Topic 2: Supply and Demand

Economics 1, Fall 2002
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Based Primarily on Frank Chapters 2, 4

Supply and Demand: Equilibrium

Example: The Market for Apartments
The (Market) Demand Curve

- Demand curve for one bedroom apartments:

A downward-sloping demand curve tells us that:
- The higher the price, the less the demand for the good.

Why?
- As price increases, fewer potential buyers can afford to buy the good (*income/wealth effect*).
- As price increases, some potential buyers substitute other goods (*substitution effect*).

We can write the (inverse) demand curve as $p(q)$. Then we know that $dp / dq < 0$. 
The (Industry) Supply Curve

The supply curve for a good tells us how much of that good is supplied at each price.

The Supply Curve, cont’d

- An upward-sloping supply curve tells us that:
  - The higher the price, the greater the supply for the good.

- Why?
  - Typically: the more you produce, the greater the production cost for each additional unit. In order to be willing to supply more, you therefore need to be able to charge a higher price for each unit. (The price must cover the production cost.)
**Equilibrium**

Equilibrium in the market for apartments:

In equilibrium, prices are such that the quantity demanded equals the quantity supplied.

**Excess Supply / Excess Demand**

- **Excess supply**: the amount by which quantity supplied exceeds quantity demanded.
- **Excess demand**: the amount by which quantity demanded exceeds quantity supplied.
Price Ceiling (Rent Control)

- Price ceiling at $400:

The price ceiling causes excess demand: some potential buyers who would want to pay more than the ceiling cannot obtain the good (rationing).

Price Floor

- Price floor at $800:

The price floor causes excess supply: some potential suppliers who would want to supply at a lower price cannot sell the good.
Welfare Properties of Equilibrium

- Equilibrium has “nice” welfare properties:
  - Example: Prices are fixed at $400, so 200 apartments are rented.
  - Now suppose some buyer offered $700 for one more apartment. A seller should be happy to provide one more apartment (since the cost of providing that apartment is $400).

Prices

- Prices serve two important functions:
  - Rationing function:
    » We live in a world of scarcity. If all goods were free, how could we ration people’s unlimited wants?
  - Allocative function:
    » Since we live in a world of scarcity, we need to allocate the available resources so that:
      - those who value goods most highly obtain them;
      - those goods that are most wanted are being produced (suppose there is excess demand in one market: firms would have an incentive to expand production in that market, because supernormal profits can be made).
Using Supply and Demand

Changes in Demand
Changes in Supply
Application: Taxes
Elasticity

Changes in Demand

- What shifts the demand curve? (Alternatively: What causes a rise (fall) in the quantity demanded at every price?)
  - Changes in income/wealth: as consumers’ income/wealth increases, they will want to buy more of a good at each price.
  - Prices of substitutes/complements:
    - complements (e.g. coffee and cream): if the price of coffee rises, your demand for cream will fall;
    - substitutes (e.g. coffee and tea): if the price of coffee rises, your demand for tea will increase.
  - etc.
Changes in Supply

- What shifts the supply curve? (Alternatively: What causes a rise (fall) in the quantity supplied at every price?)
  - Technology: better technology reduces cost of production.
  - Factor prices: higher factor prices (e.g. cost of labor) means higher cost of production.
  - Number of suppliers (e.g. computer manufacturers)
  - etc.

Demand v. Quantity Demanded

- Distinguish between:
  - a change in demand (the entire demand curve shifts), and
  - a change in the quantity demanded (a movement along the demand curve).

Example: consumers expect a future price rise

Example: good weather before harvest
Supply v. Quantity Supplied

- Similarly …
- Distinguish between:
  - a change in supply (the entire supply curve shifts), and
  - a change in the quantity supplied (a movement along the supply curve).

Using Supply and Demand

- **Example:** Why do airfares increase in summer?
  
  ![Diagram](image1)
  
  **Example (a): carriers can expand capacity**
  
  ![Diagram](image2)
  
  **Example (b): carriers cannot expand capacity**
  
  ![Diagram](image3)

- Think about your own example with a fall in demand!
Using Supply and Demand, cont'd

- **Example**: What happened during the oil price shock?

  - Example (a): demand for gas is (relatively) elastic
  - Example (b): demand for gas is (relatively) inelastic

- Think about your own example with a supply increase!

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Application: Taxes

Producer/Consumer Taxes
(Economic) Tax Incidence
Taxes

- Suppose a tax of $T$ is levied on each unit sold by the producer.

Supply curve shifts up by the amount $T$.

Tax incidence: who bears the tax?

In order to cover cost, the producer needs to charge $T$ more for each unit sold.

But some of the cost $T$ of the tax is borne by consumers.

Taxes, cont’d

- Suppose a tax of $T$ is levied on each unit bought by the buyer.

Demand curve shifts down by the amount $T$.

Tax incidence: who bears the tax?

In order to buy the same quantity as before, the price has to fall by $T$.

But some of the cost $T$ of the tax is borne by producers.
Who bears the tax depends on the elasticities of supply and demand. Example: demand.

Example (a): Relatively elastic demand curve

Example (b): Relatively inelastic demand curve

Who bears the tax depends on the elasticities of supply and demand. Example: supply.

