Elasticity

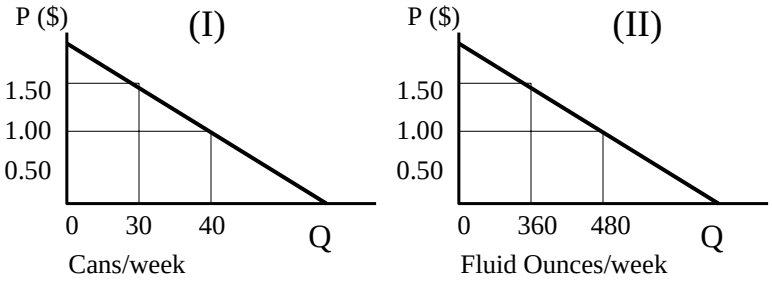
Why beer is more expensive in bars, and other stories

Price elasticity of demand

- The *price elasticity of demand* of a good measures the responsiveness of the quantity demanded of the good to changes in the price of that good.
  - It is the percent change in the quantity demanded of the good divided by the percent change in its price.
  - Since it is always negative (law of demand), it is normally reported as the absolute value.
- Why don't we just use the slope?
  - It tells us about the price/quantity relationship
- The slope is not "units free"

Slope is not “units free”

- Consider the demand curve for soda



- Response to a price fall from $1.50 to $1.00?
- Slope = (P2-P1)/(Q2-Q1)

I: -.5/10 = -1/20 **II:** -.5/120 = -1/240

Price elasticity of demand

- Thus, instead we use elasticity of demand
- Example:
  - As the price of soda decreases from $1.50 to $1 per can, the quantity demanded rises from 30 cans to 40 cans.
    - As the price of soda decreases by 33%, the quantity demanded increases by 33%.
      - The price elasticity of demand is 33% / 33% = 1.00.
  - As the price of soda increases from $1 to $1.50 per can, the quantity demanded falls from 40 cans to 30 cans.
    - As the price of soda increases by 50%, the quantity demanded falls by 25%.
      - The price elasticity of demand is 25% / 50% = 0.50.
  - Huh? What’s going on?
    - We need a better way of calculating percent changes.

Calculating percent changes

- The *midpoint method* says to calculate percentage changes as a percentage of the average between starting and final values.
- Example:
  - As the price of soda increases from $1 to $1.50 per can, the quantity demanded falls from 30 cans to 20 cans.
    - As the price of soda increases by $\frac{\$0.5}{(\$1+\$1.5)/2} = 40\%$
    - ... the quantity demanded falls by $\frac{10}{(40+30)/2} = 29\%$
    - The price elasticity of demand is $29\% / 40\% = 0.73$

Types of elasticity of demand

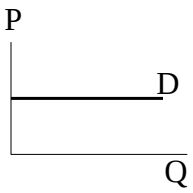
1. Elastic Demand

- We call demand (at some point) *elastic*, if the quantity demanded is relatively *responsive* to changes in price.
  - Demand is *elastic* when the price elasticity of demand is > 1.
- The percentage change in quantity demanded is greater than the percentage change in price
  - Small increase in price yields a large decrease in quantity demanded

Example: Soda - lots of substitutes (Gatorade, Juice)

2. Perfectly Elastic Demand

- Price elasticity of demand = ∞
- Only able to sell good at a fixed price
- Demand curve is horizontal



Example: Homogeneous goods (milk, eggs, gas)

Types of elasticity of demand

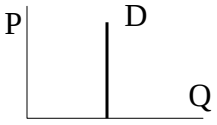
3. Inelastic Demand

- We call demand (at some point) *inelastic*, if the quantity demanded is relatively *unresponsive* to changes in price.
  - Demand is *inelastic* when the price elasticity of demand is between 0 and 1.
- The percentage change in quantity demanded is smaller than the percentage change in price
  - A big increase in price leads to a small change in quantity

Example: Necessities (telephone, electricity)

4. Perfectly Inelastic Demand

- Price elasticity of demand = 0
- Demand does not respond to price changes
- The demand curve is vertical



Example: absolute necessities (Insulin)

Types of elasticity of demand

5. Unit Elastic Demand

- We call demand (at some point) *unit elastic*, if the quantity demanded changes proportionately to changes in price.
  - Demand is *unit elastic* when the price elasticity of demand is = 1.

