

Chapter 3: Demand, Supply, and Price

Introductory Microeconomics

Jacob Hazen

McGill University

September 16, 2025,
jacobhazen1.github.io

Learning goals

By the end of this chapter, you should be able to:

- Define and distinguish *demand* and *supply*.
- Interpret shifts vs. movements along curves.
- Find market equilibrium and perform comparative statics.
- Compute and interpret price elasticities (if time permits).
- Apply the concepts of substitutes and complements.

To be successful

General Tips to not fall behind:

- ① Time Management, use a task manager, write what you need to do down (Trello, Tasks, Todolist).
- ② Go over the slides once then go straight to practice problems.
- ③ Get a calendar.
- ④ 80% of learning happens outside the classroom.

Key definitions

Demand

The quantity consumers are willing and able to buy at each possible price.

Supply

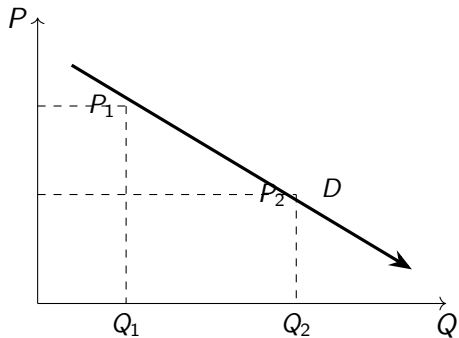
The quantity producers are willing and able to sell at each possible price.

Market equilibrium

A price P^* and quantity Q^* such that $Q_d(P^*) = Q_s(P^*)$.

The law of demand

- Holding other factors constant, as price rises, quantity demanded falls.

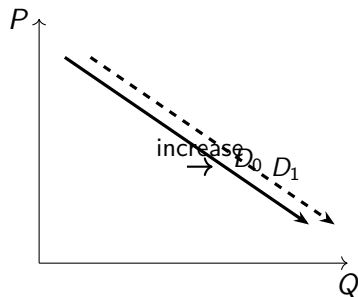


Demand: movements vs. shifts

Movement along D : only when the good's own price changes. Example: higher price of ice cream \Rightarrow lower Q_d .

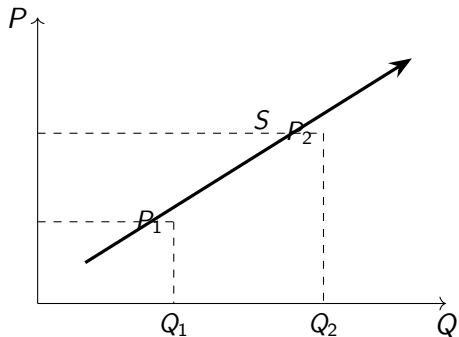
Shift of D : when other demand factors change. Examples: income (normal/inferior goods), tastes, substitutes vs. complements, expectations, number of buyers.

Key difference: movement = own price; shift = everything else.



The law of supply

- Holding other factors constant, as price rises, quantity supplied rises.

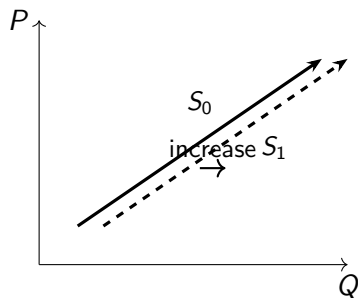


Supply: movements vs. shifts

Movement along S : only when the good's own price changes. Example: higher wheat price \Rightarrow more supplied.

Shift of S : when other supply factors change. Examples: input costs, technology, expectations, number of sellers, taxes or subsidies.

Key difference: movement = own price; shift = production conditions.



Substitutes and complements

Substitutes

Goods that can replace each other in consumption. If the price of good A rises, demand for good B increases. *Example: coffee and tea.*

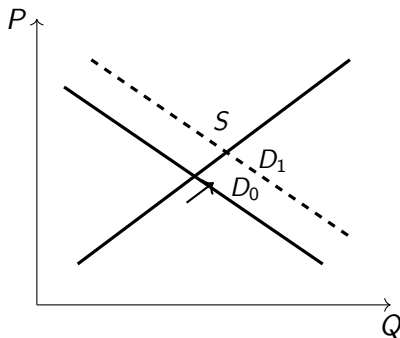
Complements

Goods that are consumed together. If the price of good A rises, demand for good B decreases. *Example: printers and ink cartridges.*

Key idea: substitutes \Rightarrow demand moves in the same direction as the other good's price;
complements \Rightarrow demand moves in the opposite direction.

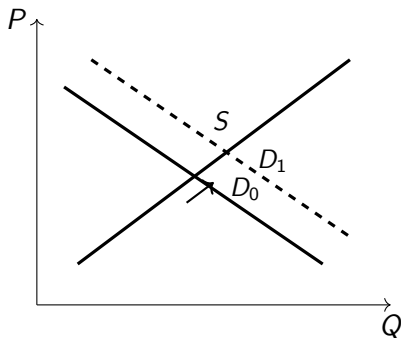
Substitutes: example with ice cream and frozen yogurt

Price of frozen yogurt increases \Rightarrow consumers switch to ice cream. Demand for ice cream shifts to the right.



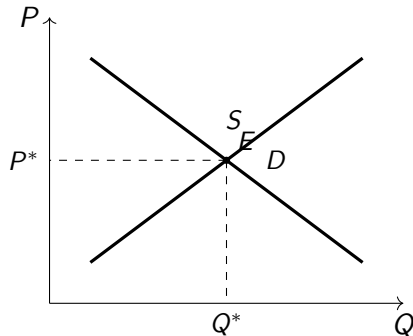
Complements: example with ice cream and cones

Price of cones decreases \Rightarrow people buy more cones and more ice cream. Demand for ice cream shifts to the right.



