

Tuesday, Sept 28, Lecture 08

Other Types of Elasticity

Midterm Exam a week from today
See the Course Website for Instructions

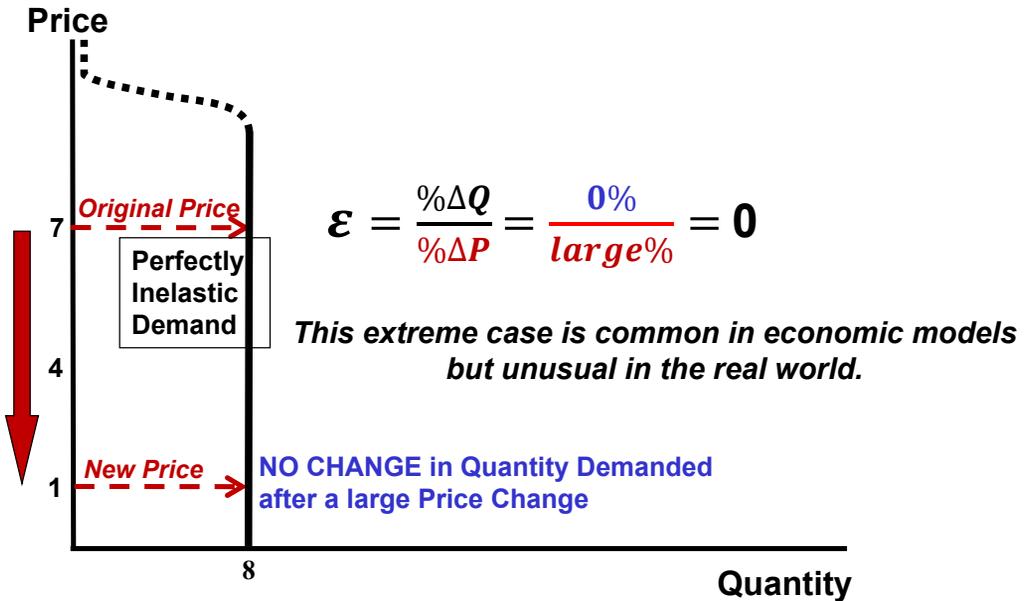


Clicker Question

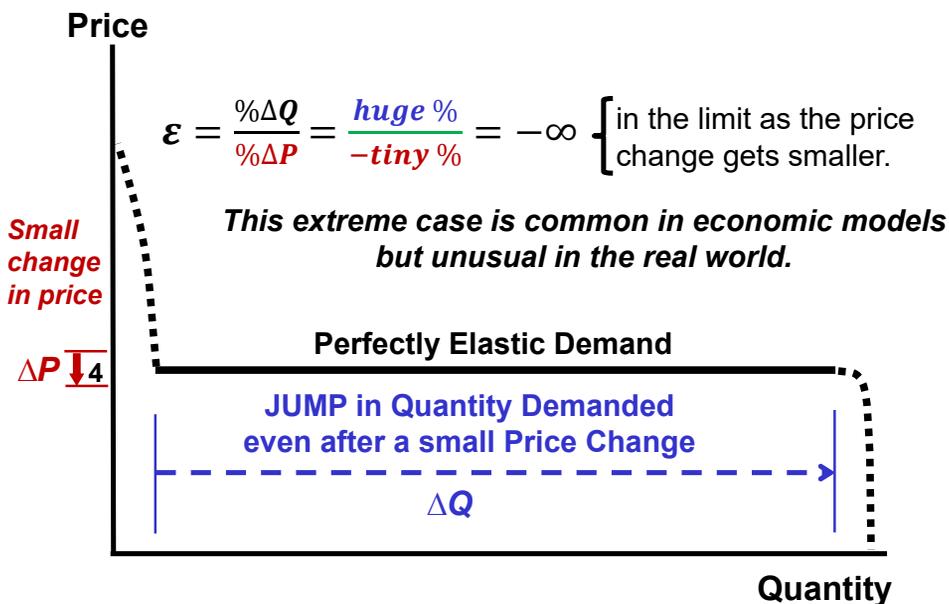
Suppose that the elasticity of demand for *iPads* is **-1.5** . If the price of *iPads* increases by **20%**, then the quantity of *iPads* demanded will...

- a. fall by 30%.
- b. fall by 60%.
- c. rise by 60%.
- d. remain unchanged.

