PRINCIPLES OF

MICROECONOMICS

ELEVENTH EDITION

CASE · FAIR · OSTER

PEARSON

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Elasticity 5

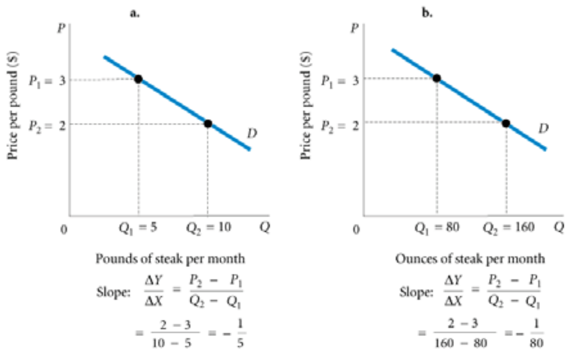
CHAPTER OUTLINE

elasticity A general concept used to quantify the response in one variable when another variable changes.

$$\text{elasticity of } A \text{ with respect to } B = \frac{\%\Delta A}{\%\Delta B}$$

Price Elasticity of Demand

Slope and Elasticity



▲ **FIGURE 5.1 Slope Is Not a Useful Measure of Responsiveness**
Changing the unit of measure from pounds to ounces changes the numerical value of the demand slope dramatically, but the behavior of buyers in the two diagrams is identical.

The slope of a demand curve is:

a. The best way of measuring the responsiveness in quantity demanded to changes in price.
b. Equivalent to elasticity as a measure of responsiveness.
c. A poor measure of the responsiveness compared to elasticity.
d. A measure of the proportional change in quantity demanded, given a proportional change in price.
e. A negative value, while demand elasticity is always a positive value.

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e. A negative value, while demand elasticity is always a positive value.

price elasticity of demand The ratio of the percentage of change in quantity demanded to the percentage of change in price; measures the responsiveness of quantity demanded to changes in price.

$$\text{price elasticity of demand} = \frac{\%\text{ change in quantity demanded}}{\%\text{ change in price}}$$

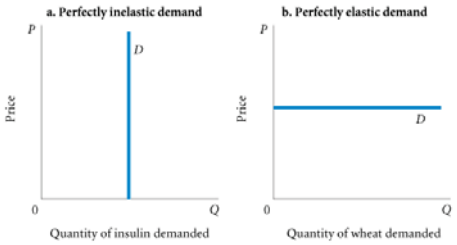
Types of Elasticity

perfectly inelastic demand Demand in which quantity demanded does not respond at all to a change in price.

perfectly elastic demand Demand in which quantity drops to zero at the slightest increase in price.

A good way to remember the difference between the two perfect elasticities is

Perfectly Elastic
and Perfectly Inelastic



▲ **FIGURE 5.2 Perfectly Inelastic and Perfectly Elastic Demand Curves**

Figure 5.2(a) shows a perfectly inelastic demand curve for insulin.
Price elasticity of demand is zero.
Quantity demanded is fixed; it does not change at all when price changes.
Figure 5.2(b) shows a perfectly elastic demand curve facing a wheat farmer.
A tiny price increase drives the quantity demanded to zero.
In essence, perfectly elastic demand implies that individual producers can sell all they want at the going market price but cannot charge a higher price.

When a good has few close substitutes readily available:

a. Quantity demanded is not nearly as responsive to a change in price.
b. Price tends to remain the same, regardless of quantity demanded.
c. Proportional changes in quantity demanded tend to be greater than proportional changes in price.
d. Elasticity cannot be measured.

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a. **Quantity demanded is not nearly as responsive to a change in price.**
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elastic demand A demand relationship in which the percentage change in quantity demanded is larger than the percentage change in price in absolute value (a demand elasticity with an absolute value greater than 1).

inelastic demand Demand that responds somewhat, but not a great deal, to changes in price. Inelastic demand always has a numerical value between zero and 1.

unitary elasticity A demand relationship in which the percentage change in quantity of a product demanded is the same as the percentage change in price in absolute value (a demand elasticity of 1).

A warning:

You must be very careful about signs. Because it is generally understood that demand elasticities are negative (demand curves have a negative slope), they are often reported and discussed without the negative sign.

