

Elasticity and Its Application

The Elasticity of Supply

- Elastic supply
 - Quantity supplied responds substantially to changes in the price
- Inelastic supply
 - Quantity supplied responds only slightly to changes in the price

The Elasticity of Supply

Determinant of price elasticity of supply

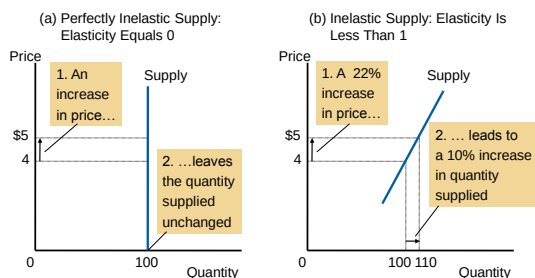
- Time period
- Productive capacity
- The size of the firm/industry
- Mobility of factors of production
- Ease of storing stock/inventory

The Elasticity of Supply

- **Computing price elasticity of supply**
 - Percentage change in quantity supplied divided by percentage change in price
 - Always positive
- **Midpoint method**
 - Two points: (Q_1, P_1) and (Q_2, P_2)

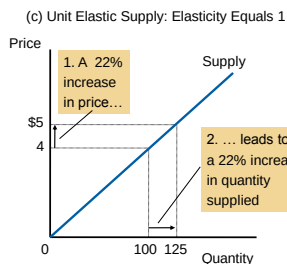
$$\text{Price elasticity of supply} = \frac{(Q_2 - Q_1) / [(Q_2 + Q_1) / 2]}{(P_2 - P_1) / [(P_2 + P_1) / 2]}$$

The Price Elasticity of Supply (a, b)



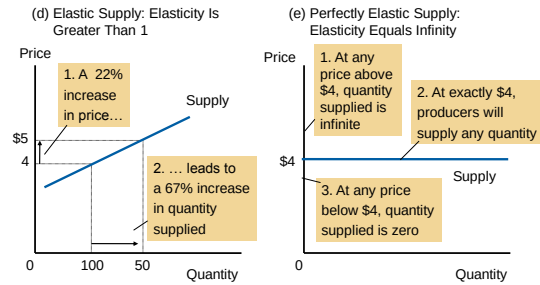
The price elasticity of supply determines whether the supply curve is steep or flat. Note that all percentage changes are calculated using the midpoint method.

The Price Elasticity of Supply (c)



The price elasticity of supply determines whether the supply curve is steep or flat. Note that all percentage changes are calculated using the midpoint method.

The Price Elasticity of Supply (d, e)



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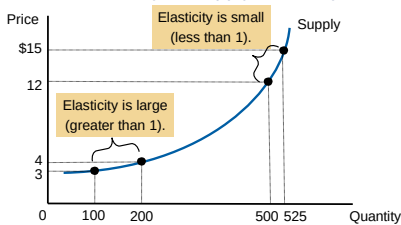
The Elasticity of Supply

• Supply curve

– Different price elasticities

- Points with low price and low quantity
 - Elastic supply
 - Capacity for production not being used
- Points with high price and high quantity
 - Inelastic supply

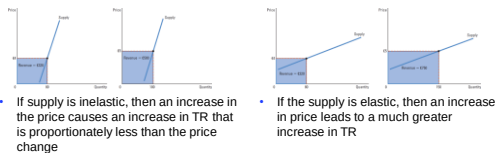
How the Price Elasticity of Supply Can Vary



Because firms often have a maximum capacity for production, the elasticity of supply may be very high at low levels of quantity supplied and very low at high levels of quantity supplied. Here an increase in price from \$3 to \$4 increases the quantity supplied from 100 to 200. Because the 67% increase in quantity supplied (computed using the midpoint method) is larger than the 29% increase in price, the supply curve is elastic in this range. By contrast, when the price rises from \$12 to \$15, the quantity supplied rises only from 500 to 525. Because the 5% increase in quantity supplied is smaller than the 22% increase in price, the supply curve is inelastic in this range.