Perfectly Inelastic Demand



Perfectly Elastic Demand

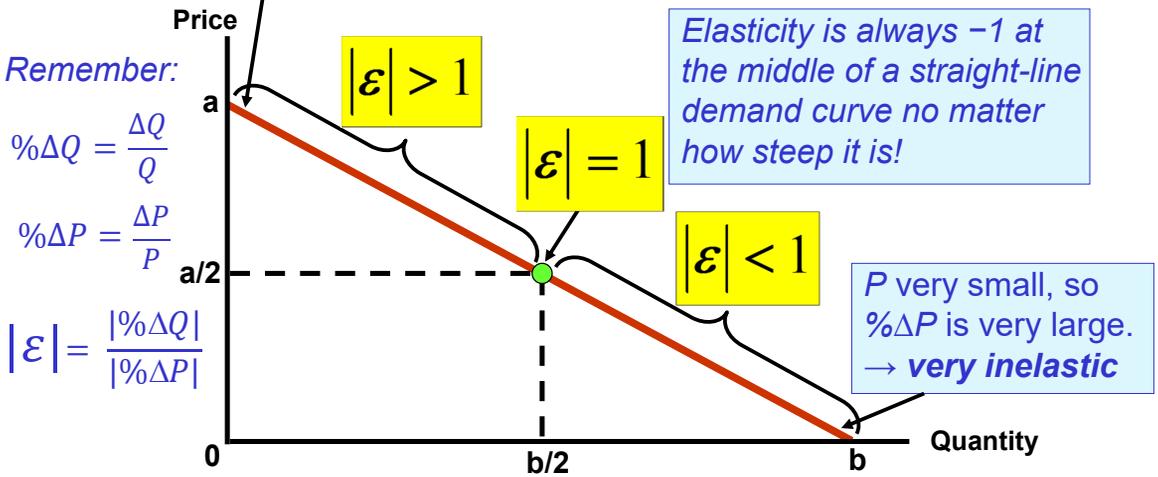


Price Elasticity along a Downward-Sloping Straight-Line Demand Curve

Q is very small, so %ΔQ is very large.
→ **very elastic**

NOTE!

Price elasticity varies at every point along a downward-sloping straight-line demand curve.



Straight-line demand curves are common in economic models but unusual in the real world.

Changes in Total Expenditure

- Will an increase in price always result in an increase in buyers' total expenditure = the revenues of firms?
- Suppose price and quantity demanded are as follows:

	Price	Quantity	Expenditures or Revenues (P x Q)	
	2	5	10	
UP	4	4	16	UP
UP	6	3	18	UP
UP	8	2	16	Down
UP	10	1	10	Down

- Answer: NOT NECESSARILY!**

Elasticity and Changes in Revenue

- Suppose demand is elastic.
 - If the price increases by some percentage,
 - then the quantity falls by a larger percentage
 - so total revenue (price x quantity) decreases.
- Suppose demand is inelastic.
 - If the price increases by some percentage,
 - then the quantity falls by a smaller percentage,
 - so total revenue (price x quantity) increases.
- If demand is unit-elastic and the price increases, total revenue stays the same.

Cross-Price Elasticity of Demand

- A **cross-price elasticity** is the ratio of the percentage change in the quantity demanded of **one** good to the percentage change in price of **another** good.

Example

$$\varepsilon = \frac{\% \Delta Q_{\text{chick}}}{\% \Delta P_{\text{hamb}}}$$

- Two goods are **substitutes** [*in demand*] if you can use one of them **instead** of the other.
 - The cross-price elasticity of demand for substitutes is positive.
- Two goods are **complements** [*in demand*] if you normally use both of them together.
 - The cross-price elasticity of demand for complements is negative.

Examples of Cross Price Elasticity

- When the price of beef goes up by 10% the quantity of chicken demanded rises by 5%. Then the cross-price elasticity of chicken with respect to beef is ____ .
 - Answer: ?
 - Positive, because when the price of beef increases by a positive percentage,...
 - people switch from beef to chicken (*they are substitutes*)...
 - ...and the quantity demanded of chicken increases by a positive percentage.

- We can start with a cross-price elasticity and work in the other direction.
 - **Example:** Suppose the cross-price elasticity of shirts with respect to trousers is $-1/5$.
 - If the price of trousers goes up by 10% the quantity of shirts demanded _____ .
 - Answer: ?
 - Here we see that shirts and trousers are complements because their cross-price elasticity is negative.

Clicker Question

When the price of gasoline increases by 20%, the quantity of tires demanded drops by 8%. The cross-price elasticity of tires with respect to gasoline is _____ .

- a. $-5/2$
- b. $-2/5$
- c. $+5/2$
- d. $+2/5$

Are gasoline and tires substitutes or complements?

Income Elasticity

- The **income elasticity of demand** is the ratio of the percentage change in quantity demanded to the percentage change in the person's **income**.
- **Normal** goods: Income elasticity is **positive** (more income, greater demand).
- **Inferior** goods: Income elasticity is **negative** (more income, smaller demand).

