An Introduction to

Price Elasticity

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Objectives

- Definition of price elasticity

- Why knowing elasticity is important

- Why goods differ in price elasticity

- How to measure price elasticity

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Outline

- Review of Basic Supply & Demand Theory

- Definition of Price Elasticity

- Everyday Examples

- Graphical Representation

- Factors that Affect Elasticity

- Calculating Elasticity

- Exit Question #1

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Law of Demand Recap

- As the price of a good increases, the quantity demanded for the good decreases

⬆️ Price ⬇️ Quantity

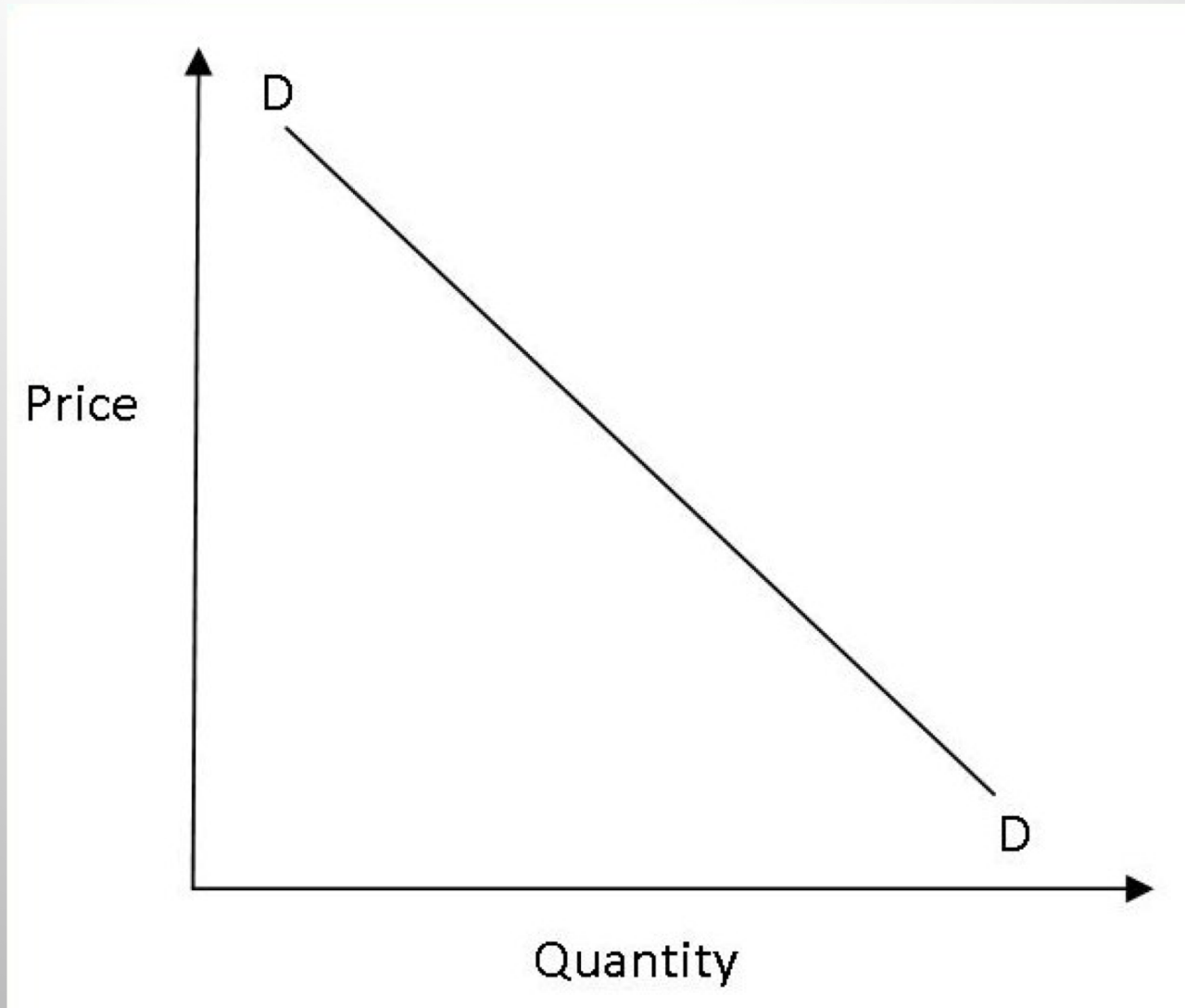- Ex: I like tacos, but if the price of tacos increases I will buy fewer tacos