Factors affecting elasticity of demand

1. Availability of Substitutes

- If you can substitute easily demand is likely to be more elastic
  - e.g. Coke - lots of substitutes (Pepsi, drinks)
- Coke is a pretty specific good
- In general, broader categories have few substitutes

2. Importance in Budget

- Goods that make up a large fraction of budget tend to be more elastic
  - e.g. Canada - increased price of cigarettes
- This had a bigger effect on teenagers

Factors affecting elasticity of demand

2. Necessity or Luxury

- Elasticity of demand tends to be low if the good is something you must have
  - e.g. medicine
- Elasticity tends to be high if the good is something you can easily live without

3. Time Duration

Short-Run: can't locate substitutes, more inelastic

Long-Run: can search for substitutes

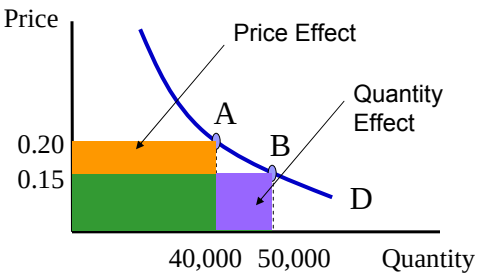
Example: OPEC 1970's colluded to raise price of oil

Elasticity and total revenue

- Why do we care whether a good is elastic or inelastic?
- The elasticity can tell us something about what happens to total revenue as price changes

Example: price increase

- What happens to revenue if price rises?
- Total Revenue = Price X Quantity



- The price rises but quantity demanded falls

Elasticity and total revenue

- Therefore, the overall effect on total revenue depends on which effect is bigger
- Elasticity tells us this

% rise in P ⇔ % fall in Q

- Total revenue will increase
- True if demand is inelastic

$\%\Delta Q/\%\Delta P \Leftrightarrow 1$

$\%\Delta Q \Leftrightarrow \%\Delta P$

Elasticity and total revenue

Price decrease: change in price effect is negative and the quantity effect is positive

- Demand Elastic: Total revenue will increase
- Demand Inelastic: Total revenue will decrease

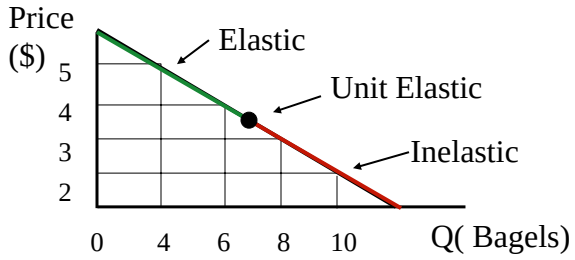
Summary Table

Price Change	Elasticity (D)	Effect on TR
Decrease	Inelastic (%ΔQ<%ΔP)	⇓
Decrease	Elastic (%ΔQ>%ΔP)	⇑
Increase	Inelastic (%ΔQ<%ΔP)	⇑
Increase	Elastic (%ΔQ>%ΔP)	⇓

Linear demand curves

- Elasticity changes along curve even if the slope doesn't

P	Q
2	10
3	8
4	6
5	4



- Elasticity in 3 different regions

$4-$5: elasticity of demand = 1.8 (elastic)

$3-$4: elasticity of demand = 1 (unit elastic)

$2-$3: elasticity of demand = 0.56 (inelastic)

Linear demand curves and revenue

What does this imply about Total Revenue?

Above Midpoint (elastic: $\%\Delta Q > \% \Delta P$)

- Decrease P, Increase Q will increase Revenue
- Increase P, Decrease Q will decrease Revenue

Below Midpoint (inelastic: $\%\Delta Q < \% \Delta P$)

- Decrease P, Increase Q will decrease Revenue
- Increase P, Decrease Q will increase Revenue

At Midpoint (unit elastic)

- Total Revenue is maximized

Other important elasticities

Cross-price elasticity of demand:

- The *cross-price elasticity of demand* between two goods measures the responsiveness of the quantity demanded of one good to changes in the price of another good.
  - It is the percent change in the quantity demanded of one good divided by the percent change in the price of the other good.
  - It can be positive or negative.
    - If it is *positive*, the two goods are *substitutes*.
    - If it is *negative*, the two goods are *complements*.

