Elasticity

LEARNING OBJECTIVES

After learning about this chapter, you should know

LO6-1 How to compute price elasticity of demand.

LO6-2 The relationships between price changes, price elasticity, and total revenue.

LO6-3 What the cross-price elasticity of demand measures.

LO6-4 What the income elasticity of demand tells us.

LO6-5 What the elasticity of supply measures.

Elasticity

- If a seller needs to lower the price of a product, how much should it be lowered?
  - Reduce too little, and projected increase in sales will not meet desired goals.
  - Reduce too much, and the projected profit target might not be achieved.
- We need to know the **price elasticity of demand:** how much quantity demanded changes in response to a change in price.

Elasticity II

- We will focus on elasticity.
  - How does a change in a product's price affect the quantity we purchase or the amount of money we spend on it?
  - How do changes in the prices of other products affect the amount of a product we buy?
  - How do changes in income affect the quantity demanded of various goods and services?

Price Elasticity

- **Law of demand:** the quantity of a good demanded in a given time period increases as its price falls, ceteris paribus.

- The critical question is **how much** quantity demanded will change due to a price change.

- **Price elasticity of demand:** the percentage change in quantity demanded divided by the percentage change in price.

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Price Elasticity II

Price elasticity (E)   = $\dfrac{\% \text{ change in quantity demanded}}{\% \text{ change in price}}$

- A 10% increase in quantity demanded in response to a 20% price decrease yields a price elasticity of 0.5.

Computing Price Elasticity

- We use the average method of computation.
  - Take the quantity before and the quantity after the price change and average them.
  - Divide the average quantity into the change in quantity to get the percentage change in quantity.
- If quantity went from 2 to 4, then the average is 3. The change is 2, so the percentage change is 2/3 or 0.667.

Computing Price Elasticity II

- We do the same thing to get the percentage change in price.

  – Take the price before and the price after and average them.

  – Divide the average price into the change in price to get the percentage change in price.

- If price went from 45 to 40, then the average is 42.5. The change is 5, so the percentage change is 5/42.5, or 0.118.

Computing Price Elasticity III

- The % change in quantity is 0.667 and the % change in price is 0.118.

Price elasticity (*E*) = $\dfrac{\text{\% change in quantity demanded}}{\text{\% change in price}}$

- We can now compute the price elasticity of demand:

$$E = 0.667 / 0.118 = 5.65$$

- A 1% change in price brings about a 5.65% change in quantity demanded.
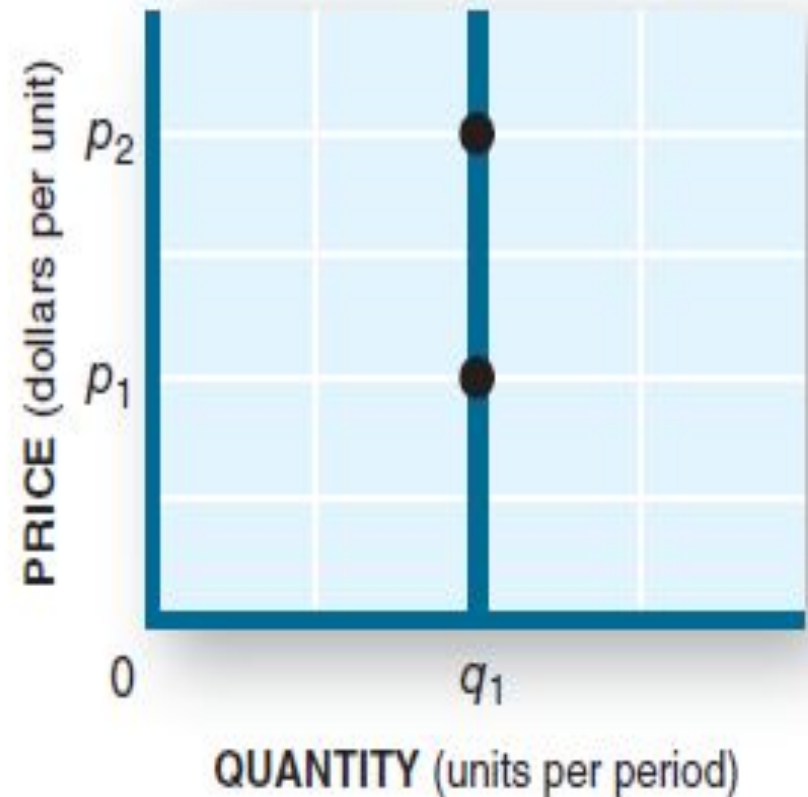
Interpreting Elasticity

- If *E > 1*, demand is elastic.
  - Consumer response is large relative to the price change.
- If *E < 1*, demand is inelastic.
  - Consumer response is small relative to the price change.
- If *E = 1*, demand is unitary elastic.
  - % change in quantity demanded is exactly equal to % change in price.