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Law of Demand Recap

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Supply Recap

- As the price of a good rises, the quantity supplied of the good increases

⬆ Price   ⬆ Supply

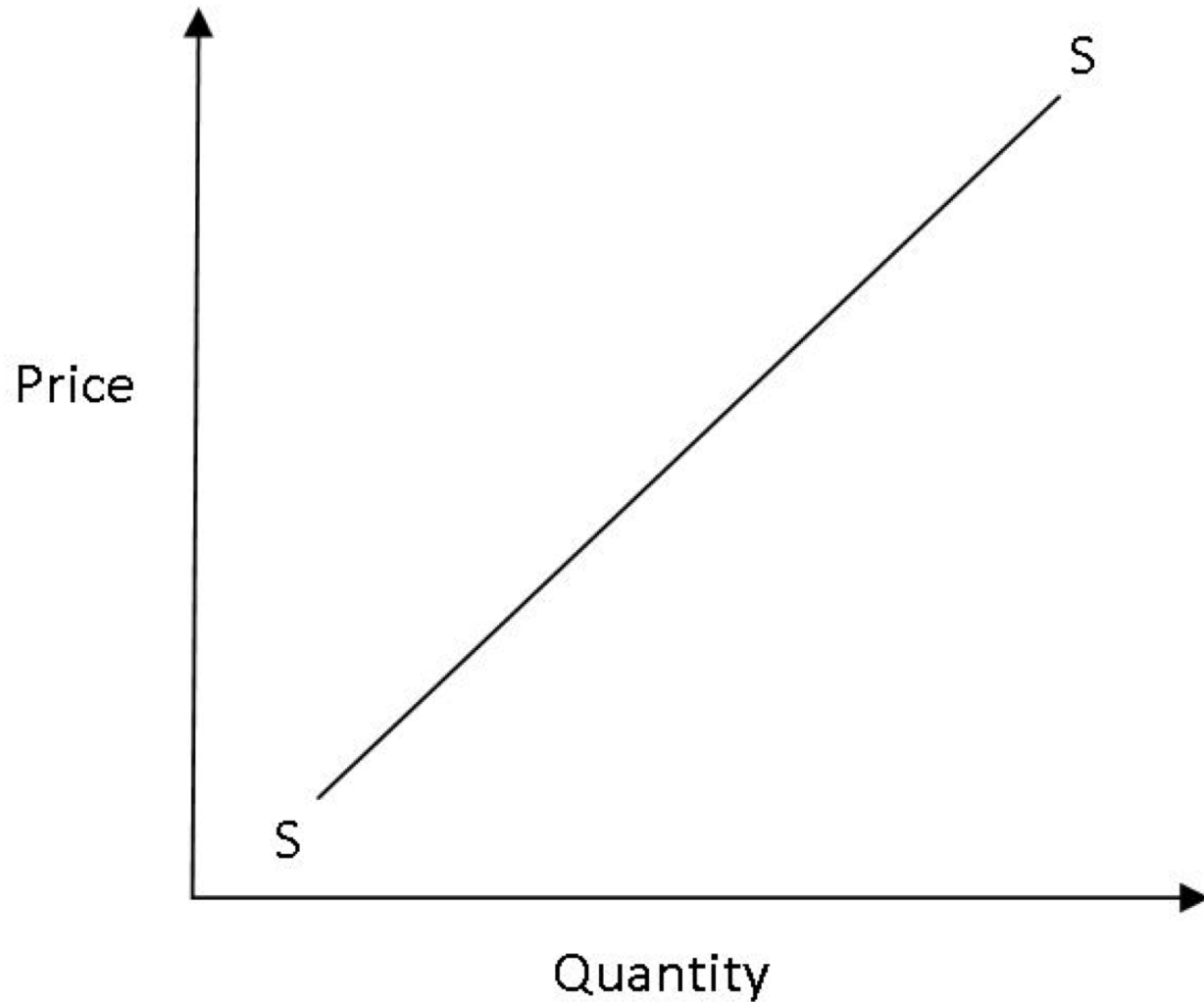- Ex. I produce soybeans and the price increases so I will grow more soybeans

Supply Recap

Law of Supply & Demand

- The laws of supply and demand tell us the direction that quantities and prices will theoretically move or shift to find equilibrium, but it does not tell us by how much

- Ex. If prices increase by X%, by how much will demand or supply change?

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What is Elasticity?

- The measurement of how **responsive** one variable is to a change in another variable

  - Price Elasticity (Supply & Demand)
  - Arc Price Elasticity
  - Income Elasticity
  - Cross Price Elasticity

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Why measure Elasticity?

