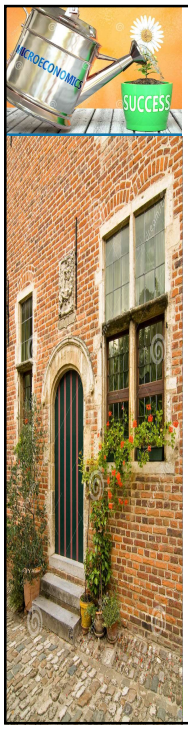

Unit 3: Elasticity and Its Application

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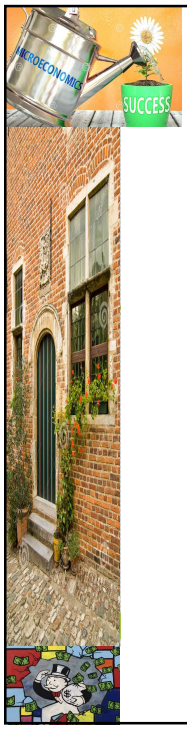

3.1 Introduction to Elasticity

You design websites for local businesses.

You charge $200 per website, and currently sell 12 websites per month.

Your costs are rising (including the opp. cost of your time), so you're thinking of raising the price to $250.

The law of demand says that you won't sell as many websites if you raise your price. How many fewer websites? How much will your revenue fall, or might it increase?

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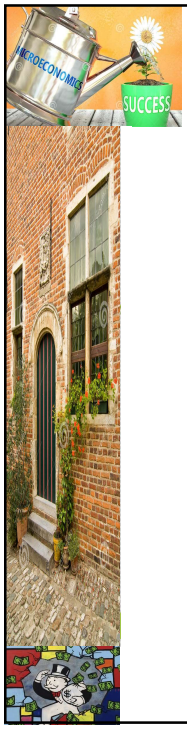

Elasticity . . .

- … allows us to analyze supply and demand with greater precision.
- … is a measure of how much buyers and sellers respond to changes in market conditions

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3.2 THE ELASTICITY OF DEMAND

- *Price elasticity of demand* is a measure of how much the quantity demanded of a good responds to a change in the price of that good.

- Price elasticity of demand is the percentage change in quantity demanded given a percent change in the price.

$$E_P = \frac{\frac{\Delta Q}{Q}100\%}{\frac{\Delta P}{P}100\%}$$

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What determines price elasticity?

To learn the determinants of price elasticity, we look at a series of examples.
Each compares two common goods.

In each example:

- Suppose the prices of both goods rise by 20%.
- The good for which $\boldsymbol{Q^d}$ falls the most (in percent) has the highest price elasticity of demand.
  Which good is it? Why?
- What lesson does the example teach us about the determinants of the price elasticity of demand?

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Determinants of Elasticity

- Whether close substitutes are available
- Broadly defined goods vs. narrowly defined goods
- Necessities vs. Luxuries
- How much of the consumer's budget is spent on the good
- Long run vs. Short run

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EXAMPLE 1:
Closeup vs. Electricity

- The prices of both of these goods rise by 20%.
  For which good does $\boldsymbol{Q}^{d}$ drop the most? Why?

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EXAMPLE 2:
"Blue Jeans" vs. "Clothing"

- The prices of both goods rise by 20%.
  For which good does $\boldsymbol{Q}^{\mathbf{d}}$ drop the most? Why?

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EXAMPLE 3:
Insulin vs. Caribbean Cruises

- The prices of both of these goods rise by 20%.
  For which good does $\boldsymbol{Q}^{\mathbf{d}}$ drop the most? Why?

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EXAMPLE 4:
Gasoline in the Short Run vs. Gasoline in the Long Run

- The price of gasoline rises 20%. Does $\boldsymbol{Q}^{\mathbf{d}}$ drop more in the short run or the long run? Why?

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EXAMPLE 5:
Toothpick vs. Motorbike

- Motorbike represents a large share of a consumer's budget. A price increase importantly reduces the amount of the good that a consumer is able to buy
  - The amount demanded will decrease significantly.
- Toothpick represents a smaller share of the consumer's budget, the consumer's overall income and purchasing power are less effected by an increase in price.
  - Therefore, demand is less price elastic in these cases.

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The Price Elasticity of Demand and Its Determinants

- Demand tends to be more elastic :
  - the larger the number of close substitutes.
  - if the good is a luxury.
  - the more narrowly defined the market.
  - the longer the time period.
  - the larger percentage of income.

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Computing the Price Elasticity of Demand

- The price elasticity of demand is computed as the percentage change in the quantity demanded divided by the percentage change in price.

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

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Computing the Price Elasticity of Demand

- Example: If the price of an ice cream cone increases from $2.00 to $2.20 and the amount you buy falls from 10 to 8 cones, then your elasticity of demand would be calculated as:

$$E_P = \frac{\frac{\Delta Q}{Q}100\%}{\frac{\Delta P}{P}100\%}$$

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The Midpoint Method: A Better Way to Calculate Percentage Changes and Elasticities

- The midpoint formula is preferable when calculating the price elasticity of demand because it gives the same answer regardless of the direction of the change.

