Lecture 7.
Elasticity of Demand

Session ID: DDEE

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So far we've seen that…

- On the demand curve, when the price rises, the quantity demanded falls.
- On the supply curve, when the price rises, the quantity supplied increases.
- But by how much will the quantity demanded fall?
- And by how much will the quantity supplied rise?

- Firms care:

- Governments care:

- Most important, your mother cares.

- To answer these questions, we have to understand the concept of elasticity,…
- …which measures the responsiveness of one variable to another as a ratio of *percentages*.
- We begin with the *price elasticity of demand*.
  - Sometimes we call it just the *"elasticity of demand."*
  - Or maybe *"own-price elasticity of demand."*

Price Elasticity of Demand

- The elasticity of demand tells us how sensitive the quantity demanded is to the good's price *at a given point on a demand curve*.
- The price elasticity of demand ε is defined by:

$$\varepsilon = \frac{\textit{Percentage Change in Quantity Demanded}}{\textit{Percentage Change in Price}}$$

result (numerator) *cause* (denominator)

or equivalently by

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

Δ *means "change in"*

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

Example: Cigarettes

- Suppose that when the price of cigarettes rises by 10%,…
- the quantity of cigarettes demanded falls by 5%.
- Then the elasticity of demand for cigarettes is:

$$\varepsilon = \frac{-5\%}{10\%} = -1/2$$

Midpoint (Arc) Elasticities

- There are some things that are better NOT to know, like the midpoint elasticity formula.

$$\varepsilon = \frac{(Q_2 - Q_1)/[(Q_2 + Q_1)/2]}{(P_2 - P_1)/[(P_2 + P_1)/2]}$$

- I want you to understand concepts.
- I don't want you to *memorize* formulas,...
- …not even when the formula is in the textbook.

- The normal way to calculate percentage changes is to place the old (original) value in the denominator.

$$\textbf{Percentage change} = \frac{\textbf{New Value} - \textbf{Old Value}}{\textbf{Old Value}}$$

- The midpoint method calculates percentage changes in a strange way. Don't use it.

$$\textbf{Percentage change} = \frac{\textbf{New Value} - \textbf{Old Value}}{(\textbf{New Value} + \textbf{Old Value})/2}$$

Example: Pork

- Suppose the price of pork falls by 2%, and the quantity demanded increases by 6% as a result.
- Then the price elasticity of demand for pork is…

$$\varepsilon = \frac{\qquad}{\qquad} =$$

- The own-price elasticity of demand is generally negative (when price rises, quantity falls).
- Economists sometimes drop the minus sign, because we *know* that the elasticity is negative,…
- but I will keep the minus sign most of the time!

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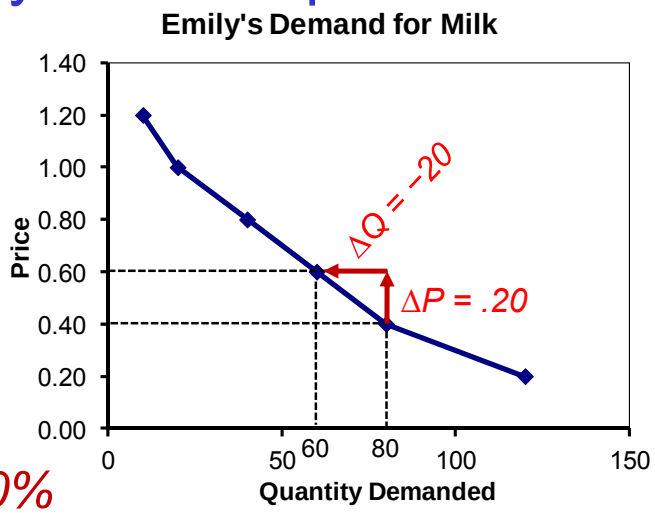
Why Percentages?

- We use percentage changes to compute elasticities, *not* the amounts of the changes. Why?
- **Example:** Pork again.
  - When the price is $4.00 per kg, 500 grams are demanded.
  - But when the price changes to $3.92, then 530 grams are demanded.
  - What is the price elasticity of demand?

- Solution with percentages (%ΔQ / %ΔP):
  - We have $\Delta P = 3.92 - 4.00 = -.08$
  - so that $\%\Delta P = -.08/4.00 = -.02 = -2\%$. (change / old value)
  - Also $\Delta Q = 530 - 500 = 30$
  - so that $\%\Delta Q = 30/500 = 6\%$. (change / old value)
  - and $\varepsilon = 6\% / -2\% = -3$
- Without percentages (ΔQ / ΔP):
  - With prices in dollars: $\Delta Q/\Delta P = 30/-.08 = 375$
  - With prices in cents: $\Delta Q/\Delta P = 30/-8 = 3.75$
  - Different units ⇒ different results!
  - But percentages don't have units—no problems.

Elasticity on a Graph

- Suppose the price of milk goes from $.40 to $.60.
- What is Emily's elasticity of demand when the price is $.40?



- $\%\Delta P = .20/.40 = 50\%$
- $\%\Delta Q = -20/80 = -25\%$
- $\varepsilon = \%\Delta Q/\%\Delta P = -25\%/50\% = -1/2$

Interpreting Elasticity of Demand

- Remember: $\varepsilon = \dfrac{\text{Percentage Change in Quantity Demanded}}{\text{Percentage Change in Price}}$
- We see whether $|\varepsilon|$ (the elasticity without the minus sign), is larger or smaller than 1.
  - For $|\varepsilon| > 1$, we say that demand is elastic.
  - For $|\varepsilon| < 1$, we say that demand is inelastic.
  - For $|\varepsilon| = 1$, we say that demand is unit-elastic.

Example: Ski Passes

- What is the elasticity of demand for season ski-passes?

