- **Submit Questionnaire**:To Front of Class (or to end of aisle if seated)
- **First Week:** Must be present for roll call each day. If you are trying to switch section, request GSI of original section not to mark you absent
- **Text:** Should buy 2nd Edition. I always will refer to 2nd edition. Can only give rough guide about 1st vs 2nd edition
- **Lecture 1 Slides**: posted
- **Lecture 2 Slides & Problem Set 1:** to be posted by 5P

Supply and Demand

Questions We Can Answer

Why do the prices of some goods like airline tickets to Europe go up during months of heaviest consumption, while others, like sweet corn, go down?

What will happen to the price of tortilla chips if consumers get information that corn is bad for health and there is unusually good weather that gives a bumper crop?

Alfred Marshall (1842-1924)

What determines price of a good? Picasso vs Pollock: what's the difference!

Aristotle, Plato, Copernicus and Newton: don't have answer

Adam Smith and Karl Marx: Cost of production
Stanley Jevons: Valuation of good by buyers

Alfred Marshall: Both! Supply AND Demand. Much of neo-classical analysis we do today due to his insight. Marshall chose to study economics because he saw it as a way to help poor and unfortunate in society. His definition of economics:study of individual and social action most connected with attainment and use of material requisites of well-being.

Buyers & Demand Curve

Demand curve: buyers' marginal willingness to pay

Slope of Demand Curve: As price rises quantity demanded falls and as price falls quantity demanded rises.

At very high prices the the cost-benefit test is satisfied for few buyers, so in the market few units are demanded. Vice versa at low prices.

For an individual buyer, the first unit has high value. As he gets more units of the good, the value of an extra unit (ie marginal unit) falls.

Sellers & Supply Curve

Supply curve: sellers' marginal willingness to accept

Slope of Supply Curve: Quantity supplied rises only as price rises.

For a firm, as more of a good is produced, more variable factors must be combined with fixed factors (like equipment) and the returns to those additional units of variable factors falls (in this sense they become more "costly"). Only higher prices can justify producing more.

Sellers & Supply Curve

From the point of view of all sellers, the lowest cost sellers would be expected to produce the first units of the good, only then are higher cost sellers brought into production. For them a higher price is needed to justify production.

Market: Buyers & Sellers

Market Equilibrium: price and quantity at which both buyers and sellers are satisfied with the quantity they buy and sell, respectively, at the market price.

Out of Equilibrium:

Excess Demand: When price is below equilibrium, quantity demanded exceeds quantity supplied.

Excess Supply: When price is above equilibrium Quantity supplied exceeds quantity demanded.

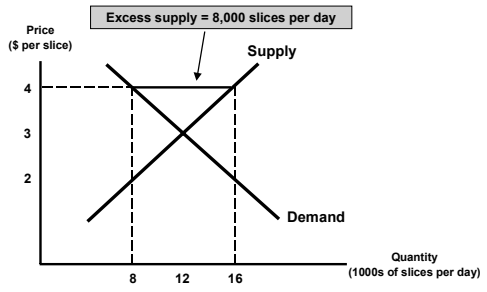
Pizza Market

Price $ per slice	Quantity Demanded	Quantity Supplied	Excess Demand/Supply
4	8	16	ES
3	12	12	Equilibrium
2	16	8	ED
1	20	4	ED

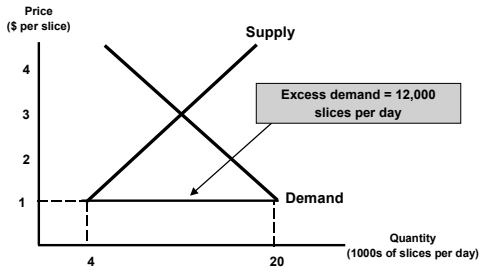
At $4, ES = 16 - 8 or 8000 slices, Price Must Fall
At $1, ED = 20 - 4 or 12000 slices, Price Must Rise

At $3 , Market is in equilibrium, ED=ES=0
Equilibrium price = $3 per slice
Equilibrium quantity = 12,000 slices per day

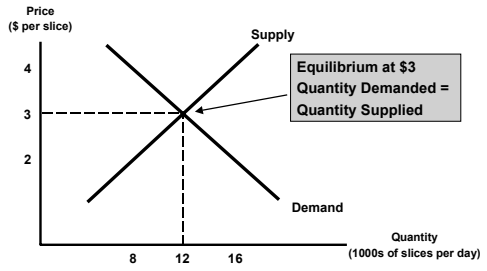
Excess Supply



Excess Demand



The Equilibrium Price and Quantity of Pizza in Chicago



Problem to Do

World Tea Market (Billions of Pounds)

