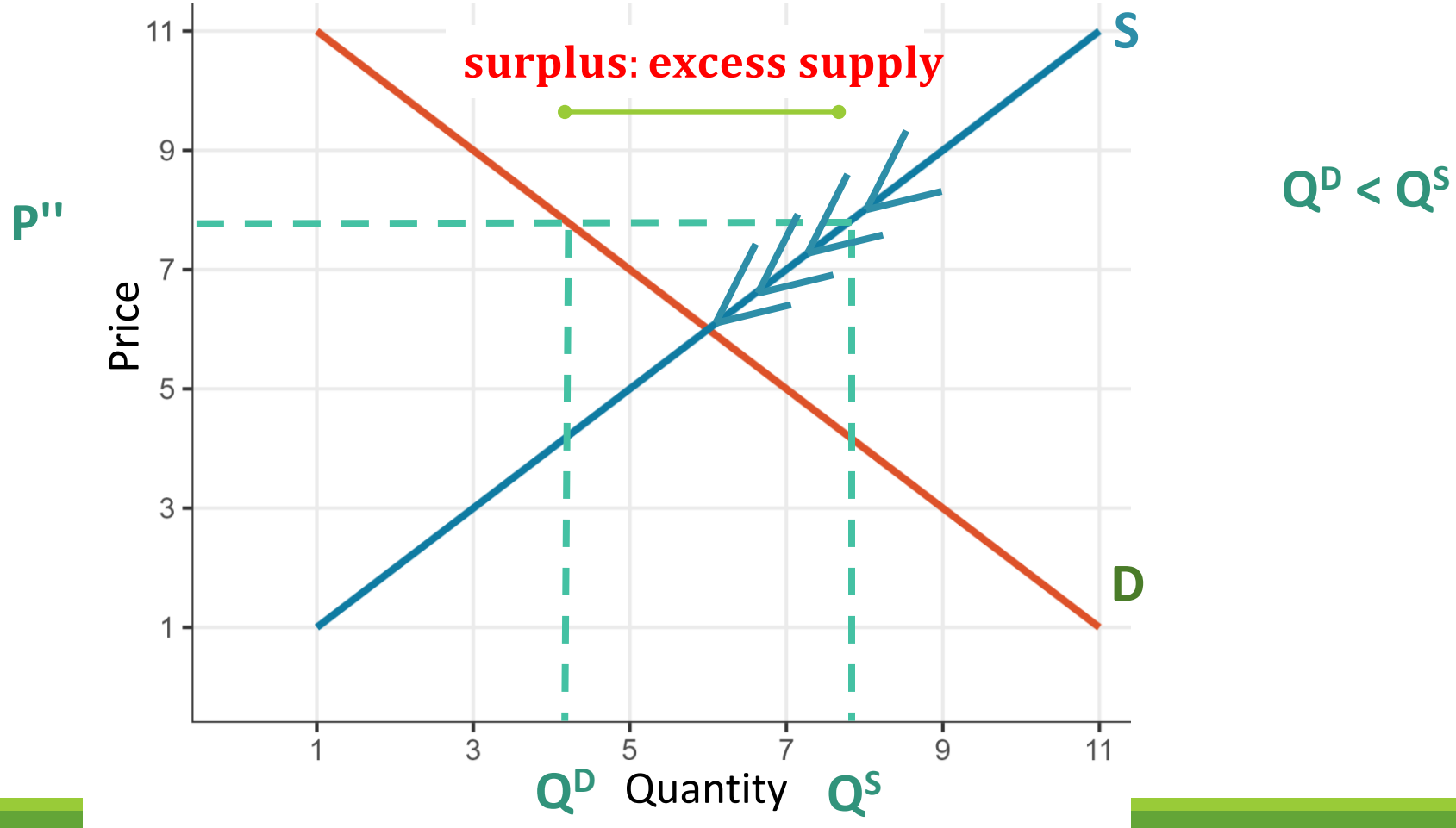
Market equilibrium



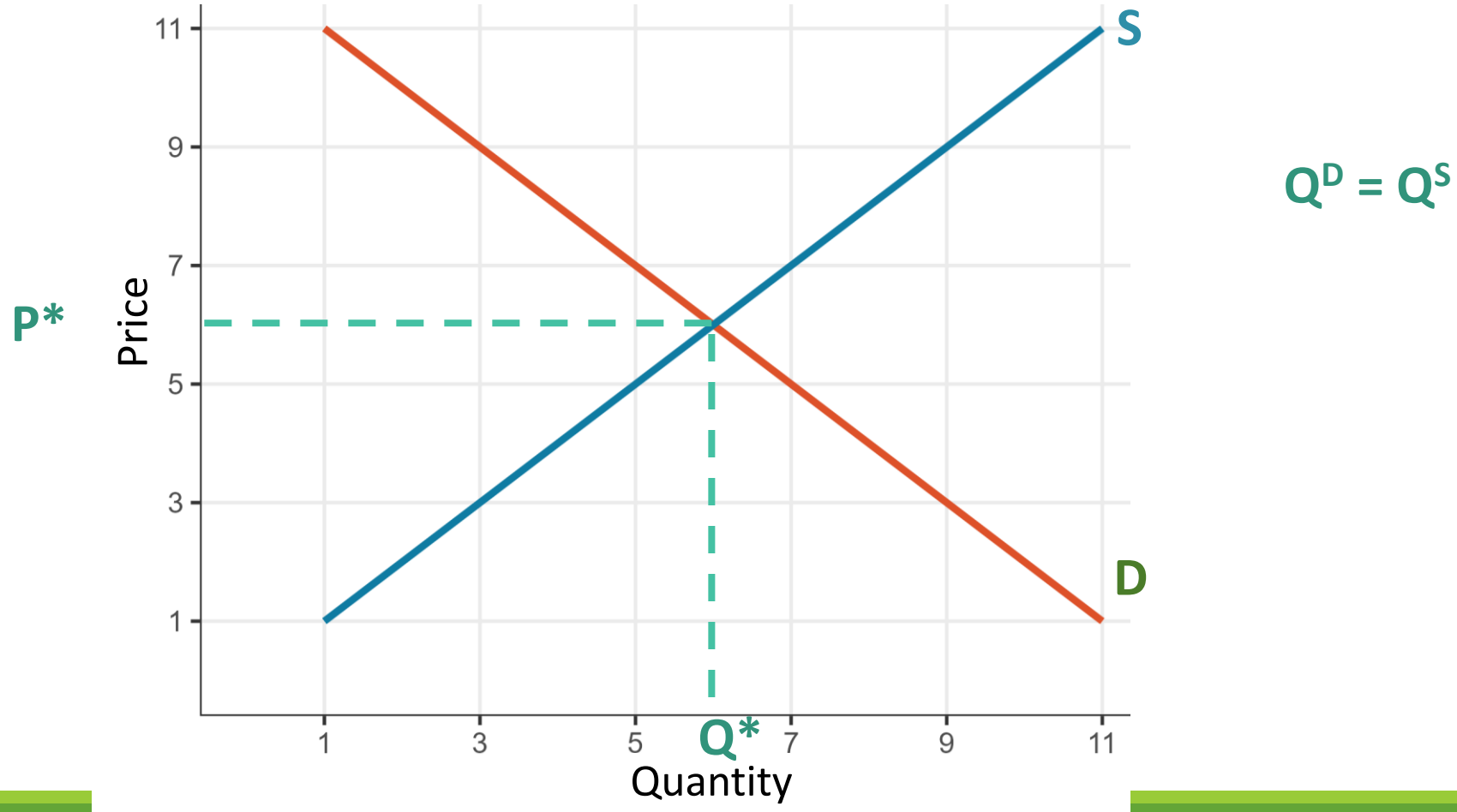
Market equilibrium



Market equilibrium

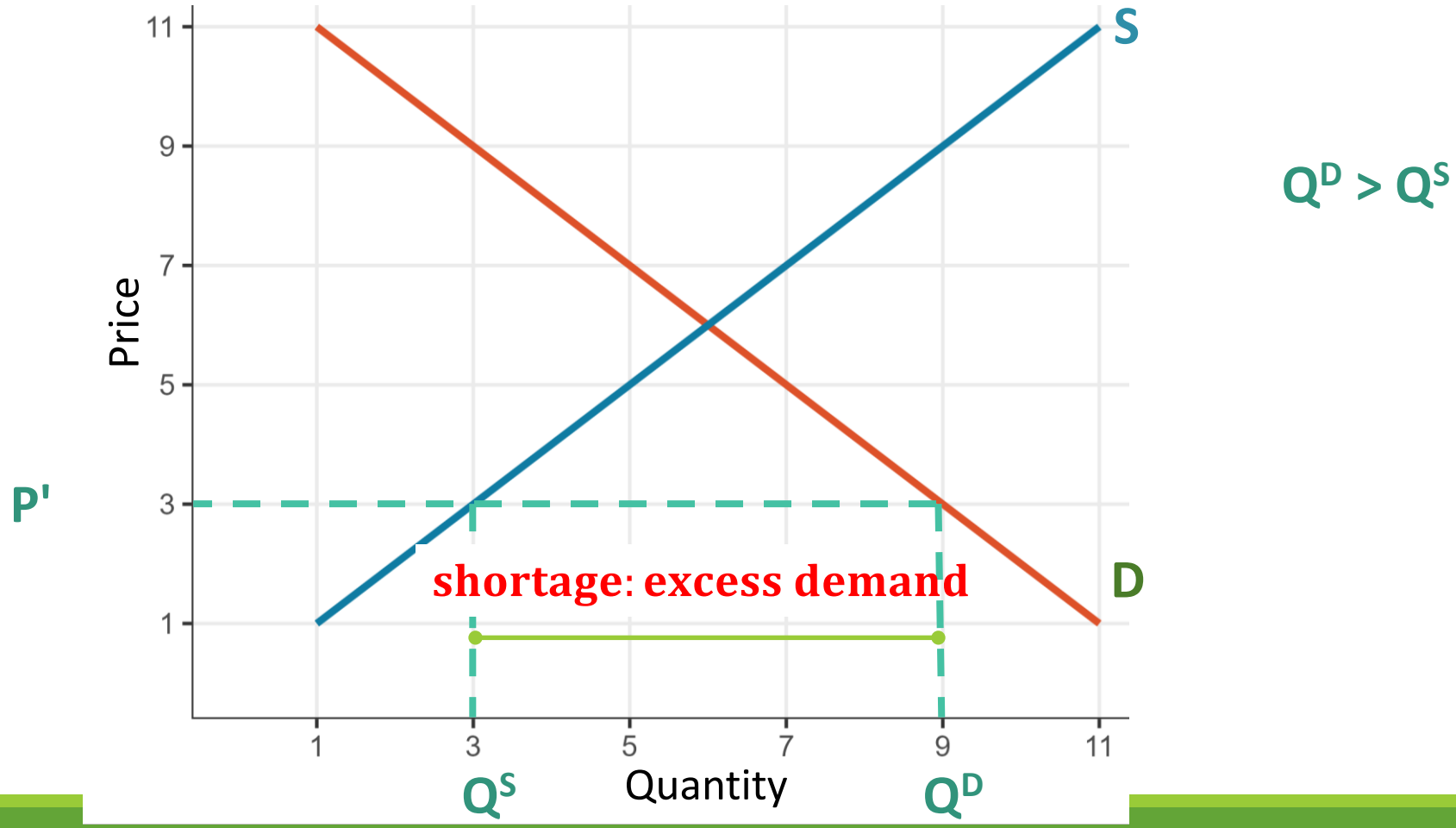


Market equilibrium



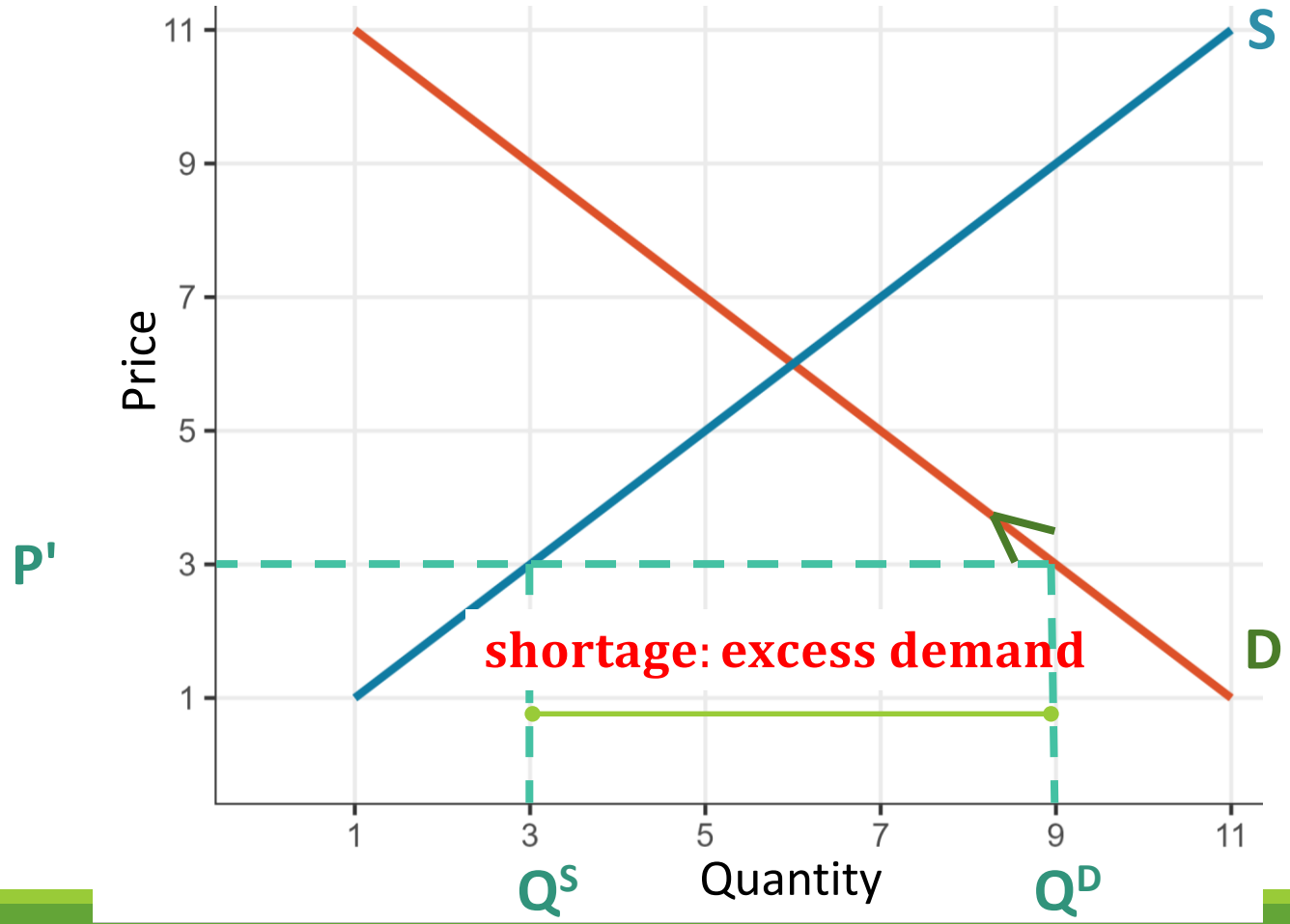
$Q^D = Q^S$

Market equilibrium



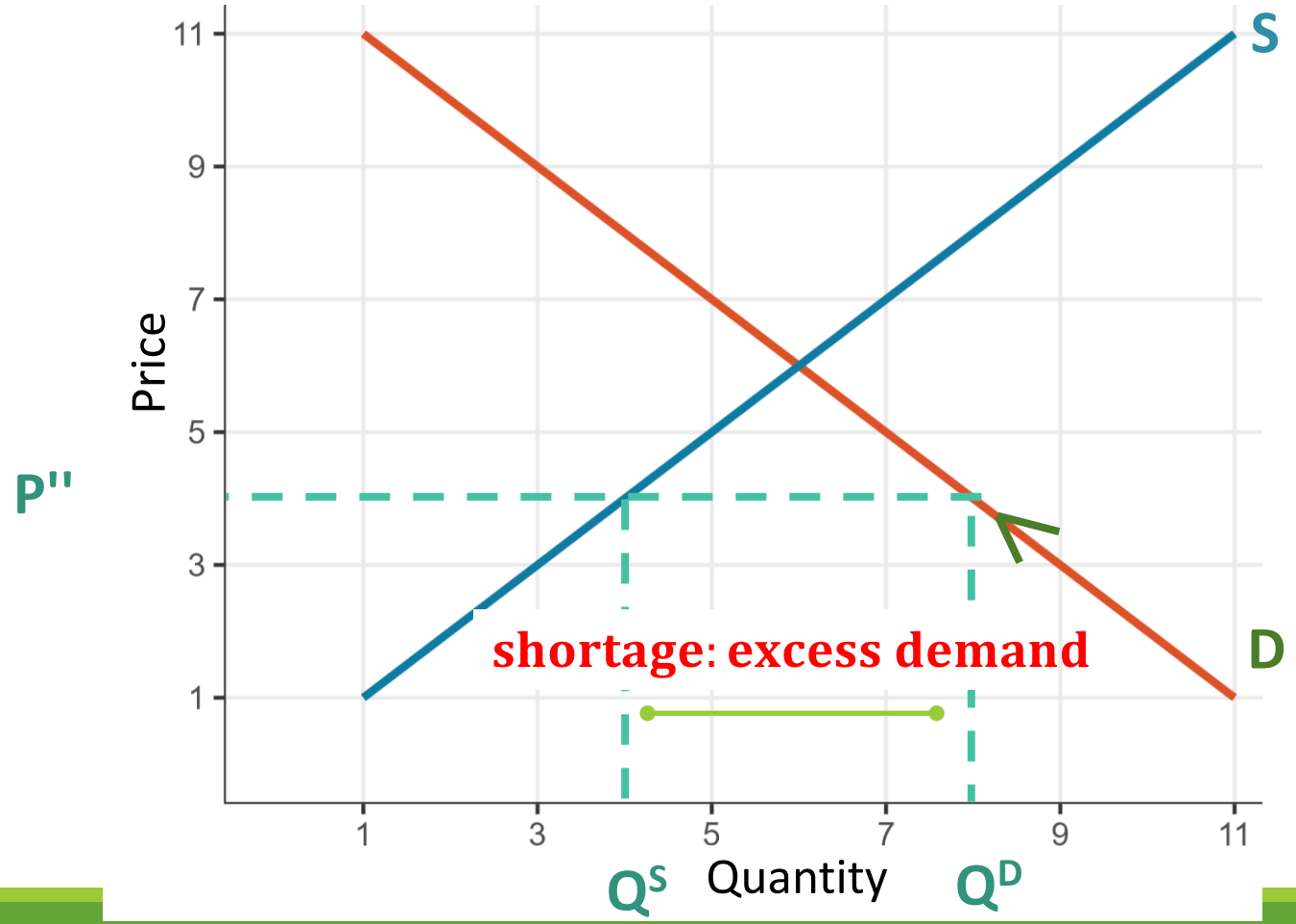
$Q^D > Q^S$

Market equilibrium



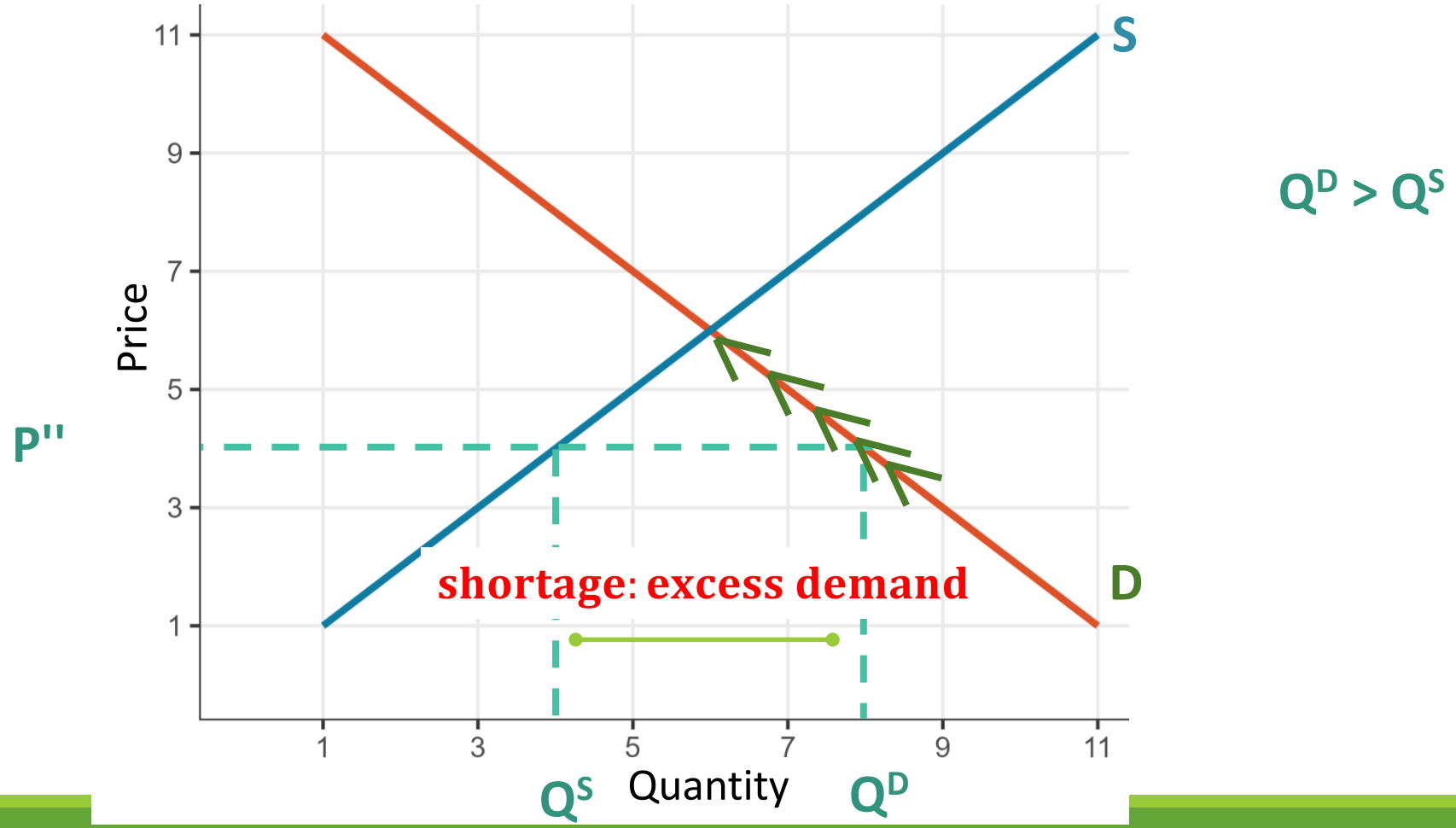
$Q^D > Q^S$

Market equilibrium



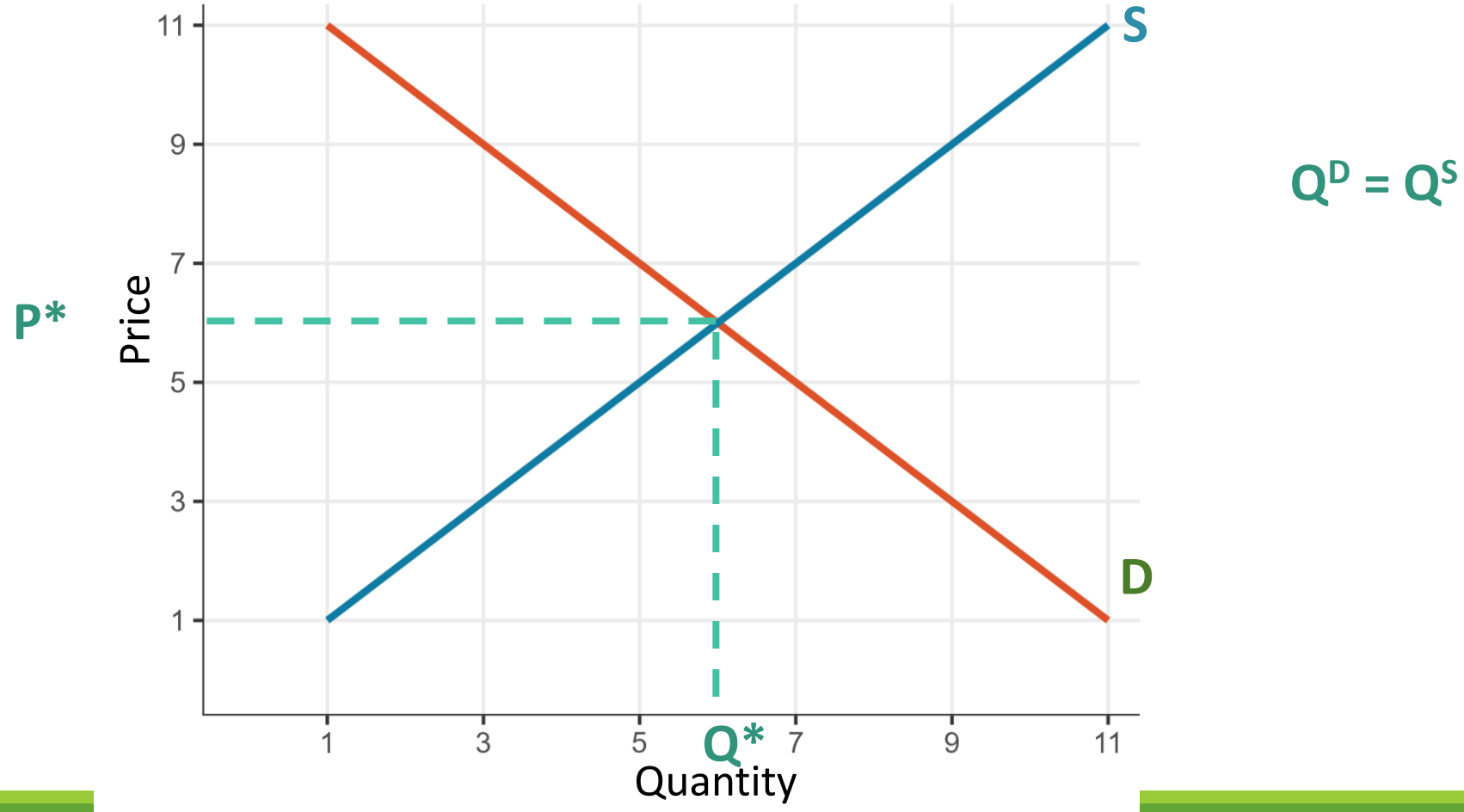
$Q^D > Q^S$

Market equilibrium



$Q^D > Q^S$

Market equilibrium



$Q^D = Q^S$

Market equilibrium

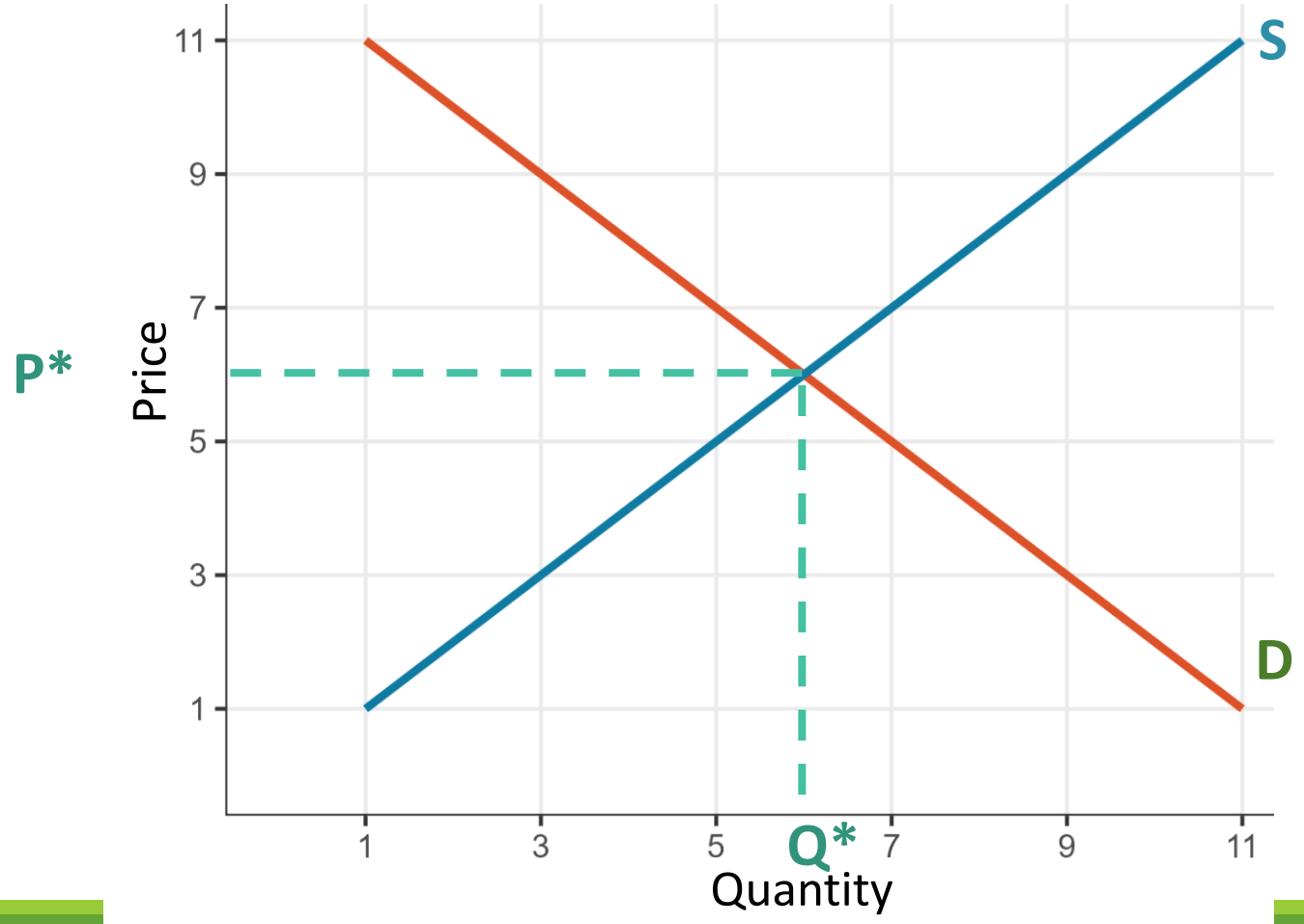
- **Conclusion**: at the level of **P*** nobody has an incentive to move.

Market equilibrium: shifts of the curves

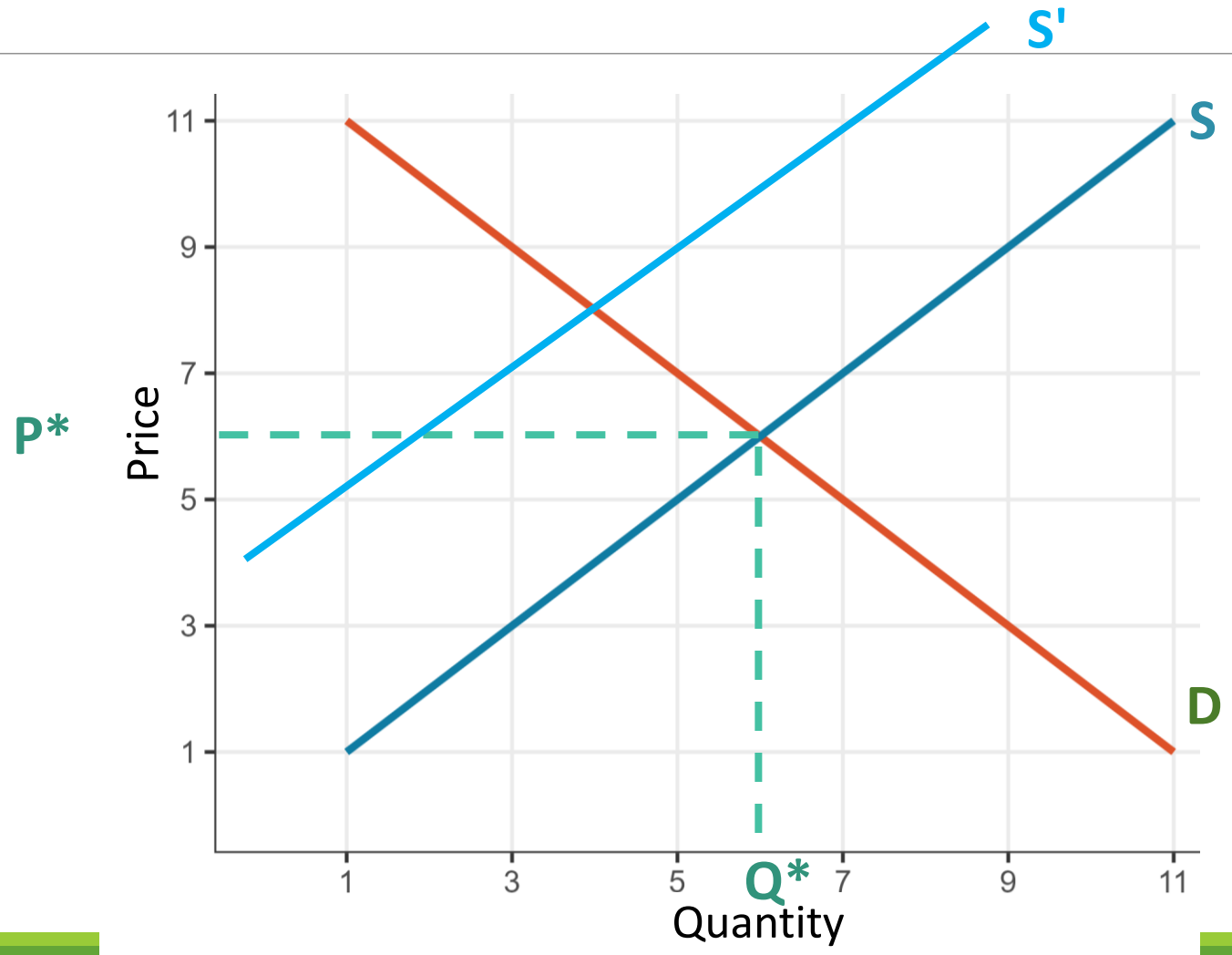
- The examples from excess supply and excess demand are examples of **movements along** the curves.

- What happens if there are **shifts of** the supply and demand curves?