The **total revenue (TR)** received by sellers is $P \times Q$, the price of the good times the quantity of the good sold

The change in **TR** as one moves along the supply curve depends on the elasticity of a supply



The Elasticity of Demand

- **Elasticity**
 - Measure of the responsiveness of quantity demanded or quantity supplied
 - To a change in one of its determinants
- **Price elasticity of demand**
 - How much the quantity demanded of a good responds to a change in the price of that good

The Elasticity of Demand

- **Price elasticity of demand**
 - Percentage change in quantity demanded divided by the percentage change in price
- **Elastic demand**
 - Quantity demanded responds substantially to changes in price
- **Inelastic demand**
 - Quantity demanded responds only slightly to changes in price

The Elasticity of Demand

- Determinants of price elasticity of demand

- Availability of close substitutes
 - Goods with close substitutes: more elastic demand
- Necessities vs. luxuries
 - Necessities: inelastic demand
 - Luxuries: elastic demand

The Elasticity of Demand

- Determinants of price elasticity of demand

- Definition of the market
 - Narrowly defined markets: more elastic demand
- Time horizon
 - Demand is more elastic over longer time horizons
- Proportion of income devoted to the product
 - Demand is more elastic for goods that take up a higher proportion of our income

The Elasticity of Demand

- Computing the price elasticity of demand

- Percentage change in quantity demanded divided by percentage change in price
- Use absolute value (drop the minus sign)

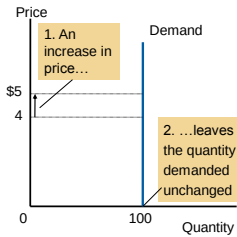
- Midpoint method

- Two points: (Q_1, P_1) and (Q_2, P_2)

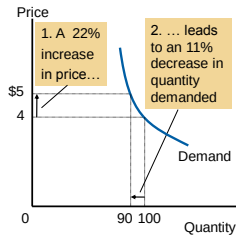
Price elasticity of demand =
$$\frac{(Q_2 - Q_1) / [(Q_2 + Q_1) / 2]}{(P_2 - P_1) / [(P_2 + P_1) / 2]}$$

The Price Elasticity of Demand (a, b)

(a) Perfectly Inelastic Demand:
Elasticity Equals 0



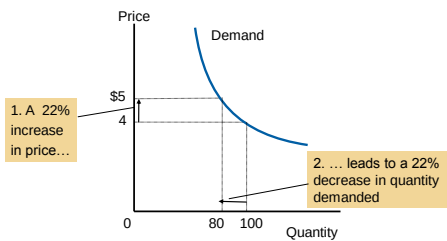
(b) Inelastic Demand: Elasticity Is Less Than 1



The price elasticity of demand determines whether the demand curve is steep or flat. Note that all percentage changes are calculated using the midpoint method.

The Price Elasticity of Demand (c)

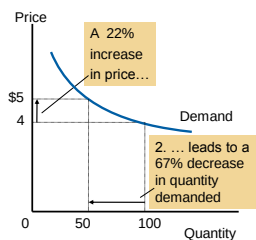
(c) Unit Elastic Demand: Elasticity Equals 1



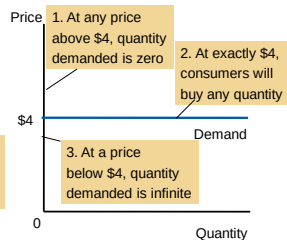
The price elasticity of demand determines whether the demand curve is steep or flat. Note that all percentage changes are calculated using the midpoint method.

The Price Elasticity of Demand (d, e)

(d) Elastic demand:
Elasticity > 1



(e) Perfectly elastic demand:
Elasticity equals infinity

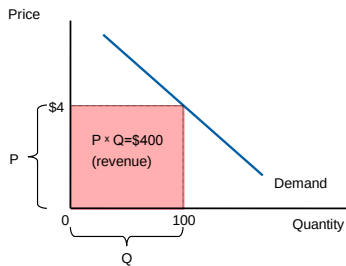


The price elasticity of demand determines whether the demand curve is steep or flat. Note that all percentage changes are calculated using the midpoint method.

The Elasticity of Demand

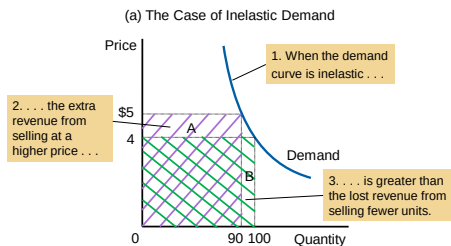
- Total revenue, TR
 - Amount paid by buyers and received by sellers of a good
 - Price of the good times the quantity sold ($P \times Q$)
- For a price increase
 - If demand is inelastic, TR increases
 - If demand is elastic, TR decreases

Total Revenue



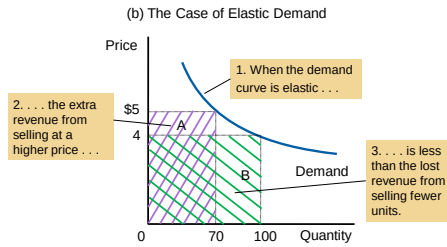
The total amount paid by buyers, and received as revenue by sellers, equals the area of the box under the demand curve, $P \times Q$. Here, at a price of \$4, the quantity demanded is 100, and total revenue is \$400.