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

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The Midpoint Method: A Better Way to Calculate Percentage Changes and Elasticities

- Example: If the price of an ice cream cone increases from $2.00 to $2.20 and the amount you buy falls from 10 to 8 cones, then your elasticity of demand, using the midpoint formula, would be calculated as:

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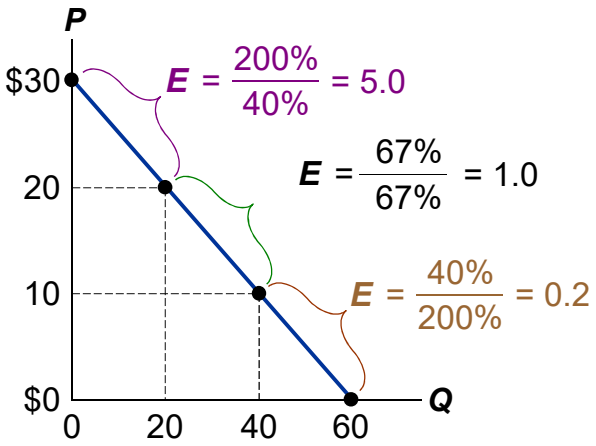
Elasticity of a Linear Demand Curve



The slope of a linear demand curve is constant, but its elasticity is not.

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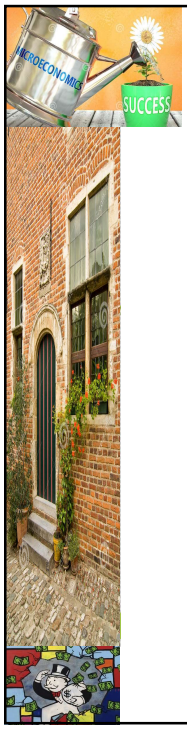

Point method of calculation

- Let Qd = 200 – 20P
- At market P = 4, Ep = ?

$$E_P = \frac{\frac{\Delta Q}{Q}100\%}{\frac{\Delta P}{P}100\%} = \frac{dQ}{dP}x\frac{P}{Q}$$

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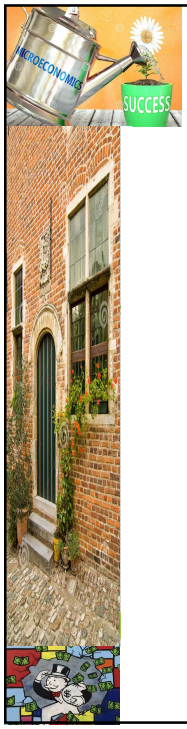

The Variety of Demand Curves

- Inelastic Demand
  - Quantity demanded does not respond strongly to price changes.
  - Price elasticity of demand is less than one.
- Elastic Demand
  - Quantity demanded responds strongly to changes in price.
  - Price elasticity of demand is greater than one.
- Perfectly Inelastic
  - Quantity demanded does not respond to price changes.
- Perfectly Elastic
  - Quantity demanded changes infinitely with any change in price.
- Unit Elastic
  - Quantity demanded changes by the same percentage as the price.

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The Variety of Demand Curves

- Because the price elasticity of demand measures how much quantity demanded responds to the price, it is closely related to the slope of the demand curve.

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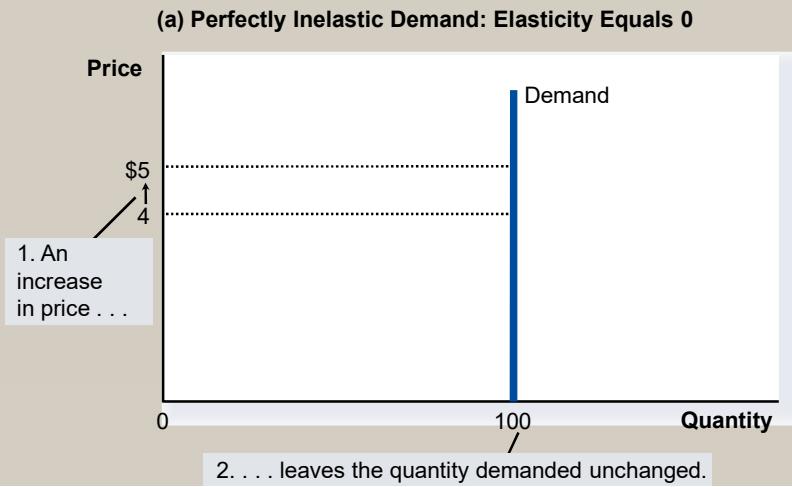
The Variety of Demand Curves