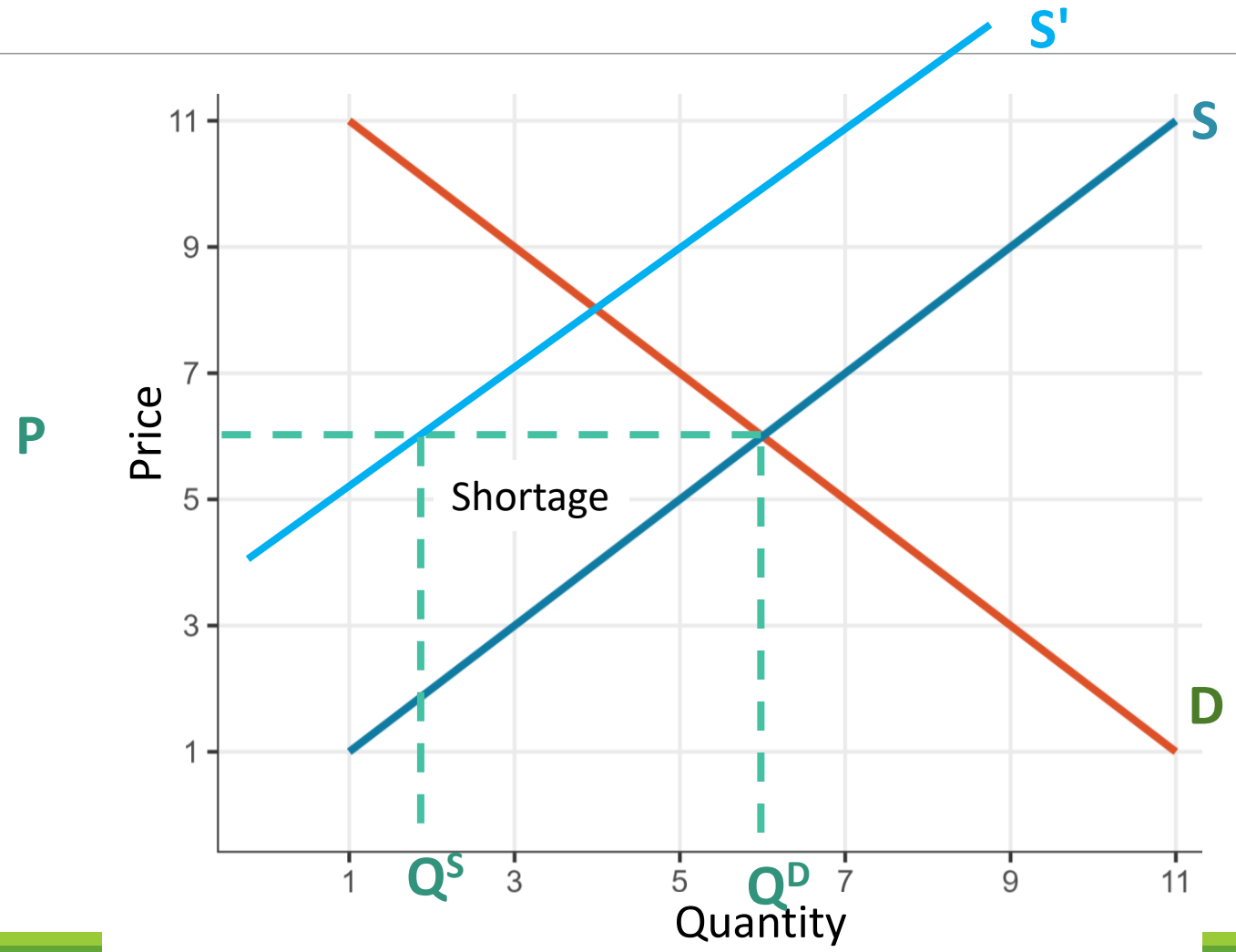
Market equilibrium: Supply shifts



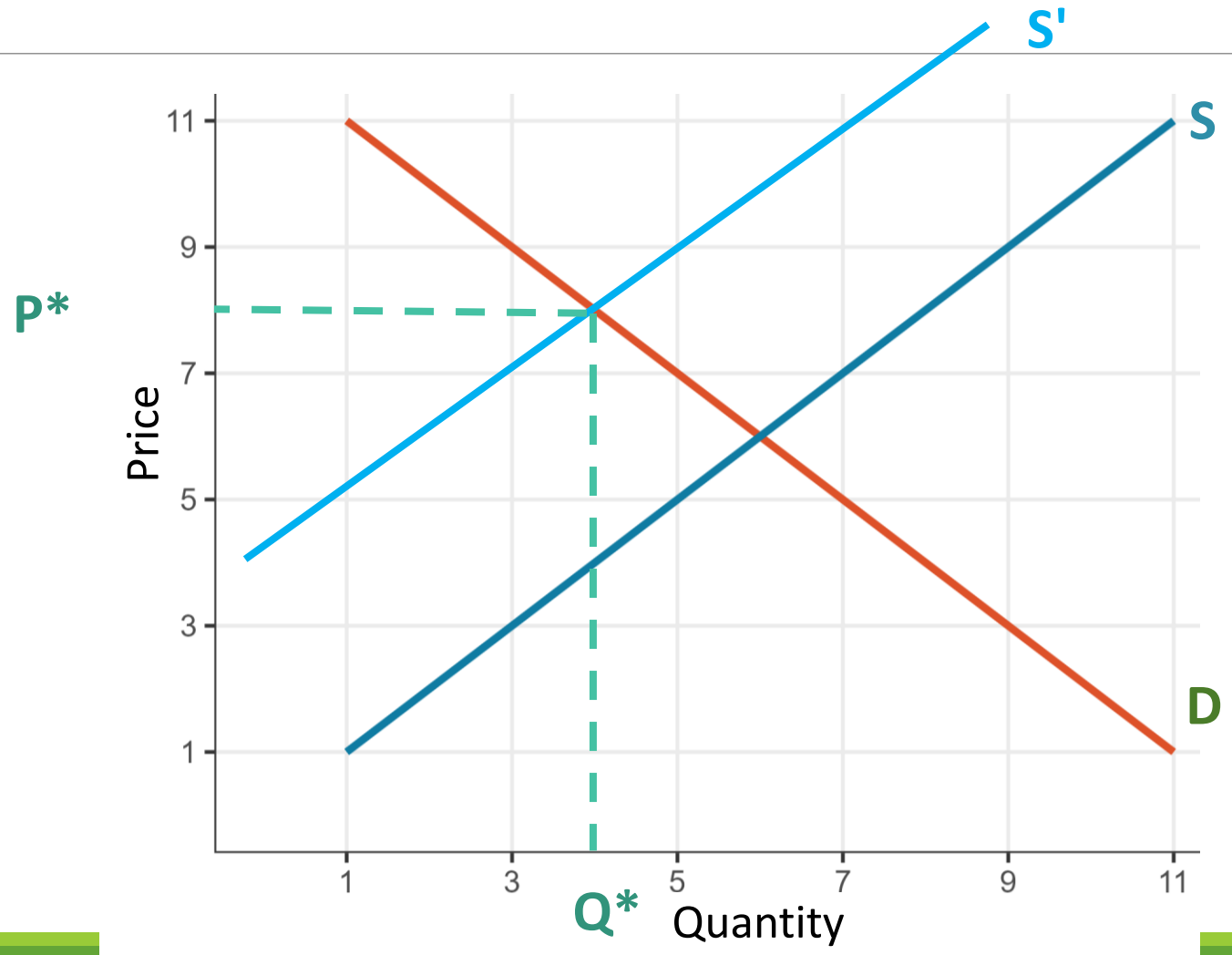
Market equilibrium: Supply shifts



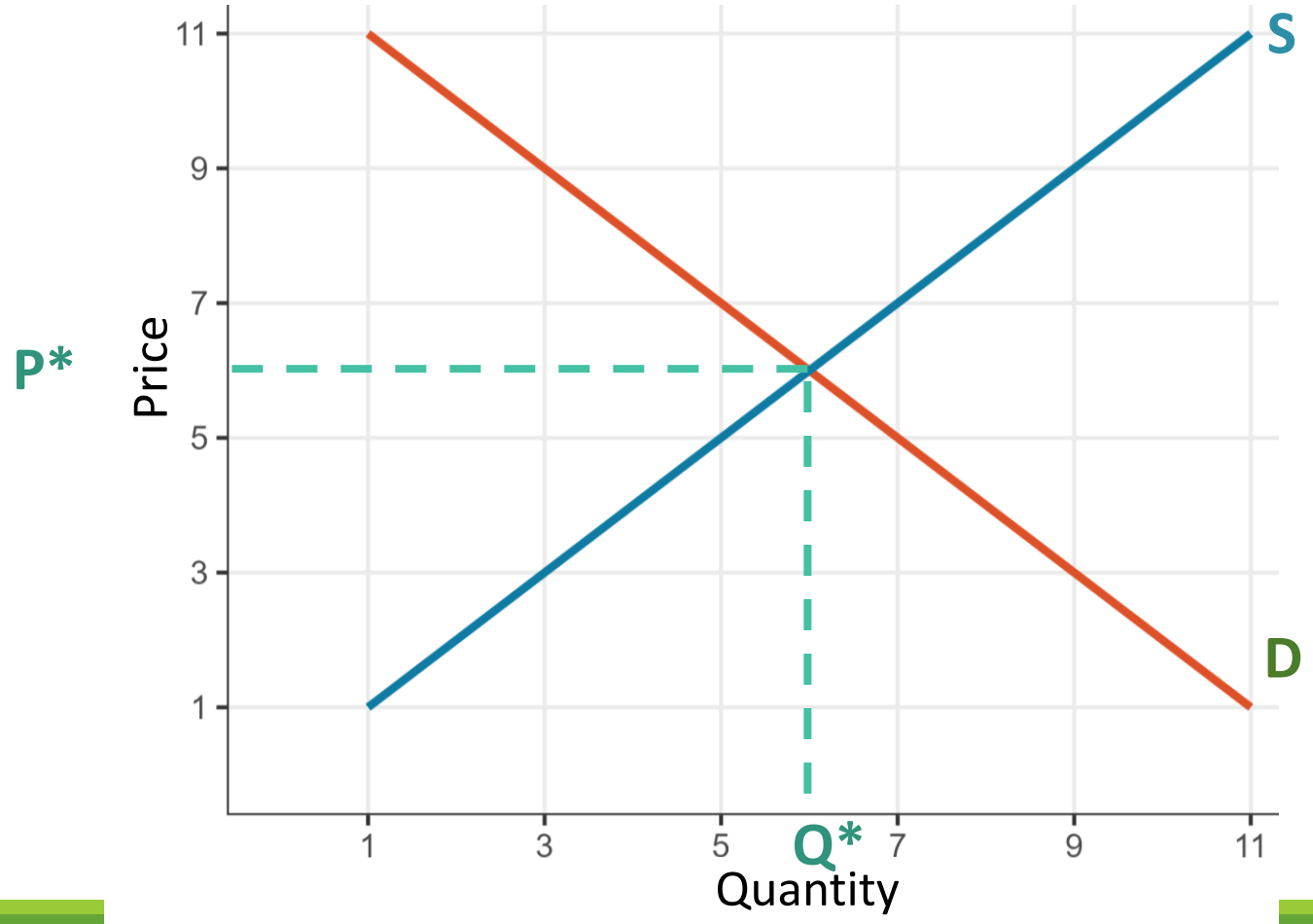
Market equilibrium: Supply shifts



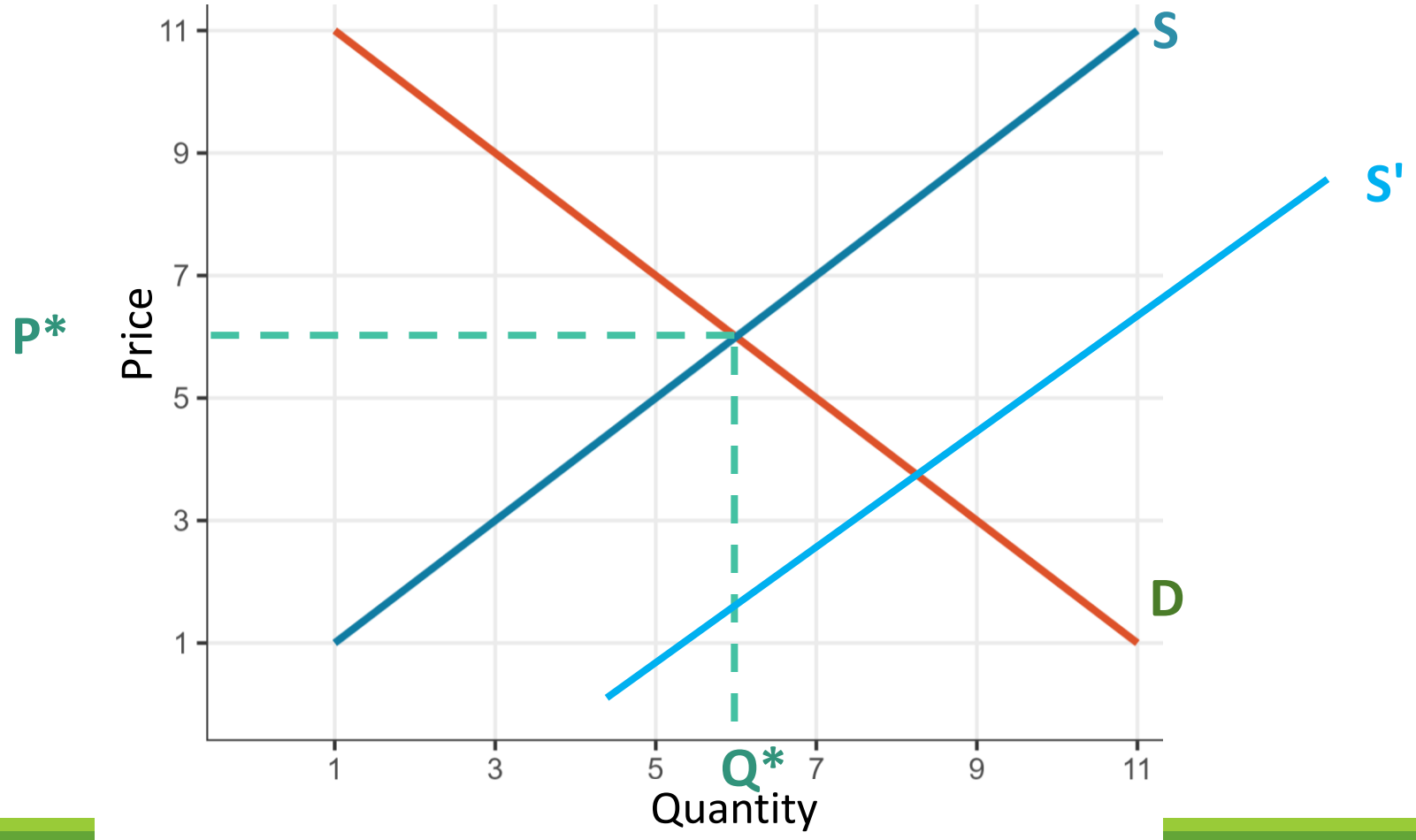
Market equilibrium: Supply shifts



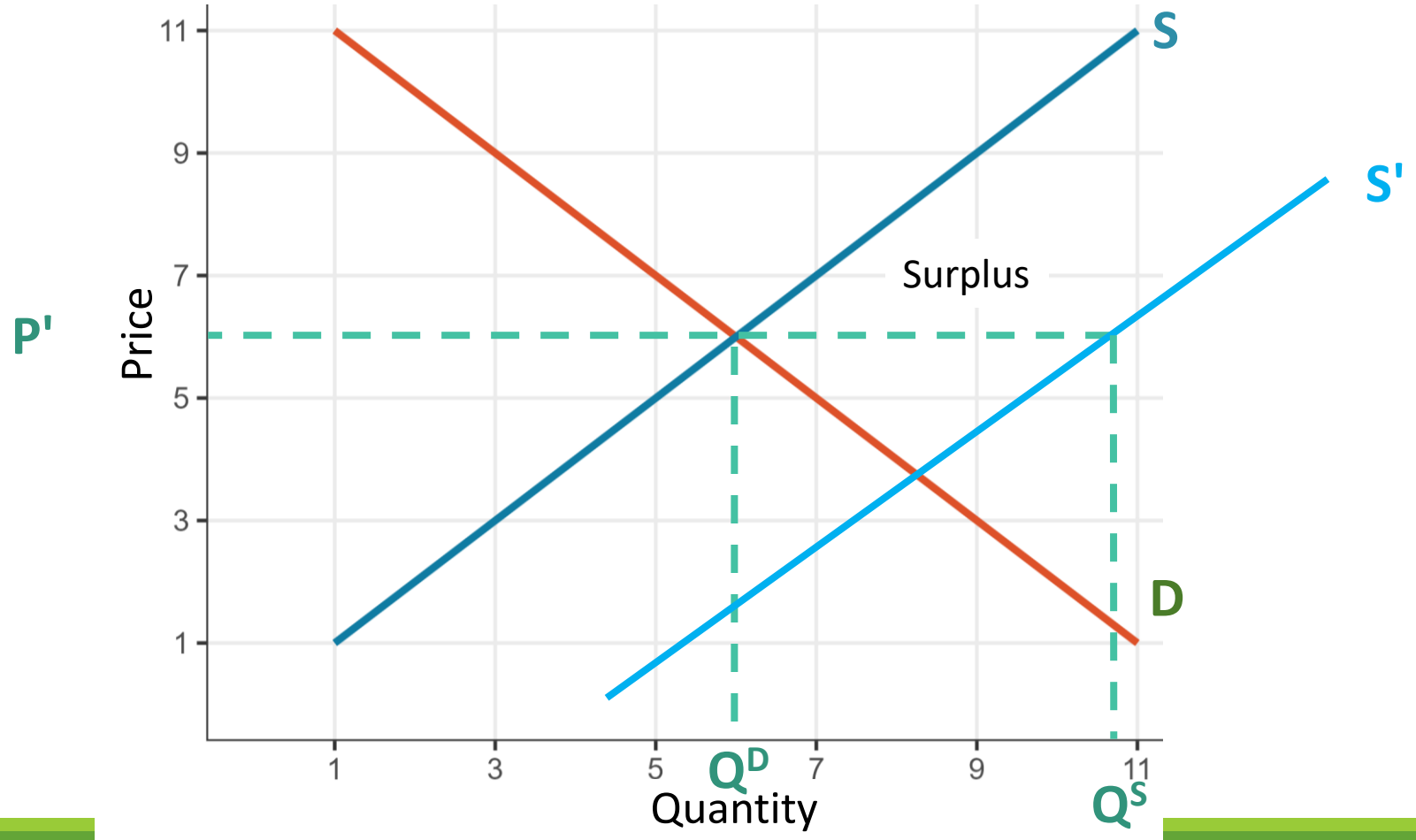
Market equilibrium: Supply shifts



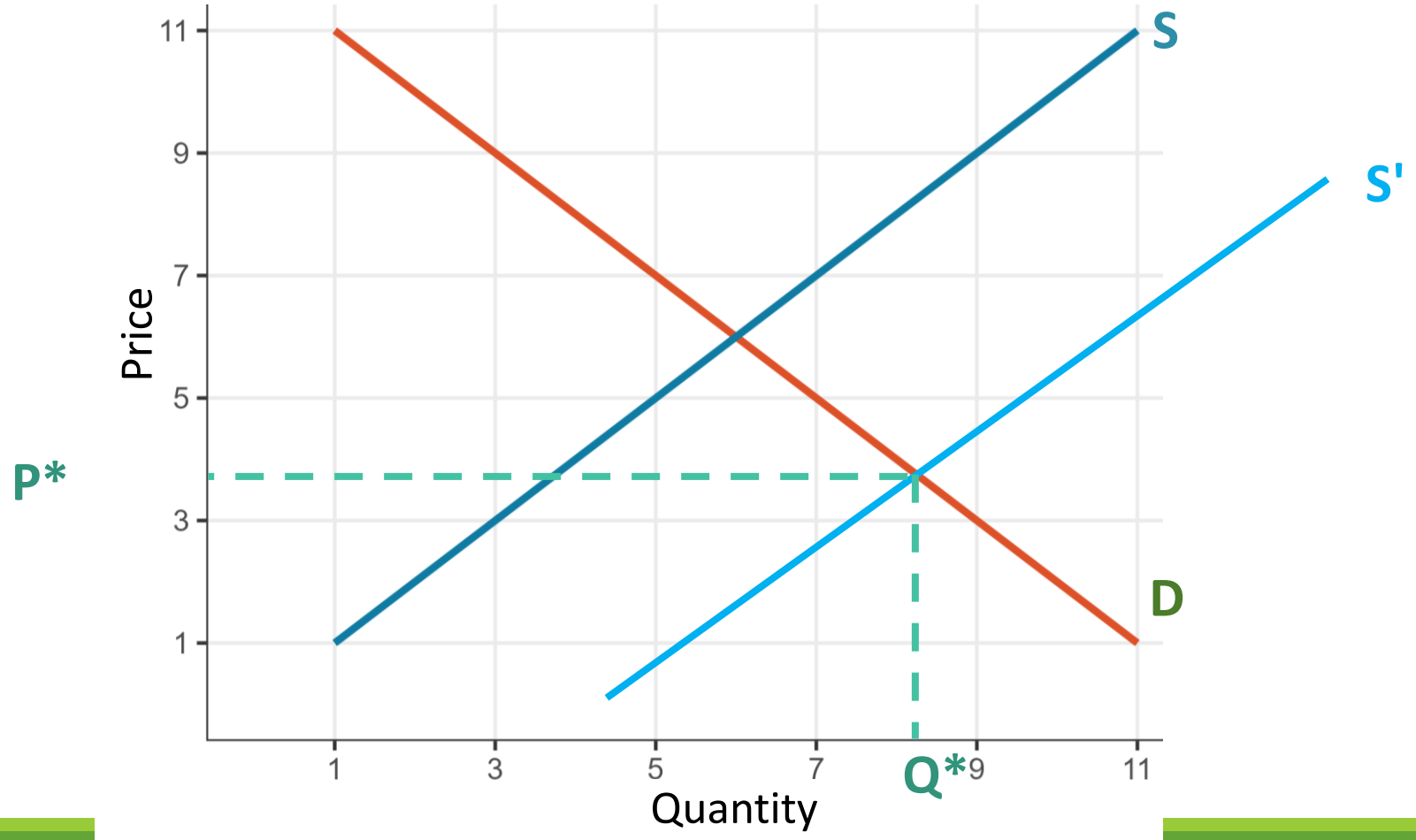
Market equilibrium: Supply shifts



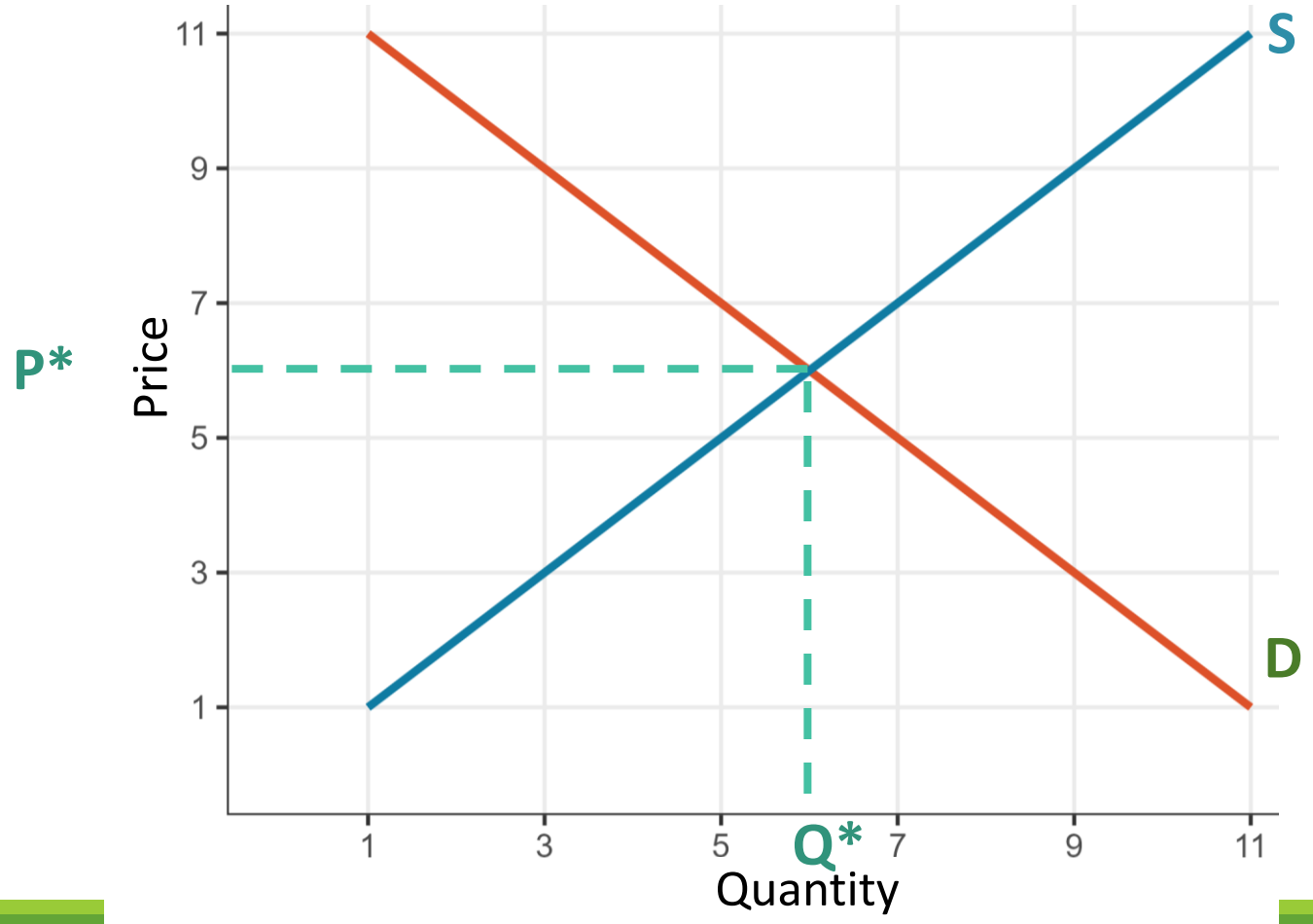