- Demand and supply responsiveness matter for market analysis

- Elasticity is a unit-free measurement, which allows for comparison between markets

- Producers/Business Owners want to know how changing their prices will affect their profits

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Price Elasticity of Demand Definition

- AKA: Own Price Elasticity

- The measure of the *responsiveness* of quantity demanded to a change in price.
    - Perfectly Elastic
    - Elastic
    - Unit Elastic
    - Inelastic
    - Perfectly Inelastic

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Degree of Elasticity

- Perfectly Elastic – extremely price sensitive

- Elastic – sensitive to price

- Unit Elastic – equally sensitive to price

- Inelastic – fairly insensitive to price

- Perfectly Inelastic – completely insensitive to price

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Examples

Price Elasticity of Demand Example: Gold

- When the price of jewelry rises by 1% the quantity demanded decreases by 2.5%, so gold jewelry is **price sensitive**.

- Price elasticity of demand is 2.5

Price Elasticity of Demand Example: Gasoline

- When the price of gasoline rises by 1% the quantity demanded decreases by .4%, so gasoline is **not very price sensitive**.

- Price elasticity of demand is 0.40

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Price Elasticity of Supply Example: Beef

- When the price of beef rises by 2% the quantity supply increases by 8%, so beef is very **price sensitive**.

- Price elasticity of supply is 4

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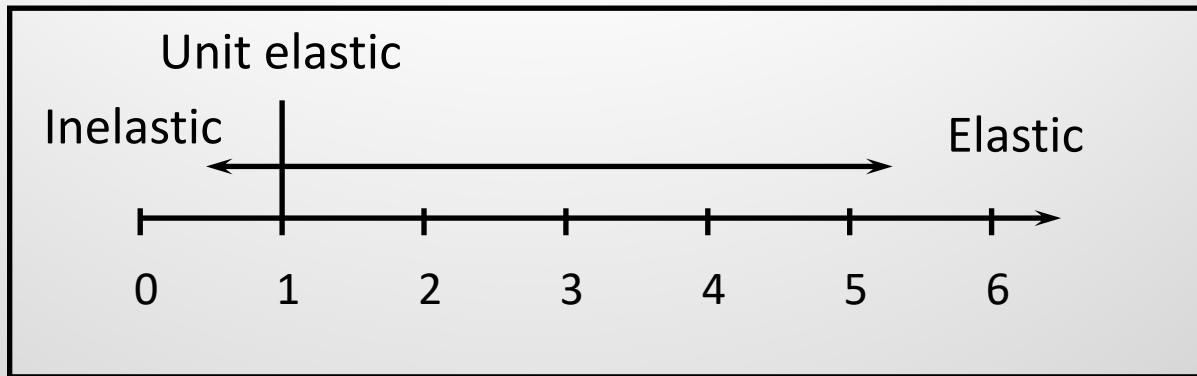
Price Elasticity of Supply Example: Paintings

- When the price of Vincent van Gogh paintings rises by 1% the quantity supplied does not change. Therefore the quantity supplied of van Gogh paintings is **completely insensitive to the price**.