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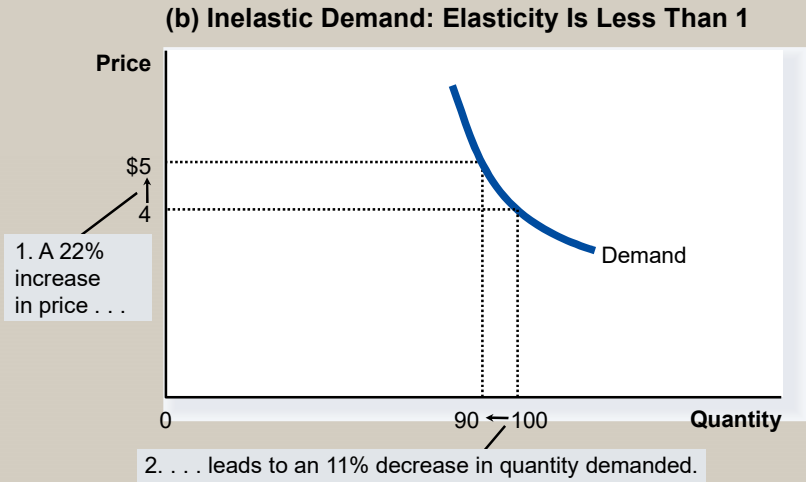
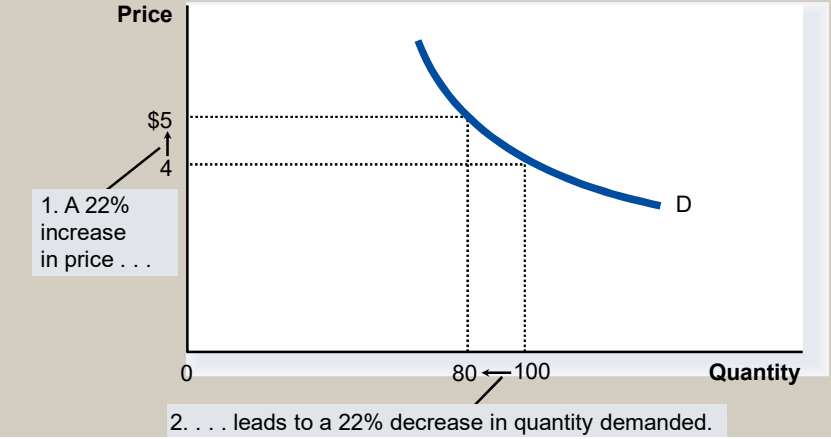
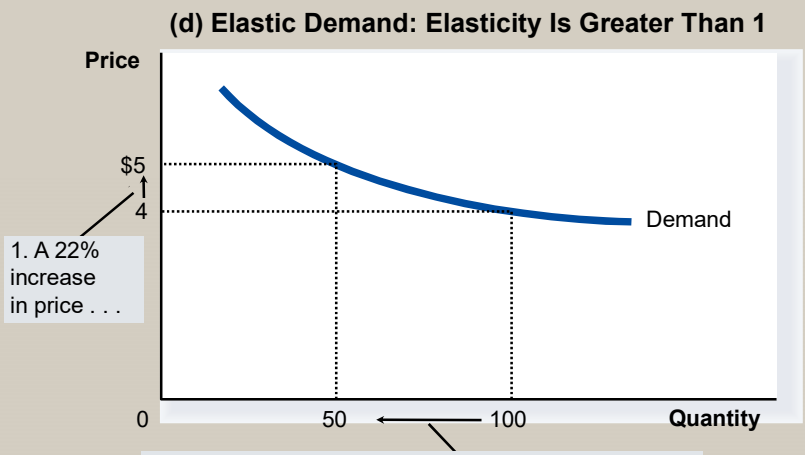
The Variety of Demand Curves



The Variety of Demand Curves



The Variety of Demand Curves



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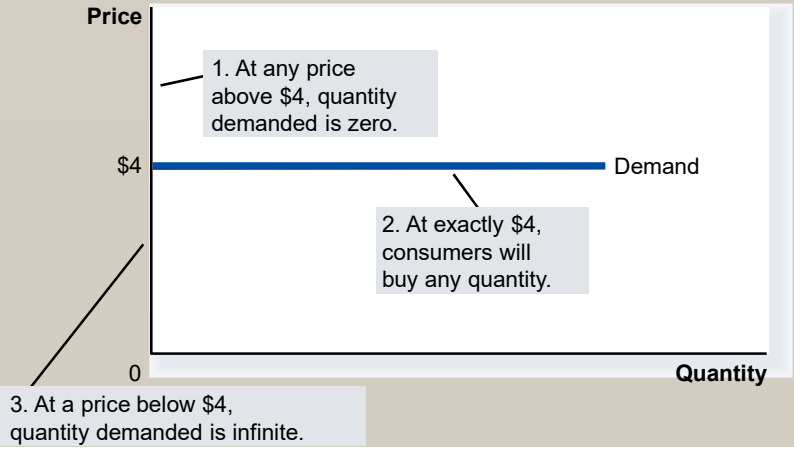
The Variety of Demand Curves



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Total Revenue and the Price Elasticity of Demand

- *Total revenue* is the amount paid by buyers and received by sellers of a good.
- Computed as the price of the good times the quantity sold.