Market equilibrium: Supply shifts



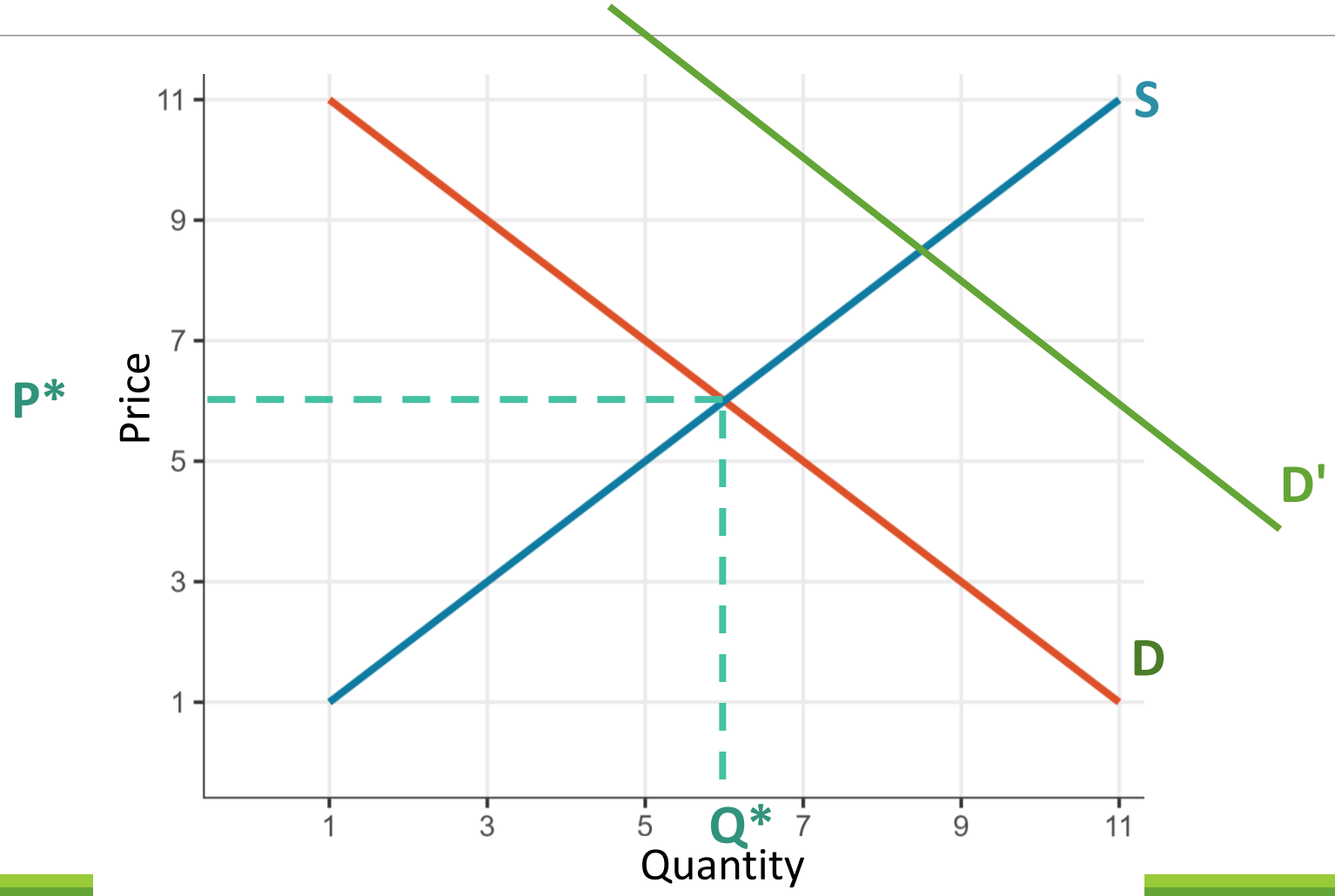
Market equilibrium: Supply shifts



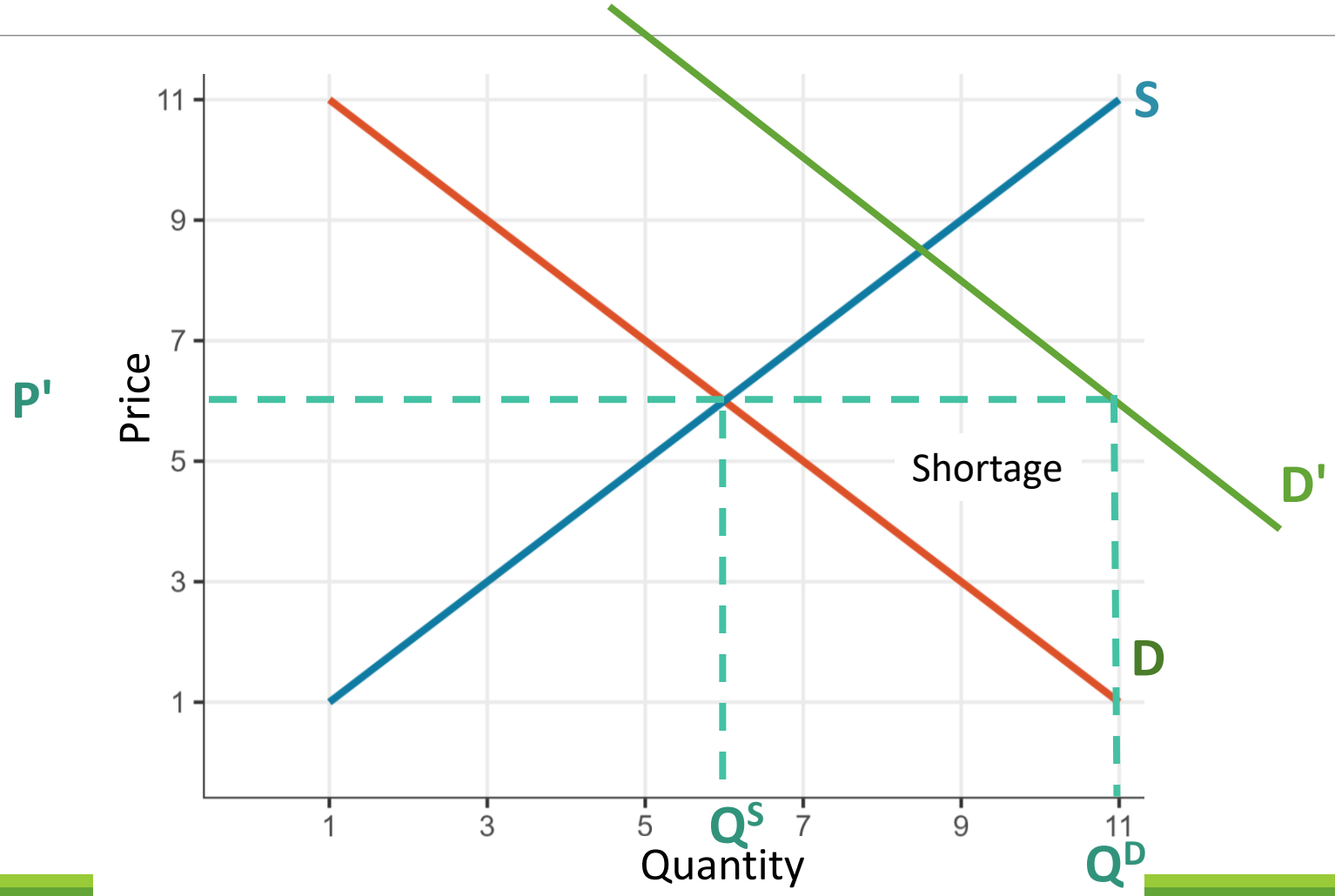
Market equilibrium: Demand shifts



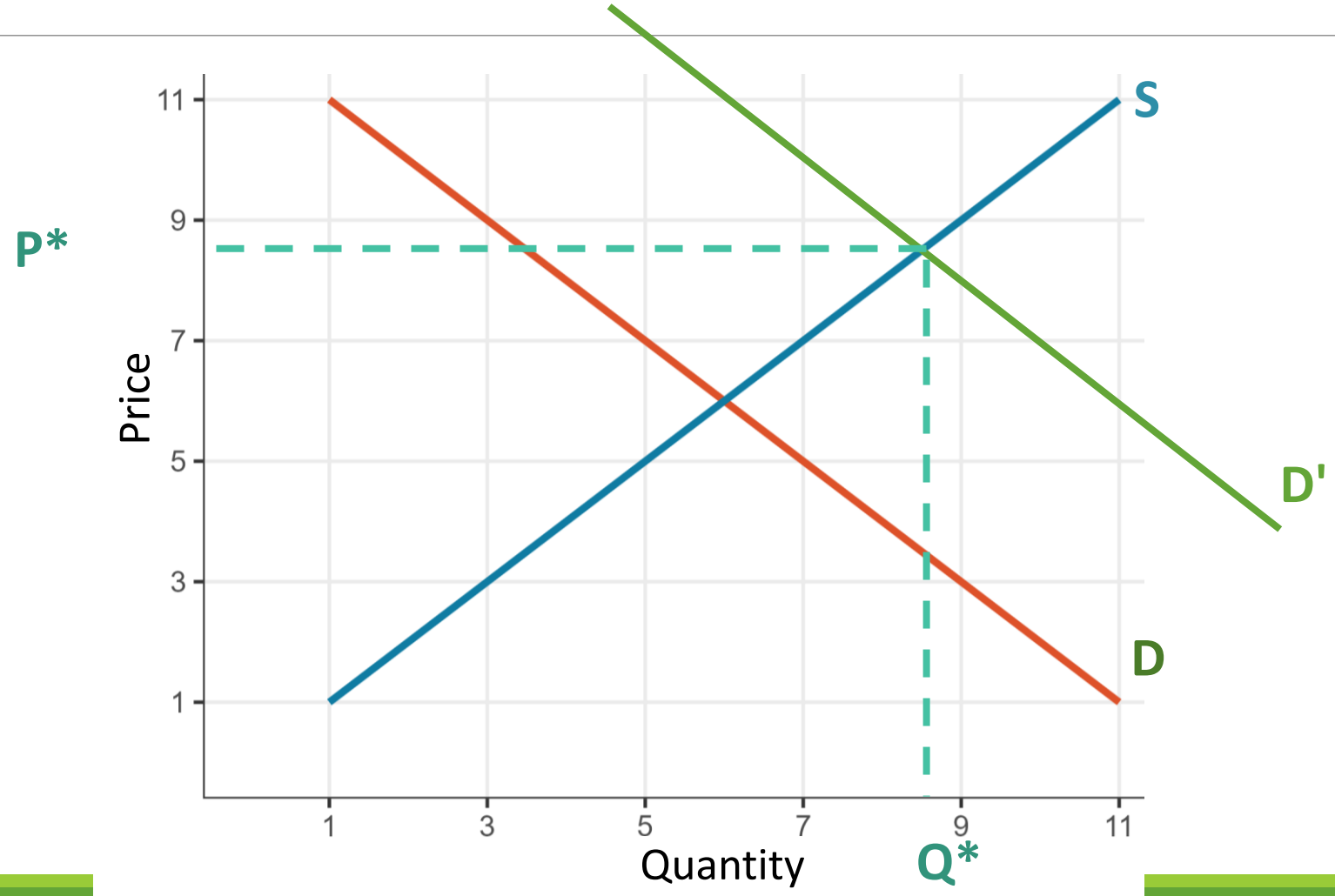
Market equilibrium: Demand shifts



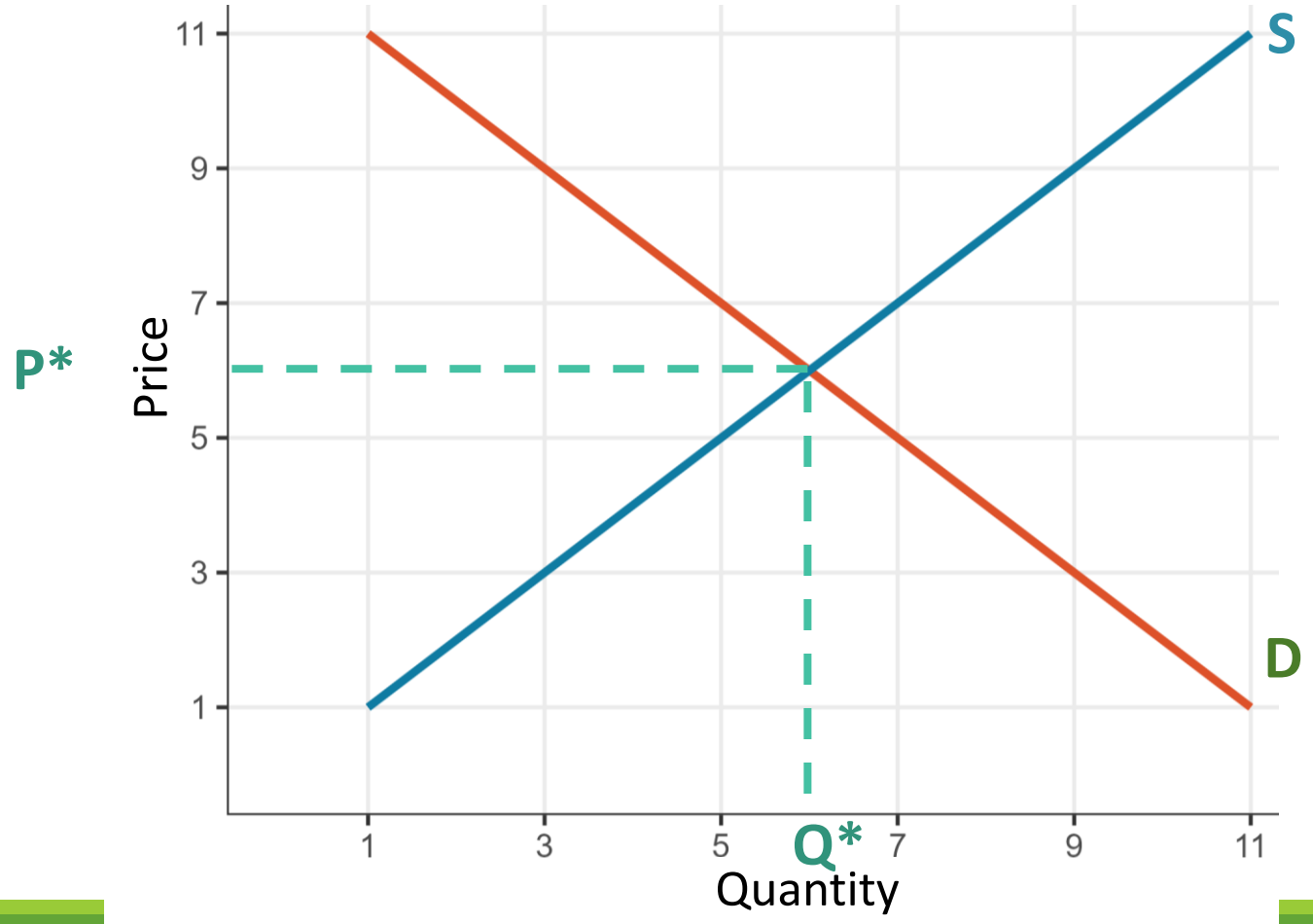
Market equilibrium: Demand shifts



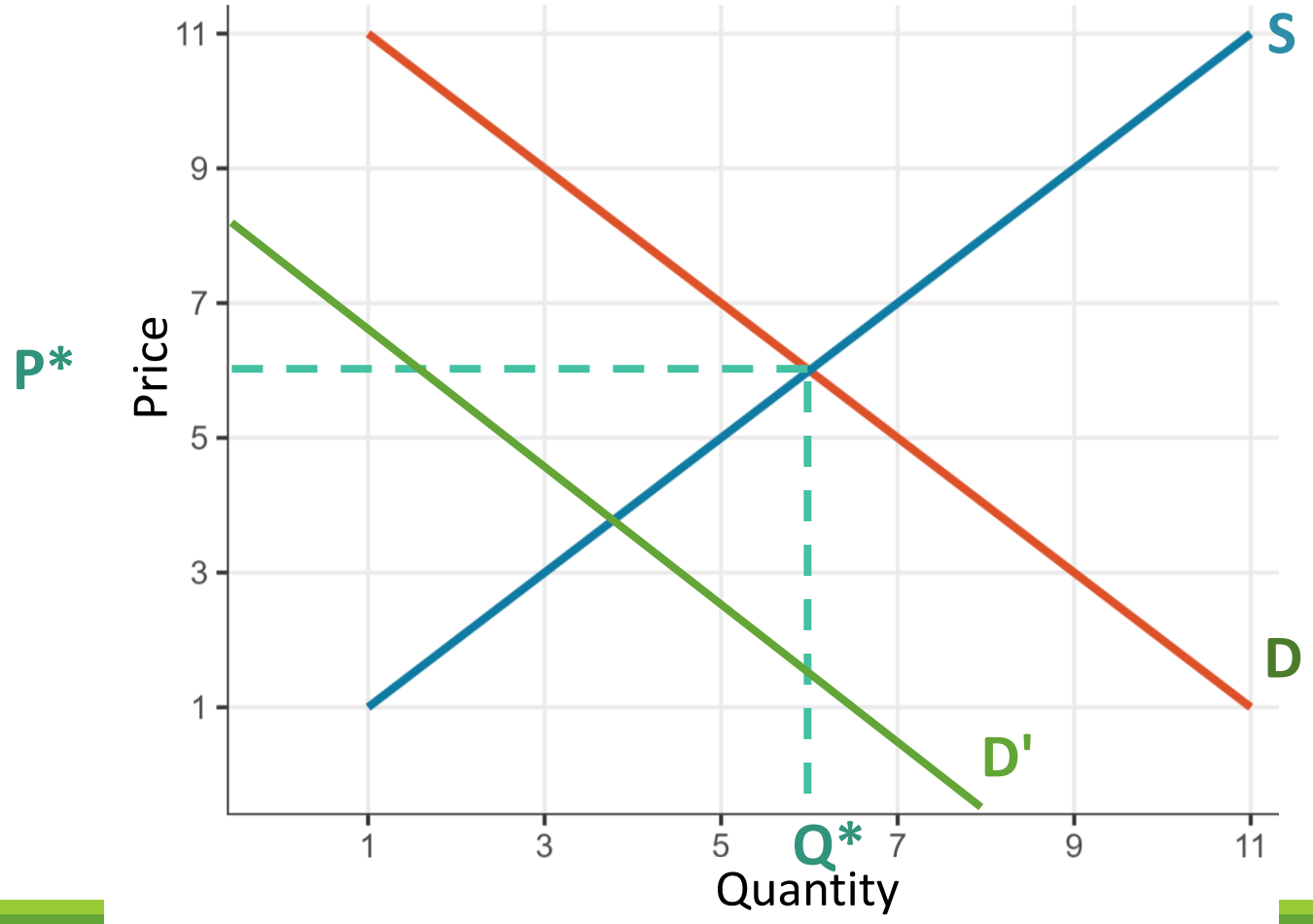
Market equilibrium: Demand shifts



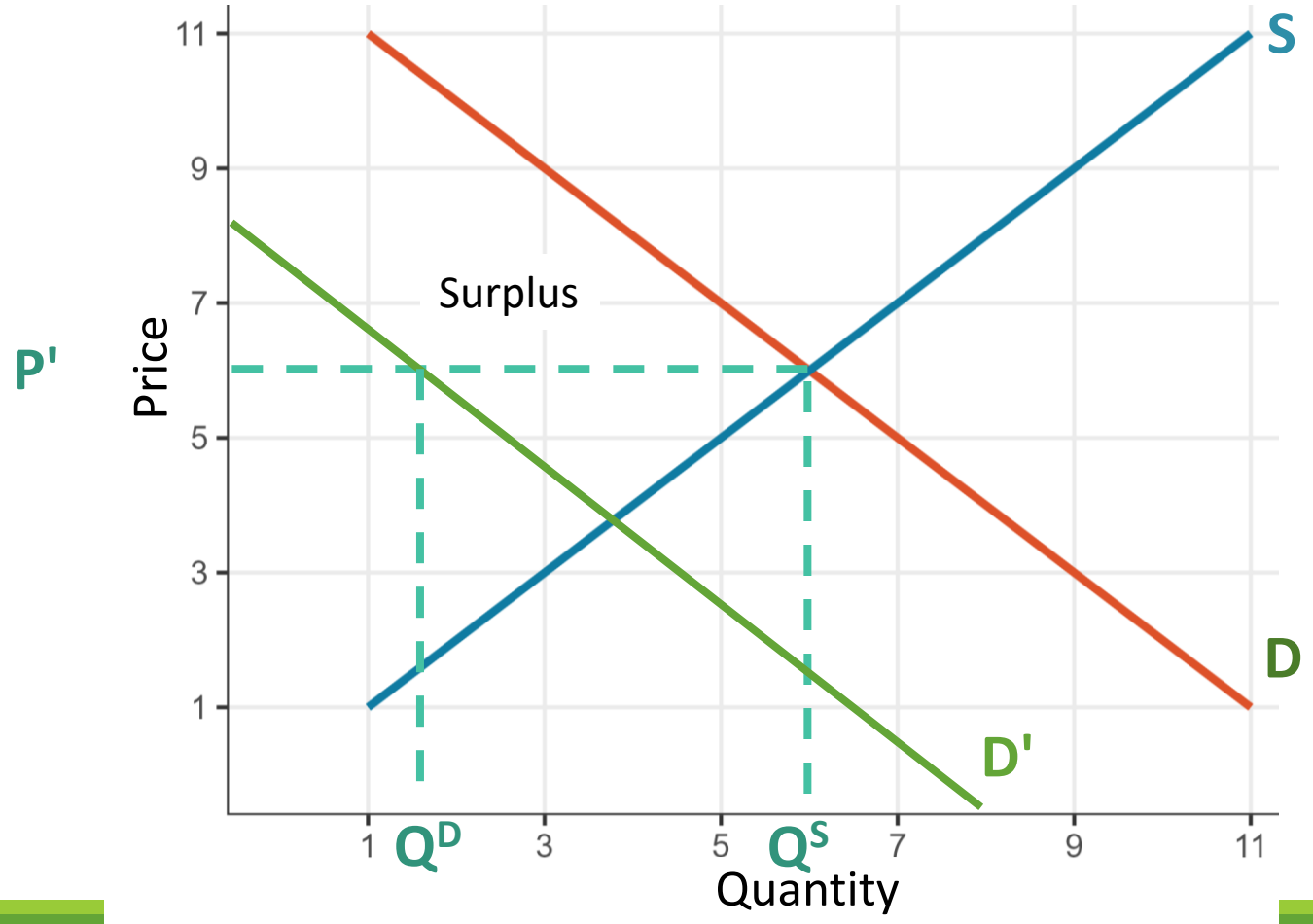
Market equilibrium: Demand shifts



