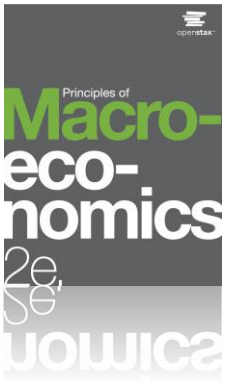
PRINCIPLES OF ECONOMICS 2e

Chapter 5 Elasticity
PowerPoint Image Slideshow



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CH.5 OUTLINE

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5.1: Price Elasticity of Demand and Price Elasticity of Supply

5.2: Polar Cases of Elasticity and Constant Elasticity

5.3: Elasticity and Pricing

5.4: Elasticity in Areas Other Than Price

Netflix and Economic Elasticity

Netflix, Inc. is an American provider of on-demand Internet streaming media to many countries around the world, including the United States, and of flat rate DVD-by-mail in the United States. How did customers react in 2011 when it announced a major packaging change, including an increase in price? This is a modern day digital example of a concept economists call elasticity, and will be further explored in this chapter. (Credit: modification of work by Traci Lawson/Flickr Creative Commons)

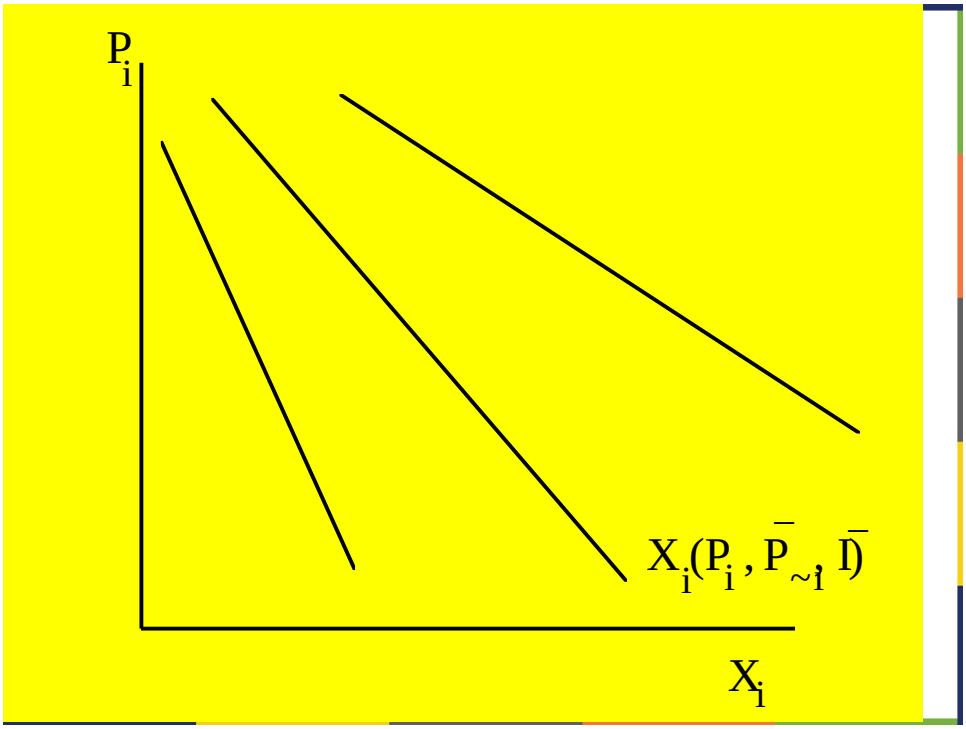
Elasticity

Elasticity- The percentage change in a dependent variable resulting from a 1% change in another variable.

We have seen how the demand for the i^{th} good depends on the prices of all goods and income x_i (p, I). Since there are too many variables (n prices and income) I will assume that except for the price of the i^{th} good, all prices and income are kept constant. We can now draw a familiar demand curve (see figure below). To find the market demand curve, I add up horizontally all the demand curves of different people.

5.1 Price Elasticity of Demand and Price Elasticity of Supply

- **Elasticity** is an economics concept that measures the responsiveness of one variable to changes in another variable.
- **Price elasticity** is the ratio between the percentage change in the quantity demanded (Qd) or supplied (Qs), and the corresponding percent change in price.
- **Price elasticity of demand** - percentage change in the quantity *demanded* of a good or service divided the percentage
- **Price elasticity of supply** - the percentage change in quantity *supplied* divided by the percentage change in price.