When the percentage change in quantity demanded is greater than the percentage change in price:

a. The value of demand elasticity is greater than one.
b. The demand curve is relatively steep.
c. There are few substitutes for the good in question.
d. There is little responsiveness in quantity demanded to changes in price.
e. All of the above.

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Calculating Elasticities

Calculating Percentage Changes

To calculate percentage change in quantity demanded using the initial value as the base, the following formula is used:

$$\%\ \text{change in quantity demanded} = \frac{\text{change in quantity demanded}}{Q_1} \times 100\% = \frac{Q_2 - Q_1}{Q_1} \times 100\%$$

We can calculate the percentage change in price in a similar way. Once again, let us use the initial value of P—that is, P_1—as the base for calculating the percentage. By using P_1 as the base, the formula for calculating the percentage of change in P is

$$\%\ \text{change in price} = \frac{\text{change in price}}{P_1} \times 100\% = \frac{P_2 - P_1}{P_1} \times 100\%$$

Elasticity Is a Ratio of Percentages

Once the changes in quantity demanded and price have been converted to percentages, calculating elasticity is a matter of simple division. Recall the formal definition of elasticity:

$$\text{price elasticity of demand} = \frac{\%\ \text{change in quantity demanded}}{\%\ \text{change in price}}$$

The Midpoint Formula

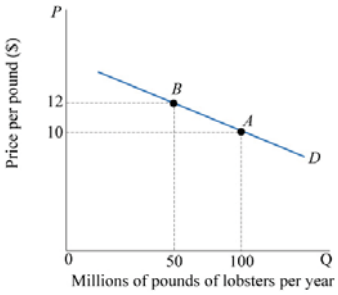
midpoint formula A more precise way of calculating percentages using the value halfway between P_1 and P_2 for the base in calculating the percentage change in price and the value halfway between Q_1 and Q_2 as the base for calculating the percentage change in quantity demanded.

$$\%\text{ change in quantity demanded} = \frac{\text{change in quantity demanded}}{Q_1} \times 100\%$$

$$= \frac{Q_2 - Q_1}{Q_1} \times 100\%$$

Refer to the figure below. Using the arc elasticity formula, the value of price elasticity of demand equals:

a. 2.5.
b. 6.0
c. 3.7.
d. 0.27.
e. None of the above.



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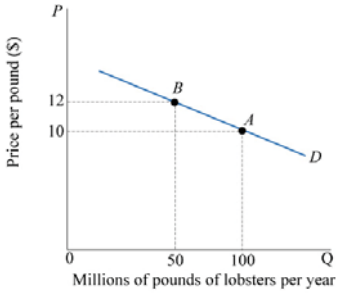


Point Elasticity

point elasticity A measure of elasticity that uses the slope measurement.

We have defined elasticity as the percentage change in quantity demanded divided by the percentage change in price. We can write this as

$$\frac{\frac{\Delta Q}{Q_1}}{\frac{\Delta P}{P_1}}$$

Where Δ denotes a small change and Q_1 and P_1 refer to the original price and quantity demanded.
This can be rearranged and written as

$$\frac{\Delta Q}{\Delta P} \cdot \frac{P_1}{Q_1}$$

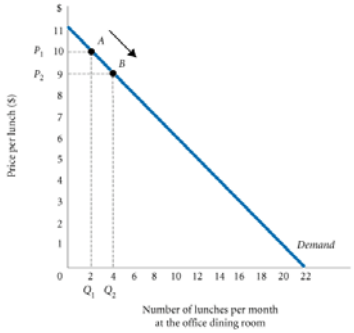
Notice that $\Delta Q/\Delta P$ is the reciprocal of the slope.

Elasticity Changes Along a Straight-Line Demand Curve

TABLE 5.1 Demand Schedule for Office Dining Room Lunches

Price (per Lunch)	Quantity Demanded (Lunches per Month)
$11	0
10	2
9	4
8	6
7	8
6	10
5	12
4	14
3	16
2	18
1	20
0	22

▼ **FIGURE 5.3 Demand Curve for Lunch at the Office Dining Room**



To calculate price elasticity of demand between points *A* and *B* on the demand curve, first calculate the percentage change in quantity demanded:

$$\%\text{ change in quantity demanded} = \frac{4-2}{(2+4)/2} \times 100\% = \frac{2}{3} \times 100\% = 66.7\%$$