$$TR = P \times Q$$

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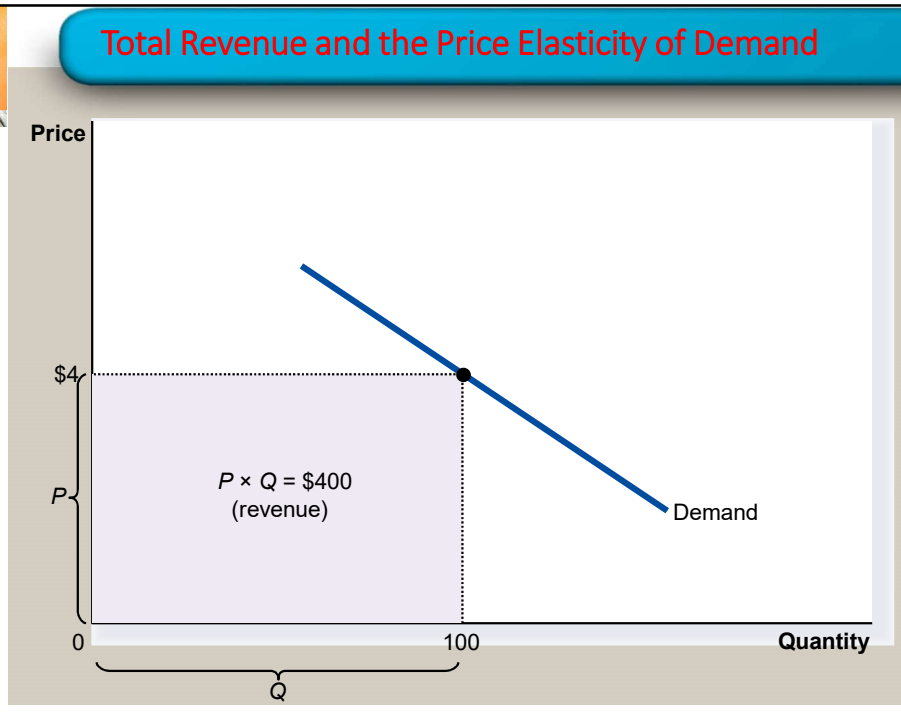
Total Revenue and the Price Elasticity of Demand



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Elasticity and Total Revenue along a Linear Demand Curve

- With an inelastic demand curve, an increase in price leads to a decrease in quantity that is proportionately smaller. Thus, *total revenue increases.*

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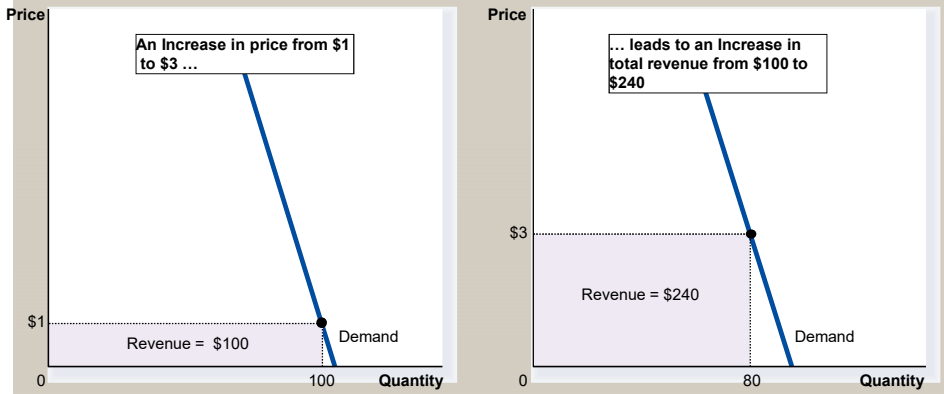
How Total Revenue Changes When Price Changes: Inelastic Demand



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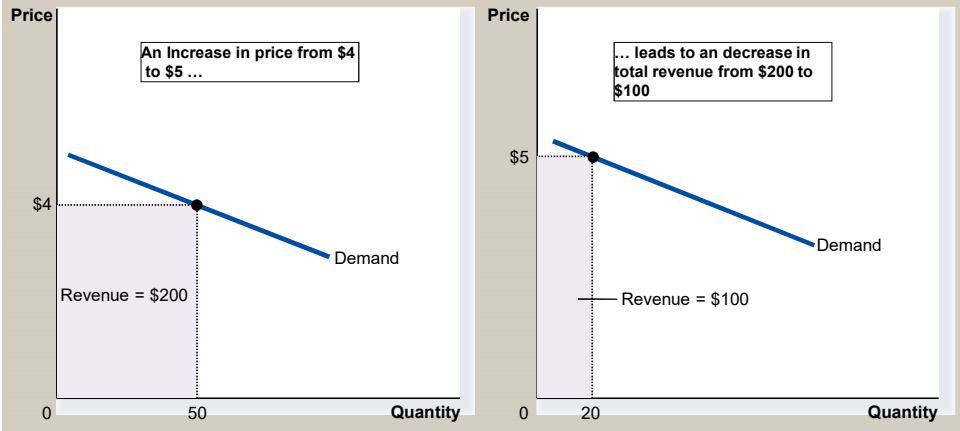
Elasticity and Total Revenue along a Linear Demand Curve

- With an elastic demand curve, an increase in the price leads to a decrease in quantity demanded that is proportionately larger. Thus, *total revenue decreases.*

How Total Revenue Changes When Price Changes: Elastic Demand



Elasticity & Total Revenue Test

- Elastic > 1

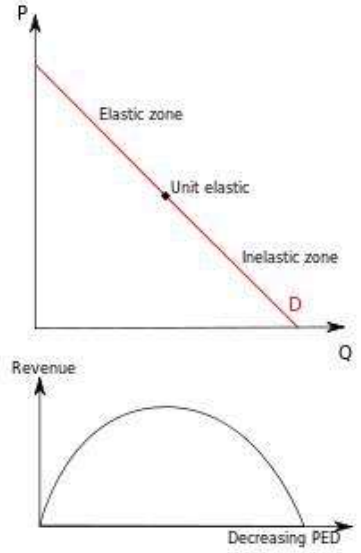
  if P decreases => TR increases; if P increases TR decreases

