

Handout 05 - ECON 101 (Fall 2026)

Elasticity

1 Elasticity Measures How Much a Quantity Responds

The law of demand tells us the *direction* of a response: a higher price reduces quantity demanded, other things equal. **Elasticity** measures how large that response is relative to the price change, using percentages.

1.1 Keep the direction separate from the degree of responsiveness

The **own-price elasticity of demand** compares the percentage change in quantity demanded with the percentage change in that good's own price:

$$\varepsilon_d = \frac{\% \Delta Q_d}{\% \Delta P}.$$

The ratio is negative for downward-sloping demand. Classify responsiveness using its **absolute value**: -1.8 describes a larger response than -0.4 , even though it is the smaller signed number.

Magnitude	Classification	Quantity response relative to price
$0 < \varepsilon_d < 1$	Inelastic	Smaller percentage change
$ \varepsilon_d = 1$	Unit elastic	Equal percentage change
$ \varepsilon_d > 1$	Elastic	Larger percentage change

1.2 Use the midpoint to compare two points consistently

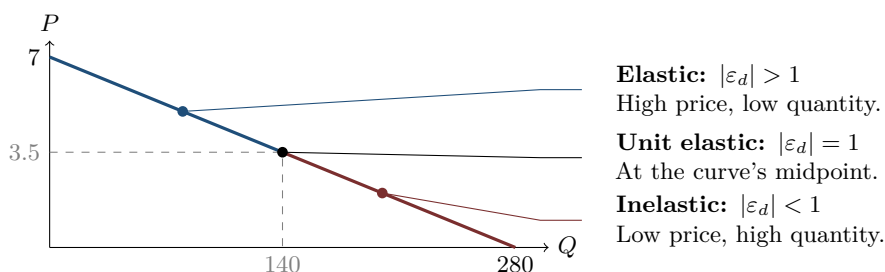
Consider a hypothetical café. Raising the price from \$4 to \$5 per cup reduces quantity demanded from 120 to 80 cups per day, with other demand determinants fixed. The **midpoint method** divides each change by the average of its two values:

$$\% \Delta Q_d = \frac{80 - 120}{(80 + 120)/2} = -40\%, \quad \% \Delta P = \frac{5 - 4}{(5 + 4)/2} = \frac{2}{9} \approx 22.22\%.$$

Thus $\varepsilon_d = (-0.40)/(2/9) = -1.8$: over this interval, quantity falls by 1.8 times the percentage increase in price. Demand is elastic here. Reversing the comparison changes both signs, but leaves the ratio at -1.8 . The midpoint method gives the same answer in either direction.

1.3 Slope and elasticity answer different questions

Slope is $\Delta P / \Delta Q$, measured in units; elasticity compares *percentages* and has no units. Along a straight demand curve, the same changes in dollars and cups represent different percentages as P and Q change. Constant slope therefore does not imply constant elasticity.



The curve extends our café example. Labels describe elasticity for small changes near each location; -1.8 above measures the entire \$4–\$5 interval.

Where to revisit the material. Demand elasticity, midpoint calculations, and slope: textbook Section 5.1, pp. 110–118, slides 36–40, worksheet Q3. Textbook references use Stevenson and Wolfers, *Principles of Microeconomics*, 3rd ed. Slide numbers count PDF pages.

2 A Higher Price Can Raise or Lower Total Revenue

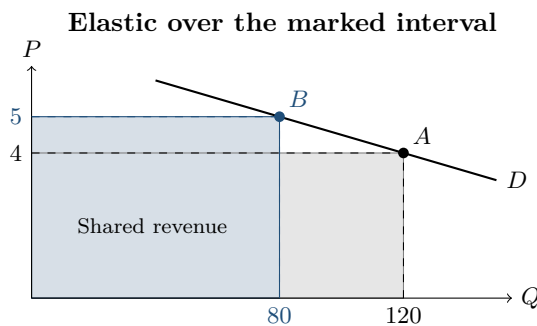
Total revenue is $TR = P \times Q$. In our café example, it is measured in dollars per day. A price increase brings in more dollars per cup, but reduces the number of cups sold. Elasticity tells us which effect dominates. Compare two possible demand responses to the *same* price increase:

Response	Initial (P, Q)	New (P, Q)	ε_d	Daily revenue
Elastic	(4, 120)	(5, 80)	-1.8	\$480 $\rightarrow$ \$400
Inelastic	(4, 120)	(5, 110)	$-9/23 \approx -0.39$	\$480 $\rightarrow$ \$550

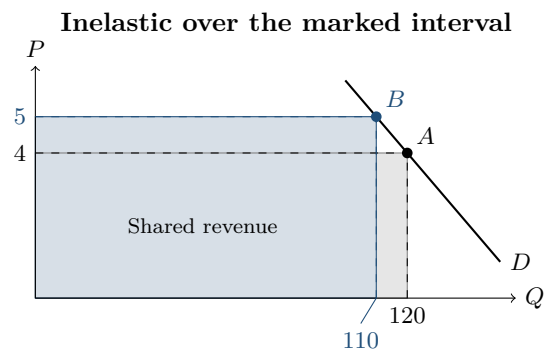
The second calculation uses $\% \Delta Q_d = -10/115$ and the same midpoint price change, $2/9$. Retain unrounded values until the final answer.