- Price elasticity of supply is 0

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Price Elasticity Scale

Inelastic: own price elasticity less than 1

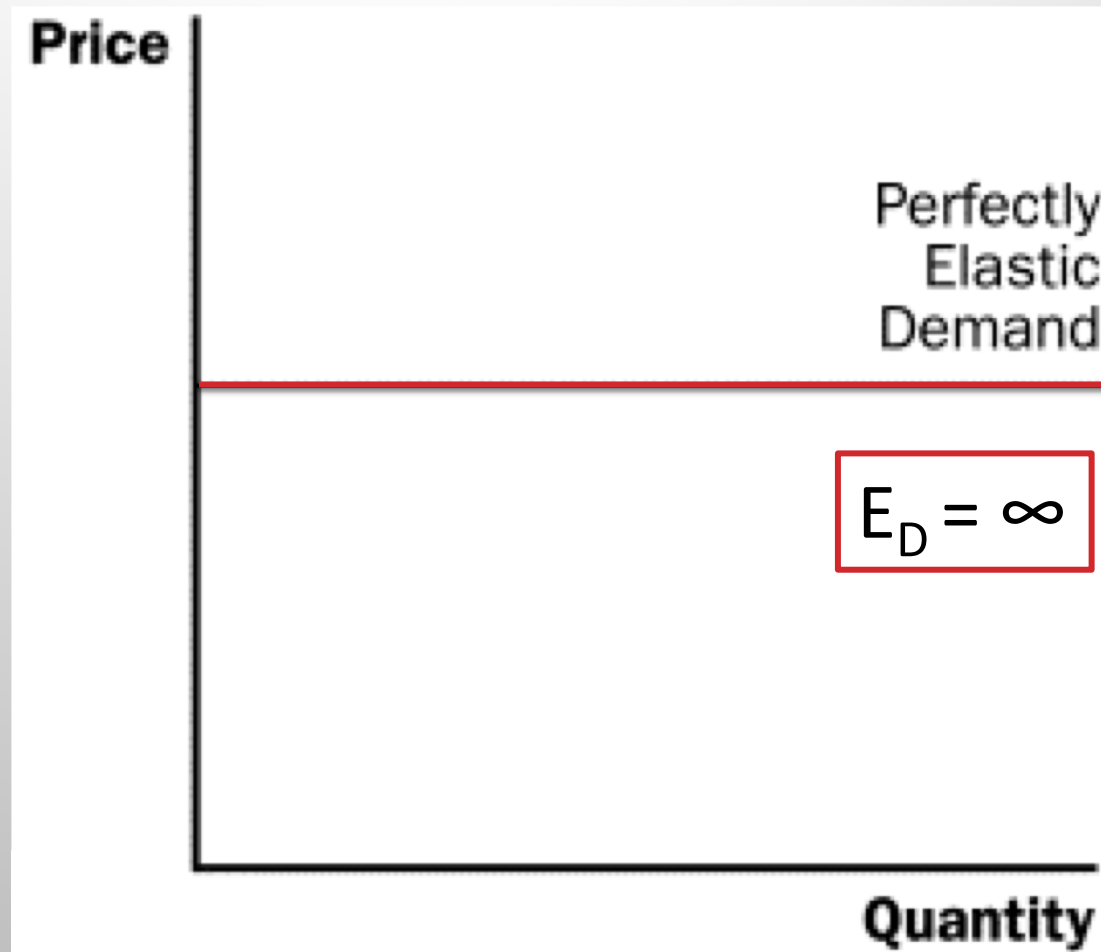Unit elastic: own price elasticity equal to 1

Elastic: own price elasticity greater than 1

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Graphical Representation: Perfectly Elastic Demand

Price

Perfectly Elastic Demand

$E_D = \infty$

Quantity

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Graphical Representation: Elastic Demand

$E_D > 1$

Price p

D

Quantity q

Elastic Demand

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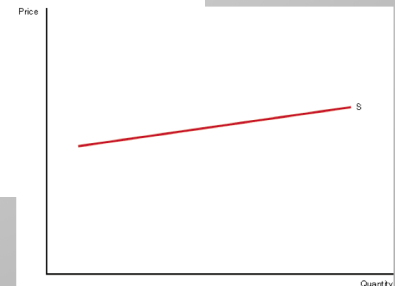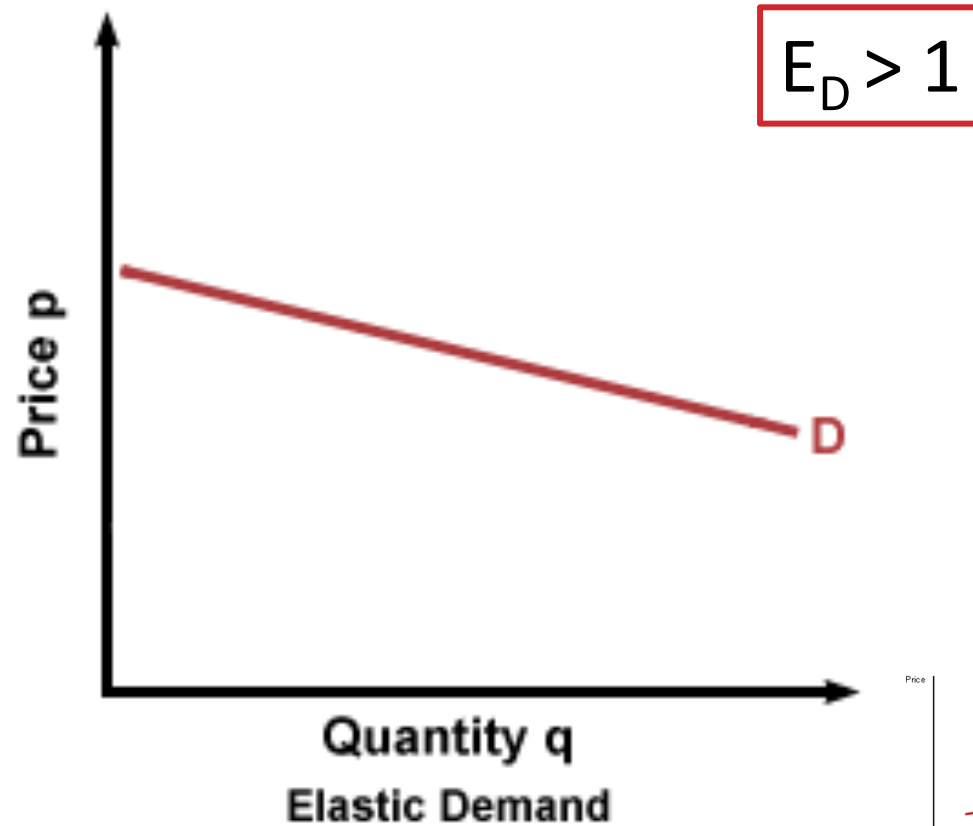
Graphical Representation: Unit Elastic Demand

