Lecture 7.
Elasticity of Demand

Session ID: DDEE

Clicker Question
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?
- *(And who cares about the answer to this question 😊?)*

- **Firms care**

- **Governments care:**
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:

\[ \varepsilon = \frac{\text{Percentage Change in Quantity Demanded}}{\text{Percentage Change in Price}} \]

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:

\[ \varepsilon = \frac{?}{?} = \]
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.

Use this most of the time!

**Percentage change** = \( \frac{\text{New Value} - \text{Old Value}}{\text{Old Value}} \)

The midpoint method calculates percentage changes in a strange way.

Use this only when the midpoint formula is requested!

**Percentage change** = \( \frac{\text{New Value} - \text{Old Value}}{(\text{New Value} + \text{Old Value})/2} \)
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…

\[ \varepsilon = \frac{\% \text{ change in quantity}}{\% \text{ change in price}} = \]

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!
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 ΔP = 3.92 − 4.00 = −0.08
- so that %ΔP = −0.08/4.00 = −0.02 = −2%.
- Also ΔQ = 530 − 500 = 30
- so that %ΔQ = 30/500 = 6%.
- and ε = 6% /−2% = −3

Without percentages (ΔQ / ΔP):

- With prices in dollars: ΔQ/ΔP = 30/−.08 = 375
- With prices in cents: ΔQ/ΔP = 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?

\[ \% \Delta P = \] \[ \% \Delta Q = \]

\[ \varepsilon = \frac{\% \Delta Q}{\% \Delta P} = \]

Interpreting Elasticity of Demand

- Remember: \[ \varepsilon = \frac{\text{Percentage Change in Quantity Demanded}}{\text{Percentage Change in Price}} \]
- 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?

<table>
<thead>
<tr>
<th>Price</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old $400</td>
<td>10,000</td>
</tr>
<tr>
<td>New $380</td>
<td>12,000</td>
</tr>
</tbody>
</table>

So demand for ski passes at $400 is elastic.

\[
\%\Delta P = \quad \%
\]

\[
\%\Delta Q = \quad \%
\]

\[
\varepsilon = \frac{?}{?} =
\]

**Clicker Question**
What Determines Demand Elasticity?

- Why is the demand for peas...
- …so much more elastic than the demand for coffee?
  - Availability of Substitutes

- 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: …

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.

- People aren’t sensitive to the price of salt, because …
**Example: Demand for Eggs and Demand for Gala Apples**

- **Demand for Eggs**
  - Very Elastic
- **Demand for Gala Apples**
  - Very Inelastic

<table>
<thead>
<tr>
<th>Quantity Demanded</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>8</td>
</tr>
<tr>
<td>200</td>
<td>6</td>
</tr>
<tr>
<td>300</td>
<td>4</td>
</tr>
<tr>
<td>400</td>
<td>2</td>
</tr>
</tbody>
</table>

**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?
Example: Mosquito Nets for Malaria Prevention*
*suggested by Amrit Amirapu

According to WHO, malaria killed an estimated 584,000 people in 2013 (down by 47 percent since the year 2000).

A 2010 study** finds that the elasticity of demand for the nets is very large!

What are the policy implications of the study?

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

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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)
  -0.03 to -0.06 (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)

* 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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**Clicker Question**
Clicker Question

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