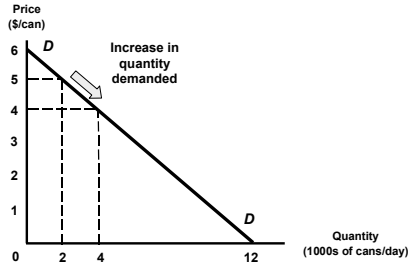
Price cents/lb	Quantity Demanded	Quantity Supplied	ED/ES
34	1500	525	975
35	1000	600	400
36	700	700	0
37	600	900	300
38	550	1200	650

Equilibrium Price = 36 cents per lb
Equilibrium Quantity = 700 billion lb

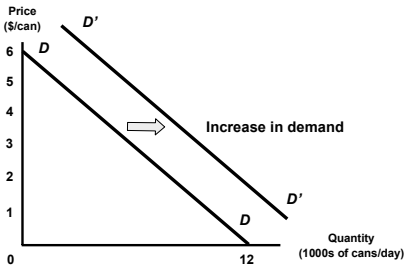
Predicting and Explaining Changes in Prices and Quantities

- **A <u>change in the quantity demanded</u>**
  - ◆A movement along the demand curve that occurs in response to a change in price
- **A <u>change in demand</u>**
  - ◆A shift of the entire demand curve

An Increase in Quantity Demanded vs. an Increase in Demand



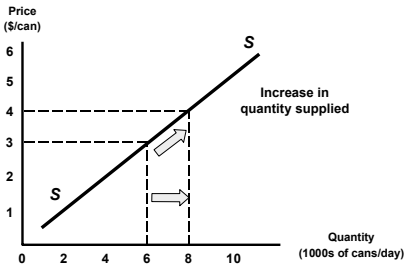
An Increase in Quantity Demanded vs. an Increase in Demand



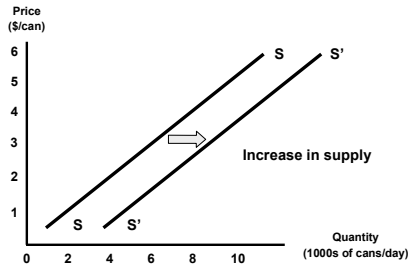
Predicting and Explaining Changes in Prices and Quantities

- **<u>Change in the quantity supplied</u>**
  - A movement along the supply curve that occurs in response to a change in price
- **<u>Change in supply</u>**
  - A shift of the entire supply curve

An Increase in Quantity Supplied vs. an Increase in Supply



An Increase in Quantity Supplied vs. an Increase in Supply



Demand Shifters

- Prices of Other Goods
  - **Complements**
    - Two goods are complements in consumption if increase (decrease) in price of one causes decrease (increase) in the demand for the other eg. coffee & cream
  - **Substitutes**
    - Two goods are substitutes in consumption if increase (decrease) in price of one causes an increase (decrease) in the demand for the other eg. tea & coffee

Demand Shifters

- Change in Income
  - Normal Good
    - One whose demand increases (decreases) when the incomes of buyers increase (decrease) eg. restaurant meals?
  - Inferior Good
    - One whose demand decreases (increases) when the incomes of buyers increase (decrease) eg. macaroni and cheese?

Demand Shifters

- Changes in Tastes
  - from information on health effects
- Changes in Population of Potential Buyers
- Changes in Price Expectations

From Recap (p. 79): Demand Shifters

- Rightward or upward shift in Demand due to:
  - 1. Decrease in the price of complements to good
  - 2. Increase in the price of substitutes to good
  - 3. Increase in income (for a normal good)
  - 4. Increased preference for good
  - 5. Increase in the population of potential buyers
  - 6. Expectation of higher prices in the future
    - o buy more now
  - (Reverse for Leftward downward shift)