$E_D = 1$

Price P

D

Quantity Q

Unit Elastic Demand

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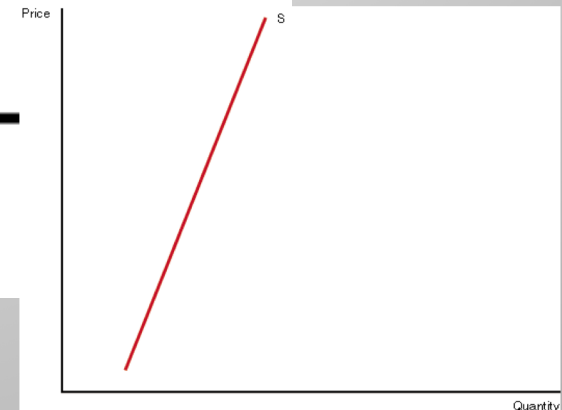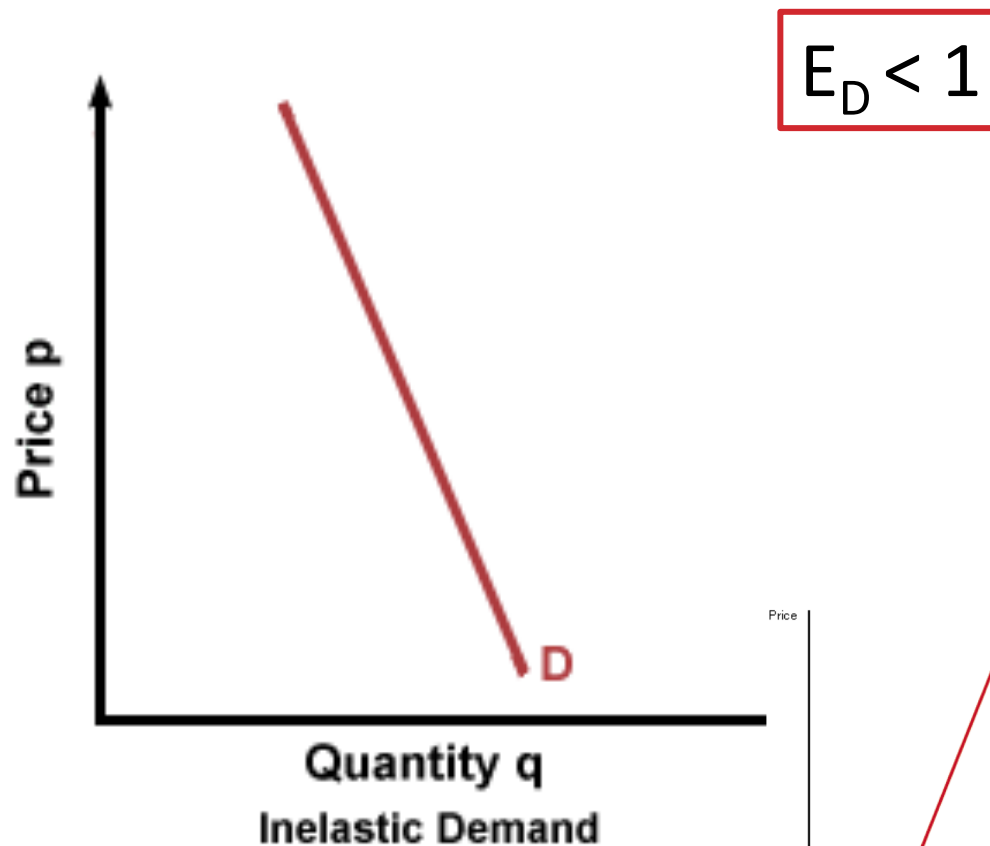
Graphical Representation: Inelastic Demand

$E_D < 1$

Price p

D

Quantity q

Inelastic Demand

Price

S

Quantity

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Graphical Representation: Perfectly Inelastic Demand