Elasticity Extremes

(a) Completely elastic ($E = \infty$)
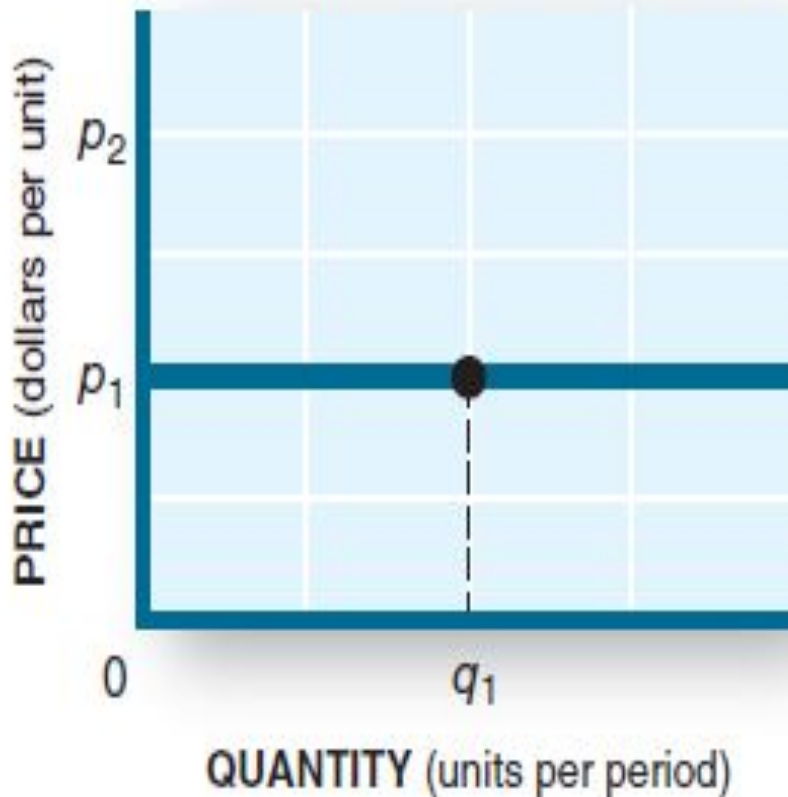
(b) Completely inelastic ($E = 0$)

Elasticity Estimates II

Product	Price Elasticity
Relatively elastic (E > 1)	
Airline travel, long run	2.4
Restaurant meals	2.3
Fresh fish	2.2
New cars, short run	1.2–1.5
Unitary elastic (E = 1)	
Private education	1.1
Radios and televisions	1.2
Shoes	0.9
Movies	0.9
Relatively inelastic (E < 1)	
Milk	0.6
Cigarettes	0.4
Coffee	0.3
Eggs	0.3
Gasoline, short run	0.2
Electricity (in homes)	0.1

Determinants of Elasticity

- Necessities vs. luxuries
  - Demand for necessities is relatively inelastic.
  - Demand for luxuries is relatively elastic.
- Availability of substitutes
  - The greater the availability of substitutes, the more elastic is the product's demand.
  - No or few substitutes? Inelastic demand.

Determinants of Elasticity II

- Relative price to income
  - Demand for low-priced goods is relatively inelastic.
  - Demand for high-priced goods is relatively elastic.
- Time
  - The more time you have to adjust to a price change, the more elastic your response.
  - No time to adjust? Highly inelastic demand.

Price Elasticity and Total Revenue

- Total revenue is the amount of money received from product sales.

Total revenue = Price x Quantity sold

– If demand is inelastic ($E<1$), a price rise increases total revenue, and vice versa.

– If demand is elastic ($E>1$), a price rise decreases total revenue, and vice versa.