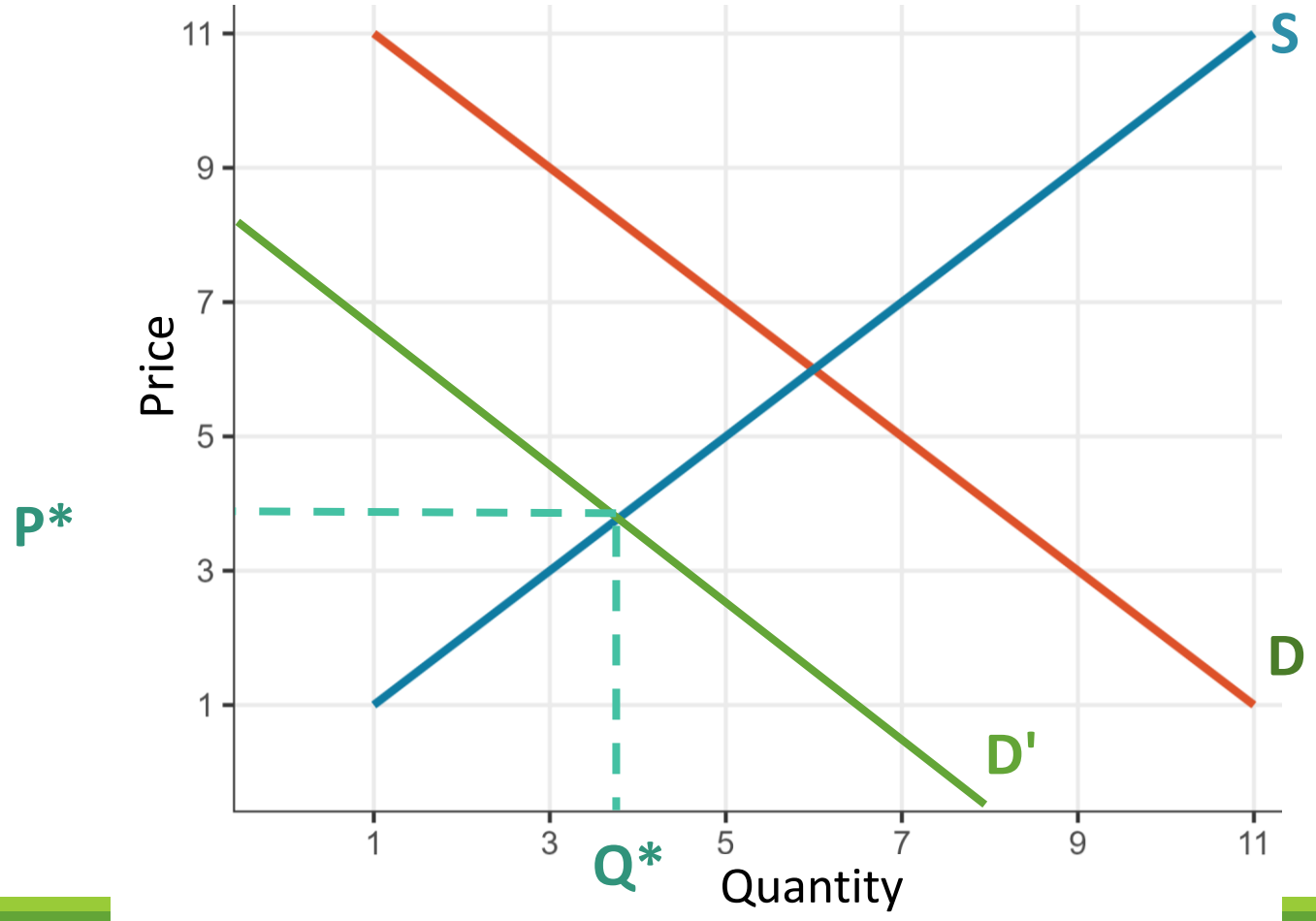
Market equilibrium: Demand shifts



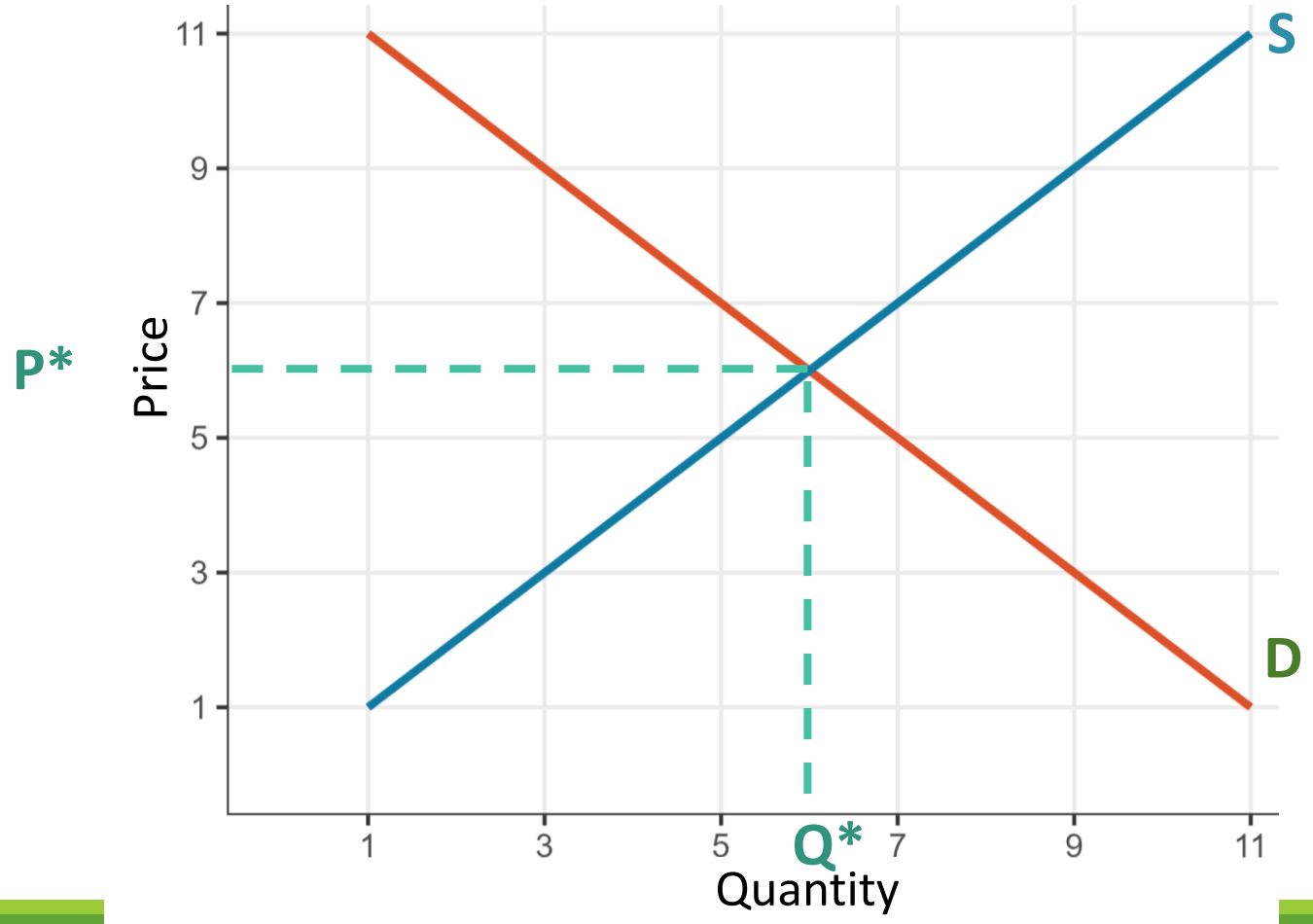
Market equilibrium: Demand shifts



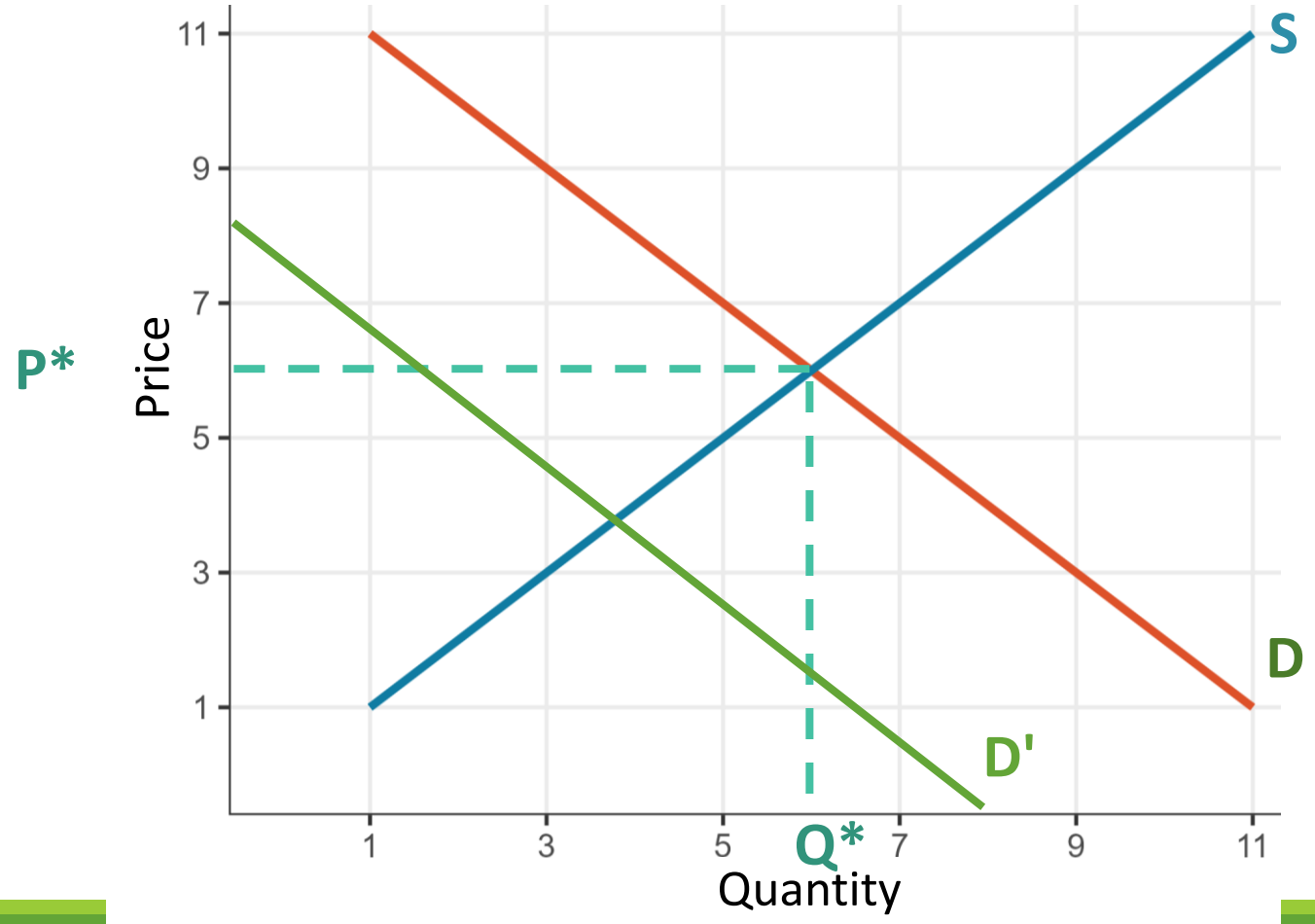
Market equilibrium: Demand shifts



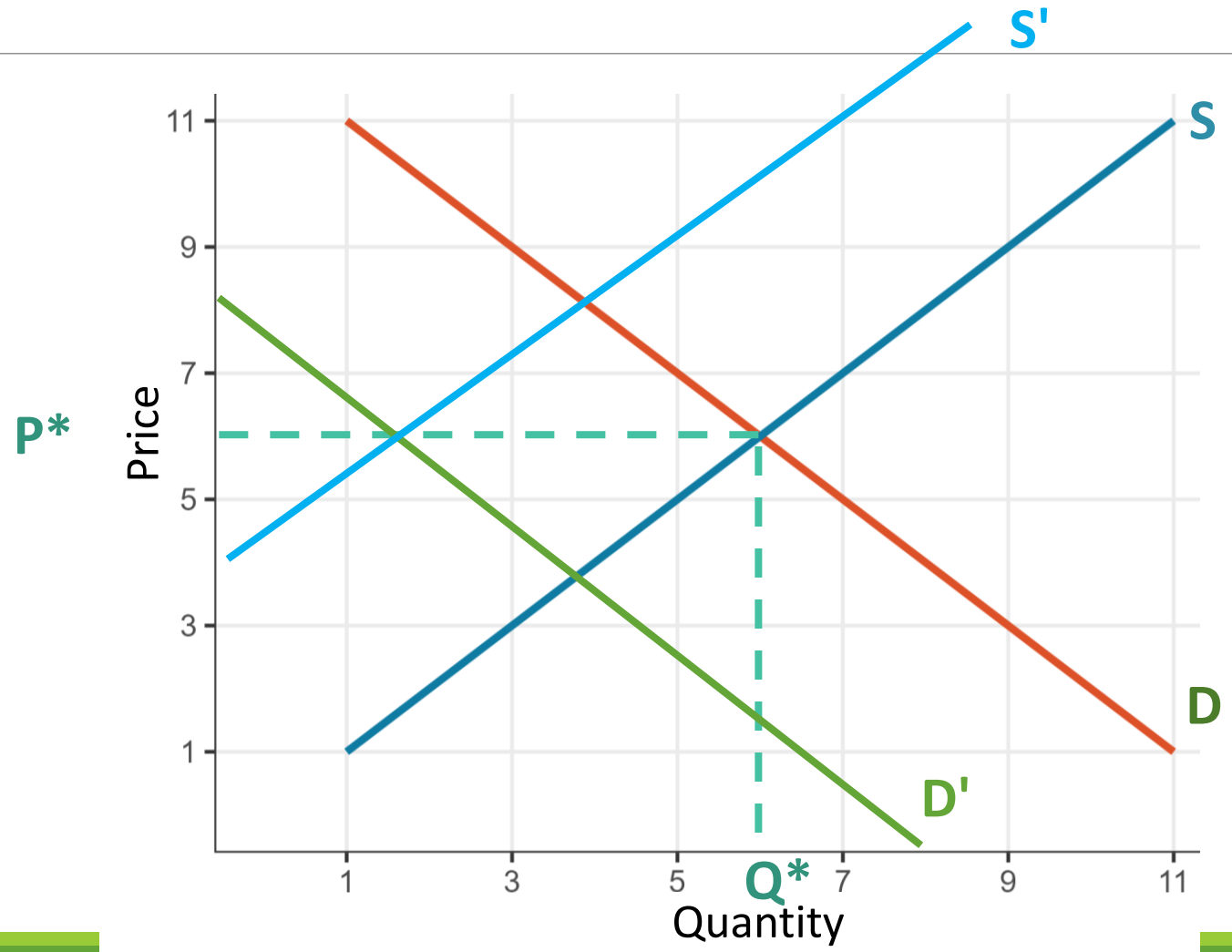
Market equilibrium: Simultaneous shifts



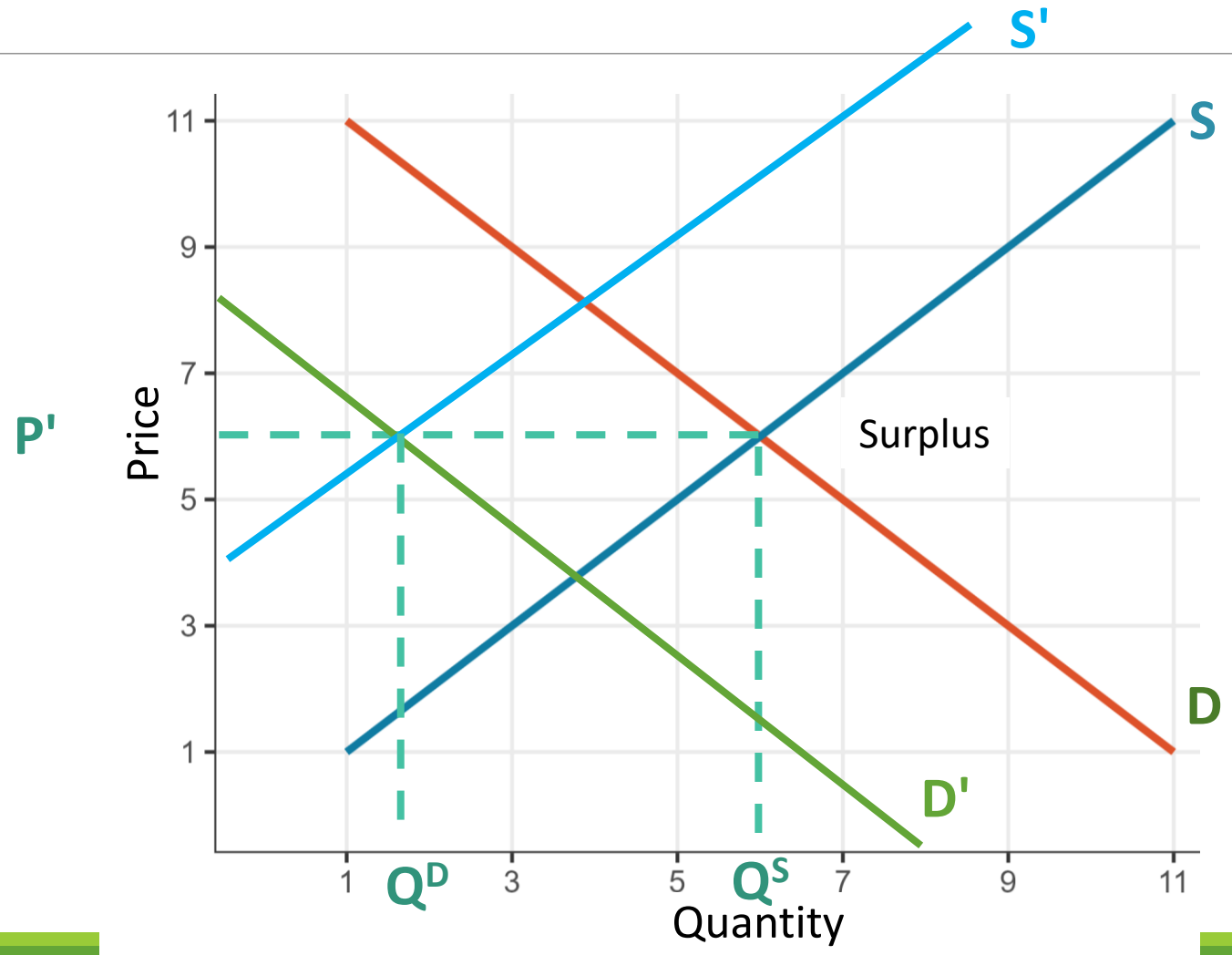
Market equilibrium: Simultaneous shifts



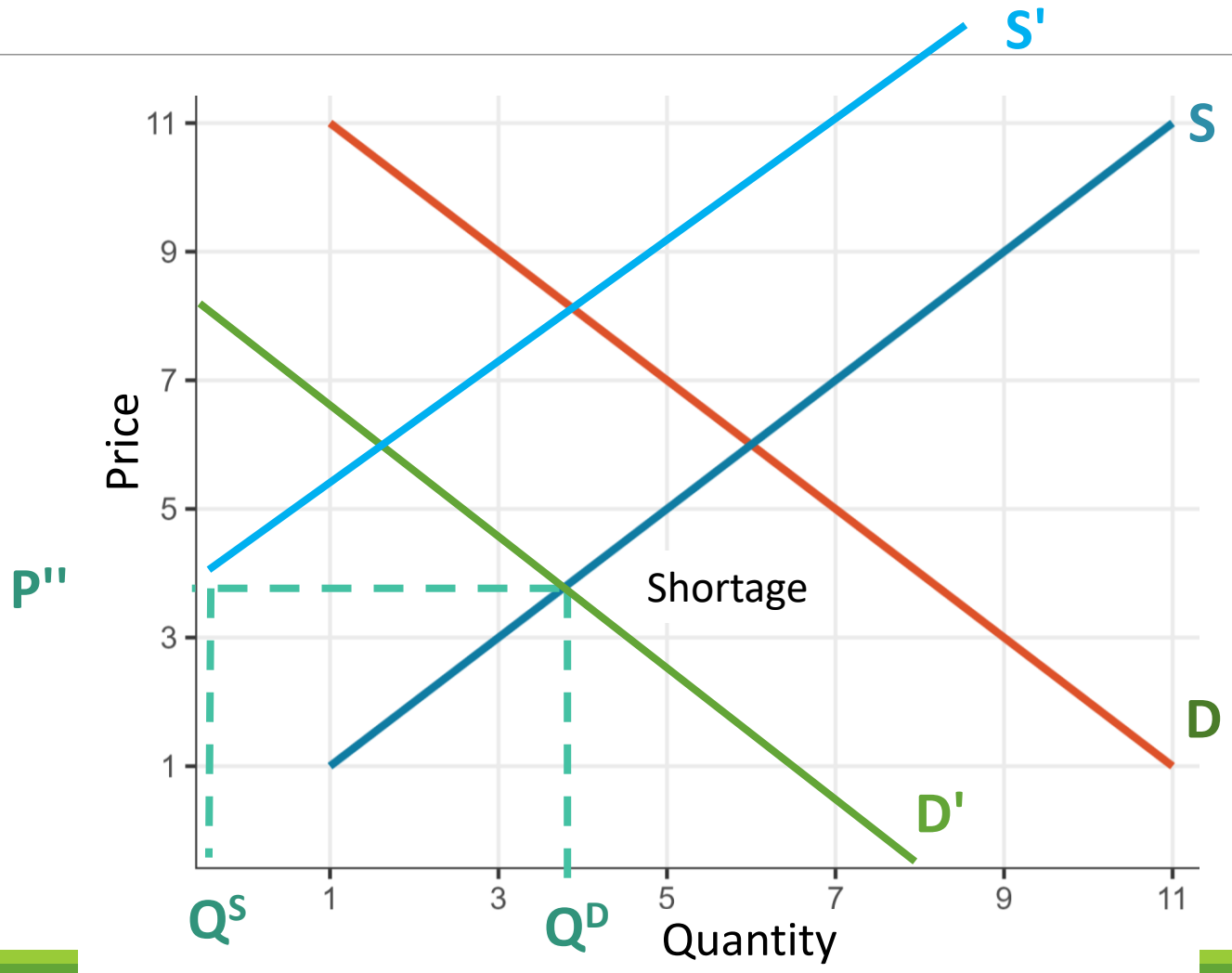
Market equilibrium: Simultaneous shifts



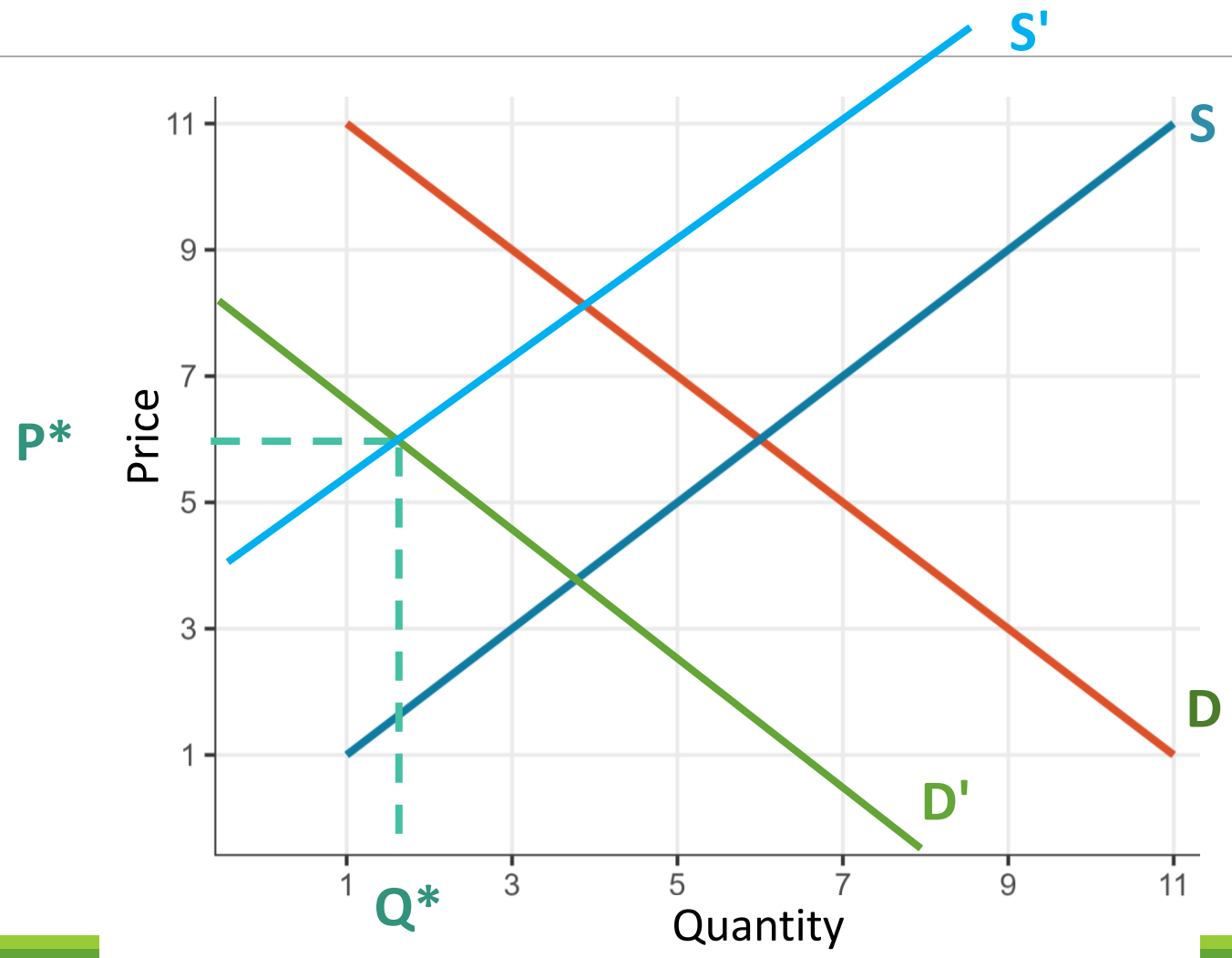