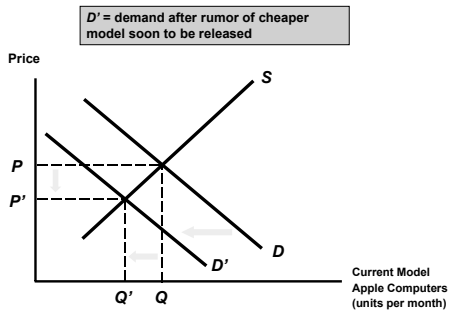
Supply Shifters

- Change in factor prices
  - wages, materials prices
- Change in technology
  - new high yield seeds, faster computer chip
- Change in Biological/Physical/Political factors
  - weather, government regulations
- Change in number of suppliers
- Change in price expectations

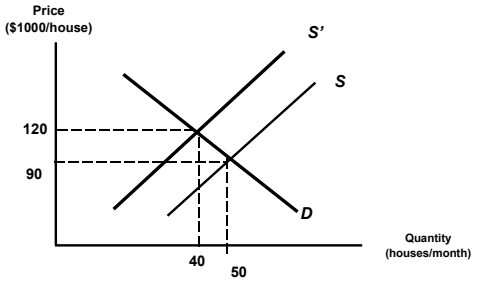
From Recap (p. 79): Supply Shifters

- Rightward or upward shift in Supply due to:
  - 1. decrease in cost of materials, labor, or other inputs used in production of good
  - 2. improvement in technology that reduces the cost of producing good
  - 3. improvement in the weather, especially for agricultural products
  - 4. increase in the number of suppliers
  - 5. expectation of lower prices in the future
    - o sell more now
  - (Reverse for Leftward downward shift)

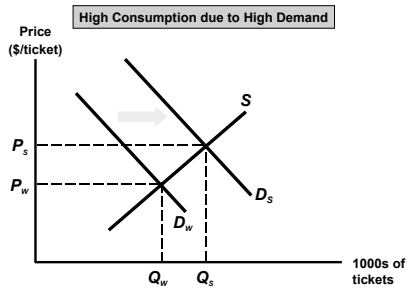
The Effect of a Credible Rumor on the Market for Current Model Apple Macintosh Computers



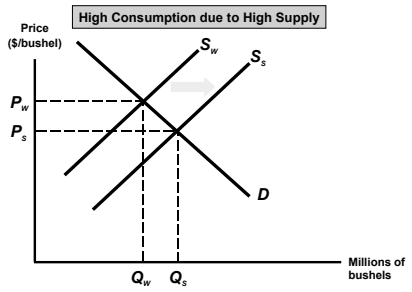
The Effect on the Market for New Houses of a Increase in Carpenters' Wage Rates



Seasonal Variation in Air Travel and Corn Markets



Seasonal Variation in Air Travel and Corn Markets



Problem to Do : Graph it.

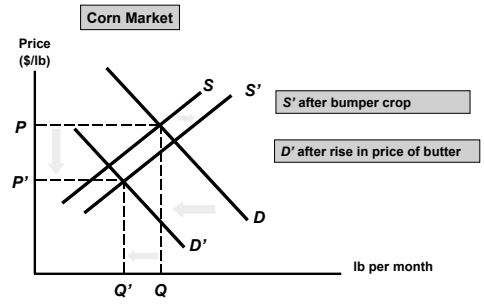
What will happen to the equilibrium quantity and price of corn if the price of butter increases and unusually good weather brings bumper crop?

Butter is a complement to corn (yum!). Good weather is a favorable biological factor .

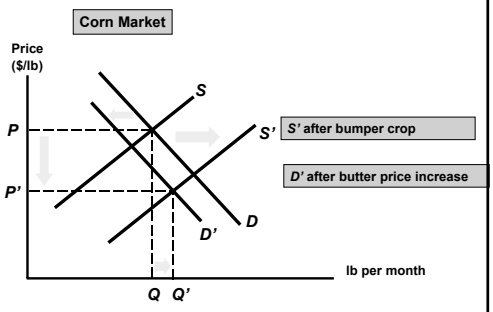
Price of complement increases so demand for corn shifts in. Increase in favorable biological factor, so supply of corn shifts out.

Equilibrium price unambiguously falls. Equilibrium output may go up/down depending on relative sizes of supply and demand shift.

The Effects of Simultaneous Shifts in Supply and Demand



The Effects of Simultaneous Shifts in Supply and Demand



Summary

Market Equilibrium is determined by the reservation prices of buyers and sellers. A buyer must be willing to pay and a seller willing to accept the market price, at a given market quantity.

With price above equilibrium, get excess supply. With price below equilibrium, get excess demand.