– If demand is unitary-elastic ($E=1$), a price change does not change total revenue.

Price Elasticity and Total Revenue II

- You sell cigarettes. Should you put them on sale?

  - No. Cigarettes are inelastic goods. If price falls, total revenue will fall.

- You sell furniture or automobiles. Should you put them on sale?

  - Yes. These are elastic goods. Always have the appearance that your product is "on sale." If price falls, total revenue will rise.

Elasticity on the Demand Curve

At low prices, demand is relatively inelastic. As prices rise, however, demand becomes less inelastic and more elastic.

Note that total revenue maxes out when demand switches from elastic to inelastic.

(a) The demand curve

(b) Total revenue

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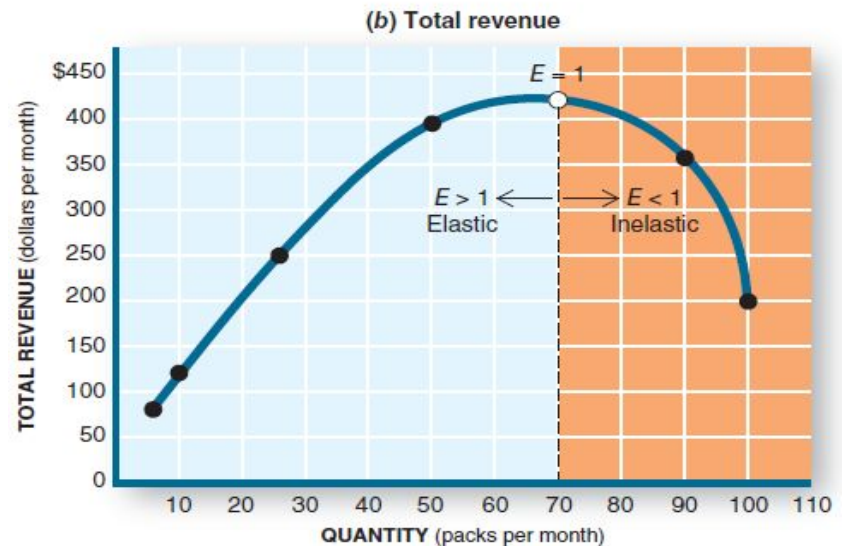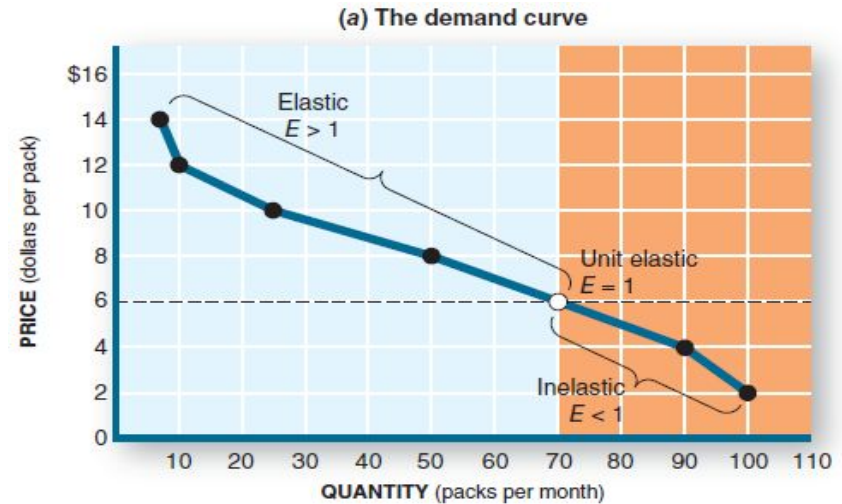
Cross-Price Elasticity

- Suppose the price of candy in the theater falls. How would this affect the sales of popcorn?
  - Candy and popcorn are **substitutes** for each other.
  - Lower-priced candy will see an increase in quantity demanded. Also, the demand for popcorn will decrease. But by how much?

- **Cross-price elasticity of demand:** the % change in quantity demanded of X divided by the % change in price of Y.

Cross-Price Elasticity II

- **Substitute goods:** goods that can replace each other; when the price of good X rises, the demand for good Y increases, and vice versa, *ceteris paribus*.

- **Complementary goods:** goods frequently consumed in combination; when the price of good X rises, the demand for good Y decreases, and vice versa, *ceteris paribus*.