Price

Perfectly Inelastic Demand

$E_D = 0$

Quantity

Price Elasticity Summary Table

%Δ Q compared to %Δ P	Absolute Value of E	Interpretation
%Δ Q > %Δ P	> 1	Elastic
%Δ Q = %Δ P	= 1	Unit Elastic
%Δ Q < %Δ P	< 1	Inelastic

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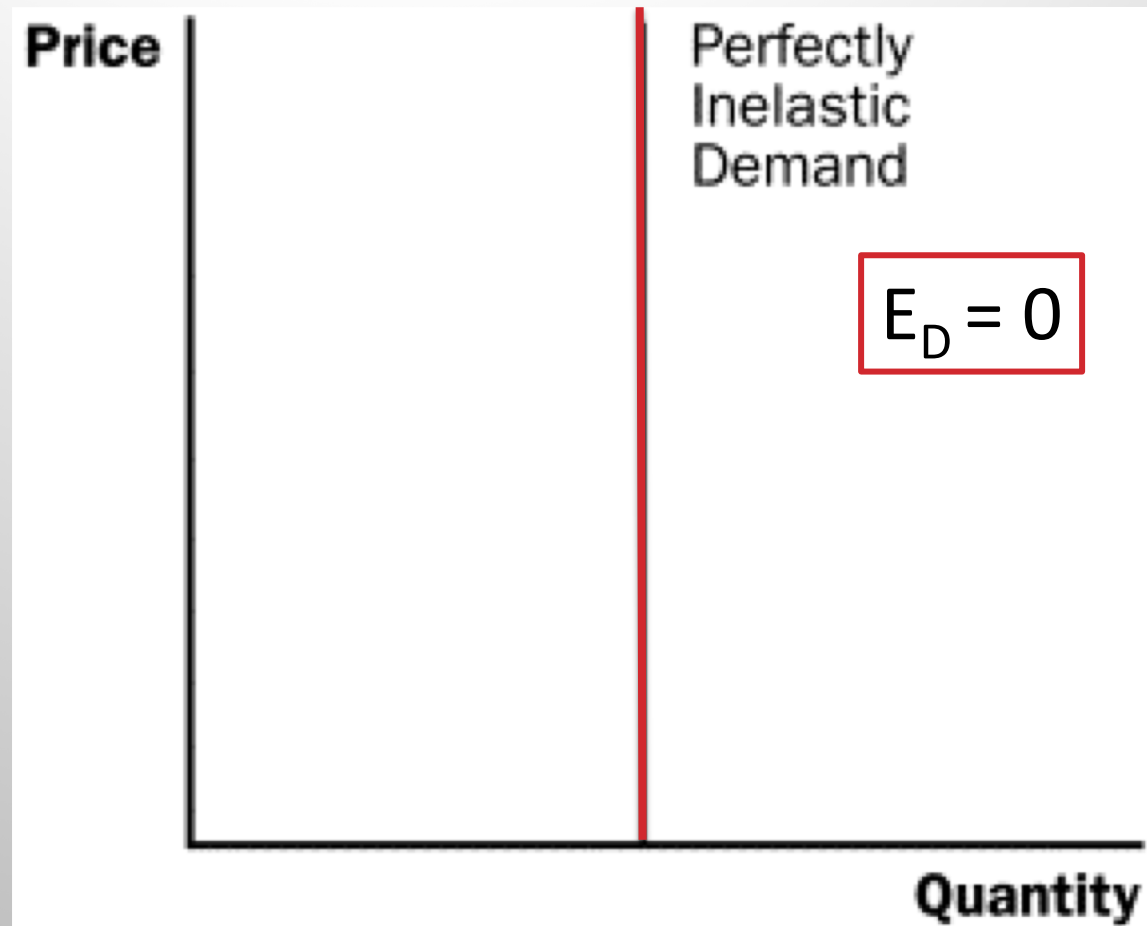*Agricultural Economics & Agribusiness*

Factors that Affect
Price Elasticity of Demand

- Availability of substitutes
  - Beef vs Pork
  - Insulin vs ?
- Degree of necessity
  - Insulin
- Proportion of buyer's budget consumed by good
- Time period
  - Long vs short (gasoline)

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Factors that Affect
Price Elasticity of Supply

- Availability of resources

- Number of producers

- Storing ability
  - Shelf life

- Cost of production compared to output

- Time period
  - Inelastic short run (labor)
  - Elastic long run (increase all resources)

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Calculating Elasticity

- You will need to know the formula!