Market equilibrium: Simultaneous shifts



Market equilibrium: Simultaneous shifts



Market equilibrium: Simultaneous shifts



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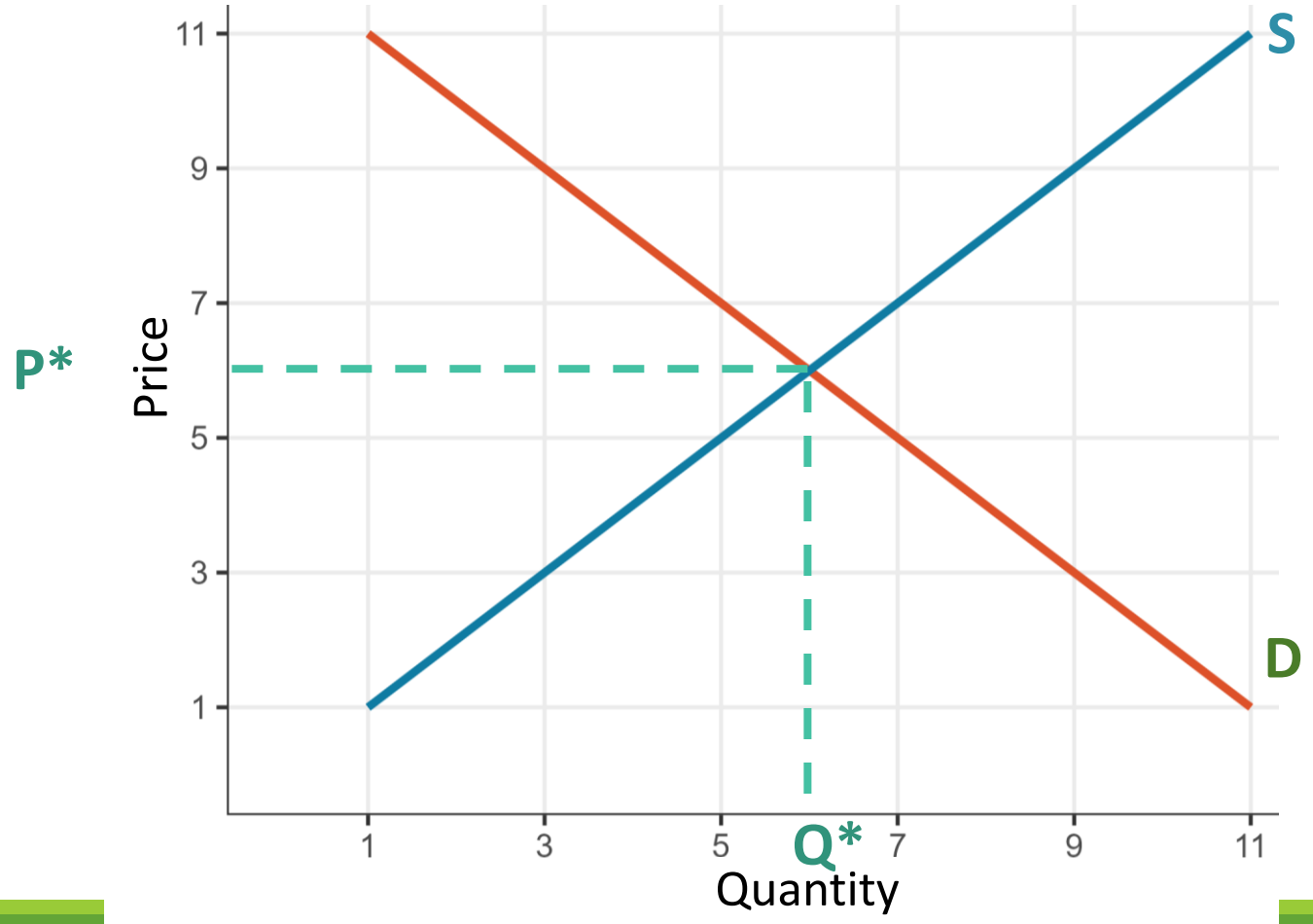

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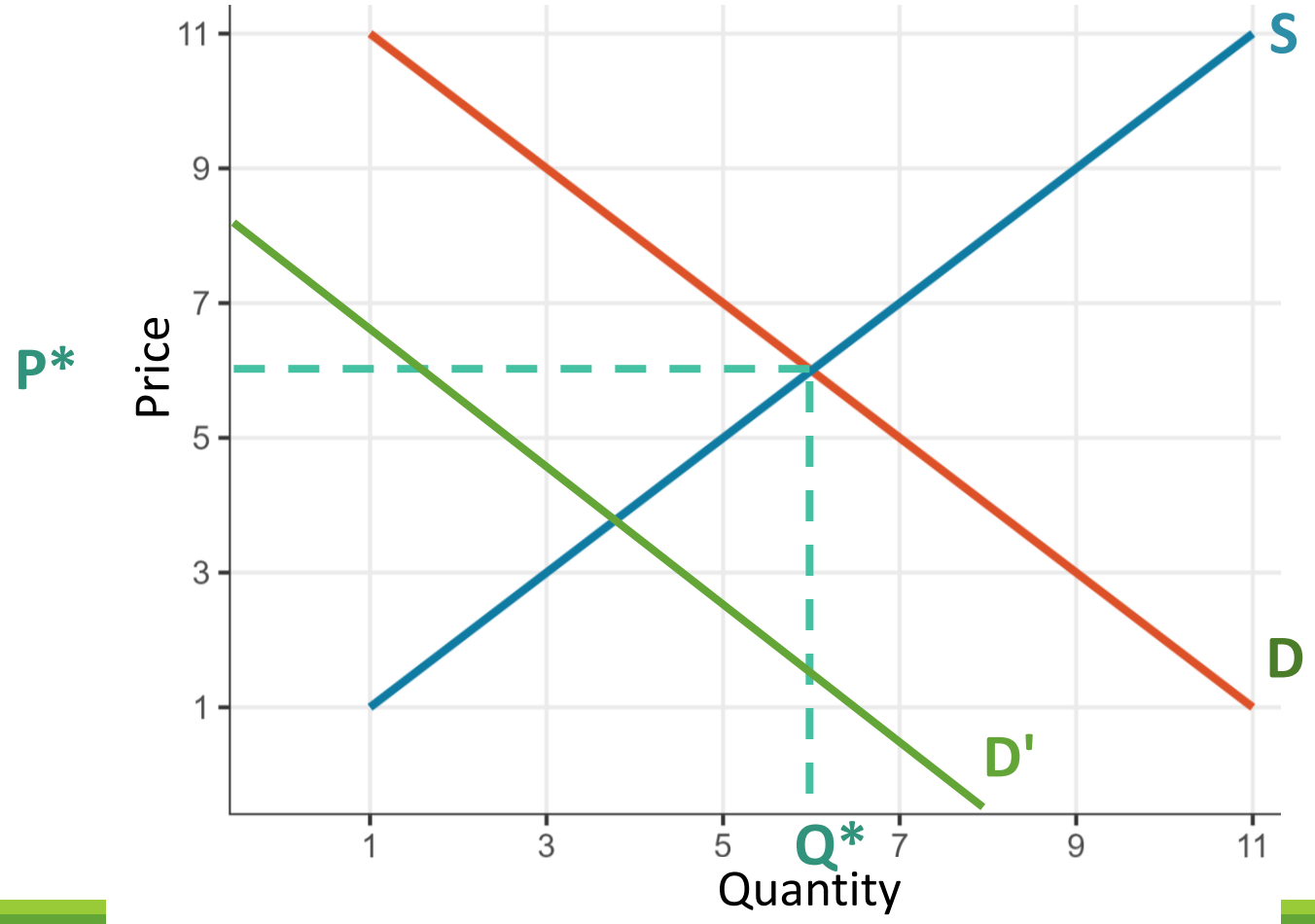

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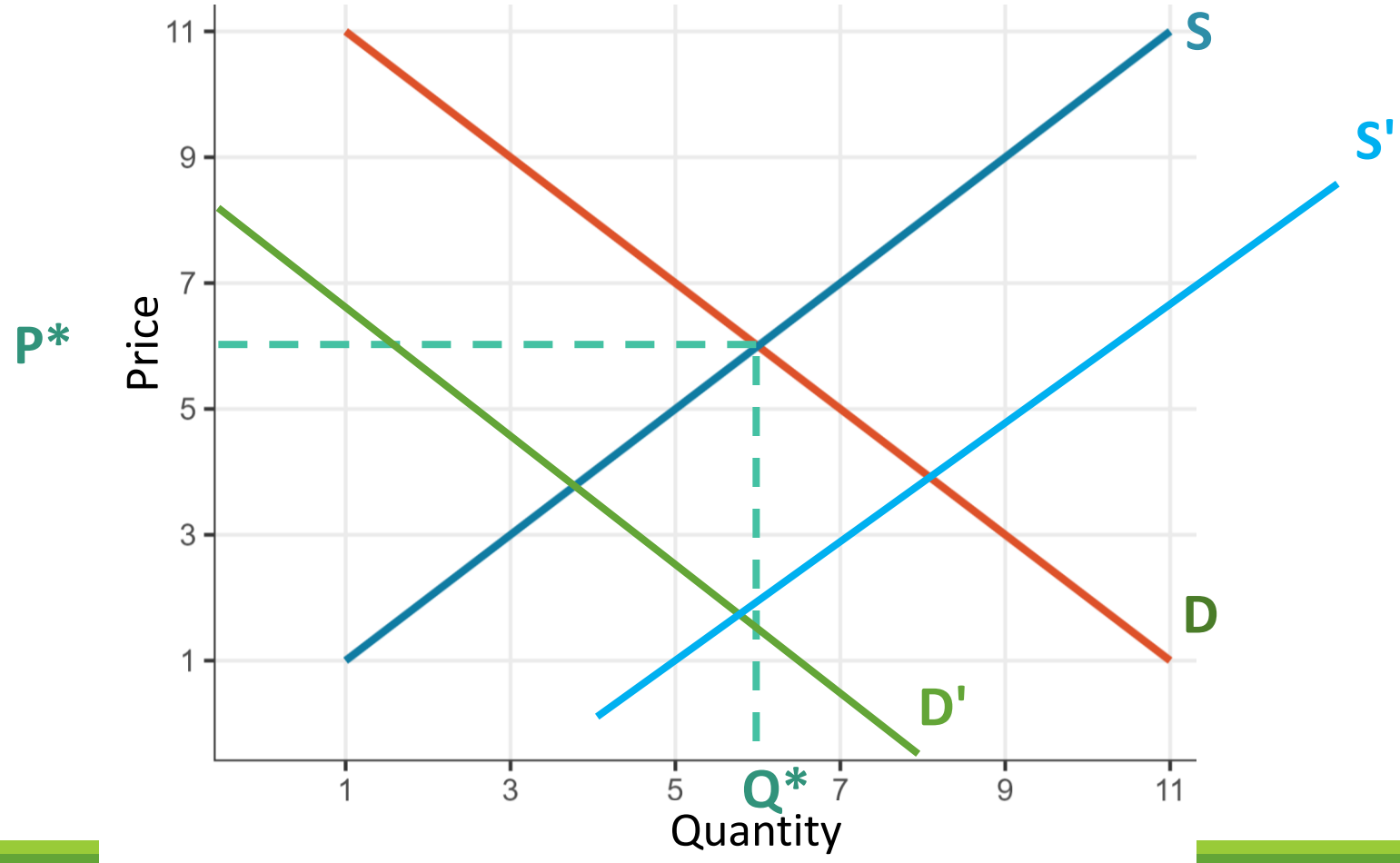
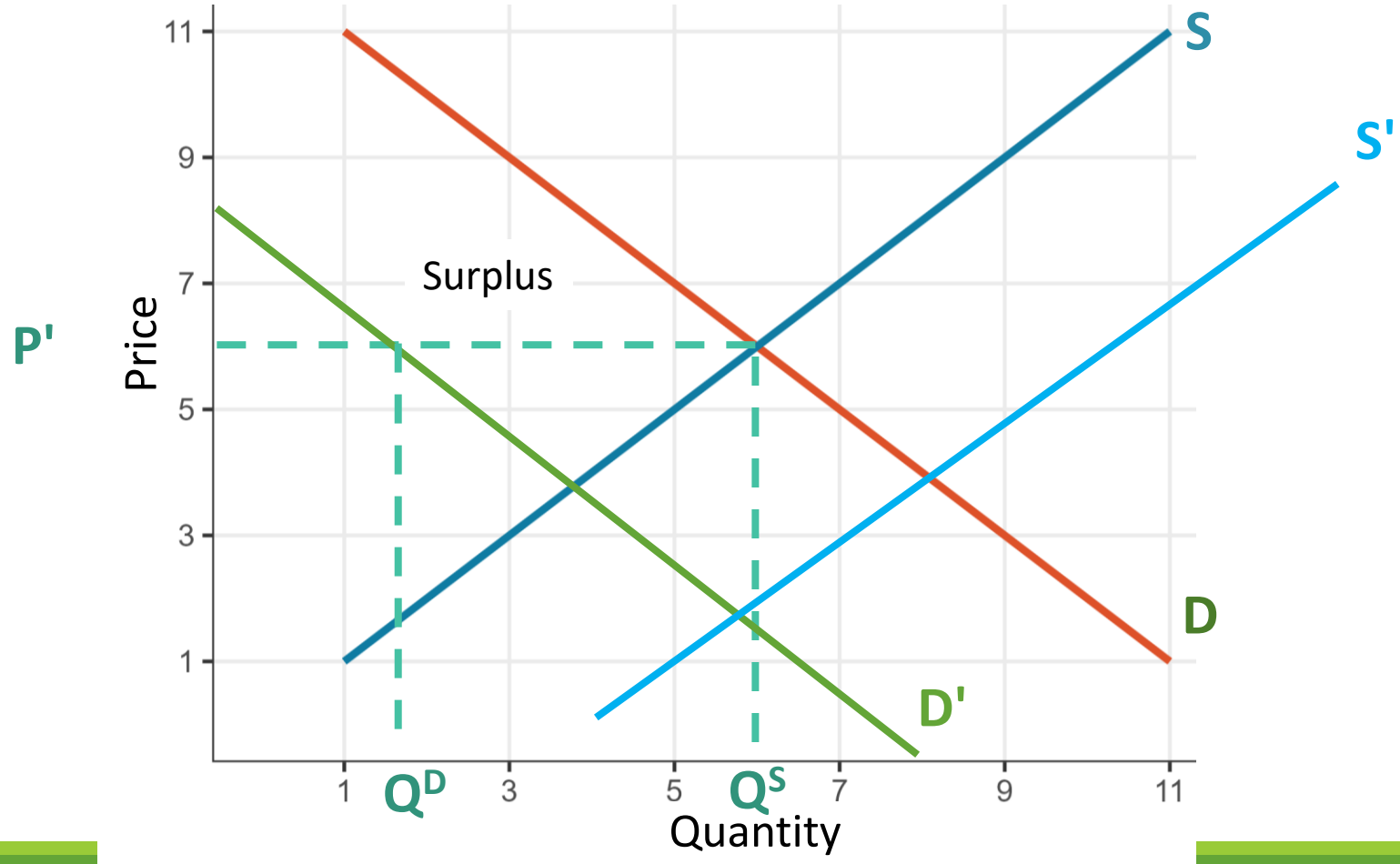
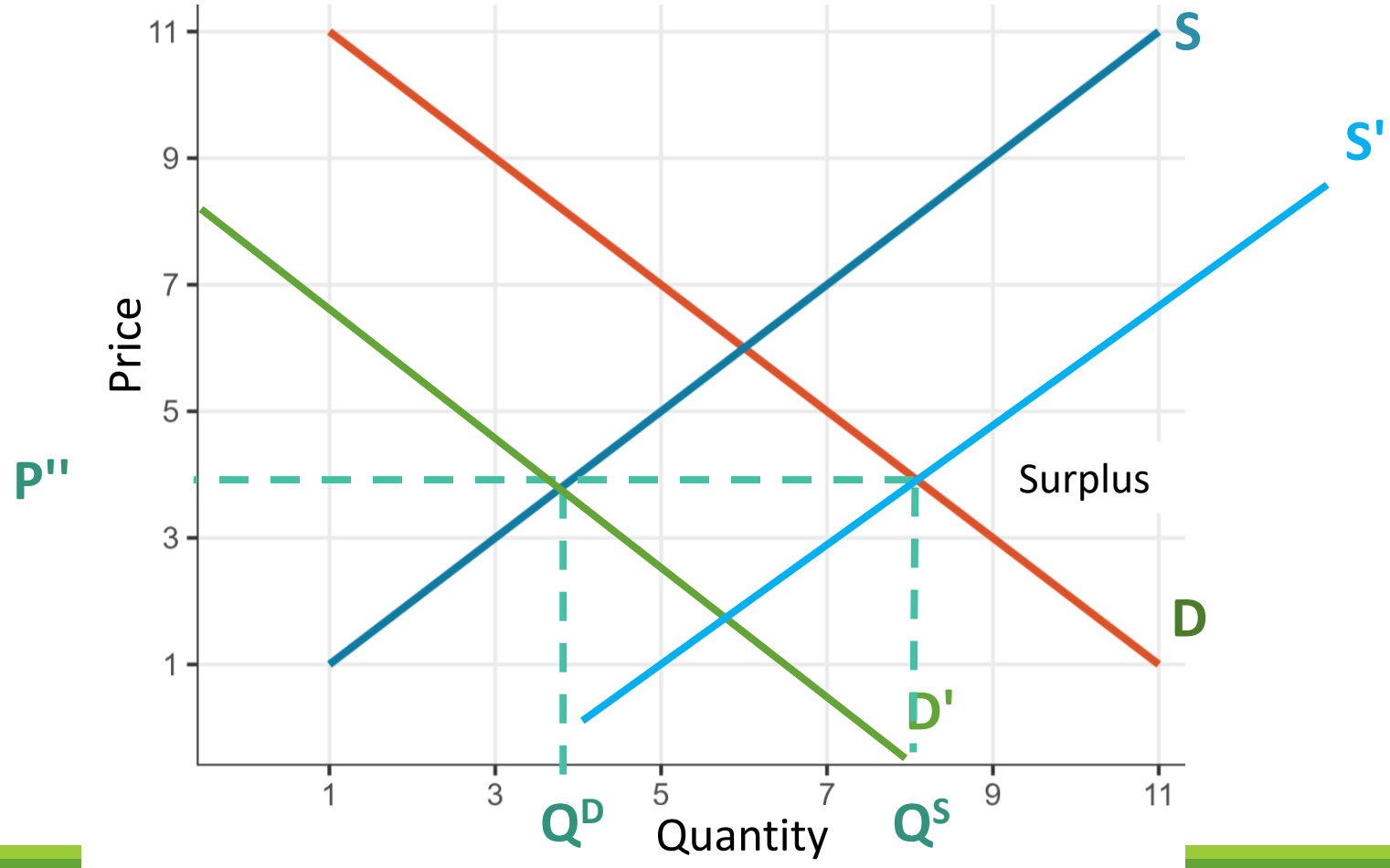