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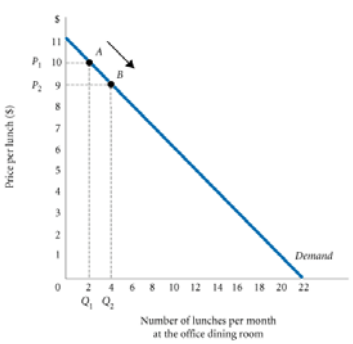

Next, calculate the percentage change in price:

$$\%\text{ change in price} = \frac{9-10}{(10+9)/2} \times 100\% = \frac{-1}{9.5} \times 100\% = -10.5\%$$

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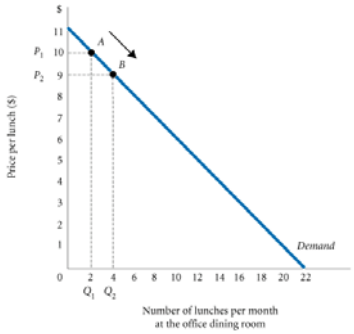

Finally, calculate elasticity:

$$\text{elasticity of demand} = \frac{66.7\%}{-10.5\%} = -6.33$$

Elasticity Changes Along a Straight-Line Demand Curve

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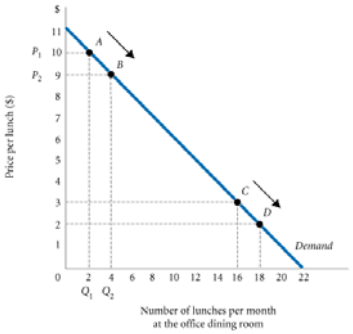
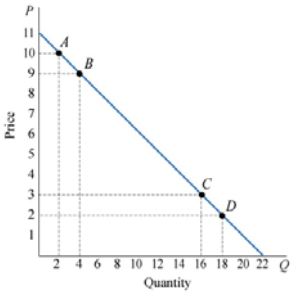


Between points *A* and *B*, demand is quite elastic at −6.33.

Between points *C* and *D*, demand is quite inelastic at −.294. (You can work this number out for yourself using the midpoint formula.)

Refer to the figure. Using the midpoint formula, calculate the values of elasticity between points *A* and *B*, and then between points *C* and *D*. Those values are, respectively:

a. –6.4 and –0.294
b. –0.1 and –4.54
c. –0.15 and –3.40
d. –0.5 and –0.5. Elasticity is the same for both sets of points because the demand curve is linear; thus, the slope of the line remains constant.



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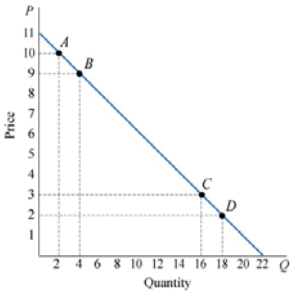
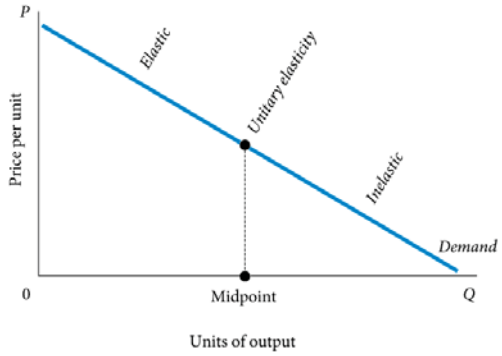


▼ **FIGURE 5.4 Point Elasticity Changes Along a Demand Curve**



Elasticity and Total Revenue

In any market, $P \times Q$ is total revenue (TR) received by producers:

$$TR = P \times Q$$
total revenue = price × quantity

When price (P) declines, quantity demanded (Q_D) increases. The two factors, P and Q_D, move in opposite directions:

effects of price changes on quantity demanded: $P \uparrow \rightarrow Q_D \downarrow$ and $P \downarrow \rightarrow Q_D \uparrow$

Because total revenue is the product of *P* and *Q*, whether *TR* rises or falls in response to a price increase depends on which is bigger: the percentage increase in price or the percentage decrease in quantity demanded.

effect of price increase on a product with inelastic demand:	$\uparrow P \times Q_D \downarrow = TR \uparrow$

If the percentage decline in quantity demanded following a price increase is larger than the percentage increase in price, total revenue will fall.

effect of price increase on a product with elastic demand:	$\uparrow P \times Q_D \downarrow = TR \downarrow$

The opposite is true for a price cut. When demand is elastic, a cut in price increases total revenues:

effect of price cut on a product with elastic demand:	$\downarrow P \times Q_D \uparrow = TR \uparrow$

When demand is inelastic, a cut in price reduces total revenues:

effect of price cut on a product with inelastic demand:	$\downarrow P \times Q_D \uparrow = TR \downarrow$

When demand is *elastic*, a decrease in price leads to:

a. A decrease in total revenue.
b. An increase in total revenue.
c. An increase in quantity demanded, but no change in revenue.
d. A change in revenue, without a change in quantity demanded.

