Econ 201: Introduction to Economics Analysis

September 11 Lecture: Elasticity

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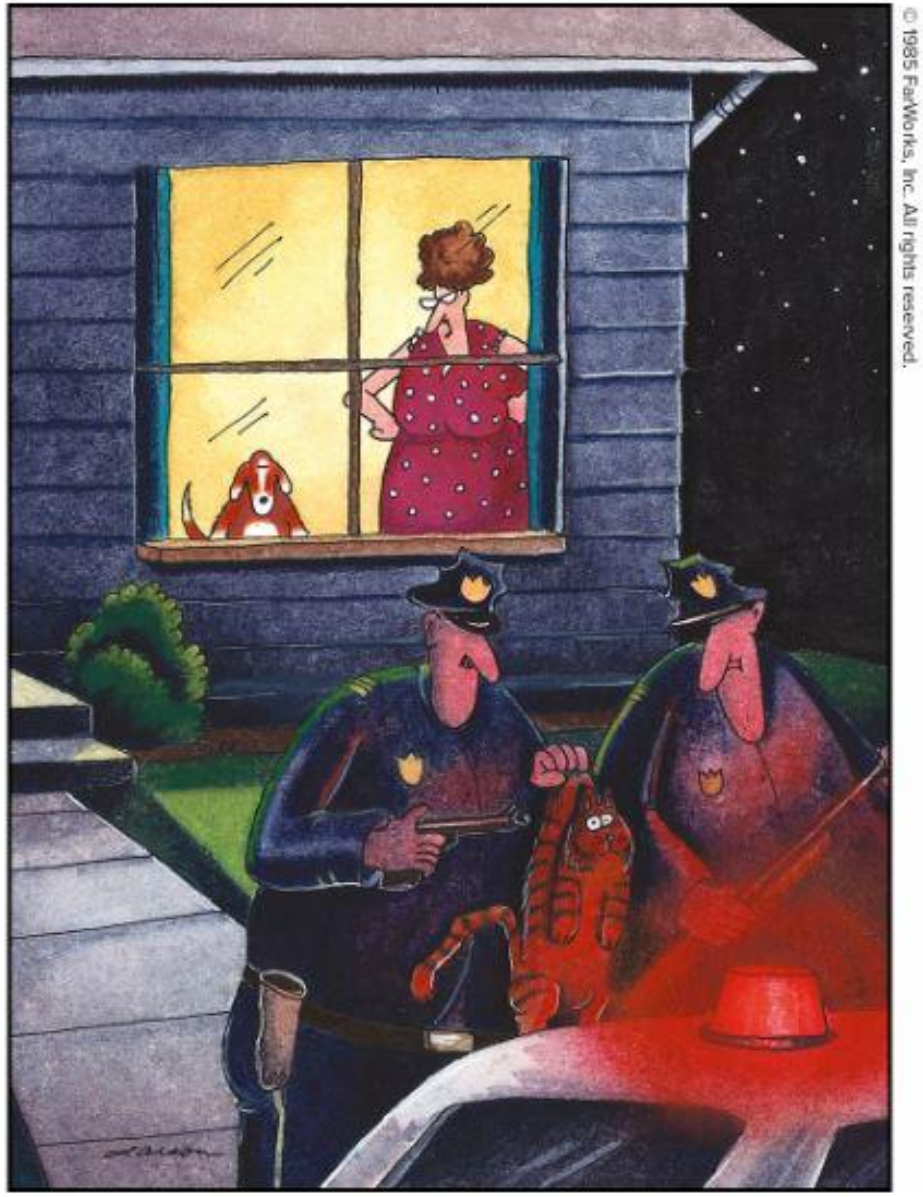
Daily Far Side

www.thefarside.com



"And I suppose *you* think this is a dream come true."