Market equilibrium

- Equilibrium occurs where $Q_d(P) = Q_s(P)$.
- Stable: if $P > P^*$, surplus pushes price down;
if $P < P^*$, shortage lifts price up.



Price elasticity of demand (brief)

Definition

The price elasticity of demand at a point is $\varepsilon_d = \frac{dQ_d}{dP} \cdot \frac{P}{Q_d}$.

- Midpoint formula (arc elasticity) between (Q_1, P_1) and (Q_2, P_2) :

$$\varepsilon_d = \frac{Q_2 - Q_1}{(Q_1 + Q_2)/2} \bigg/ \frac{P_2 - P_1}{(P_1 + P_2)/2}$$

- $|\varepsilon_d| > 1$ elastic, $|\varepsilon_d| < 1$ inelastic, $|\varepsilon_d| = 1$ unit elastic.

Per-unit tax and incidence (qualitative)

- A tax t per unit shifts the supply curve up by t (or demand down by t).
- The burden (incidence) falls more on the side of the market that is less elastic.

Takeaways

- Demand slopes down; supply slopes up.
- Movements: own-price changes. Shifts: external factors (income, substitutes, complements, input costs).
- Equilibrium where $Q_d = Q_s$; shocks shift curves and change (P^*, Q^*) .
- Elasticities matter for magnitudes and tax incidence.

Appendix: algebra for a per-unit tax

With demand $Q_d = a - bP$ and supply $Q_s = c + dP$, a tax t on sellers implies sellers receive $P_s = P_b - t$.

$$\begin{aligned}Q &= a - bP_b = c + dP_s = c + d(P_b - t) \\&\Rightarrow (b + d)P_b = a - c + dt \\&\Rightarrow P_b = \frac{a - c + dt}{b + d}, \quad P_s = P_b - t, \quad Q = a - bP_b.\end{aligned}$$

Linear demand and supply functions

Let's practice with simple linear functions:

$$Q_d = a - bP, \quad Q_s = c + dP$$

- Q_d : quantity demanded decreases as price P increases ($b > 0$).
- Q_s : quantity supplied increases as price P increases ($d > 0$).
- The **slope** tells us how much Q changes when P changes by one unit.

Example: $Q_d = 20 - 2P$, $Q_s = 2 + P$. If $P = 5$, then $Q_d = 10$ and $Q_s = 7$.

Meaning of the slope

In $Q_d = 20 - 2P$:

- Slope is -2 : each \$1 increase in price reduces demand by 2 units.
- Intercept is 20: if $P = 0$, maximum demand is 20 units.

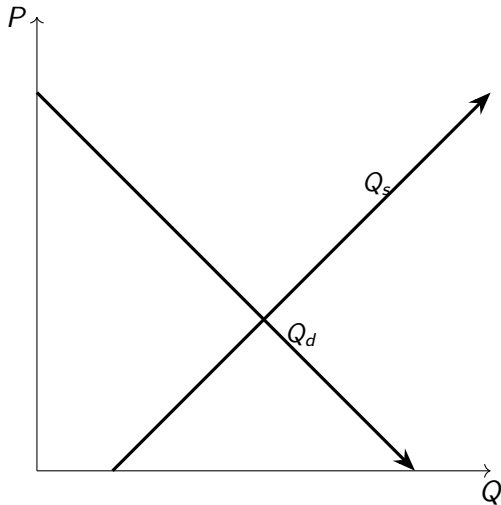
In $Q_s = 2 + P$:

- Slope is $+1$: each \$1 increase in price increases supply by 1 unit.
- Intercept is 2: if $P = 0$, producers would still supply 2 units.

Ask: why might producers supply even if price is zero?

Drawing the curves

Using $Q_d = 20 - 2P$ and $Q_s = 2 + P$:



Practice: plug in some values

For $Q_d = 20 - 2P$ and $Q_s = 2 + P$:

- If $P = 3$: $Q_d = ?$, $Q_s = ?$
- If $P = 7$: $Q_d = ?$, $Q_s = ?$
- If $P = 10$: $Q_d = ?$, $Q_s = ?$

Work these out together, then we'll check answers. (*See black board for step-by-step.*)

Practice: changing the slope

Suppose demand is $Q_d = 30 - P$ (flatter demand).

- Compare with $Q_d = 20 - 2P$.
- Which is more sensitive to price?
- What happens to equilibrium if we use $Q_s = 2 + P$?

Inverted demand and supply

Sometimes we solve for P as a function of Q :

$$Q_d = a - bP \quad \Rightarrow \quad P = \frac{a}{b} - \frac{1}{b}Q$$

$$Q_s = c + dP \quad \Rightarrow \quad P = -\frac{c}{d} + \frac{1}{d}Q$$

- Now price P is on the left-hand side, matching the vertical axis.
- The slope of the line on the graph corresponds directly to $-1/b$ for demand, $1/d$ for supply.

If time: walk through calculating and drawing these inverted lines.

Inverted demand and supply

Sometimes we solve for P as a function of Q :

$$Q_d = 20 - 2P \quad \Rightarrow \quad P = 10 - 0.5Q$$

$$Q_s = 2 + P \quad \Rightarrow \quad P = Q - 2$$

- The slope on the graph is visible directly: -0.5 for demand, $+1$ for supply.

Inverted function intuition:

- Demand: each 1 unit Q reduces **price** by \$0.50.
- Supply: each 1 unit Q increases **price** by \$1.00.

Standard form intuition:

- Demand: each \$1 increase in price reduces **demand** by 2 units.
- Supply: each \$1 increase in price increases **supply** by 1 unit.