Examples of Income Elasticity

- Suppose the income elasticity of air travel is **+1.5**.
- When per capita income increases from **\$25,000** to **\$30,000**, the demand for air travel will change by _____ percent.
 - Income is increasing by _____ percent.
 - Demand for air travel must increase by _____ percent.

Price Elasticity of Supply

- The [own-price] elasticity of supply tells us how sensitive the quantity supplied is to the good's own price *starting at a given point on a supply curve and moving along the curve*.
- The elasticity of supply ϵ is defined by:

$$\epsilon = \frac{\text{Percentage Change in Quantity Supplied}}{\text{Percentage Change in Price}}$$

result (arrow pointing to the numerator)

cause (arrow pointing to the denominator)

or equivalently by

$$\epsilon = \frac{\% \Delta Q}{\% \Delta P}$$

Δ means "change in"

- Note: Elasticity is *always* computed as a ratio of **percentages**, never as a ratio of amounts.

Example: Supply of Chicken

- Suppose the price of chicken falls by **2%**, and the quantity supplied falls by **5%** as a result.
- Then the price elasticity of supply of chicken is...

$$\varepsilon = \frac{?}{?} = ?$$

- The own-price elasticity of **supply** is **positive** (when price rises, quantity rises, and *vice versa*).

Clicker Question

Suppose the elasticity of supply is **+3** and the price of chicken increases by **2%**. Then the quantity supplied will...

- increase by one third.
- decrease by **0.67%**.
- not change.
- increase by **6%**.
- More information is needed.

The Determinants of Supply Elasticity

■ Availability of excess capacity.

- If oil wells are producing below full capacity, then the short-run elasticity of petroleum supply will be high...
- ...because the producer can simply run the oil pumps for more hours.
- But if the pumps are already running at full capacity,...
- then the elasticity will be low (less elastic), because drilling and construction will be required before the producer can pump more oil.

■ Elasticity of the supply of inputs.

- The supply of medical services is inelastic,...
- because the supply of doctors is inelastic, and most medical services require doctors.
- The supply of wheat is elastic, because the supply of wheat-growing land is elastic.
 - ◆ Land can be shifted from other uses to wheat,....
 - ◆ although, the supply of ALL land is *very inelastic*.
- Elasticity of supply of output is greater if the elasticities of supply of inputs are greater.

■ Transport costs for inputs and outputs

- If transport costs for inputs are low, then production can be more easily expanded, by bringing cheap inputs from far away.
- Otherwise, more costly local inputs would have to be used.
- Also, it's easier to bring output from far away when transport costs are low.
- Elasticity of supply is greater, when transport costs are low.

■ Production complexity reduces short-run elasticity.

- The production of electric power is complex, so after a price increase, it takes a long time to expand production.

Estimated Price-Elasticities of Supply

■ Heating Oil

- 1.57 (Short Run)

■ Gasoline

- 1.61 (Short Run)

■ Tobacco

- 7.0 (Long Run)

■ Housing

- 1.6-3.7 (Long Run)

■ Cotton

- 0.3 (Short Run)

- 1.0 (Long Run)

■ Steel

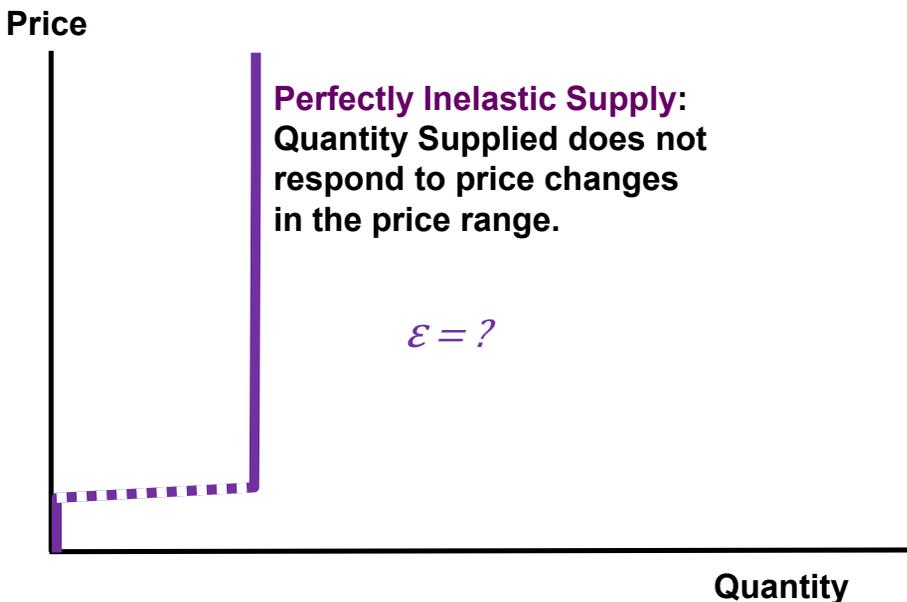
- 1.2 (Long Run, from Minimills)