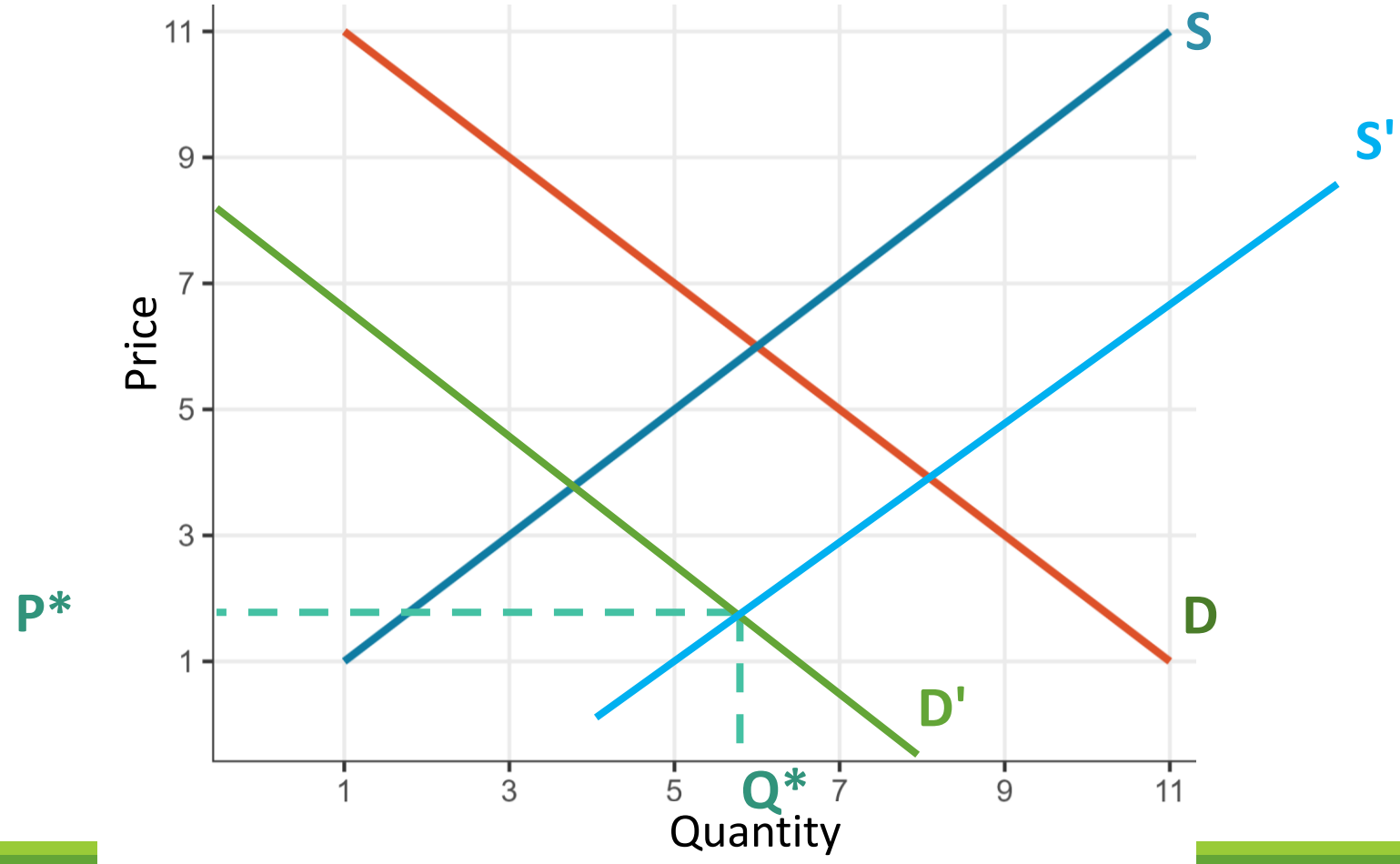
Market equilibrium: Simultaneous shifts



Market equilibrium: Simultaneous shifts



Market equilibrium: Simultaneous shifts



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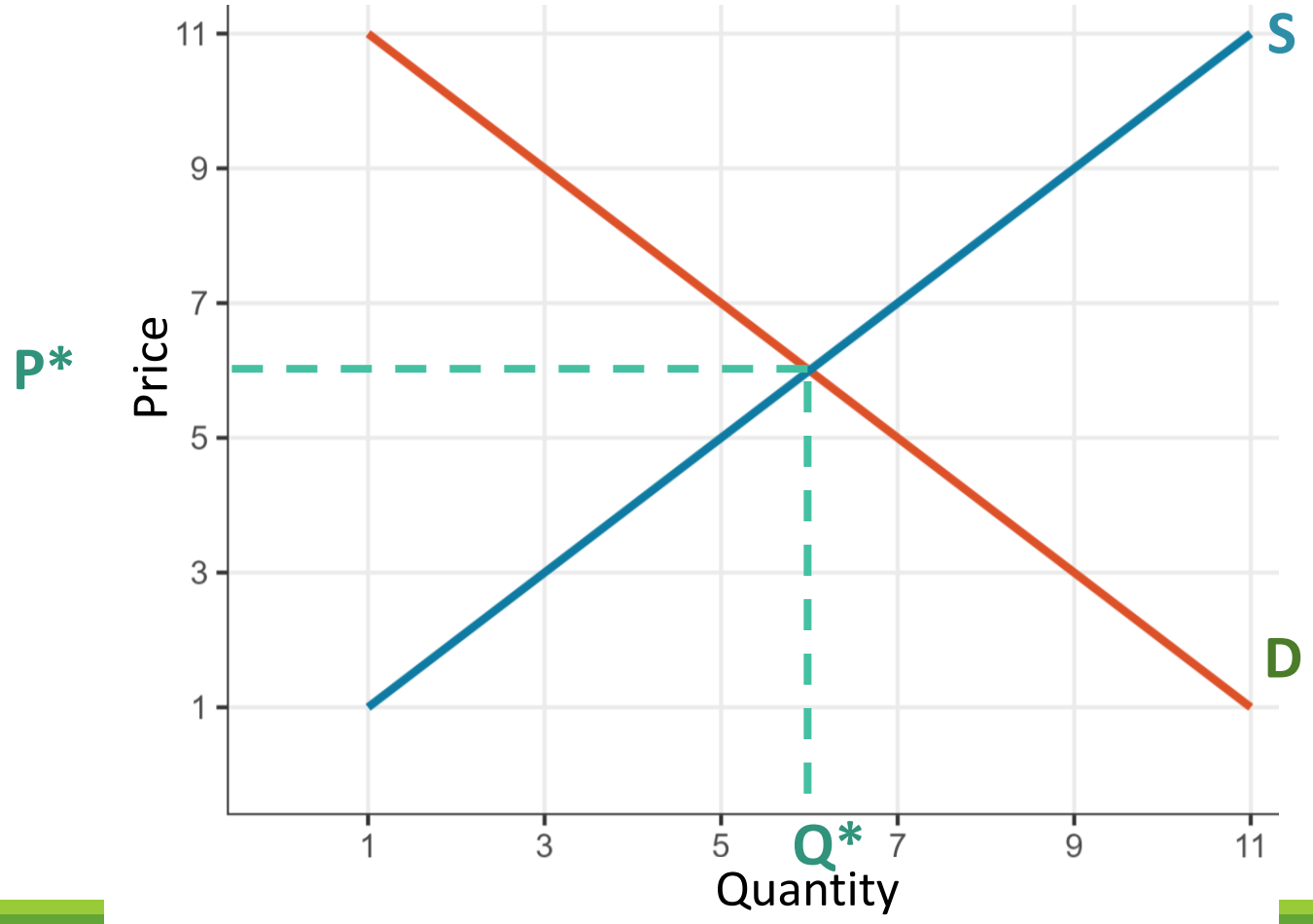

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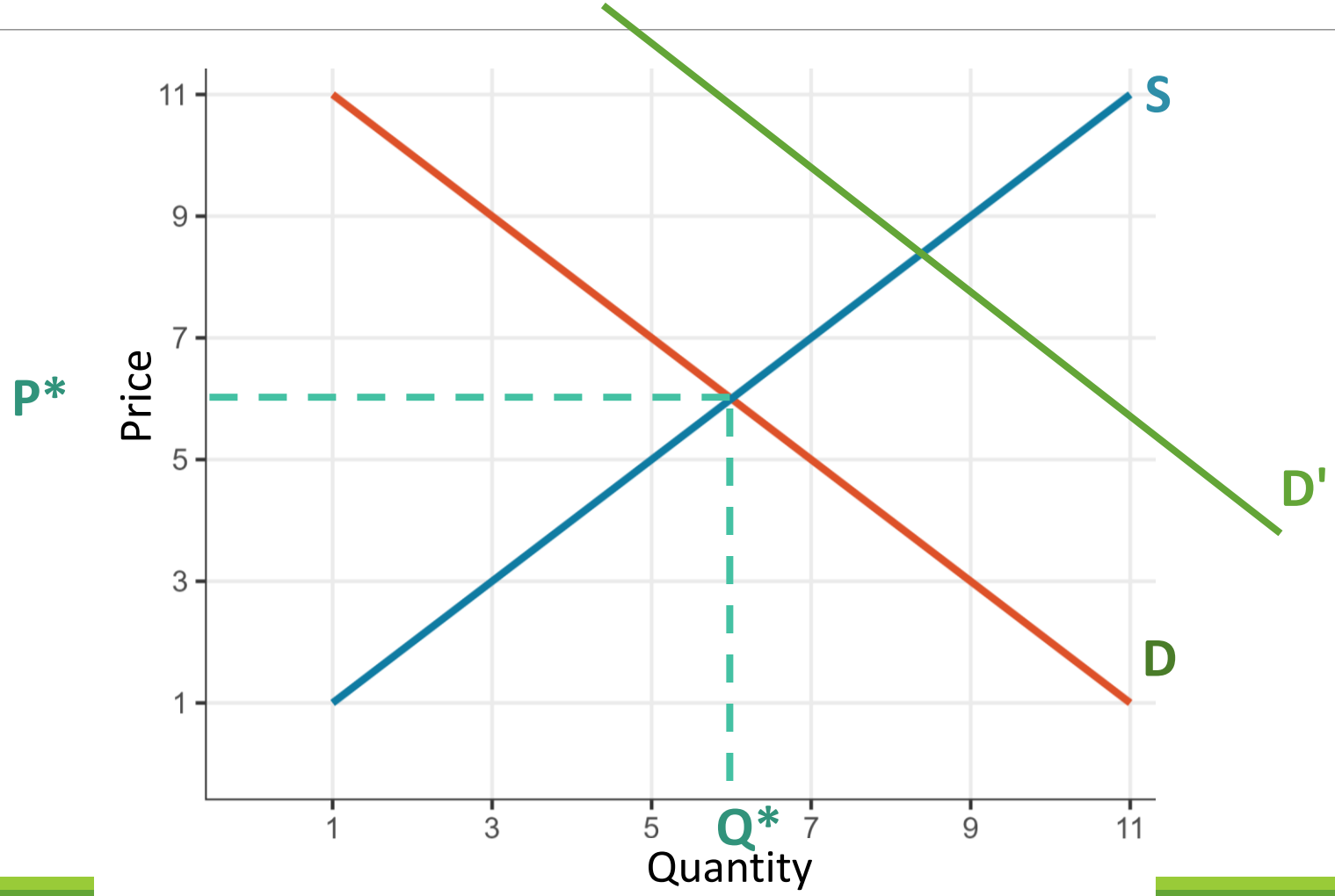

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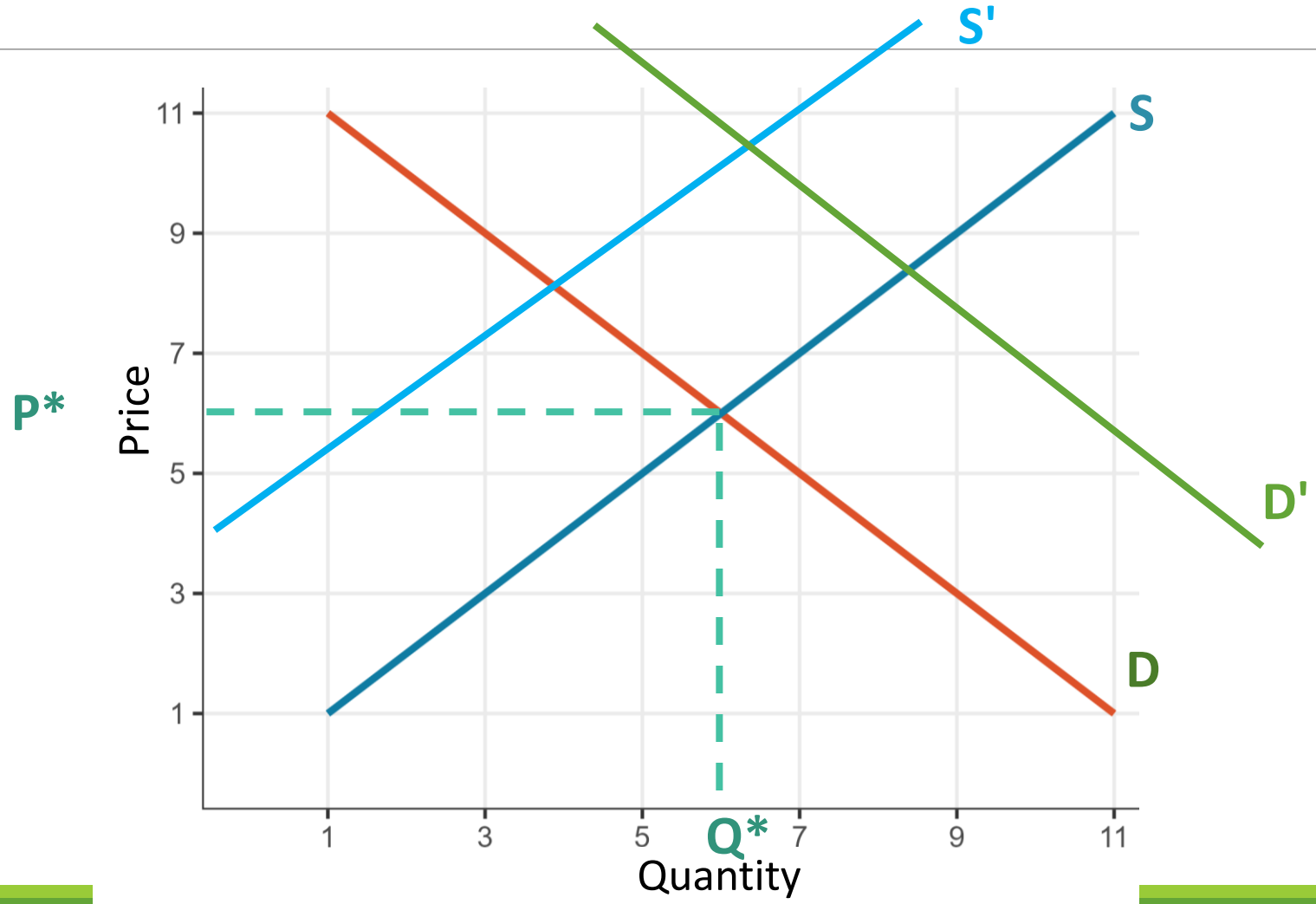

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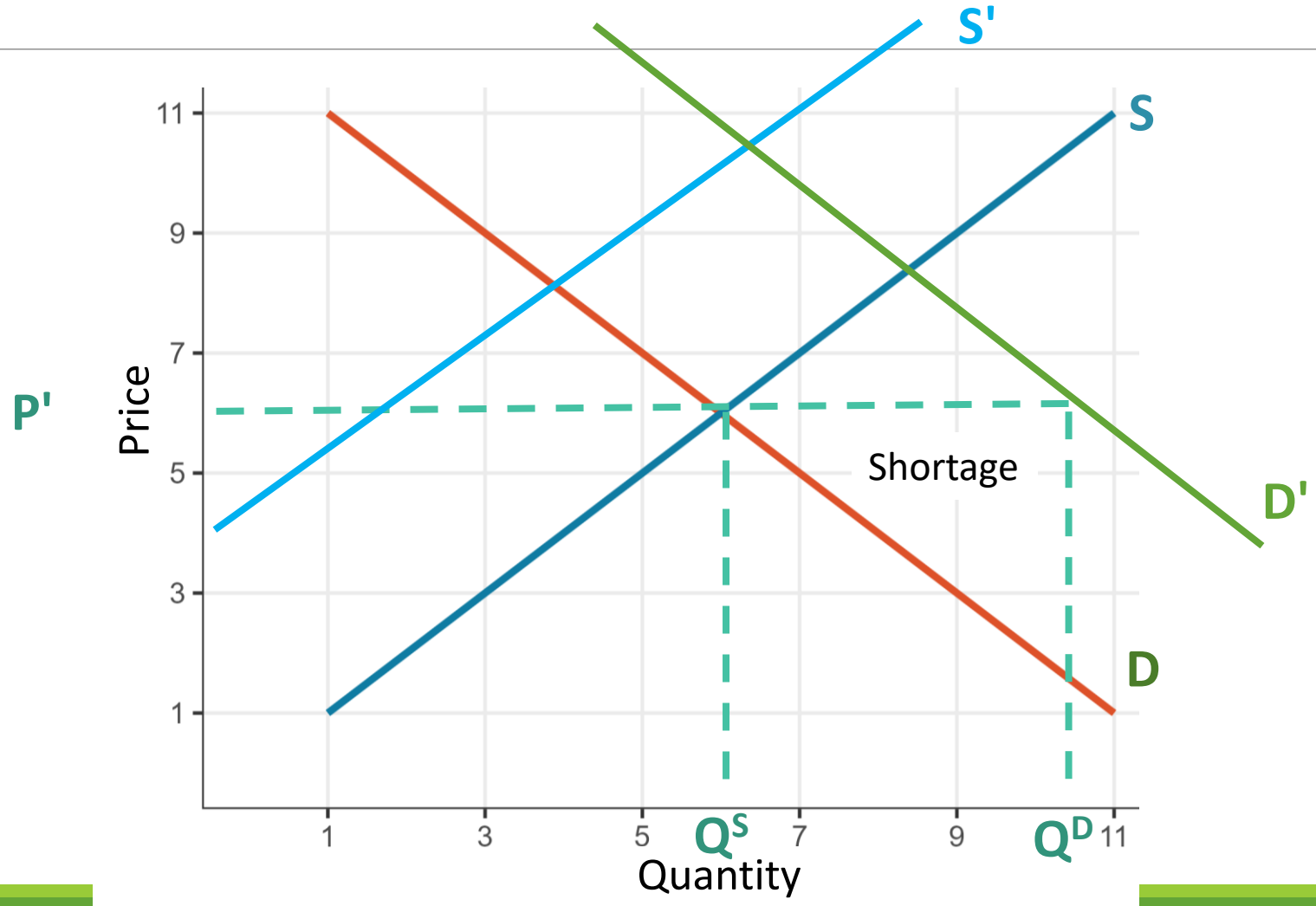

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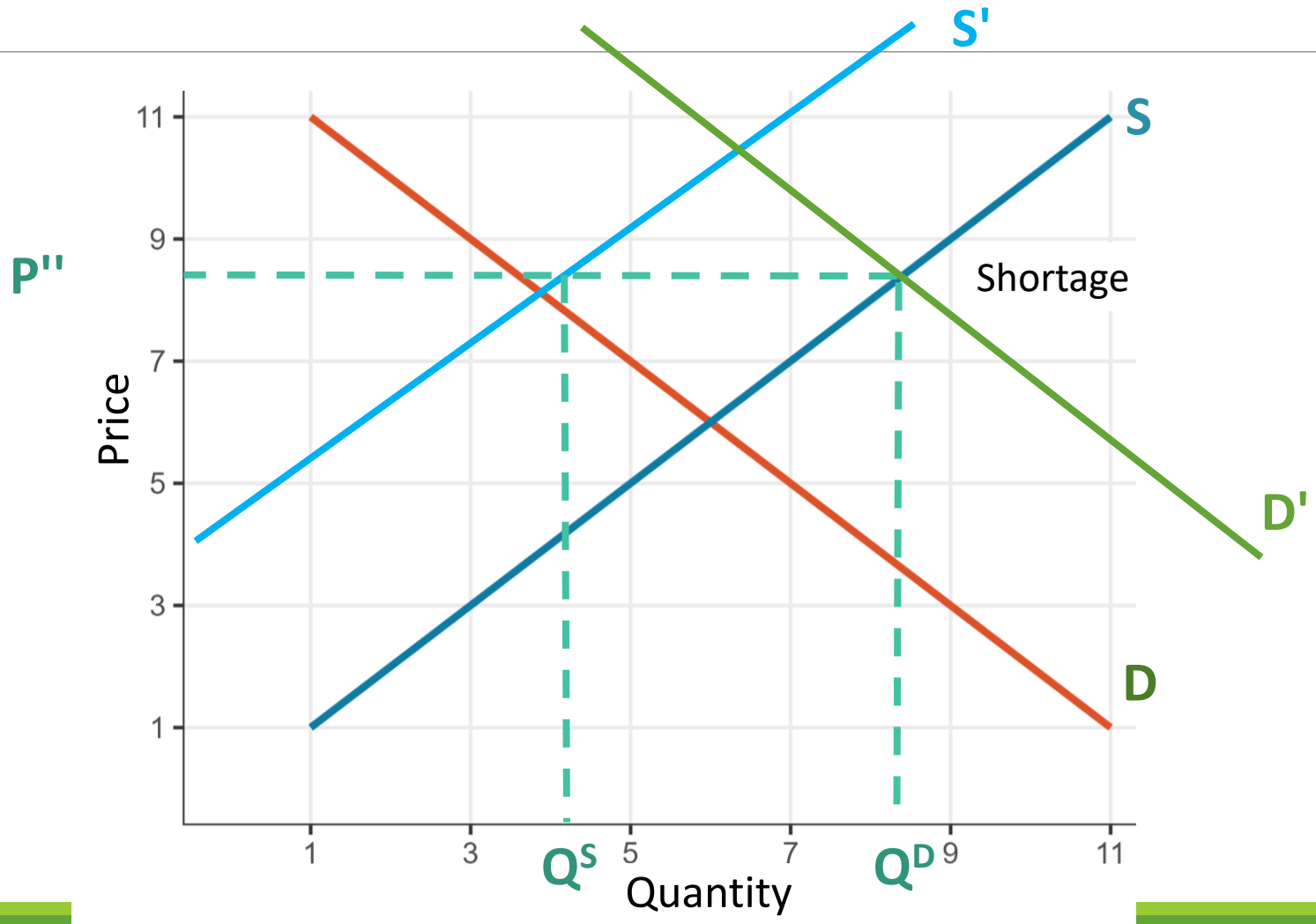
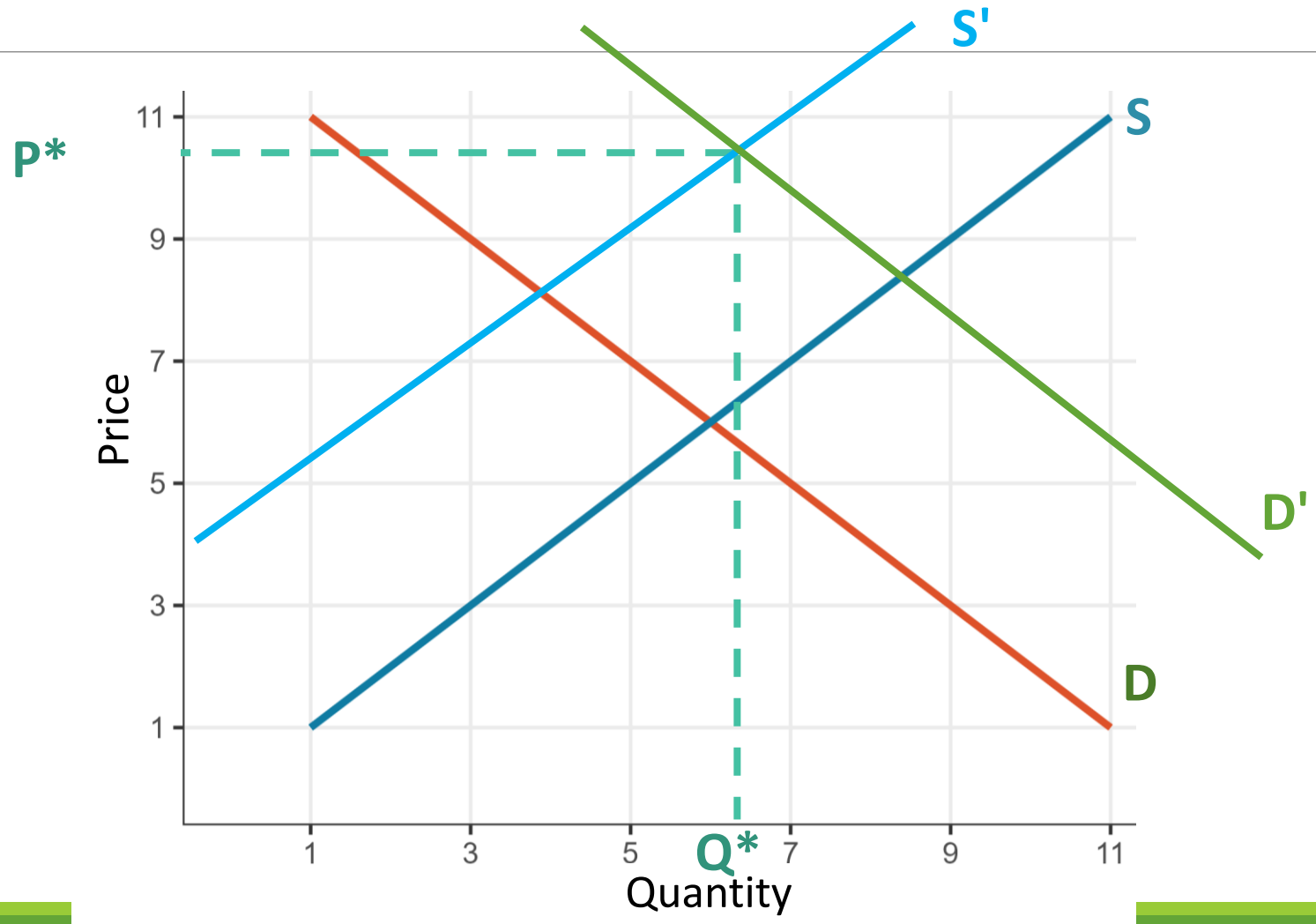