Preview of this class session

- Elasticities measure the sensitivity of economic relationships
- Like slopes, but in terms of percentage changes
  - Unit free
- Price elasticity of demand for product is key measure
- Many other elasticities are also useful
- Elasticities are often different in the short run and the long run

(Inverse) slope of demand curve

- Remember that P is on vertical axis, slope of demand curve is $\frac{\Delta P}{\Delta Q^D}$
- **Inverse slope** of demand curve is $\frac{\Delta Q^D}{\Delta P}$, measures **sensitivity of quantity demanded to price**
  - How many additional units of the good would be demanded if the price rose by one unit?
  - Negative because demand curves slope downward
  - Depends on the units we use for the good
  - Cannot be compared across products because units differ

Price elasticity of demand

$$E^D = \frac{\%\Delta Q^D}{\%\Delta P} = \frac{100 \times \Delta Q^D / Q^D}{100 \times \Delta P / P} = \frac{\Delta Q^D}{\Delta P}\frac{P}{Q^D} = \frac{1}{slope}\frac{P}{Q^D}$$

- Both numerator and denominator are in **percentage terms**, so do not depend on units of measure
- Demand elasticity is negative as pure number, but often expressed as **absolute value**
- Can be compared across goods because it is unitless
  - Goods for which quantity demanded is more sensitive to price have higher (absolute) elasticities