Demand shift, given supply → change in quantity supplied.
Supply shift, given demand → change in quantity demanded.

Change in supply due to change in factor prices, technology, price expectations, number of sellers, biological and political factors
Change in demand due to change in prices of other goods, income, tastes, population of buyers, price expectations

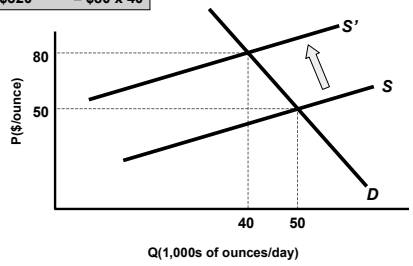
Elasticity

Questions We Can Answer

- Could reducing the supply of illegal drugs cause an increase in drug-relate burglaries?
- Why are gasoline prices so volatile?

The Effect of Extra Border Patrols on the Market for Illicit Drugs

Total Expenditure =	P x Q
S $250	= $50 x 50
S' $320	= $80 x 40



Elasticity

- Elasticity
  - A measure of the extent to which quantity demanded and quantity supplied respond to variations in price, income, and other factors.

Price Elasticity of Demand

- Defined
  - Generally
    - A measure of the responsiveness of the quantity demanded of a good to a change in the price of that good
  - Formally
    - The percentage change in the quantity demanded that results from a 1 percent change in its price

- Assume
  - The price of pork falls by 2% and the quantity demanded increases by 6%
    - Then the price elasticity of demand for pork is

$$\frac{6}{-2} = -3$$

- Measuring Price Elasticity of Demand

$$\frac{\text{Percentage Change in Quantity Demanded}}{\text{Percentage Change in Price}}$$

- Price elasticity of demand will always be negative (recall slope of demand curve)
- We drop the negative sign in this class

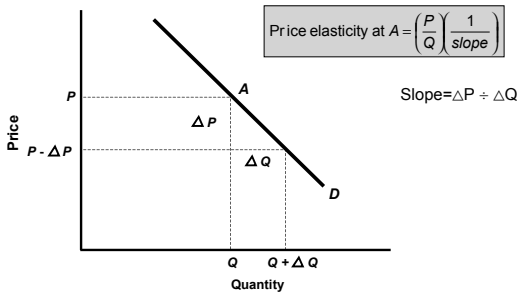
(without negative sign)

- Assume
  - The price of pork falls by 2% and the quantity demanded increases by 6%
    - Then the price elasticity of demand for pork is

6 ÷ 2 = 3

Demand is Elastic

A Graphical Interpretation of Price Elasticity of Demand

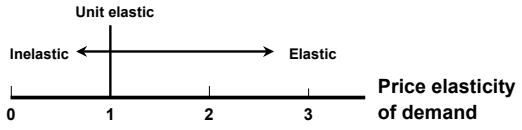


Elastic and Inelastic Demand

When $\frac{\text{Percentage Change in Quantity Demanded}}{\text{Percentage Change in Price}}$ is

> 1: elastic
< 1: inelastic
= 1: unit elastic

Elastic and Inelastic Demand



Example

- What is the elasticity of season ski passes?
  - Originally
    - Price = $400
    - Quantity demanded = 10,000 passes/year
  - New
    - Price = $380
    - Quantity demanded = 12,000 passes/year, then

$$\frac{\%\text{ Change in Quantity}}{\%\text{ Change in Price}} = \frac{20}{5} : \text{Elastic}$$

Determinants of Price Elasticity of Demand

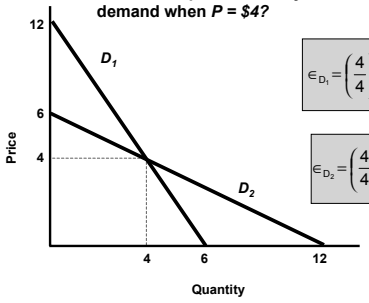
- Substitution Possibilities
- Budget Share
- Time

Price Elasticity Estimates for Selected Products

Good or service	Price elasticity	Budget Shr	Subs
Green peas	2.80	small	yes,lots
Restaurant meals	1.63	significant	yes
Electricity	1.20		
Beer	1.19		
Coffee	0.25	small	(like salt?)
Theater, opera	0.18	not so for rich	no