Market equilibrium: Simultaneous shifts



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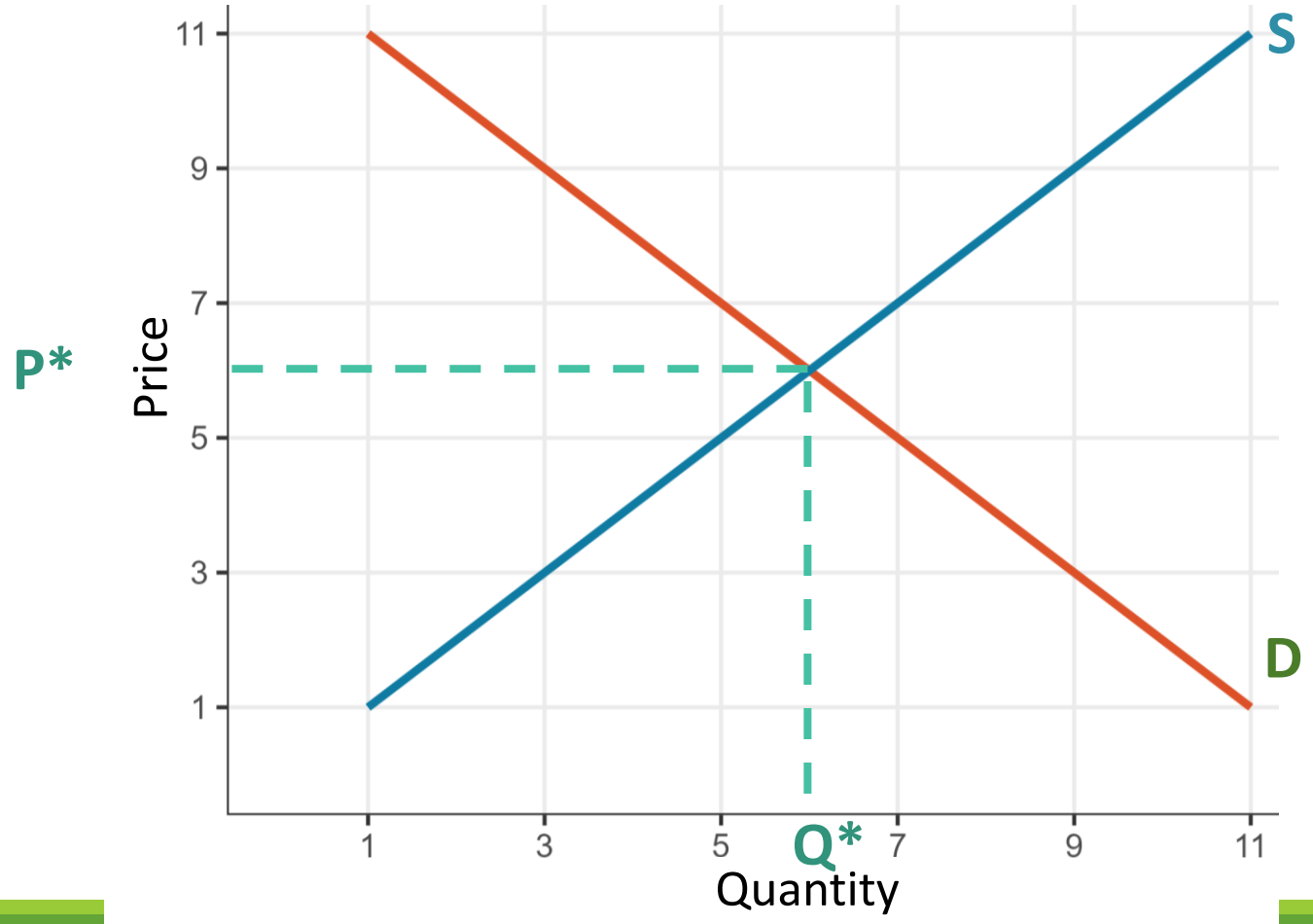

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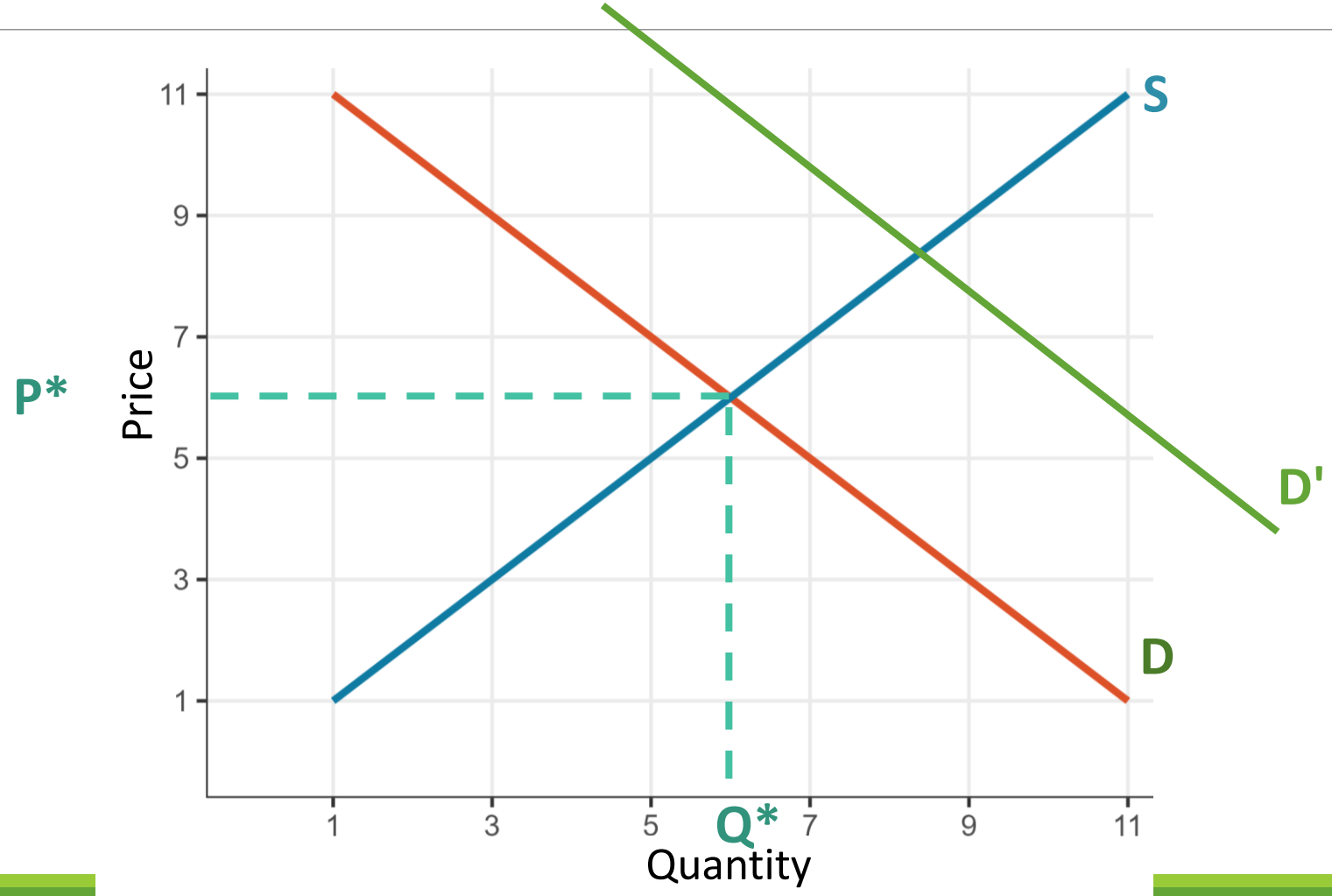

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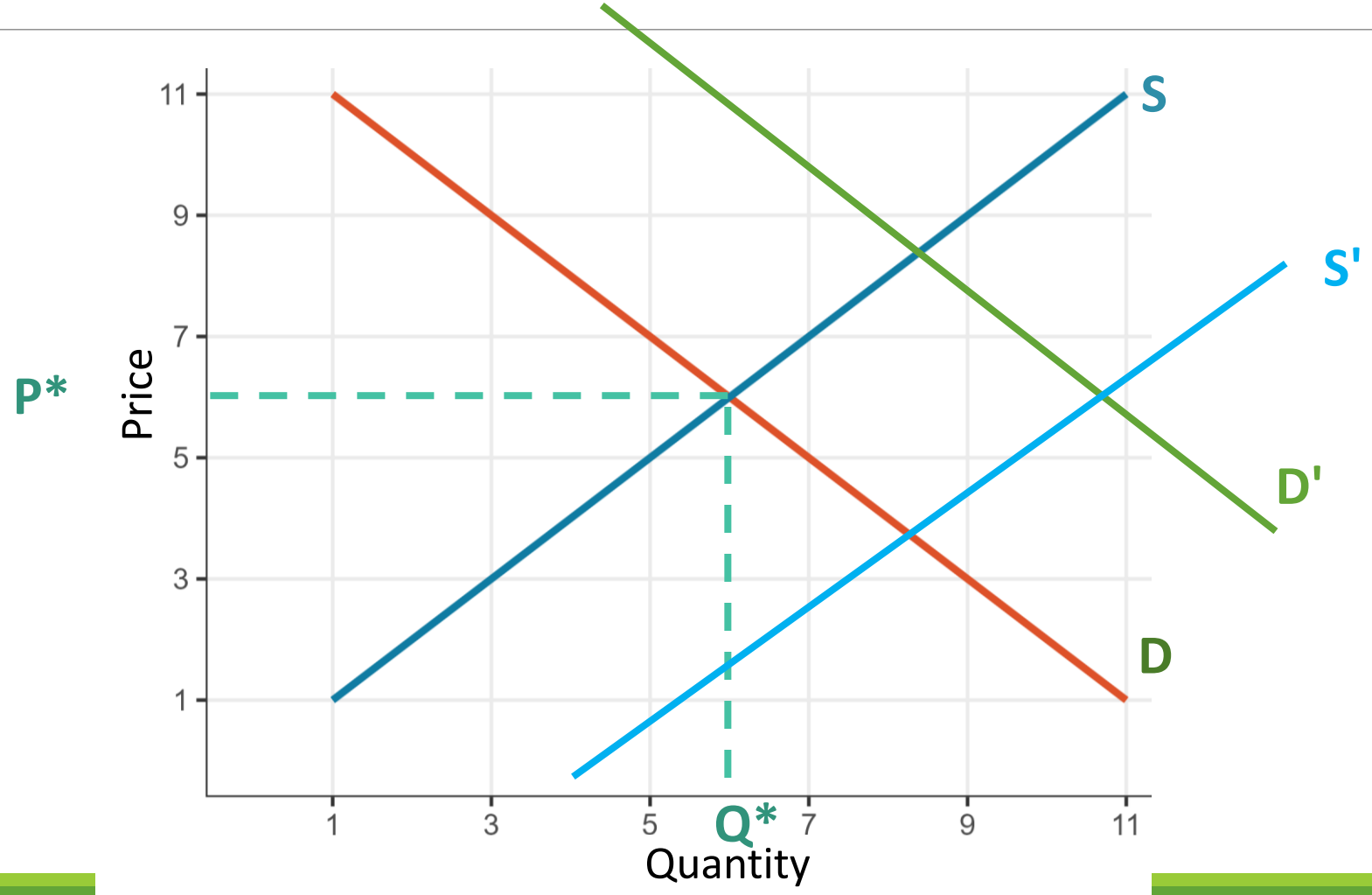

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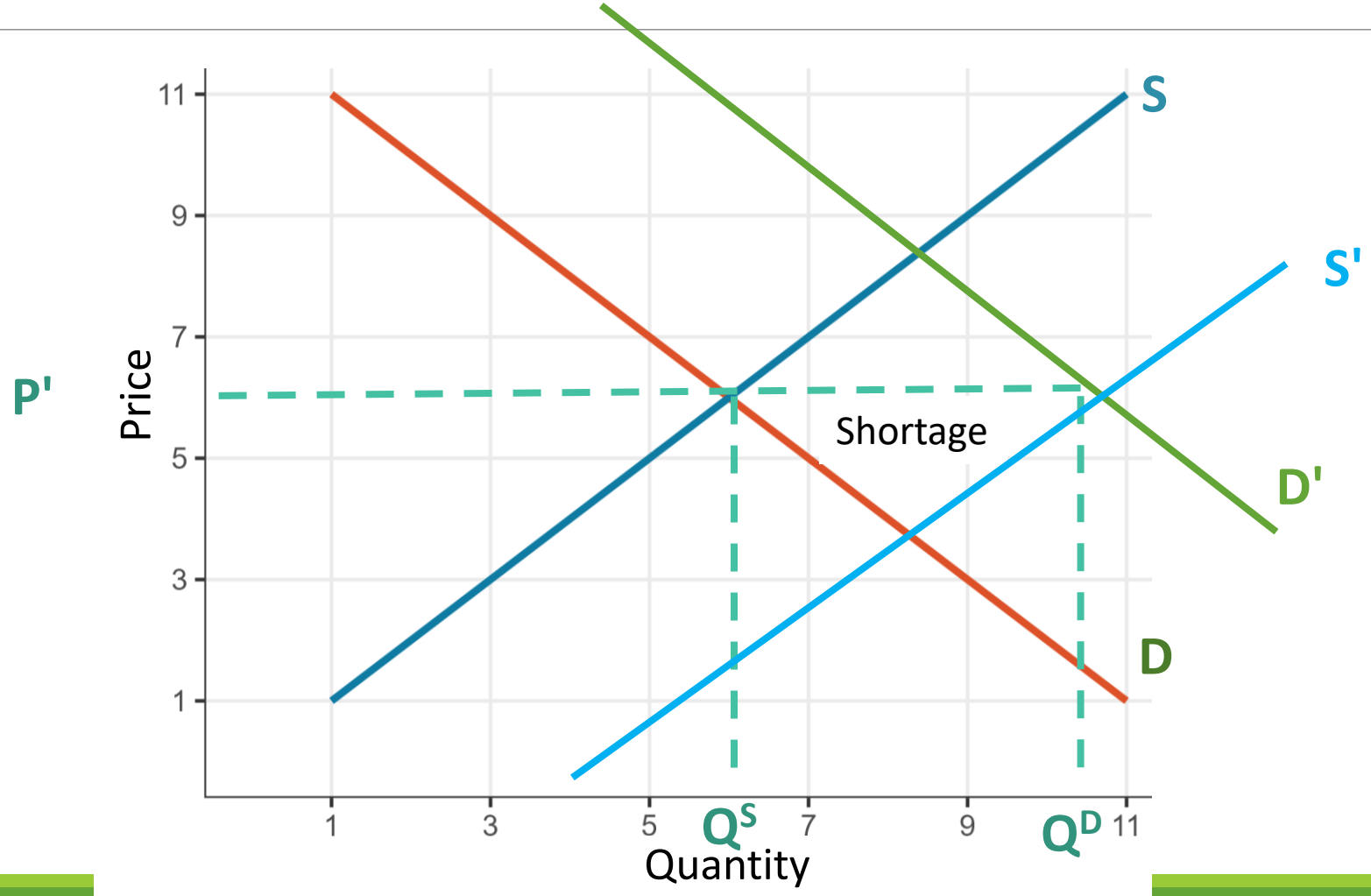
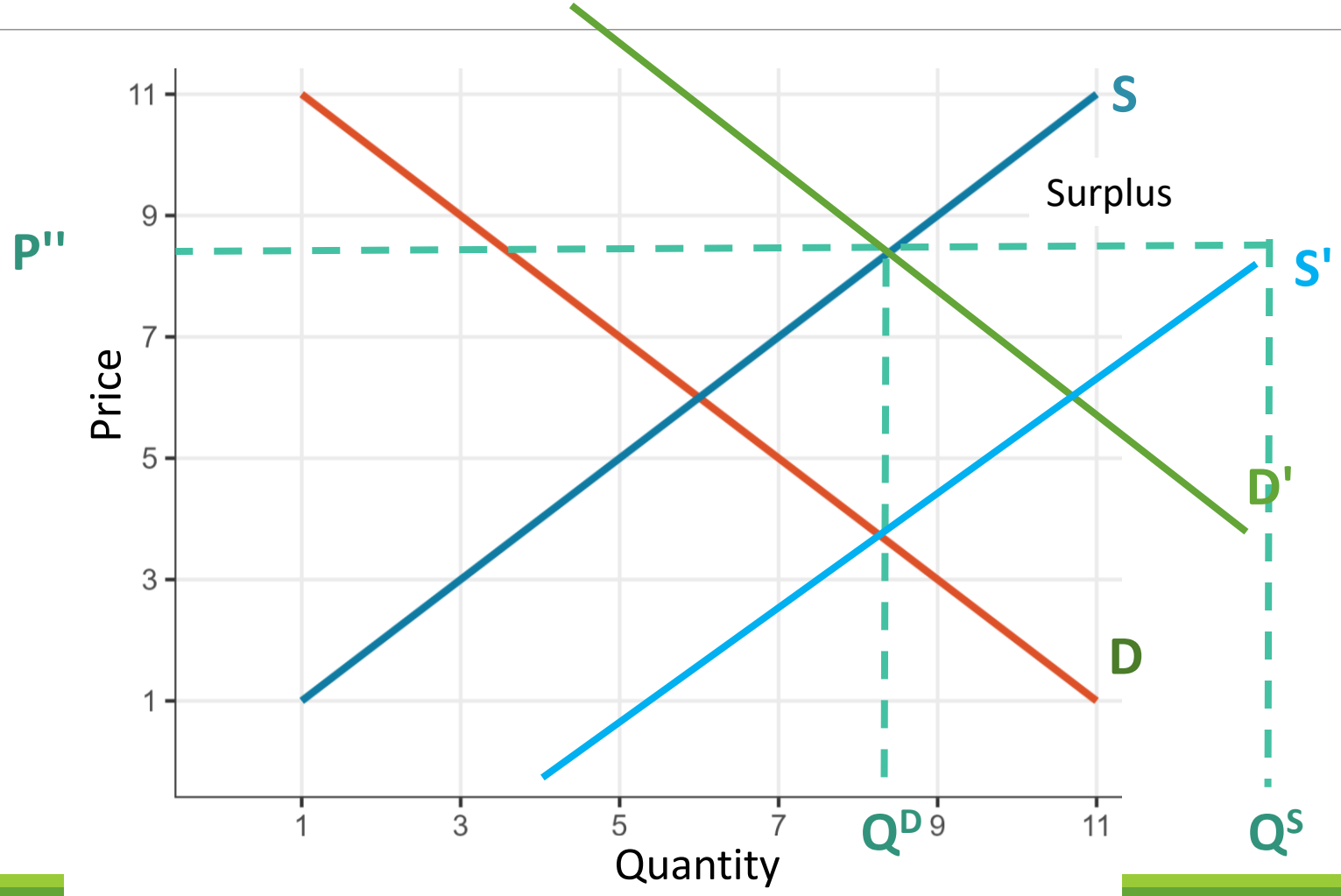
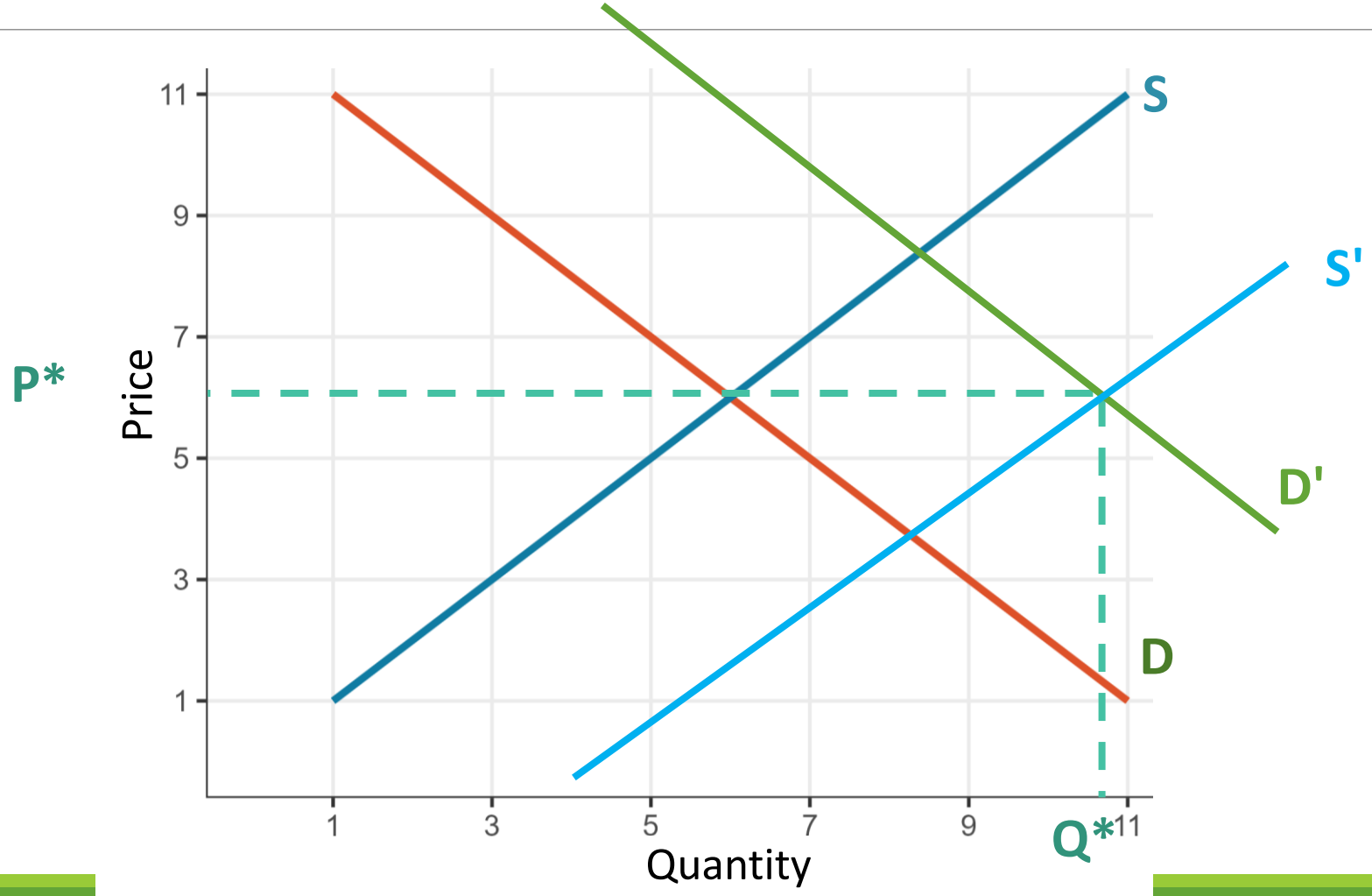


Market equilibrium: Simultaneous shifts



Market equilibrium: Simultaneous shifts



Market equilibrium: shifts of the curves

- **Simultaneous shifts**: final levels of P* and Q* depend on the magnitude of the displacements.

Outline

1. Demand:
   - Factors that change demand.
   - Movements along the curve and shifts of the curve.
   - Price elasticity of demand.

2. Supply:
   - Factors that change supply.
   - Movements along the curve and shifts of the curve.
   - Price elasticity of supply.