- Unit elastic = 1

  if ΔP => no ΔTR

- Inelastic < 1

  if P decreases => TR decreases; if P increases TR increases



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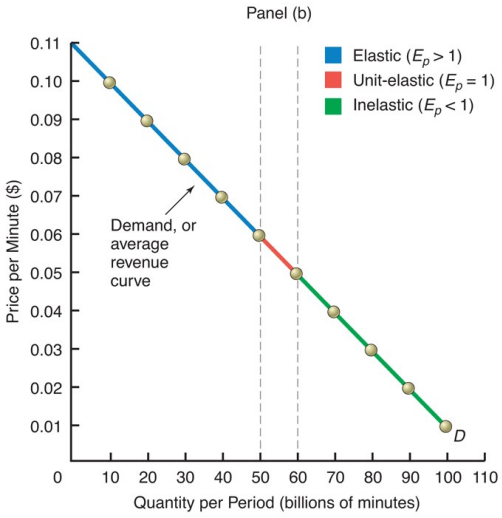
The Relationship Between Price Elasticity of Demand and Total Revenues for Cellular Phone Service, Panel (b)



Panel (a)

(1) Price, P, per Minute of Cellular Phone Service	(2) Quantity Demanded, D (billions of minutes)	(3) Total Revenue ($ billions) = (1) x (2)	(4) Elasticity, E_p = Change in Q / $(Q_1 + Q_2)/2$ ÷ Change in P / $(P_1 + P_2)/2$	
$0.11	0	0		
			21.000	
0.10	10	1.0		
			6.330	
0.09	20	1.8		
			3.400	Elastic
0.08	30	2.4		
			2.143	
0.07	40	2.8		
			1.144	
0.06	50	3.0		
			1.000	Unit-elastic
0.05	60	3.0		
			.692	
0.04	70	2.8		
			.467	Inelastic
0.03	80	2.4		
			.294	
0.02	90	1.8		
			.158	
0.01	100	1.0		

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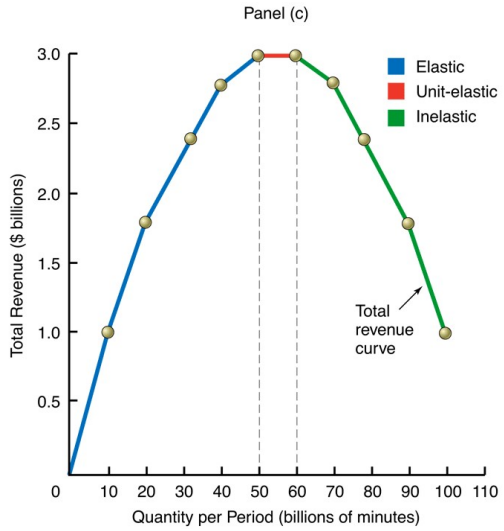
The Relationship Between Price Elasticity of Demand and Total Revenues for Cellular Phone Service, Panel (c)



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Relationship Between Price Elasticity of Demand and Total Revenues

Price Elasticity of Demand (E_p)		Effect of Price Change on Total Revenues (TR)	
		Price Decrease	Price Increase
Inelastic	($E_p < 1$)	TR ↓	TR ↑
Unit-elastic	($E_p = 1$)	No change in TR	No change in TR
Elastic	($E_p > 1$)	TR ↑	TR ↓

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Income Elasticity of Demand

- *Income elasticity of demand* measures how much the quantity demanded of a good responds to a change in consumers' income.
- It is computed as the percentage change in the quantity demanded divided by the percentage change in income.

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Computing Income Elasticity

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

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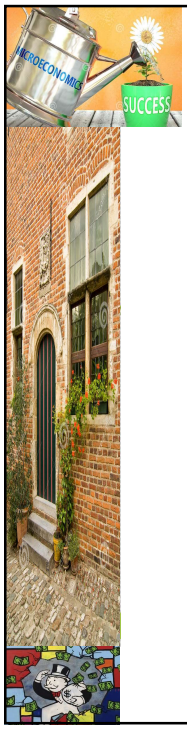

Income Elasticity

- Types of Goods
  - Normal Goods
  - Inferior Goods
- Higher income raises the quantity demanded for normal goods but lowers the quantity demanded for inferior goods.
- Goods consumers regard as necessities tend to be income inelastic
  - Examples include food, fuel, clothing, utilities, and medical services.
- Goods consumers regard as luxuries tend to be income elastic.
  - Examples include sports cars, furs, and expensive foods.