	Price	Quantity
Old	$400	10,000
New	$380	12,000

$$\%\Delta P = (380 - 400)/400 = -5\%$$

$$\%\Delta Q = (12000 - 10000)/10000 = 20\%$$

$$\varepsilon = \frac{20\%}{-5\%} = -4$$

So demand for ski passes at $400 is elastic.

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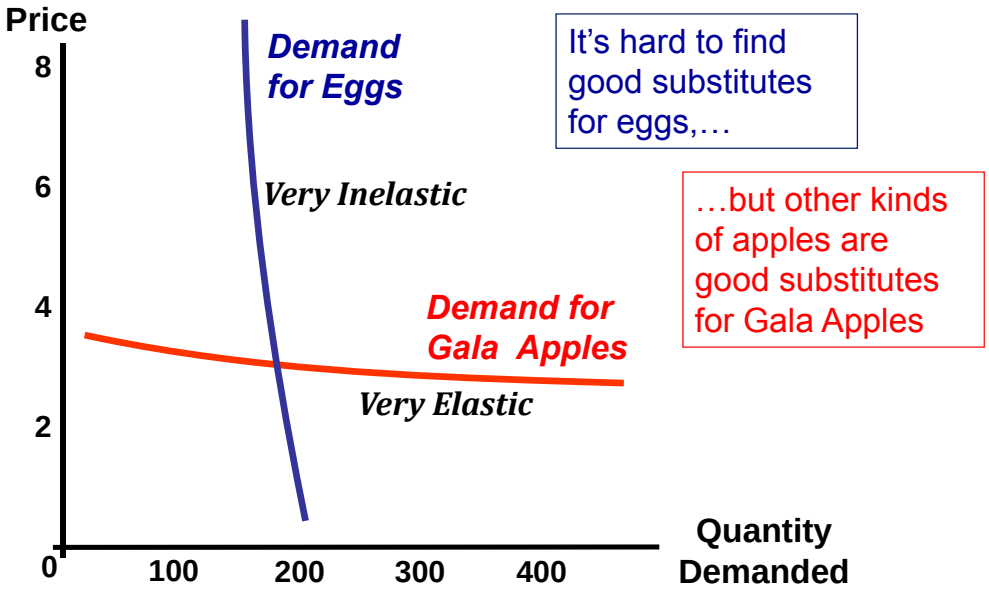
What Determines Demand Elasticity?

- Why is the demand for peas…
- …so much more elastic than the demand for coffee?
  - Availability of Substitutes: "Few things can give you such a good jolt as a shot of coffee" – but you can substitute other vegetables for peas.
- The demand for Colombian coffee is more elastic than the demand for coffee in general,…
- …because it's easier to substitute between different types of coffee than to substitute something else for coffee.
- The demand for the product of a single firm is more elastic than that for the whole industry—for the same reason.

- Why is the demand for housing…
- …so much more elastic than the demand for coffee?
  - **Budget Share:** Housing is expensive, and a large share of the budget,…
- But the demand for edible salt is much less elastic than the demand for coffee, exactly because the budget share of salt is so small.

Example: Demand for Eggs and Demand for Gala Apples



Example: Elasticity of Demand for Rice

- An Indian economics professor who lives and teaches in Canada, visited villages in India to conduct research.
- Many people asked him the same question…
  - "How many hours do you have to work in Canada to earn enough to buy a kilogram of rice."
  - The professor was very embarrassed, because he had no idea of what the answer was.

- The professor eats lots of rice, but he doesn't even know the price of rice in his local Canadian food shop.
  - Why doesn't he know its price?
  - Do you think that most Indians know the price of rice in their shops?
- Whose demand for rice is more elastic?
  - the professor's?
  - the Indian villager's?
- If the price of rice in India jumps up, what do you think would happen?

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Example: Mosquito Nets for Malaria Prevention*

**suggested by Amrit Amirapu*

- According to WHO, malaria kills almost 700,000 people each year.
  - Malaria is spread by mosquitoes.
  - Insecticide-impregnated nets can protect against malaria.
- A 2010 study** finds that the elasticity of demand for the nets is very large!
  - People are far more likely to accept and use the nets if they get them free, than if they have to buy them…
  - even when the price is very low.
  - What are the policy implications of the study?

** Cohen and Dupas, QJE, 2010, included in course website: CLASSES > Readings.

Measured Elasticities of Demand

**** Broiler Chickens***
−0.5 to −0.6

**** Petroleum (World)***
−0.4

**** Car fuel***
−0.25 (Short run)
−0.64 (Long run)

**** Medicine (US)***
−0.31 (Insurance)
−.03 to −.06 (Pediatric Visits)

**** Soft drinks***
−0.8 to −1.0 (general)
−3.8 (Coca Cola)
−4.4 (Mountain Dew)

**** Steel***
−0.2 to −0.3

**** Eggs***
−0.1 (US)
−0.35 (Canada)
−0.55 (South Africa)

http://en.wikipedia.org/wiki/Price_elasticity_of_demand

* *Cigarettes (US)*
  - *−0.3 to −0.6 (General)*
  - *−0.6 to −0.7 (Youth)*

* *Alcoholic beverages (US)*
  - *−0.3 (Beer)*
  - *−1.0 (Wine)*
  - *−1.5 (Spirits)*

* *Airline travel (US)*
  - *−0.3 (First Class)*
  - *−0.9 (Discount)*
  - *−1.5 (for Pleasure)*

* *Rice*
  - *−0.47 (Austria)*
  - *−0.80 (Bangladesh)*
  - *−0.80 (China)*
  - *−0.25 (Japan)*
  - *−0.55 (US)*

* *Cinema visits (US)*
  - *−0.87*

* *Transport*
  - *−0.20 (Bus travel US)*
  - *−2.80 (Ford)*

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