Cross-Price Elasticity III

- **Substitutes**
  - If popcorn sales declined 20% when the candy price dropped 10%, the cross-price elasticity of demand for popcorn is -20 / -10 or *Ex* = +2.0, a relatively elastic response.
  - Note that the sign is significant. When goods are **substitutes**, cross-price elasticity is **positive**.

Cross-Price Elasticity IV

- **Complements**
  - If popcorn sales declined 20% when the movie admission price increased 10%, the cross-price elasticity of popcorn is -2.0, a relatively elastic response.
  - Again the sign is significant. When goods are **complements**, cross-price elasticity is **negative**.

Cross-Price Elasticity V

- The price of gasoline jumps 20%. Would you expect the demand for gas-guzzling SUVs to rise or fall? Why?

- Are they substitutes or complementary goods? Why?

Income Elasticity

- As income increases, people have more money to spend. Demand for goods will shift rightward.
  - For a particular good, how much of a demand increase will occur?
- **Income elasticity of demand:** % change in quantity demanded divided by % change in income.
  - Your income rises by 10%. You go to the movies more and buy 20% more popcorn. Income elasticity of demand for popcorn is 20% / 10% or 2.0.

Income Elasticity II

Normal goods and Inferior goods

- A increase in demand for a good when income rises is true for a **normal good**. Most goods are normal goods.

- For some goods the demand decreases as income rises. They are **inferior goods**.

  – Examples are used clothes and ramen noodles.

  – As income increases, people upgrade to higher-quality substitutes for inferior goods.

Elasticity of Supply

- The law of supply: an increase in price causes an increase in quantity supplied. But how much more will be produced as the price rises?

- **Elasticity of supply:** the % change in quantity supplied divided by the % change in price.

  - If it is highly elastic, producers are very responsive to a price change.

  - If it is highly inelastic, producers have a sluggish response to a price change.

Application: The Economy Tomorrow

- Will electric vehicles (EVs) overtake gas guzzlers?
  - Electric cars are gaining in popularity. With record sales of 160,000 units in 2016.
  - Less harmful to the environment.
  - Demand may rise or fall based on related goods.

Application: The Economy Tomorrow II

- Price and availability of complements
  - EVs require batteries, if cost of batteries fall then demand will rise.
  - If government rebates fall demand may fall.
- Price and availability of substitutes
  - Increase in price of gasoline will increase demand for EVs.
  - Vehicles powered by other fuels.
  - Ride-sharing like Uber and Lyft.

Revisiting the Learning Objectives

- **LO6-1 Know how to compute the price elasticity of demand.**
  - Price elasticity of demand (*E*) measures the intensity of response of consumers to a price change.
  - It equals the % change in quantity demanded divided by the % change in price.
  - If *E*>1, elastic; if *E*<1, inelastic.

Revisiting the Learning Objectives II

- **LO6-2 Know the relationships between price changes, price elasticity, and total revenue.**
  - For inelastic goods, *E*<1, a price increase generates a smaller % change in quantity demanded and an increase in total revenue. Vice versa applies.
  - For elastic goods, *E*>1, a price increase generates a larger % change in quantity demanded and a decrease in total revenue. Vice versa applies.

Revisiting the Learning Objectives III

- **LO6-3 Know what the cross-price elasticity of demand measures.**
  - It measures the response of demand for one good to a change in price of another good.
  - If they are substitutes, cross-price elasticity is **positive.**
  - If they are complements, cross-price elasticity is **negative**.

Revisiting the Learning Objectives IV

- **LO6-4 Know what the income elasticity of demand tells us.**
  - It measures the response of demand to a change in income.
  - If demand increases (shifts right) when income increases, the product is a normal good. Vice versa applies.
  - If demand decreases (shifts left) when income increases, the product is an inferior good. Vice versa applies.

Revisiting the Learning Objectives V

- **LO6-5 Know what the elasticity of supply measures.**
  - It measures the response of suppliers to a price change.
  - It is the % change in quantity supplied divided by the % change in price.

Looking Ahead: Chapter 7

The Costs of Production

After learning about this chapter, you should know:

- What the production function represents.
- What the law of diminishing returns means.
- How the various measures of cost relate to each other.
- How economic and accounting costs differ.
- What (dis)economies of scale are.