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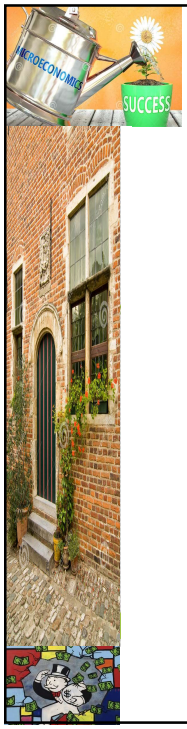

Cross-Price Elasticity of Demand

- A measure of how much the quantity demanded of one good responds to a change in the price of another good
- Cross-price elasticity of demand = percentage change in quantity demanded of good 1/percentage change in the price of good 2
- Substitute goods – cross-price elasticity of demand is positive
- Complement goods – cross-price elasticity of demand is negative

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3.3 THE ELASTICITY OF SUPPLY

- *Price elasticity of supply* is a measure of how much the quantity supplied of a good responds to a change in the price of that good.
- Price elasticity of supply is the percentage change in quantity supplied resulting from a percent change in price.

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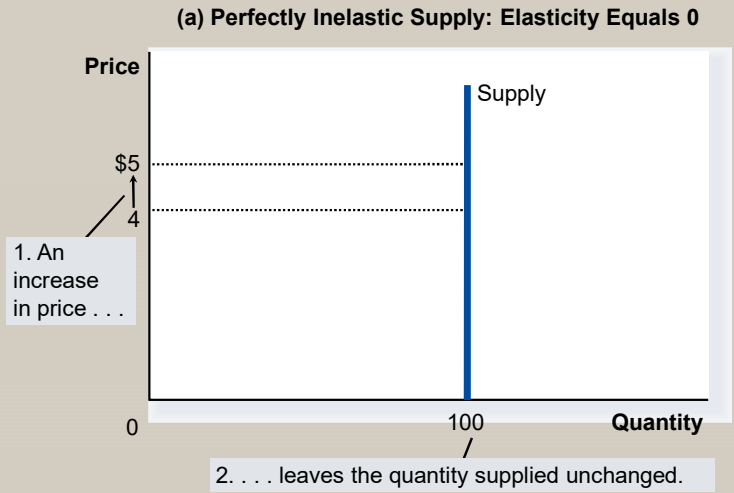
The Price Elasticity of Supply



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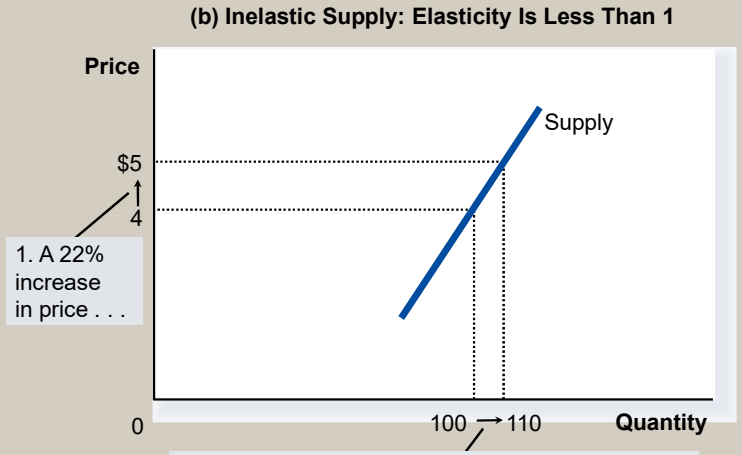
The Price Elasticity of Supply



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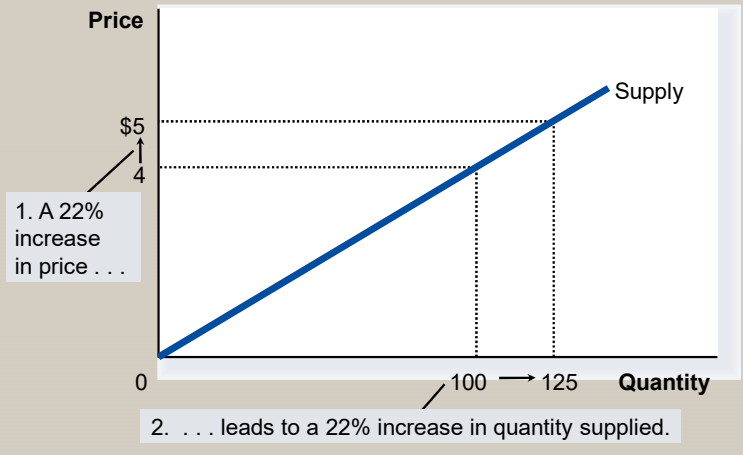
The Price Elasticity of Supply