3. Market equilibrium:
   - Changes in equilibrium due to shifts of curves.

4. Price controls:
   - Price ceilings and price floors.
   - Taxes.

Price controls

- Markets tend towards equilibrium, but that does not mean that P* is desirable.
- **The government intervenes** in the price for moral, social or political reasons: rent control, price of electricity, basic wage.
- **Price controls**: legal restrictions on how high or low a market price may go.
  - **Price ceiling**: a maximum price sellers are allowed to charge. Benefits buyers.
  - **Price floor**: a minimum price buyers are required to pay. Benefits sellers.

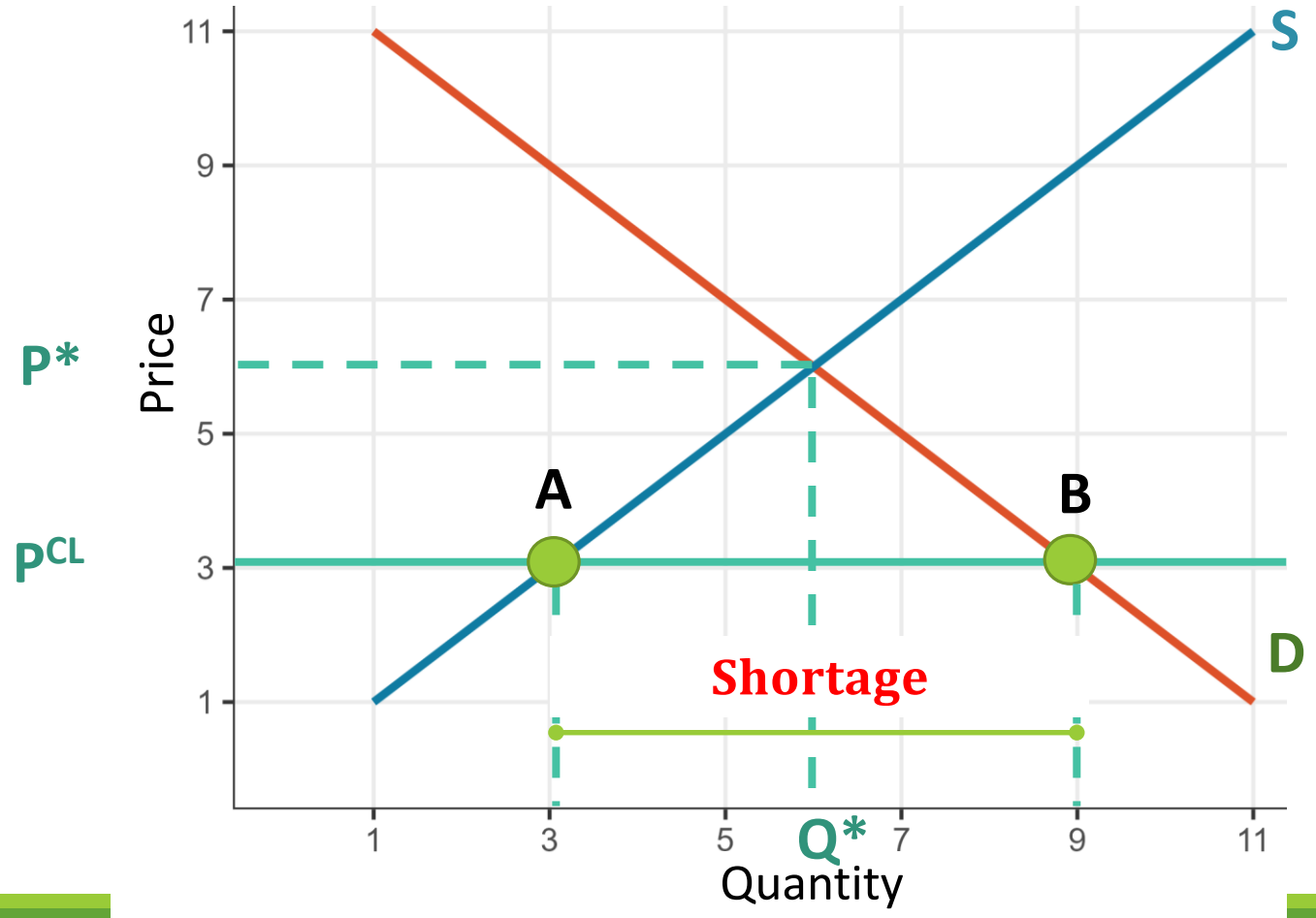
Price controls: Price ceilings

- They are usually imposed in times of crisis or recession to benefit consumers. Example: rents.

- Is it fair to implement it?
  - If not implemented:
    - These people have to go further afield to find a place to live and the access roads to the city may collapse with the increased traffic.
    - If they decide to stay, they risk impoverishment.

  - If implemented:
    - Landlords who rent out flats lose income.

Price ceiling



Price controls: Price ceilings

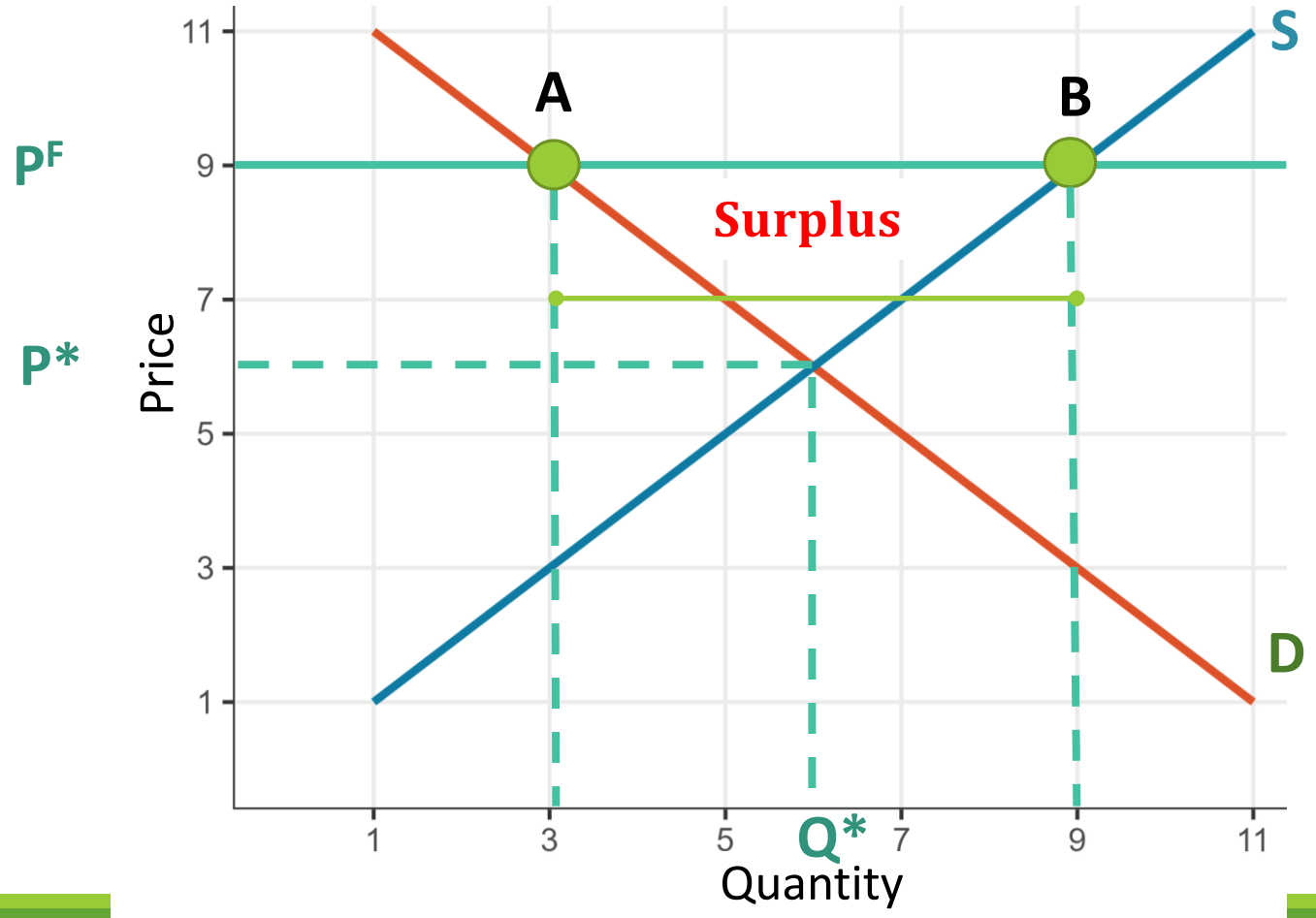
- **Disadvantages** of implementing a **price ceilings**:
  - Persistent **shortages**.
  - **Inefficiency**:
    - Inefficient allocation to consumers: people who urgently need the good cannot find it.
    - Wasted resources: people spend time and money looking for the good and don't find it.
    - Low quality of the good: producers lower the quality of the good to compensate for the lower price.
  - Emergence of **illegal activities**: black market.

Price controls: Price floors

- The **government** applies a **price-floor** policy to **secure the income** of certain groups of producers, usually farmers.

- The **basic wage** is a **price floor**: it is the minimum price of labor.

Price floor



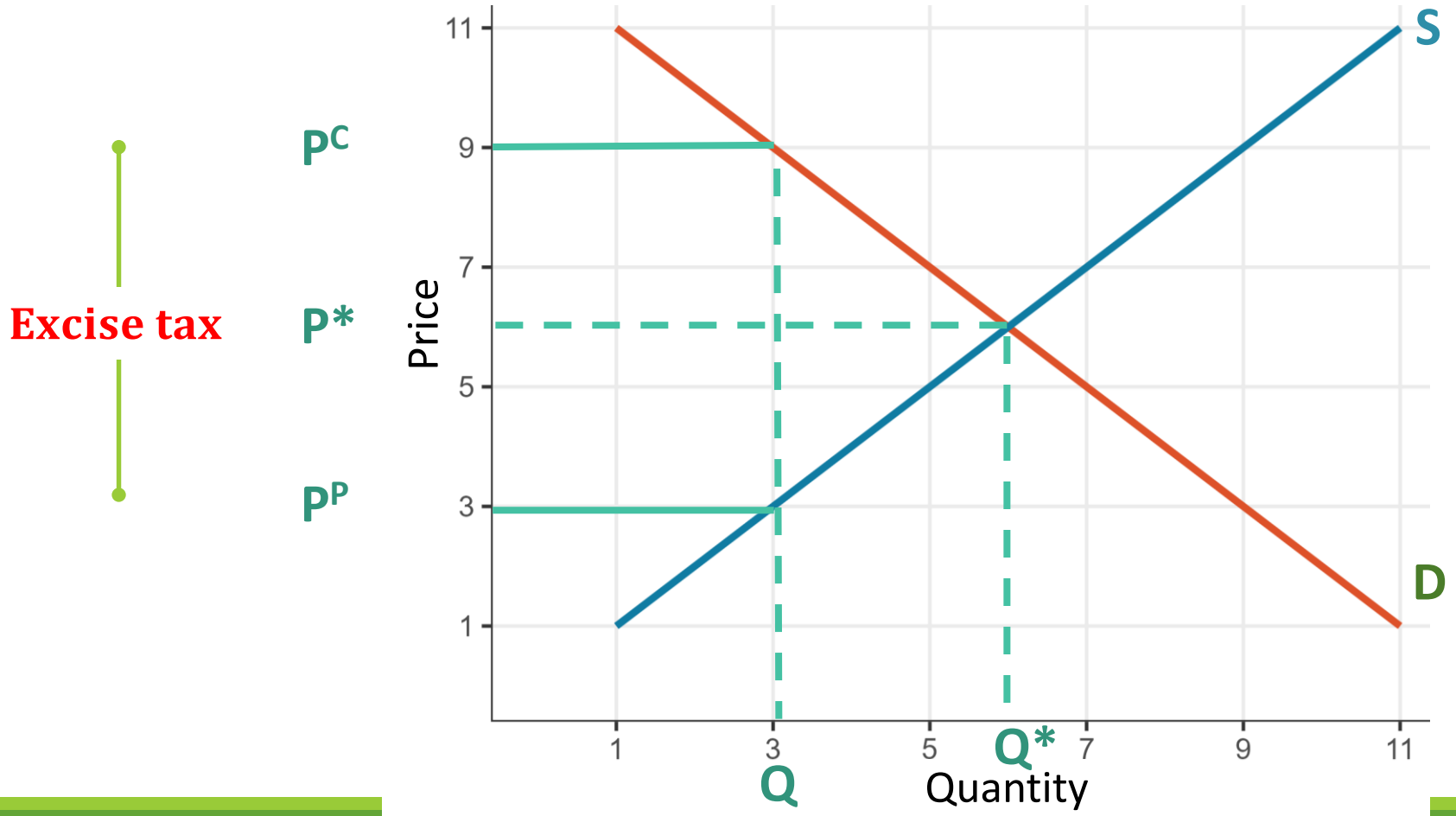
Price controls: Price floors

- **Disadvantages** of implementing a **price floor**:
  - Persistent **surplus**: inefficiently low quantity demanded.
  - **Inefficiency**:
    - Inefficient allocation of sales among sellers: those willing to sell at lower prices fail to sell: young people (e.g. waiters) are disadvantaged.
    - Wasted resources: government usually buys up surpluses; looking for work is costly in time and mental health.
    - Inefficiently high quality of the good: quality goods are not valued by consumers.
  - Occurrence of **illegal activities**: bribery and corruption. E.g., working in the black economy.

Price controls: Taxes

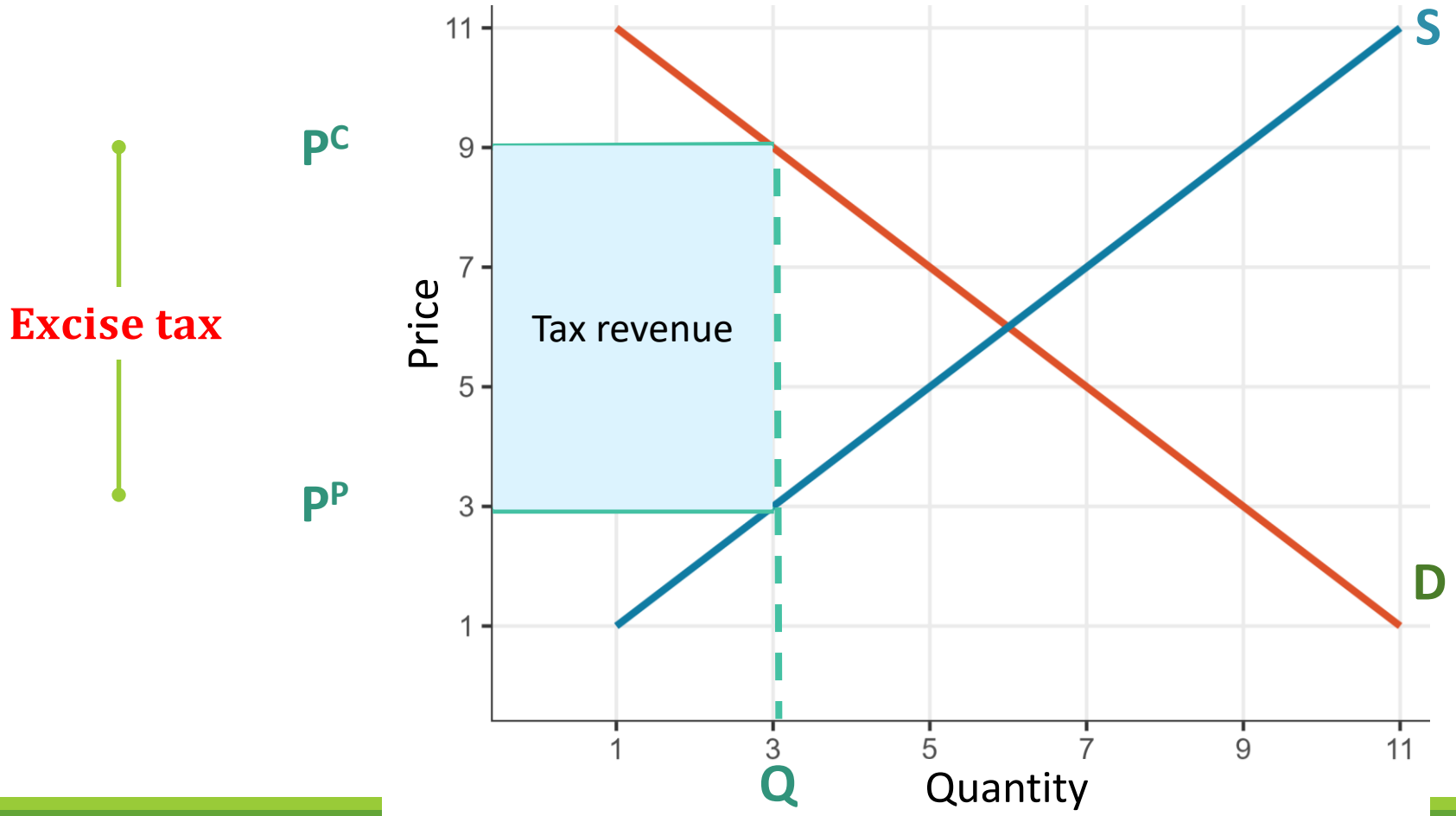
- **Taxes** apply to:
  - That the **government** can **finance its spending**.
  - Promoting **equity** in a **society**.
  - **To discourage** the **consumption** of a good or service.
- Tax rates:
  - **Direct tax**: a tax usually levied on income.
  - **Indirect tax**: a tax usually levied on consumption.

Excise tax (unit sold)



Excise tax:
It is a tax on sales of a good or service

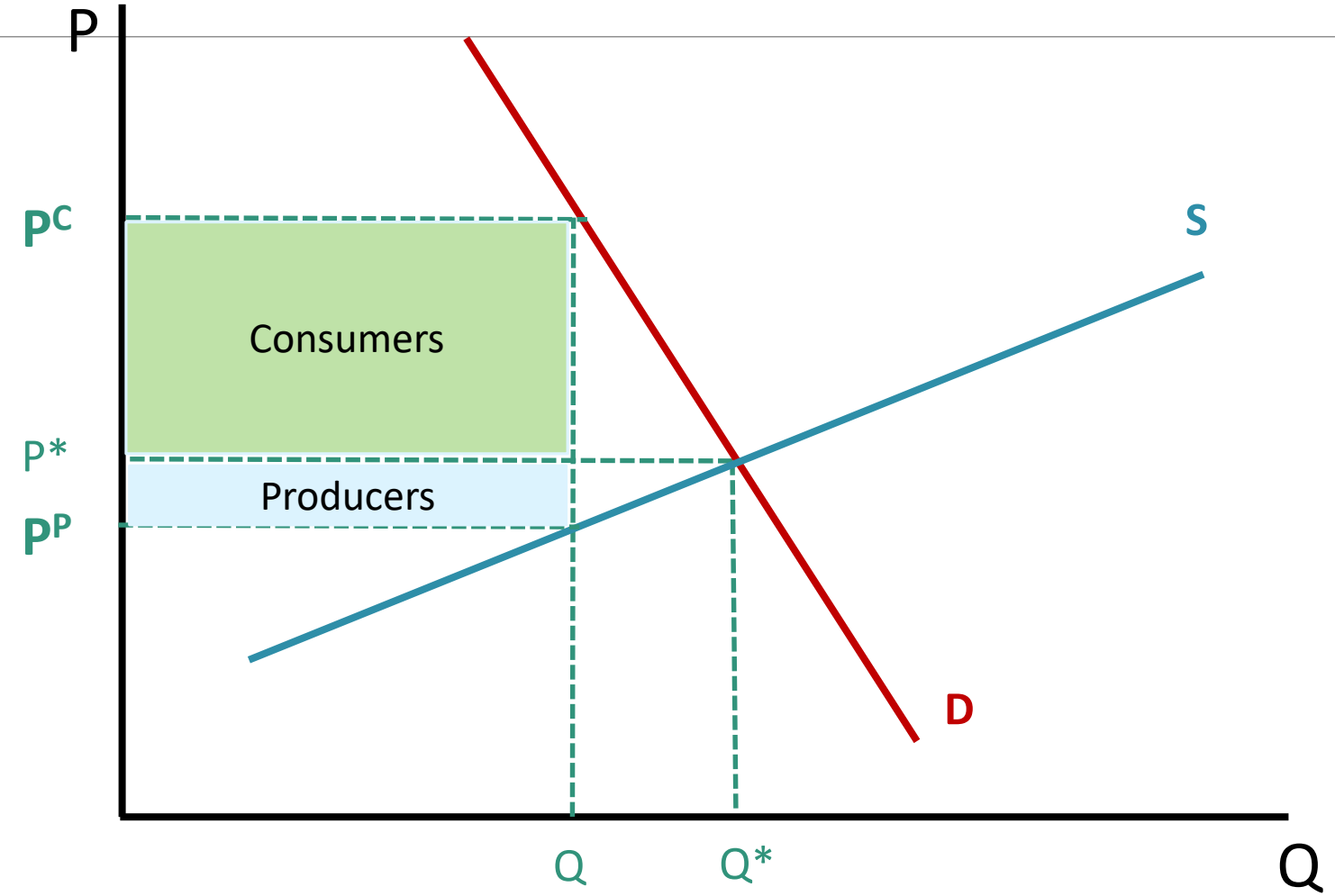
Excise tax (unit sold)



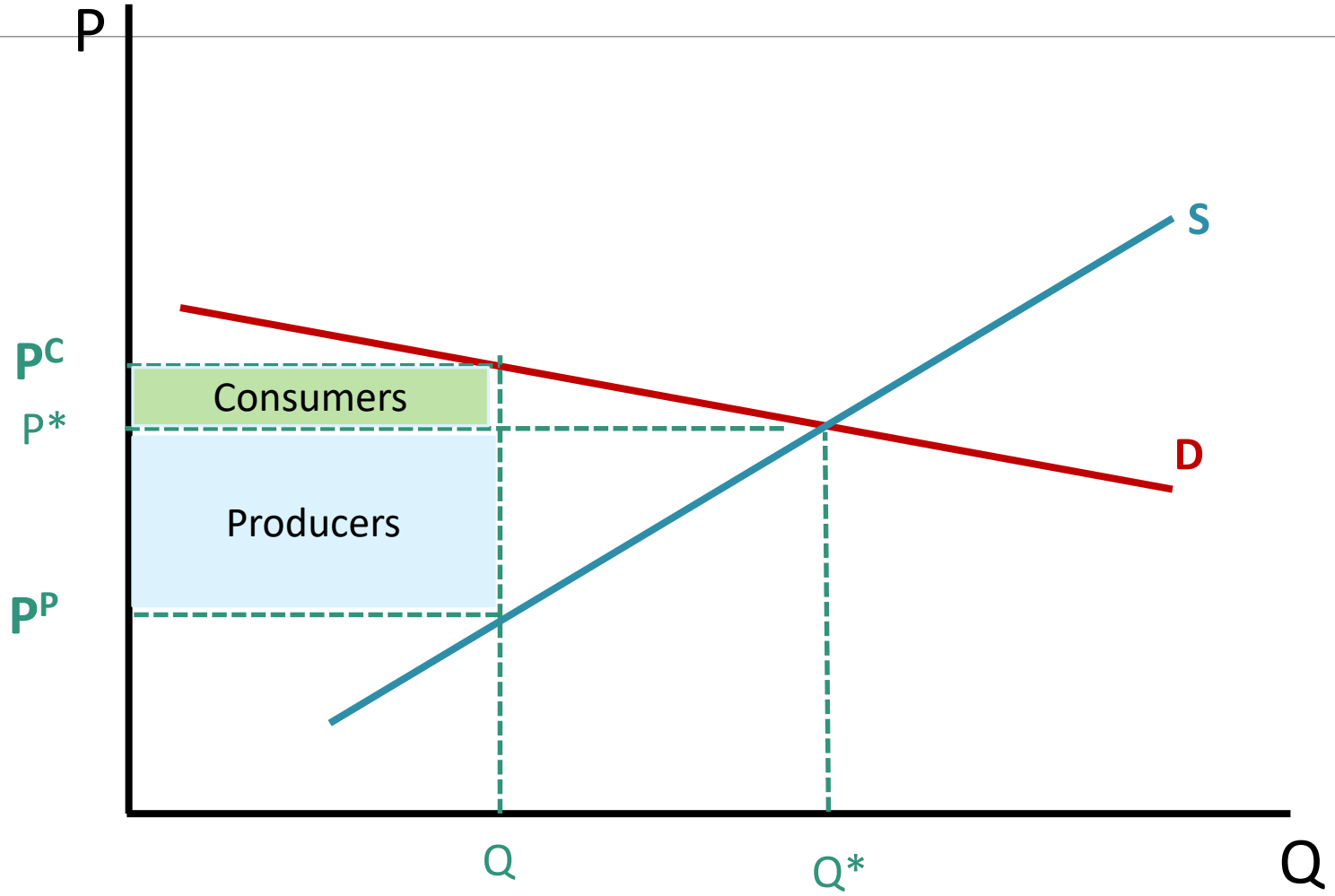
Price controls: Taxes

- The tax is shared between **consumers** and **producers**.
- Who gets the short end of the stick?
  - It depends on the price elasticity of the curves.

Excise tax (unit sold)



Excise tax (unit sold)



Price controls: Taxes

- Raising taxes **will not always** increase revenue as Q is reduced.

- Is a tax good or bad for society? It depends...

Mandatory readings

- Krugman, P. and Wells, R. (2023). *Essentials of Economics*. MacMillan Learning. 6th edition.
  - Chapter 3: Supply and demand.
  - Chapter 4: Price and quantity controls: market interference.
  - Chapter 5: Elasticity and taxes.

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End of Topic 2

Supply and demand

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