Price Elasticity and the Steepness of the Demand Curve

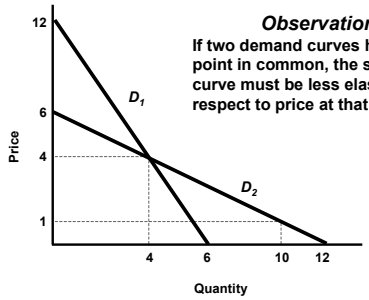
What is the price elasticity of demand when *P = $4?*



$$\epsilon_{D_1} = \left(\frac{4}{4}\right)\left(\frac{1}{12/6}\right) = \frac{1}{2}$$

$$\epsilon_{D_2} = \left(\frac{4}{4}\right)\left(\frac{1}{6/12}\right) = 2$$

Price Elasticity and the Steepness of the Demand Curve

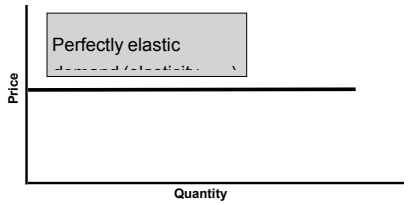


Observation

If two demand curves have a point in common, the steeper curve must be less elastic with respect to price at that point

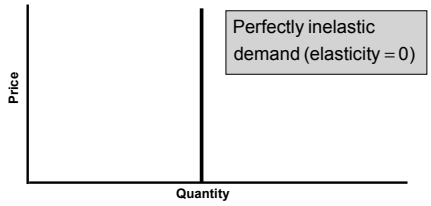
Perfectly Elastic Demand Curve

If price rises even shade above, buy nothing, price really matters



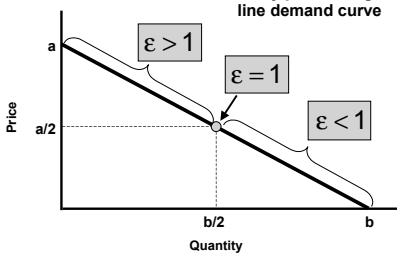
Perfectly Inelastic Demand Curve

no matter the price, buy it
eg. essential drug



Price Elasticity Regions along a Straight-Line Demand Curve

Observation
Price elasticity varies at every point along a straight-line demand curve



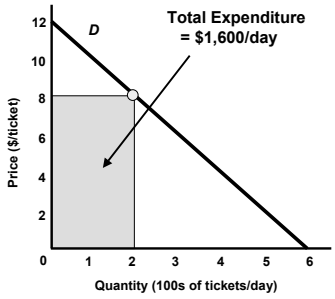
Elasticity and Total Expenditure

- Total Expenditure = *P* x *Q*
  - Market demand measures the quantity (*Q*) at each price (*P*)
- Total Expenditure = Total Revenue

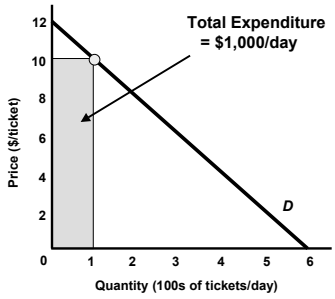
Elasticity and Total Expenditure

- Will increasing the market price always increase total revenue?

The Demand Curve for Movie Tickets



The Demand Curve for Movie Tickets

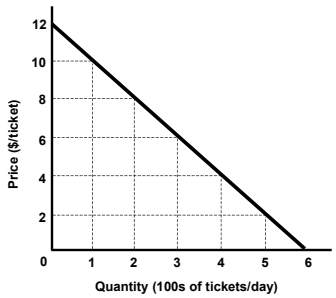


Elasticity and Total Expenditure

- General Rule
  - A price increase will increase total revenue when the % change in *P* is greater than the % change in *Q*.

    i.e. When elasticity < 1

The Demand Curve for Movie Tickets

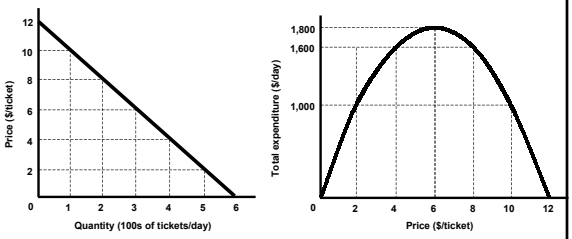


Total Expenditure as a Function of Price

Price ($/ticket)	Total expenditure ($/day)
12	0
10	1,000
8	1,600
6	1,800
4	1,600
2	1,000
0	0