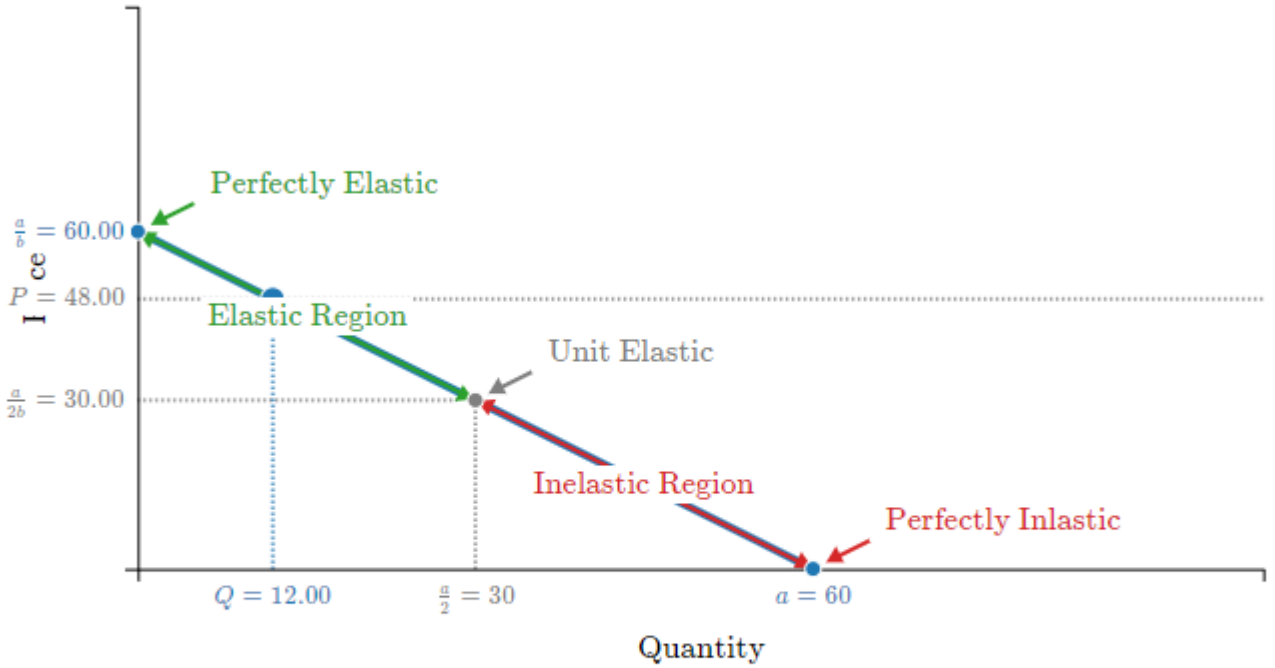
Elastic and inelastic demand

- **Elastic demand**: $|E^D| > 1$
  - Since $|E^D| = |\%\Delta Q^D / \%\Delta P|$, elastic demand → $\%\Delta Q^D > \%\Delta P$
- Perfectly elastic demand: $|E^D| \rightarrow \infty$ (horizontal demand curve)
- **Inelastic demand**: $|E^D| < 1$
  - Inelastic demand → $\%\Delta Q^D < \%\Delta P$
- Perfectly inelastic demand: $|E^D| = 0$ (vertical demand curve)

- Effect of price increase on spending on good is positive if demand is inelastic
  - $\%\Delta$ in spending = $\%\Delta Q + \%\Delta P$
  - $\%\Delta Q$ (negative) < $\%\Delta P$ (positive)
- $P\uparrow$ → decrease in spending if demand is elastic because fall in Q is greater than rise in P

Linear demand curves

- Remember that $E^D = \frac{1}{slope}\frac{P}{Q^D}$
- Slope = constant on linear curve (–1 here)
- P falls and Q^D increases as we move down along a linear demand curve
  - Elasticity is large at top and small at bottom