2.1 See revenue as the area of a rectangle

Each revenue rectangle has height P and width Q . Both diagrams start at $A = (120, 4)$. Within each diagram, the move to B follows an unchanged demand curve. Gray marks initial revenue; blue marks new revenue, including the area shared with the old rectangle. Here P is dollars per cup and Q is cups per day.



Fewer cups outweigh the higher price:
 TR falls from \$480 to \$400 per day.



The higher price outweighs fewer cups:
 TR rises from \$480 to \$550 per day.

2.2 Connect the percentage comparison to the revenue rule

The blue strip above $P = 4$ is revenue gained on cups still sold; the gray strip to the right is revenue lost on cups no longer sold.

When price rises, **elastic demand reduces revenue**; **inelastic demand increases revenue**. With unit-elastic demand, revenue is unchanged. When price falls, reverse the first two conclusions. For a change between two points, the midpoint elasticity gives this comparison exactly.

Revenue is not profit: profit also subtracts costs. These examples therefore do not establish the café's best price. Nor is demand for one café the same as demand for all coffee: customers can switch cafés while still buying coffee.

2.3 Think about the alternatives buyers can actually use

Demand tends to be more elastic when close substitutes are available. A narrowly defined product usually has more substitutes than a broad category: this café's coffee has alternatives that coffee in general does not. Necessities tend to have less elastic demand than discretionary purchases. A larger budget share makes a price change more consequential. More time to search, change habits, or replace equipment often makes demand more elastic. These are reasons to expect different responses, not enough information to calculate a particular elasticity.

Where to revisit the material. Revenue and demand elasticity: textbook Section 5.2, pp. 118–122, worksheet Q5; **Determinants of demand elasticity:** Section 5.1, pp. 113–116.

3 Choose the Elasticity That Matches the Change

Changing the denominator changes the question. Let P_x be good x 's own price, P_y another good's price, and I buyers' income. Hold other determinants fixed when interpreting each response.

Measure	Percentage ratio	What the sign tells us
Own-price demand	$\% \Delta Q_{d,x} / \% \Delta P_x$	Negative for ordinary downward-sloping demand. Use the magnitude to classify responsiveness.
Cross-price demand	$\% \Delta Q_{d,x} / \% \Delta P_y$	Positive: substitutes. Negative: complements. Near zero: little response to the other price.
Income demand	$\% \Delta Q_{d,x} / \% \Delta I$	Positive: normal good. Negative: inferior good.
Own-price supply	$\% \Delta Q_{s,x} / \% \Delta P_x$	Normally nonnegative: sellers offer more at a higher price.

3.1 Use the cause to distinguish a movement from a shift

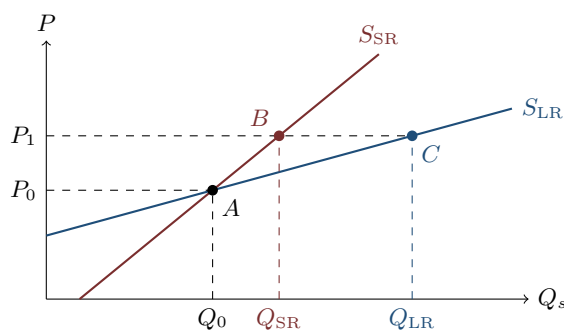
If the **price of coffee itself rises**, buyers move along coffee demand. If the **price of tea rises** and tea and coffee are substitutes, buyers want more coffee *at a given coffee price*: coffee demand shifts right. That positive cross-price response answers a different question from coffee's negative own-price response.

Income changes also shift demand: higher income raises demand for a normal good and lowers demand for an inferior good. "Inferior" describes the income response, not poor quality.

3.2 Supply responsiveness depends on opportunities to adjust

Supply elasticity uses quantity *supplied*. The cutoffs are the same: less than one is inelastic, one is unit elastic, and greater than one is elastic. To understand the response, ask what sellers can change.

Both curves below pass through the same initial point A . In this illustration, the same price increase from P_0 to P_1 produces a larger quantity response when sellers have more time to adjust.



$A \rightarrow B$: **short run**. Sellers expand with existing workers and equipment.

$A \rightarrow C$: **long run**. Sellers have more opportunities to add capacity; new firms can enter.

Same starting price and quantity; same price increase; **larger long-run quantity response**.

Supply often becomes more elastic with more adjustment opportunities. "Short run" and "long run" describe those opportunities, not a fixed number of days that applies to every market.

Before using an elasticity, specify the **good, cause, sign, magnitude, and time horizon**.

Where to revisit the material. Cross-price and income elasticity: textbook Section 5.3, pp. 122–125, worksheet Q4; **Supply elasticity and adjustment**: Section 5.4, pp. 125–130, slides 67–69, worksheet Q2; **Further practice**: textbook review problems, pp. 133–134.