Slope. To characterize a demand curve we look at the slope. The slope tells me how sensitive the quantity demanded is to changes in prices. The slope tells me what is the change in demand with respect to a change in price.

$$(\Delta X / \Delta P) = [(X2-X1)] / [(P2-P1)]$$

For example, if a demand curve is very flat, a small change in price will result in a big change in demand.

The problem with the slope is that it is not unit independent. We obtain a different number if we measure, for instance, in pounds per Dollar than if we measure it in grams per Yen. If we want to get a measure of sensitivity with respect to price that is unit free we look at percentages. Instead of looking at,

$$\frac{\Delta x_i}{\Delta p_i}$$

We look at,

$$\frac{\%\Delta x_i}{\%\Delta p_i} \quad \text{or} \quad \frac{\Delta x_i / x_i}{\Delta p_i / p_i}$$

which will be unit free. It will say something like a 1% change in price will result in a 3% change in demand. Since we expect demand curves to be downward sloping the price elasticity will be negative. The elasticity is the absolute value of the previous expression

Elastic, Inelastic, and Unitary: Three Cases of Elasticity

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- An **elastic demand** or **elastic supply** is one in which the elasticity is greater than one, indicating a high responsiveness to changes in price.
- **Inelastic demand** or **inelastic supply** - elasticities that are less than one, indicating low responsiveness to price changes.
- **Unitary elasticities** indicate proportional responsiveness of either demand or supply,

If . . .	Then . . .	And It Is Called . . .
% change in quantity > % change in price	$\frac{\%\text{ change in quantity}}{\%\text{ change in price}} > 1$	Elastic
% change in quantity = % change in price	$\frac{\%\text{ change in quantity}}{\%\text{ change in price}} = 1$	Unitary
% change in quantity < % change in price	$\frac{\%\text{ change in quantity}}{\%\text{ change in price}} < 1$	Inelastic

Calculate Elasticity of a Curve

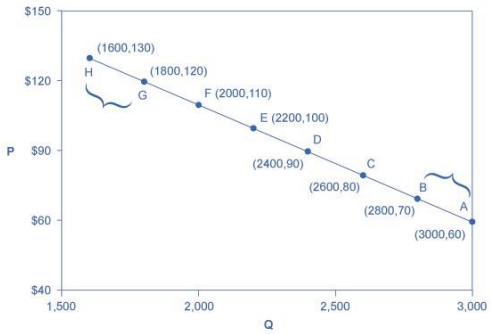
To calculate elasticity along a demand or supply curve economists use the average percent change in both quantity and price.

Midpoint Method for Elasticity:

$$\%\ \text{change in quantity} = \frac{Q2 - Q1}{(Q2 + Q1)/2} \times 100$$

$$\%\ \text{change in price} = \frac{P2 - P1}{(P2 + P1)/2} \times 100$$

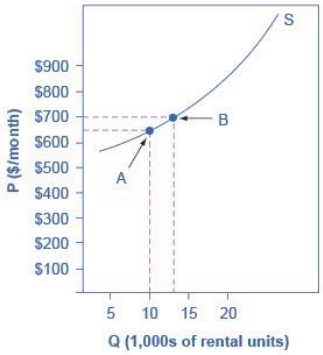
Example - Calculating the Price Elasticity of Demand



- The price elasticity of demand is calculated as the percentage change in quantity divided by the percentage change in price.
- Therefore, the elasticity of demand between these two points is 0.45, an amount *smaller* than one, showing that the demand is inelastic in this interval.

$$\begin{aligned}
\%\ \text{change in quantity} &= \frac{3{,}000 - 2{,}800}{(3{,}000 + 2{,}800)/2} \times 100 \\
&= \frac{200}{2{,}900} \times 100 \\
&= 6.9 \\
\%\ \text{change in price} &= \frac{60 - 70}{(60 + 70)/2} \times 100 \\
&= \frac{-10}{65} \times 100 \\
&= -15.4 \\
\text{Price Elasticity of Demand} &= \frac{6.9\%}{-15.4\%} \\
&= 0.45
\end{aligned}$$