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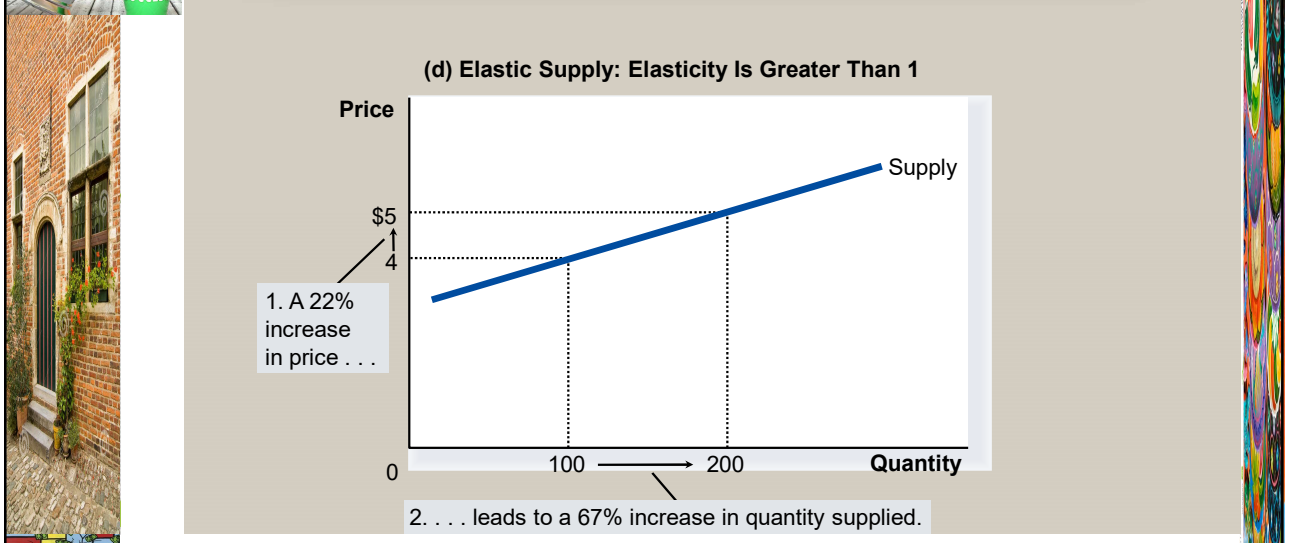
The Price Elasticity of Supply



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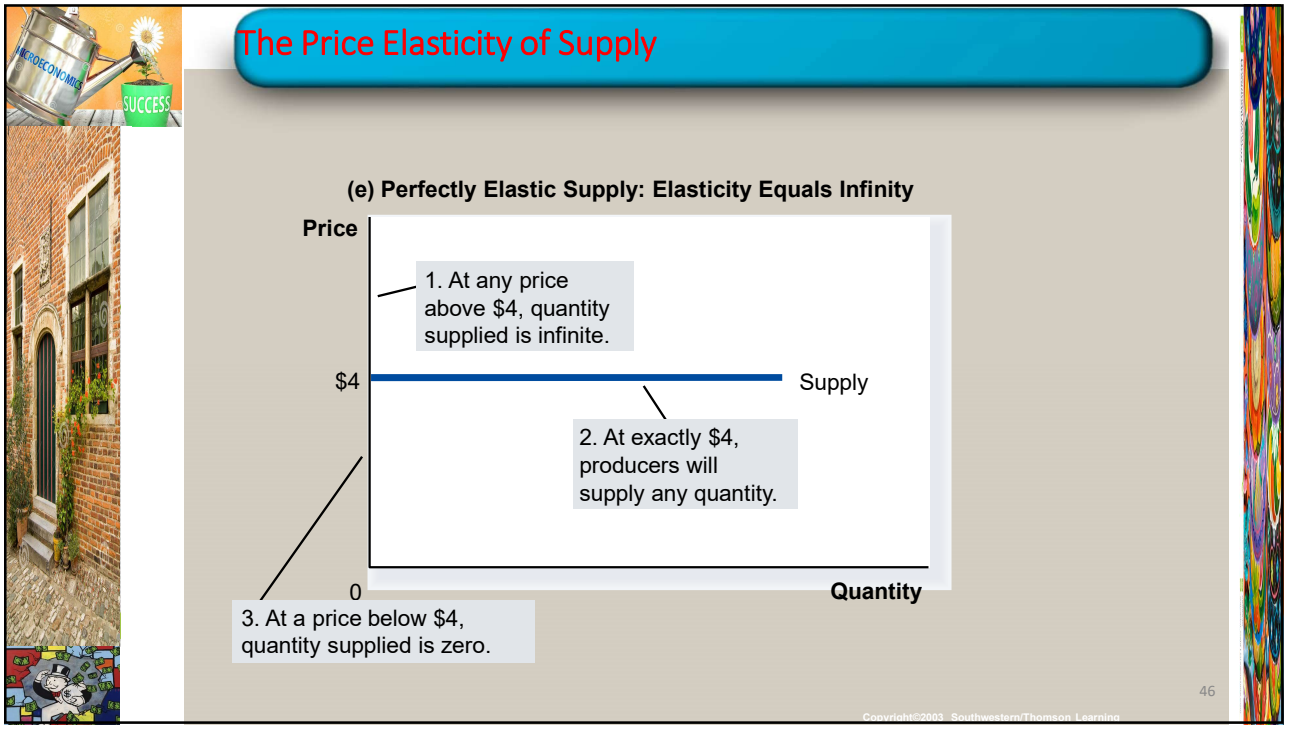
The Price Elasticity of Supply



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Determinants of Elasticity of Supply

- Ability of sellers to change the amount of the good they produce.
  - Beach-front land is inelastic.
  - Books, cars, or manufactured goods are elastic.
- Time period. (Key determinant)
  - The amount of time a seller has to change the amount of the good they can produce
  - Supply is more elastic in the long run.

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Computing the Price Elasticity of Supply

- The price elasticity of supply is computed as the percentage change in the quantity supplied divided by the percentage change in price.