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Calculating Price Elasticity of Demand

- $E_D = \left| \dfrac{\text{percentage change in quantity demanded of Good A}}{\text{percentage change in price of Good A}} \right|$

- All other factors held constant
  - (ceteris paribus)

- Elasticity is a unit-less measurement

- Absolute Value (Demand – negative)

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Take note:

- Elasticity can change along the curve

Calculating Price Elasticity

- Symbols
  - E_D = Elasticity of Demand
  - E_S = Elasticity of Supply
  - $\%\Delta$ = Percentage Change
  - Q_D = Quantity Demanded
  - P = Price

$\%\Delta\ Q_D \rightarrow$ Percentage Change of Quantity Demanded
$\%\Delta\ P \rightarrow$ Percentage Change of Price

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Calculating Price Elasticity of Demand

- $E_D = \left| \dfrac{\text{percentage change in quantity demanded of Good A}}{\text{percentage change in price of Good A}} \right|$

- $E_D = \left| \dfrac{\%\Delta\ Q_D \text{ of Good A}}{\%\Delta\ P \text{ Good A}} \right|$

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Calculating Price Elasticity of Demand

- How do you calculate Percentage Change in Quantity Demanded (%Δ Q_D)?

- %Δ Q_D = $\dfrac{\text{(new-old)}}{\text{(old)}}$

- %Δ Q_D = $\dfrac{\text{(new quantity)} - \text{(old quantity)}}{\text{(old quantity)}}$

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Calculating Price Elasticity of Demand

- Same concept for percentage change in price (%Δ P)

- %Δ P= (new - old)
    _____
    (old)

- %Δ P= (new price)- (old price)
    _____
    (old price)

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Calculating Price Elasticity

$$E = \left| \dfrac{\dfrac{(\text{new quantity}) - (\text{old quantity})}{(\text{old quantity})}}{\dfrac{(\text{new price}) - (\text{old price})}{(\text{old price})}} \right|$$

Do NOT forget:
- All other factors held constant (ceteris paribus)
- Elasticity is a unit-less measurement
- Absolute Value

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Calculating Elasticity Example 1

- $E_D = \left| \dfrac{\%\Delta\ Q_D \text{ of Good A}}{\%\Delta\ P \text{ Good A}} \right|$

- Price of Pizza at Tim's on the Square increases by 5%. This causes a decrease in quantity consumed by 8%.

- What is the elasticity of demand for Tim's pizza?

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Calculating Elasticity Example 2

- At $2.10 a gallon you buy 5.5 gallons. But a crisis in the middle east causes prices to increase to $3.10 a gallon. You reduce your gasoline consumption to 4 gallons.

- What is the price elasticity of demand for gasoline?

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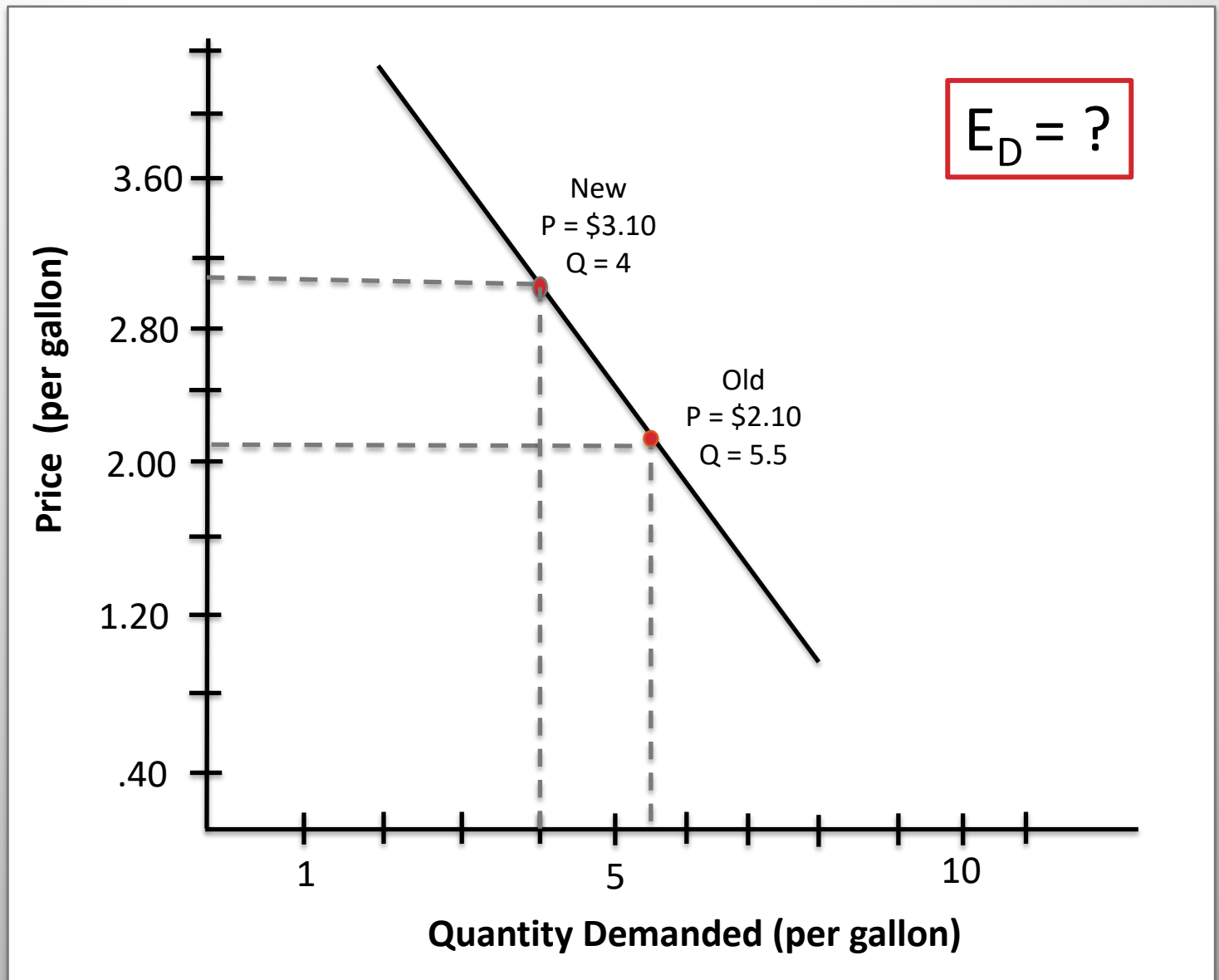*Agricultural Economics & Agribusiness*