Example - Calculating the Price Elasticity of Supply

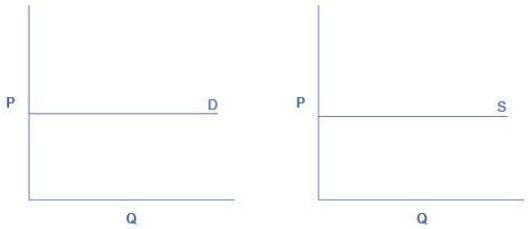


$$\text{\% change in quantity} = \frac{13{,}000 - 10{,}000}{(13{,}000 + 10{,}000)/2} \times 100$$
$$= \frac{3{,}000}{11{,}500} \times 100$$
$$= 26.1$$
$$\text{\% change in price} = \frac{\$700 - \$650}{(\$700 + \$650)/2} \times 100$$
$$= \frac{50}{675} \times 100$$
$$= 7.4$$
$$\text{Price Elasticity of Supply} = \frac{26.1\%}{7.4\%}$$
$$= 3.53$$

- The price elasticity of supply is calculated as the percentage change in quantity divided by the percentage change in price.
- What category of elasticity does the result fall into?

5.2 Polar Cases of Elasticity and Constant Elasticity

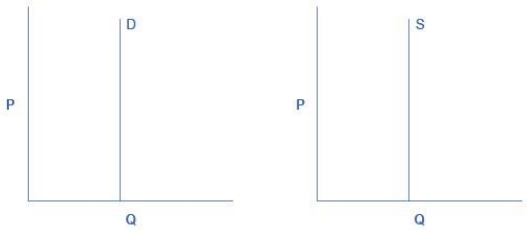
- **Infinite elasticity** or **perfect elasticity** - either the quantity demanded (Qd) or supplied (Qs) changes by an infinite amount in response to any change in price at all.
- In both cases, the supply and the demand curve are *horizontal*.
- The quantity supplied or demanded is extremely responsive to price changes, moving from zero for prices close to P to infinite when price reach P.



(a) Perfectly elastic demand curve (b) Perfectly elastic supply curve

Zero Elasticity

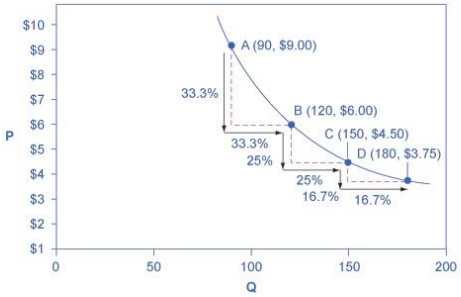
- **Zero elasticity** or **perfect inelasticity** - a percentage change in price, no matter how large, results in zero change in quantity.
- The *vertical* supply curve and *vertical* demand curve show that there will be zero percentage change in quantity (a) supplied or (b) demanded, regardless of the price.



(a) Perfectly inelastic demand curve (b) Perfectly inelastic supply curve

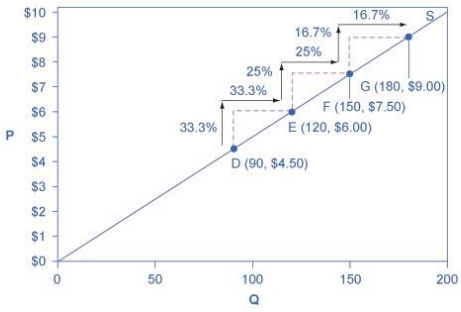
Constant Unitary Elasticity

- **Constant unitary elasticity**, in either a supply or demand curve, occurs when a price change of one percent results in a quantity change of one percent.



- A <u>demand</u> curve with constant unitary elasticity will be a *curved* line.
- Notice how price and quantity demanded change by an identical amount in each step down the demand curve.