Total Expenditure as a Function of Price

Total revenue is at a maximum at the midpoint on a straight-line demand curve



Problem: to do

- Should a rock band raise or lower its price to increase total revenue?
- Assume

P=$20
Q=4,000
ε = 2.5

Example: Rock band

- Total revenue = $20 x 4,000 = $80,000/week
- If *P* is increased 10%, *Q* will decrease 25%
  - Total revenue = $22 x 3,000 = $66,000/week
- If *P* is lowered 10%, *Q* will increase 25%
  - Total revenue = $18 x 5000 = $90,000/week

Elasticity and Total Expenditure

- Rule
  - When price elasticity is greater than 1, changes in price and changes in total expenditures always move in opposite directions.
  - When price elasticity is less than 1, changes in price and changes in total expenditures always move in the same direction.

Elasticity and Total Expenditure

- Cross-Price Elasticity of Demand
  - The percentage by which quantity demanded of the first good changes in response to a 1 percent change in the price of the second good
  - Substitute Goods
    - cross-price elasticity of demand is positive
  - Complement Goods
    - cross-price elasticity of demand is negative

Elasticity and Total Expenditure

- Income Elasticity of Demand
  - The percentage by which quantity demanded changes in response to a 1 percent change in income
  - Normal Goods
    - Income elasticity is positive
  - Inferior Goods
    - Income elasticity is negative

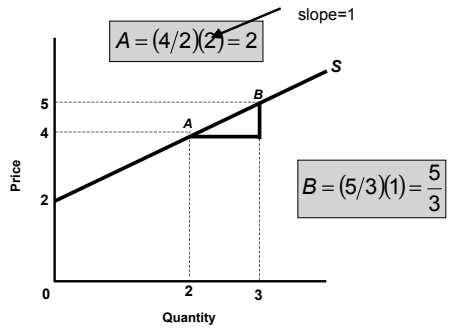
The Price Elasticity of Supply

- The percentage change in the quantity supplied that occurs in response to a 1 percent change in price

$$\text{Price elasticity of supply} = \frac{\Delta Q/Q}{\Delta P/P}$$

$$\text{Price elasticity of supply} = \left(\frac{P}{Q}\right)\left(\frac{1}{\text{slope}}\right)$$

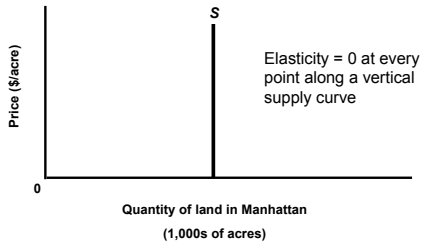
Price Elasticity Along Straight-line Supply Curve



Do not be too concerned with special case in F&B figure 4.14

A Perfectly Inelastic Supply Curve

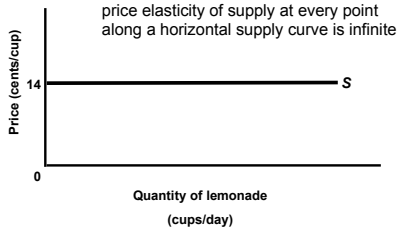
What is the price elasticity of supply of land within the borough limits of Manhattan?



A Perfectly Elastic Supply Curve

What is the price elasticity of supply of lemonade?

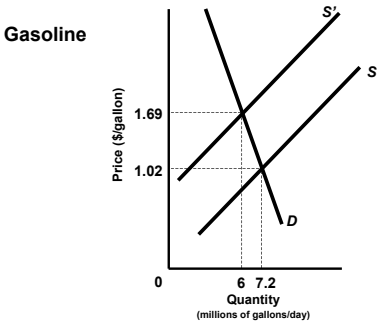
If MC is constant, then the price elasticity of supply at every point along a horizontal supply curve is infinite



The Price Elasticity of Supply

- Determinants of Supply Elasticity
  - Flexibility of inputs
  - Mobility of inputs
  - Ability to produce substitute inputs
  - Time

Greater Volatility in Gasoline Prices than in Car Prices



Summary

Demand is more elastic for goods with many substitutes, that take a large share of budget and over time.

Supply is more elastic as flexibility with respect to input use is greater and over time

Total revenue falls with a price increase when demand is elastic and vice versa when demand is inelastic

Total revenue is maximum at the midpoint of a straight-line demand curve where elasticity is 1. At points below, elasticity < 1 and at points above, elasticity > 1.