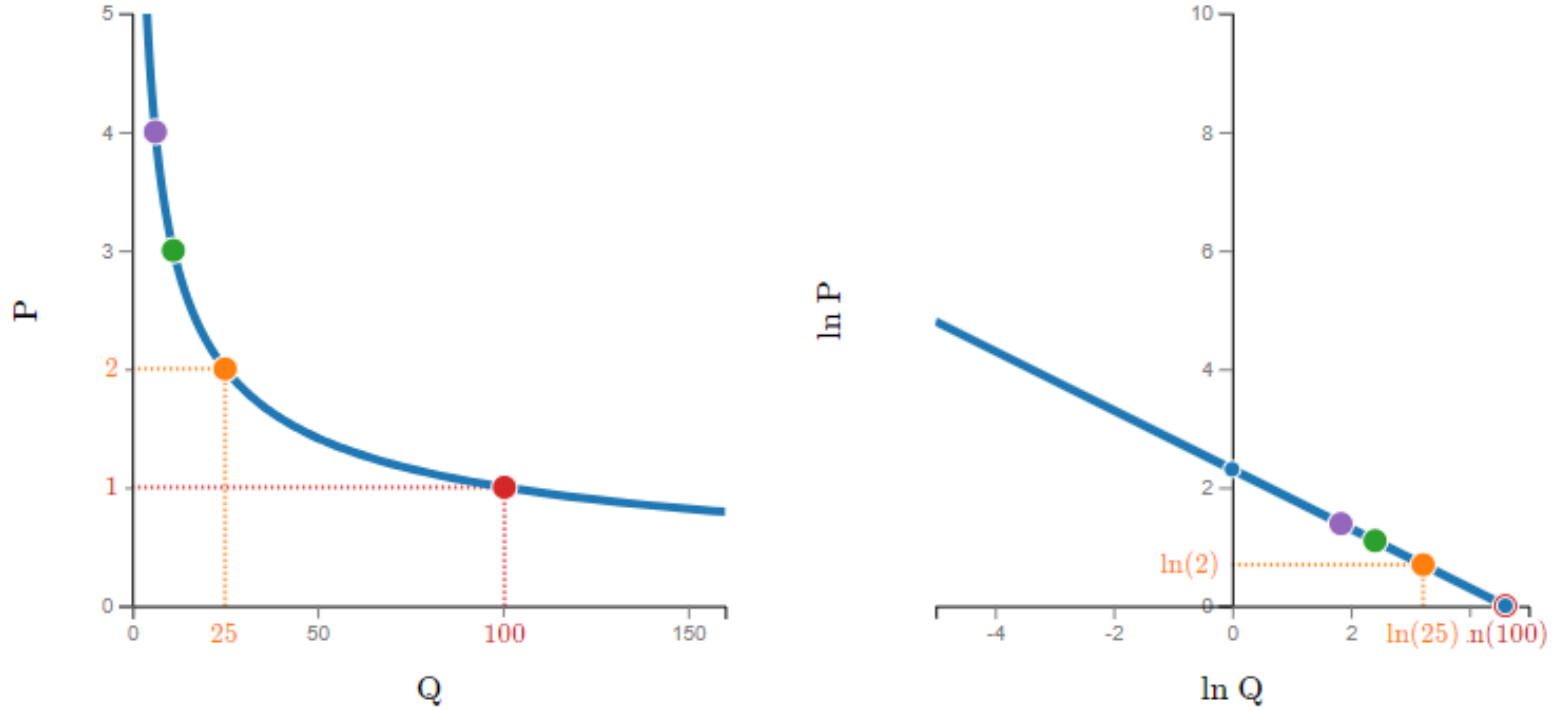
This demand curve has the equation

$$Q = a - bP$$
$$= 60 - P$$

https://www.econgraphs.org/graphs/concepts/elasticity/demand_elasticity/constant_slope

Constant-elasticity demand curves

- $\ln Q^D = \alpha - \beta \ln P$ would have **constant elasticity** of $-\beta$ (-2 here)
  - This curve would bend away from both vertical and horizontal axes
  - With $\ln Q$ and $\ln P$ on axes, it is a straight line



https://www.econgraphs.org/graphs/concepts/elasticity/calculating_elasticity/elasticity_and_logs

Point vs. arc elasticities

- Can measure $\frac{\Delta Q^D}{\Delta P}$ in two ways (same for linear):
  - At single point (inverse slope of tangent line)
  - Between two points (inverse slope of chord connecting two points on line)
- Using first gives "**point elasticity;**" second gives "**arc elasticity**"
- We will use interchangeably

Other elasticities of demand

- **Income elasticity of demand**
  - How sensitive is demand to changes in income

$$E_I^D = \frac{\%\Delta Q^D}{\%\Delta I} = \frac{\Delta Q^D}{\Delta I}\frac{I}{Q^D}$$

  - Positive for "**normal**" goods, negative for "**inferior**" goods
- **Cross-price elasticity of demand**
  - How does demand for good Y change when price of X changes?

$$E_{YX}^D = \frac{\%\Delta Q_Y^D}{\%\Delta P_X} = \frac{\Delta Q_Y^D}{\Delta P_X}\frac{P_X}{Q_Y^D}$$

  - Positive for "**substitutes**," negative for "**complements**"

Price elasticity of supply

- **Supply elasticity** $= \dfrac{\%\Delta Q^S}{\%\Delta P}$

- Usually positive, but can be:
  - zero (perfectly inelastic)
  - infinite (perfectly elastic)
  - or even negative in unusual cases

Short run vs. long run elasticities

- **Short run**: Only some things can change; others are fixed
- **Long run**: Everything can change
- Very fuzzy definitions!

- Elasticities are often **larger in the long run** than in the short run
  - More time means more ways to adjust to a price change

Examples to think about for conference

- Demand elasticity for perfect coronavirus vaccine or cure
- Demand elasticity for gasoline in short run and long run
- Supply elasticity of gasoline in short run and long run
- Demand for Reed education

Daily diversion: A bad economist joke

A woman hears from her doctor that she only has half a year to live. The doctor advises her to marry an economist.

The woman asks, “Will this cure my illness?”

“No,” the doctor answers, “but the six months will seem like a lifetime!”

--Taken from Jeff Thredgold, *On the One Hand: The Economist's Joke Book.*

What comes next?

- Monday's class applies the competitive model to analysis gains from exchange and the effects of price controls and taxes
- The material in Monday's class is essential for analyzing the results of the experiment for Problem Set #2, which is due on Wednesday
- Monday's case of the day discusses some counterintuitive examples that don't follow the usual theory