Constant Unitary Elasticity

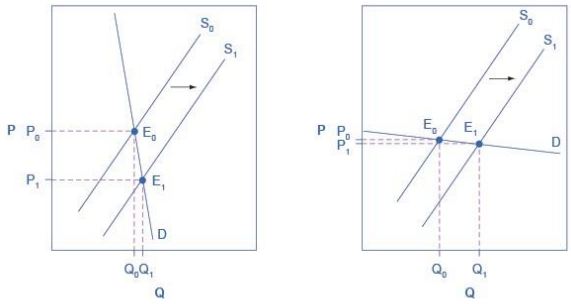


- A constant unitary elasticity supply curve is a *straight* line reaching up from the origin.
- Between each point, the percentage increase in quantity demanded is the same as the percentage increase in price.

5.3 Elasticity and Pricing

- Most businesses face a day-to-day struggle to figure out ways to produce at a lower cost, as one pathway to their goal of earning higher profits.
- However, in some cases, the price of a key input over which the firm has no control may rise or fall.
- Can businesses pass costs (or cost savings) onto consumers?

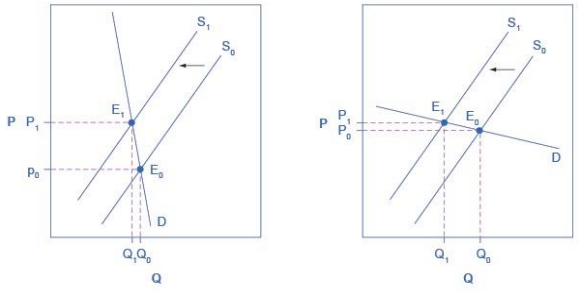
Passing Along Cost Savings to Consumers -Technological Improvements



(a) Cost-saving with inelastic demand (b) Cost-saving with elastic demand

- Cost-saving gains cause supply to shift out to the right from S_0 to S_1; that is, at any given price, firms will be willing to supply a greater quantity.
- If demand is inelastic, as in (a), the result of this cost-saving technological improvement will be substantially lower prices.
- If demand is elastic, as in (b), the result will be only slightly lower prices.
- Consumers benefit in either case, from a greater quantity at a lower price, but the benefit is greater when demand is inelastic, as in (a).

Passing Along Higher Costs to Consumers - Rising Taxes



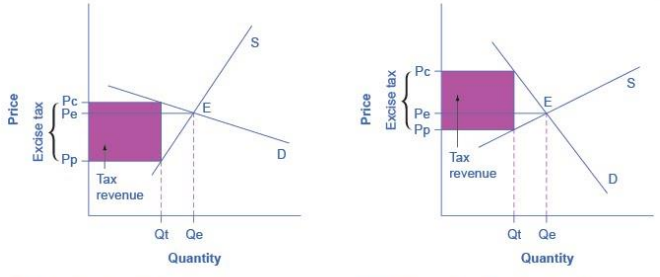
(a) Higher costs with inelastic demand (b) Higher costs with elastic demand

- Higher costs, like a higher tax on cigarette companies for example, lead supply to shift to the left. This shift is identical in (a) and (b).
- However, in (a), where demand is inelastic, the cost increase can largely be passed along to consumers in the form of higher prices, without much of a decline in equilibrium quantity.
- In (b), demand is elastic, so the shift in supply results primarily in a lower equilibrium quantity.
- Consumers suffer in either case, but in (a), they suffer from paying a higher price for the same quantity, while in (b), they suffer from buying a lower quantity (and presumably needing to shift their consumption elsewhere).

Elasticity and Tax Incidence

- **Tax incidence** - manner in which the tax burden is divided between buyers and sellers.
- If demand is more inelastic than supply, consumers bear most of the tax burden.
- If supply is more inelastic than demand, sellers bear most of the tax burden.

Elasticity and Tax Incidence



(a) Elastic demand and inelastic supply

(b) Elastic supply and inelastic demand

- An excise tax introduces a wedge between the price paid by consumers (Pc) and the price received by producers (Pp).
- The more elastic the demand and supply curves are, the lower the tax revenue.

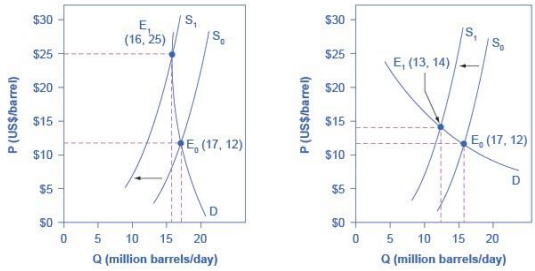
(a) When the demand is more elastic than supply, the tax incidence on consumers, Pc – Pe, is *lower* than the tax incidence on producers, Pe – Pp.