Clicker Question

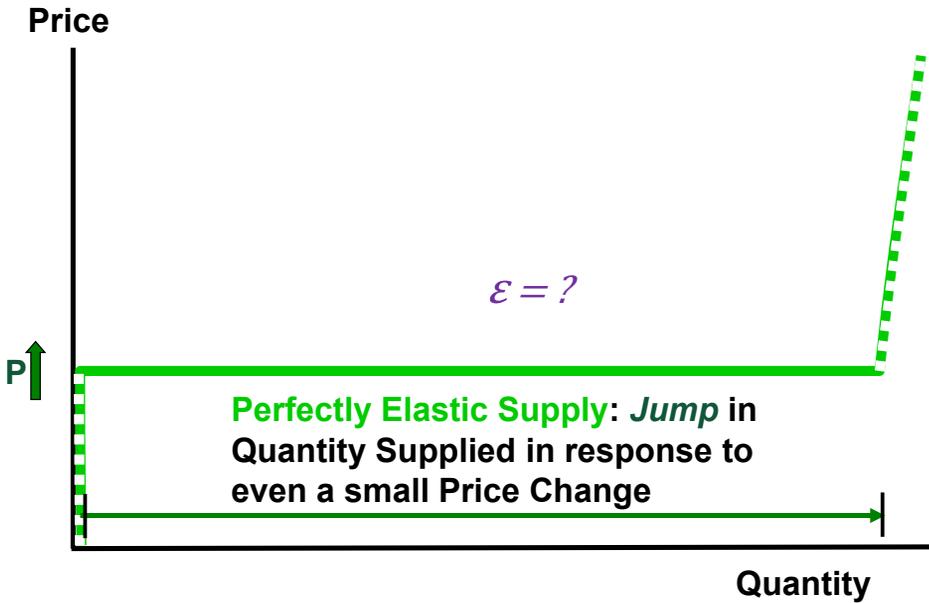
Which of the following is **not** a determinant of the price elasticity of supply?

- a. transport costs
- b. elasticity of input supply
- c. consumer demand
- d. excess capacity

Perfectly Inelastic Supply

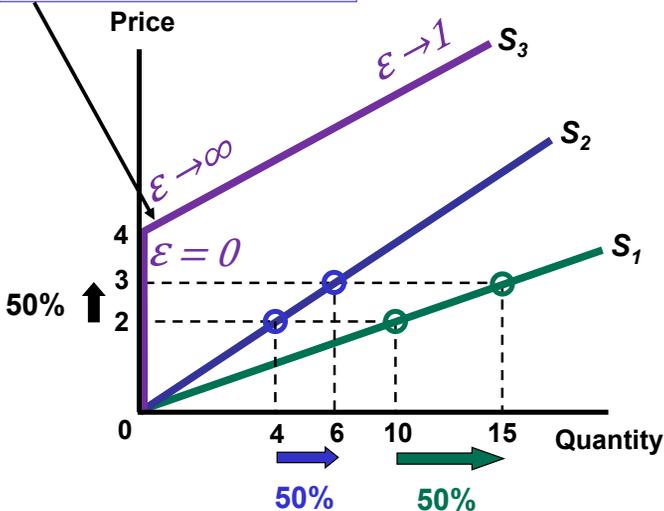


Perfectly Elastic Supply



Price Elasticity and the Slope of the Supply Curve

Q is very small, so $\% \Delta Q$ (numerator) is very large.
 → very elastic



For any straight-line supply curve from origin: $\epsilon = 1$

For any straight-line supply curve from the Y-Axis: As the price increases, the elasticity jumps from 0 to very large and then gradually falls towards 1. (You're not required to know this.)

Cross-Price Elasticity of Supply

- A cross-price elasticity of supply is the ratio of the percentage change in the quantity supplied of **one** good to the percentage change in price of **another** good.

Example

$$\varepsilon = \frac{\% \Delta Q_{\text{corn}}}{\% \Delta P_{\text{wheat}}}$$

- Two goods are **substitutes in production** if resources used to produce one could be used instead for the other.
- The cross-price elasticity of supply is negative for substitutes in production.

- Two goods are **complements in production** (joint products) if both are normally produced together.
- The cross-price elasticity of supply for complements in production is positive.
- **Example:** Molasses is a by-product of sugar refining.

Clicker Question

When the price of sugar increases by 5%, the quantity of molasses supplied increases by 2%. The cross-price elasticity of molasses supply with respect to the price of sugar is _____ .

- a. $-5/2$
- b. $-2/5$
- c. $+5/2$
- d. $+2/5$

End of Lecture 8