Calculating Elasticity Example 2

- Old Price (P1) = $2.10
- New Price (P2) = $3.10

- Old Quantity (Q1) = 5.5 gallons
- New Quantity (Q2) = 4 gallons

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Calculating Elasticity Example 2

Introduction to Price Elasticity

$E_D = ?$

New
P = $3.10
Q = 4

Old
P = $2.10
Q = 5.5

Price (per gallon)

3.60

2.80

2.00

1.20

.40

1   5   10

Quantity Demanded (per gallon)

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Calculating Elasticity Example 2

$$E_D = \left| \frac{\%\Delta\ Q_D \text{ of Good A}}{\%\Delta\ P \text{ Good A}} \right|$$

$$E_D = \left| \frac{\left\{\dfrac{(\text{new quantity}) - (\text{old quantity})}{(\text{old quantity})}\right\}}{\left\{\dfrac{(\text{new price}) - (\text{old price})}{(\text{old price})}\right\}} \right|$$

Calculating Elasticity Example 2

- Step 1: Calculate Percentage change of quantity demanded (%Δ Q_D)

- %Δ Q= $\dfrac{\text{(new - old)}}{\text{(old)}}$ = $\dfrac{(4 - 5.5)}{(5.5)}$ = $\dfrac{-1.5}{5.5}$ = -.27

  = -27%

- Old Quantity (Q1) = 5.5 gallons
- New Quantity (Q2) = 4 gallons

Calculating Elasticity Example 2

- Step 2: Calculate Percentage change of price (%Δ P)

- %Δ P= $\frac{(new - old)}{(old)}$ = $\frac{(3.10 - 2.10)}{(2.10)}$ = $\frac{1}{2.10}$

  = .476 = 47.6%

- Old Price (P1) = $2.10

- New Price (P2) = $3.10

Calculating Elasticity Example 2

- Step 3: Plug %Δ P and %Δ Q into formula

- %Δ P = .476

- %Δ Q =-.27

- $E_D = \left| \dfrac{\%\Delta\ Q_D \text{ of Good A}}{\%\Delta\ P \text{ Good A}} \right| = \left| \dfrac{-.27}{.476} \right| = .567$

Summary

- Price Elasticity tells us by how much a change in price will cause a change quantity demanded or supplied

- Also called own price elasticity

- This is important for producers to know (how will adjusting prices affect consumption and therefore total revenues?)

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Application

- If you were a producer would you prefer the demand for your good to be inelastic or elastic? Why?

- If you were a producer would you prefer the supply of your good to be inelastic or elastic? Why?

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Next Lecture

- Revenue Implications

- How/Why elasticity changes along the curve
  - Arc-price elasticity

- Income elasticity & cross price elasticity

Exit Questions

- If a good has a 7.5% change in price and a 4% change in quantity demanded the good is (elastic/inelastic).

- The price for movie tickets increase from $8.00 to $9.50. This causes a decrease in quantity demanded from 2 tickets to 1. Elasticity of demand = ___? Are they inelastic or elastic?

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