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The Determinants of Demand Elasticity

Availability of Substitutes

Perhaps the most obvious factor affecting demand elasticity is the availability of substitutes.

The Importance of Being Unimportant

When an item represents a relatively small part of our total budget, we tend to pay little attention to its price.

The Time Dimension

The elasticity of demand in the short run may be very different from the elasticity of demand in the long run. In the longer run, demand is likely to become more elastic, or responsive, simply because households make adjustments over time and producers develop substitute goods.

ECONOMICS IN PRACTICE

Who Are the Elastic Smokers?

Many people would argue that because more young people are new smokers and because they have less money than adults, their demand for cigarettes would be more elastic.

On the other hand, if peer pressure favors smoking, this could lower demand elasticity for youths.

THINKING PRACTICALLY

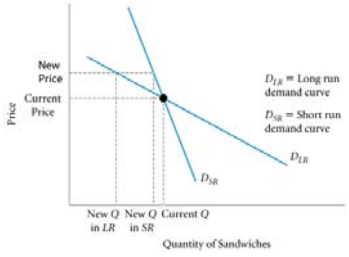
1. Cigarette taxes help discourage smoking and also raise revenue for states. How does elasticity affect each of these?

ECONOMICS IN PRACTICE

Elasticities at a Delicatessen in the Short Run and Long Run

The graph shows the expected relationship between long-run and short-run demand for Frank's sandwiches.

Notice if you raise prices above the current level, the expected quantity change read off the short-run curve is less than that from the long-run curve.



THINKING PRACTICALLY

1. Provide an example of a purchasing situation in which you think your own short and long run elasticities differ a lot and a second in which they are similar. What drives those differences?

Other Important Elasticities

Income Elasticity of Demand

income elasticity of demand A measure of the responsiveness of demand to changes in income.

$$\text{income elasticity of demand} = \frac{\%\text{ change in quantity demanded}}{\%\text{ change in income}}$$

Cross-Price Elasticity of Demand

cross-price elasticity of demand A measure of the response of the quantity of one good demanded to a change in the price of another good.

$$\text{cross-price elasticity of demand} = \frac{\%\text{ change in quantity of } Y \text{ demanded}}{\%\text{ change in price of } X}$$

Which of the following is a true statement?

a. The fewer substitutes available for a product, the greater the price elasticity of demand.
b. The more time that passes, the more inelastic the demand for a product becomes.
c. When an item represents a small portion of our total budget, demand for that item is likely to be inelastic.
d. All of the above.

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d. All of the above.

Elasticity of Supply

elasticity of supply A measure of the response of quantity of a good supplied to a change in price of that good. Likely to be positive in output markets.

$$\text{elasticity of supply} = \frac{\%\text{ change in quantity supplied}}{\%\text{ change in price}}$$

elasticity of labor supply A measure of the response of labor supplied to a change in the price of labor.

$$\text{elasticity of labor supply} = \frac{\%\text{ change in quantity of labor supplied}}{\%\text{ change in the wage rate}}$$

Looking Ahead

The purpose of this chapter was to convince you that measurement is important. If all we can say is that a change in one economic factor causes another to change, we cannot say whether the change is important or whether a particular policy is likely to work. The most commonly used tool of measurement is elasticity, and the term will recur as we explore economics in more depth.

We now return to the study of basic economics by looking in detail at household behavior. Recall that households *demand* goods and services in product markets but *supply* labor and savings in input or factor markets.

REVIEW TERMS AND CONCEPTS

cross-price elasticity of demand
elastic demand
elasticity
elasticity of labor supply
elasticity of supply
income elasticity of demand
inelastic demand
midpoint formula
perfectly elastic demand
perfectly inelastic demand
point elasticity
price elasticity of demand
unitary elasticity