Income elasticity of demand

- The *income elasticity of demand* of a good measures the responsiveness of the quantity demanded of the good to changes in income.
  - It is the percent change in the quantity demanded of the good divided by the percent change in income.
  - It can be positive or negative.
    - If it is *positive*, the good is a *normal good*.
    - If it is *negative*, the good is an *inferior good*.

Price elasticity of supply

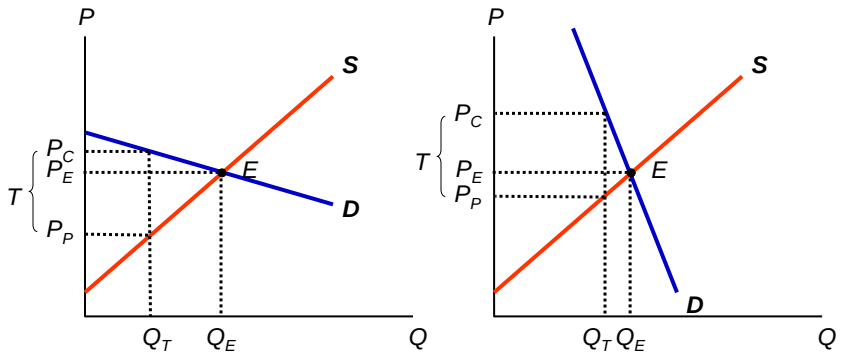
- The *price elasticity of supply* of a good measures the responsiveness of the quantity supplied of the good to changes in the price of that good.
  - It is the percent change in the quantity supplied of the good divided by the percent change in its price.
  - This is always positive ("law of diminishing returns").

Elasticity and deadweight loss

How bad are taxes?

Who bears the tax?

- The more inelastic demand is, the more of the tax falls on consumers.



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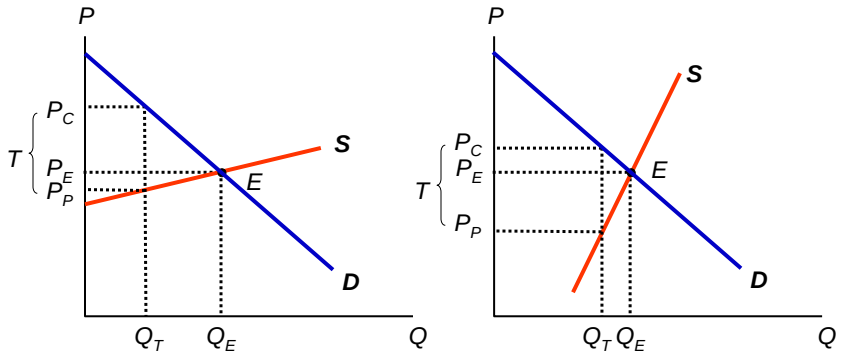
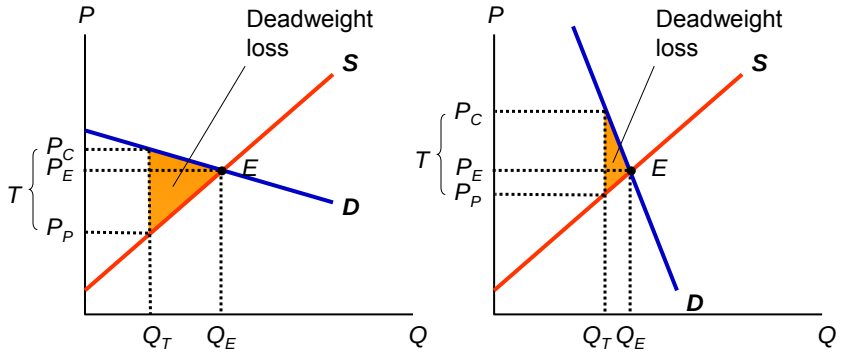


How much deadweight loss?

- The more transactions are discouraged, the greater deadweight loss.



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