How Total Revenue Changes When Price Changes (a)



The impact of a price change on total revenue (the product of price and quantity) depends on the elasticity of demand. In panel (a), the demand curve is inelastic. In this case, an increase in the price leads to a decrease in quantity demanded that is proportionately smaller, so total revenue increases. Here an increase in the price from \$4 to \$5 causes the quantity demanded to fall from 100 to 90. Total revenue rises from \$400 to \$450.

How Total Revenue Changes When Price Changes (b)



The impact of a price change on total revenue (the product of price and quantity) depends on the elasticity of demand. In panel (b), the demand curve is elastic. In this case, an increase in the price leads to a decrease in quantity demanded that is proportionately larger, so total revenue decreases. Here an increase in the price from \$4 to \$5 causes the quantity demanded to fall from 100 to 70. Total revenue falls from \$400 to \$350.

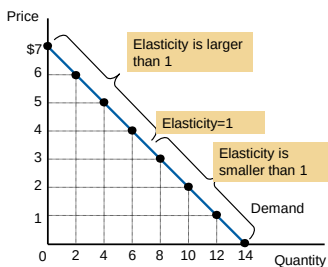
The Elasticity of Demand

- When demand is inelastic (elasticity < 1)
 - P and TR move in the same direction
 - If P $\uparrow$, TR also $\uparrow$
- When demand is elastic (elasticity > 1)
 - P and TR move in opposite directions
 - If P $\uparrow$, TR $\downarrow$
- If demand is unit elastic (elasticity = 1)
 - Total revenue remains constant when the price changes

The Elasticity of Demand

- Linear demand curve
 - Constant slope
 - Rise over run
 - Different price elasticities
 - Points with low price and high quantity
 - Inelastic demand
 - Points with high price and low quantity
 - Elastic demand

Elasticity of a Linear Demand Curve (graph)



The slope of a linear demand curve is constant, but its elasticity is not. The demand schedule in the table was used to calculate the price elasticity of demand by the midpoint method. At points with a low price and high quantity, the demand curve is inelastic. At points with a high price and low quantity, the demand curve is elastic.

The Elasticity of Demand

- Income elasticity of demand
 - How much the quantity demanded of a good responds to a change in consumers' income
 - Percentage change in quantity demanded
 - Divided by the percentage change in income

The Elasticity of Demand

- Normal goods
 - Positive income elasticity
 - Necessities
 - Smaller income elasticities
 - Luxuries
 - Large income elasticities
- Inferior goods
 - Negative income elasticities

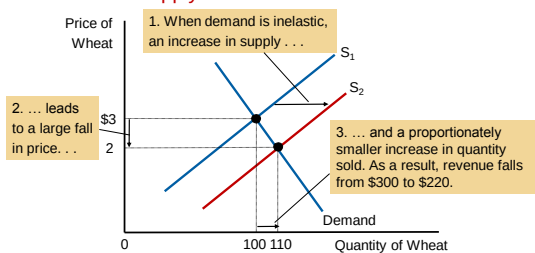
The Elasticity of Demand

- **Cross-price elasticity of demand**
 - How much the quantity demanded of one good responds to a change in the price of another good
 - Percentage change in quantity demanded of the first good (Good X)
 - Divided by the percentage change in price of the second good (Good Y)

Applications

- **Can Good News for Farming Be Bad News for Farmers?**
 - New hybrid of wheat – increase production per acre 20%
 - Supply curve shifts to the right
 - Higher quantity and lower price
 - Demand is inelastic: total revenue falls

An Increase in Supply in the Market for Wheat



When an advance in farm technology increases the supply of wheat from S_1 to S_2 , the price of wheat falls. Because the demand for wheat is inelastic, the increase in the quantity sold from 100 to 110 is proportionately smaller than the decrease in the price from \$3 to \$2. As a result, farmers' total revenue falls from \$300 ($\3×100) to \$220 ($\2×110).

Applications

- Can Good News for Farming Be Bad News for Farmers?

- Paradox of public policy

- Induce farmers not to plant crops