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

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3.4 APPLICATION of ELASTICITY

- Can good news for farming be bad news for farmers?
- What happens to rice farmers and the market for rice when university agronomists discover a new rice hybrid that is more productive than existing varieties?

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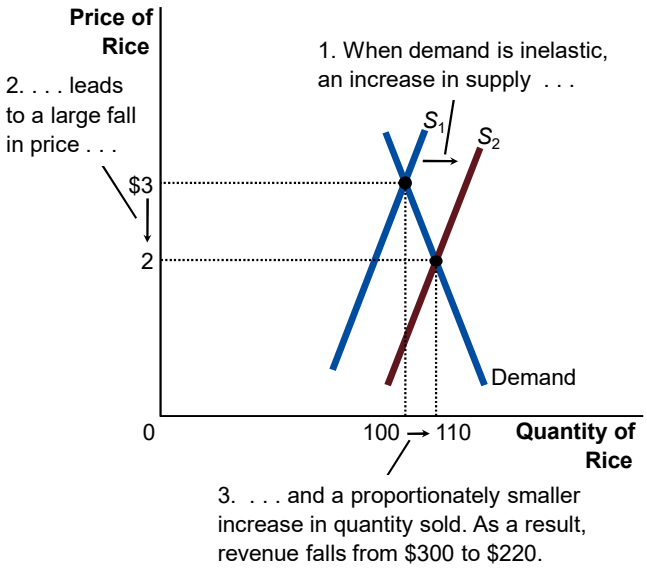
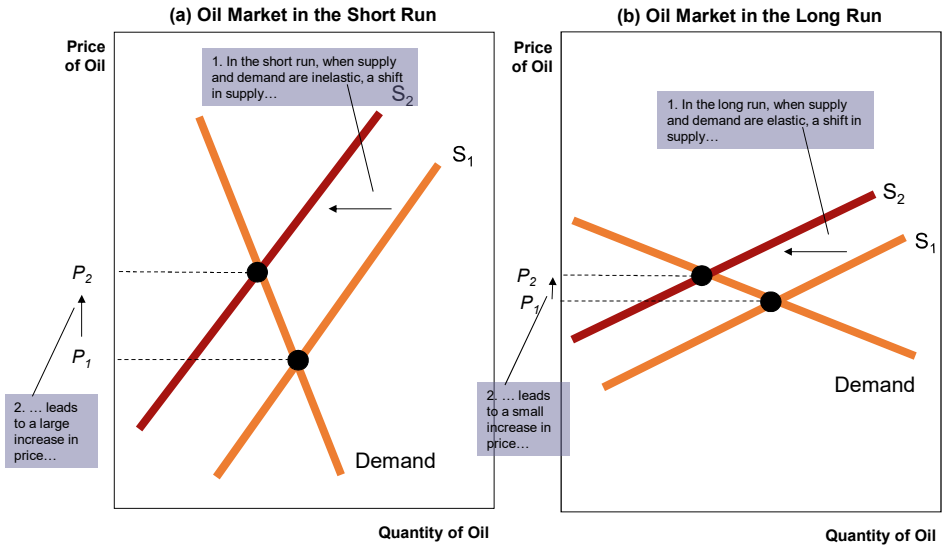
An Increase in Supply in the Market for Rice



A Reduction in Supply in the World Market for Oil



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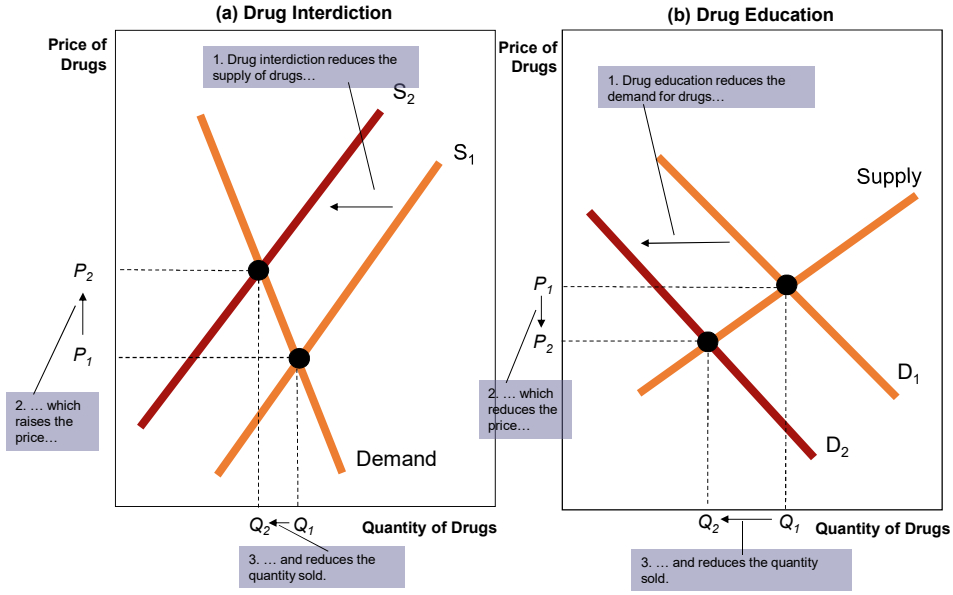
Policies to Reduce the of Illegal Drugs



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