Example (a): Relatively elastic supply curve

Example (b): Relatively inelastic supply curve
Tax Incidence, cont’d

- Similarly, supply and demand elasticities determine the incidence of a tax levied on consumers.
- **Workout:** Try this at home!

Elasticity

- Price Elasticity of Demand
- Cross-Price Elasticity of Demand
- Income Elasticity of Demand
Price Elasticity of Demand

- The price elasticity of demand measures the responsiveness of demand for a good with respect to changes in the price of that good.

**Definition:** The *price elasticity of demand* is the percentage change in the quantity demanded that results from a 1 percent change in price.

- Precisely, it is: \( \eta = \frac{\Delta q / q}{\Delta p / p} \)
- or, rewritten: \( \eta = \frac{\Delta q / q}{\Delta p / p} = \frac{\Delta q}{\Delta p} \cdot \frac{p}{q} = \frac{dq}{dp} \cdot \frac{p}{q} = \left( \frac{1}{dq} \right) \cdot \frac{p}{q} \)

Price Elasticity of Demand, cont’d

- \( \eta = \left( \frac{dp}{dq} \right) \cdot \frac{p}{q} \) says that:
  - The price elasticity of demand at some point on the demand curve is
    - the inverse of the slope of the (inverse) demand curve,
    - times the ratio of price to quantity at that point on the demand curve.

- Implications: the price elasticity of demand is
  - (probably) different at every point on the demand curve;
  - nonpositive.
**Price Elasticity of Demand, cont’d**

- We call demand (at some point) **elastic**, if the quantity demanded is relatively responsive to changes in price.
  - Definition: demand is elastic whenever $\eta < -1$.

- We call demand (at some point) **inelastic**, if the quantity demanded is relatively unresponsive to changes in price.
  - Definition: demand is inelastic whenever $-1 < \eta < 0$.

- We call demand (at some point) **unit elastic**, if the quantity demanded changes proportionately to changes in price.
  - Definition: demand is unit elastic whenever $\eta = -1$.

**Two extreme cases:**

- **Perfectly elastic demand ($\eta = -\infty$)**

- **Perfectly inelastic demand ($\eta = 0$)**

![Demand curves](image)

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Using Price Elasticity of Demand

- Example: Suppose you know that the price elasticity of demand for pizza at Thayer is -2.
  - That is, every 1% increase in price results in a 2% reduction in the quantity demanded.
- Currently, 100 slices of pizza are sold, at $1.75 each. So revenue from pizza is $175.

- If the price of pizza increased to $2.10, would total revenue increase or decrease?

Using Price Elasticity, cont’d

- An increase from $1.75 to $2.10 is an increase of 20%.
  - Since the elasticity is -2, we know that demand will fall by 40%.
- Only 60 slices of pizza will be sold after the price increase.
  - 60 slices of pizza at $2.10 each create revenue of $126, which is less than $175.
- Total revenue would decrease.
Buzz Group

- What effect does a 20% increase in price have on total revenue from pizza if the price elasticity of demand were -0.5?

Cross-Price Elasticity of Demand

- We have already seen that prices of other goods may influence demand for a good.
  - Example: If tea and coffee are substitutes, an increase in the price of coffee will increase your demand for tea.
- The cross-price elasticity of demand measures the responsiveness of demand for a good with respect to changes in the price of some other good.
Cross-Price Elasticity, cont’d

Definition: The cross-price elasticity of demand is the percentage change in the quantity demanded of one good that results from a 1 percent change in price of some other good.

Precisely, for two goods, x and y, it is:

\[ \eta_{xy} = \frac{\Delta q_x}{q_x} \frac{\Delta p_y}{p_y} \]

We can now be specific about substitutes and complements:

Two goods, x and y, are substitutes if an increase in price of good y increases demand for good x.

- Definition: x and y are substitutes if \( \eta_{xy} > 0 \).

Two goods, x and y, are complements if an increase in price of good y decreases demand for good x.

- Definition: x and y are complements if \( \eta_{xy} < 0 \).
Cross-Price Elasticity, cont’d

Income Elasticity of Demand

- We have also seen that changes in income/wealth may have an effect on the quantity demanded of some good.
  - Example: As your income/wealth rises, you can afford to buy more of everything.
- The income elasticity of demand measures the responsiveness of demand for a good with respect to changes in a consumer’s income/wealth.
Income Elasticity, cont’d

- Definition: The income elasticity of demand is the percentage change in the quantity demanded of some good that results from a 1 percent change in a consumer’s income/wealth.

- Precisely, it is:

\[ \varepsilon = \frac{\Delta q / q}{\Delta m / m} \]

(where \( m \) is income/wealth).

Income Elasticity, cont’d

- Income elasticity of demand is usually positive (normal goods).
- But there are goods of which you want to buy less as your income increases (inferior goods).
Income Elasticity, cont’d

- We can now be specific about which goods are necessities and which are luxuries:
- A good is a necessity if quantity demanded is relatively unresponsive to changes in income/wealth.
  - Definition: a good is a necessity if $0 < \varepsilon < 1$.
- A good is a luxury if quantity demanded is relatively responsive to changes in income/wealth.
  - Definition: a good is a luxury if $\varepsilon > 1$. 

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