(b) When the supply is more elastic than demand, the tax incidence on consumers, Pc – Pe, is larger than the tax incidence on producers, Pe – Pp.

Long-Run vs. Short-Run Impact

- Elasticities are often lower in the short run than in the long run.
- On the demand side of the market, it can sometimes be difficult to change Qd in the short run, but easier in the long run.
- On the supply side of markets, producers of goods and services typically find it easier to expand production in the long term of several years rather than in the short run of a few months.
- In most markets for goods and services:
  - in the short run - prices bounce up and down more than quantities.
  - in the long run - quantities often move more than prices.

Responsiveness of Demand to Price Changes of Crude Oil



(a) shows inelastic demand for oil in the short run (b) more elastic demand over the long term.

- The intersection (E_0) between demand curve D and supply curve S_0 is the same
- The shift of supply to the left from S_0 to S_1 is identical in both (a) and (b).
- The new equilibrium (E_1) has a higher price and a lower quantity than the original equilibrium (E_0) in both (a) and (b).
- However, the shape of the demand curve D is different in (a) and (b).
- As a result, the shift in supply can result either in a new equilibrium with a much higher price and an only slightly smaller quantity, as in (a).
- Or in a new equilibrium with only a small increase in price and a relatively larger reduction in quantity, as in (b).

5.4 Elasticity in Areas Other Than Price

- **Income elasticity of demand**

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

- For most products, most of the time, the income elasticity of demand is positive:
- That is, a rise in income will cause an increase in the quantity demanded.

Cross-Price Elasticity of Demand

- A change in the price of one good can shift the quantity demanded for another good.
- **Cross-price elasticity of demand** - the percentage change in the quantity of good A that is demanded as a result of a percentage change in the price good B.

$$= \frac{\%\text{ change in Qd of good A}}{\%\text{ change in price of good B}}$$

Discussion Question: What are examples of complement and substitute goods, where a change in price of one good would cause a change in demand of the other?

Elasticity in Labor

- **Wage elasticity of labor supply** - the percentage change in labor supplied divided by the percentage change in wages.

$$= \frac{\%\text{ change in quantity of labor supplied}}{\%\text{ change in wage}}$$

- **Wage elasticity of labor demand -** the percentage change in labor demanded divided by the percentage change in wages.

$$= \frac{\%\text{ change in quantity of labor demanded}}{\%\text{ change in wage}}$$

Elasticity in Financial Capital Markets

- **Interest rate elasticity of savings** - the percentage change in the quantity of savings divided by the percentage change in interest rates.

$$= \frac{\%\text{ change in quantity of financial savings}}{\%\text{ change in interest rate}}$$

- **Interest rate elasticity of borrowing** - the percentage change in the quantity of borrowing divided by the percentage change in interest rates.

$$= \frac{\%\text{ change in quantity of financial borrowing}}{\%\text{ change in interest rate}}$$

Back to Netflix

How did the 60% price increase in 2011 end up for Netflix?

- Before the price increase - 24.6 million U.S. subscribers.
- After the price increase - 810,000 U.S. consumers canceled their subscriptions.
- Fast forward to June 2013, there were 36 million streaming Netflix subscribers in the United States.
  - An average per quarter growth of about 1.6 million.
  - This was less than the 2 million per quarter increases that had been the previous norm, before the price change.

Why was the estimate of customers leaving so far off? What missteps did the Netflix management make?

- A misjudgement of the elasticity of demand.
  - Due to increase in the number of close substitutes (Vudu, Amazon Prime, Hulu, Redbox).
- Misjudgement of customers' preferences and tastes.
  - Many consumers still preferred a physical DVD disk over streaming video.

Click on the following links to view an short lecture and examples of Elasticity of supply and demand. On the second video only the first 5 examples are relative to what we have covered in the class so far.

https://www.youtube.com/watch?v=5UKw4blQdsc

https://www.youtube.com/watch?v=nAT_shQGIlk

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