

# Long Run elasticity and Income elasticity

## Econ 1101

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## ECON 1101 Lecture 3.2

1. Long Run elasticity of Demand
2. What makes the demand more elastic?
3. Income Elasticity of Demand

## We just saw

- Elasticity is the responsiveness of demand and supply to changes.
- Price elasticity  $e^D$ : as a measure of how much the quantity demanded (%) changes when the price (%) changes

- Formula: 
$$e^D = - \frac{\% \Delta Q^D}{\% \Delta P} = - \frac{\frac{Q_2 - Q_1}{\frac{1}{2}(Q_2 + Q_1)}}{\frac{P_2 - P_1}{\frac{1}{2}(P_2 + P_1)}}$$

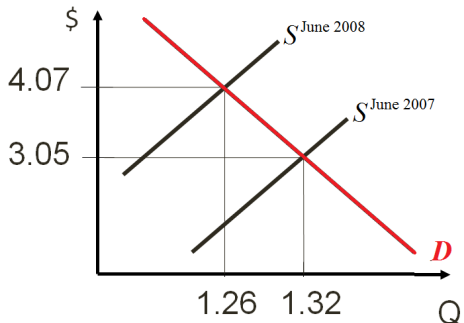
- To measure  $e^D$  we need a shift along the D curve:
  - Kept other determinants of D constant
  - Shift along the curve caused by a shift in the Supply Curve

## Example of Gas Markets in the US June 2007 and June 2008

We made the case that the change in quantity was a shift along the D curve  
 Caused by a shift of the Supply curve

- We established the determinants of demand did not change
- We established there was a change in the price of oil input of gas  
 ⇒ Shift to the left S

We explained this was short run e: consumers did not have time to adjust



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# 1. Long Run Elasticity

## Introducing the concept of long run elasticity

Elasticity we have estimated is a **short-run elasticity**

Consumers have not had much time to make a response.

However over a long period of time, if gas is significantly higher in price:

- Consumers will buy different cars
- Might live different places
- Society might change laws, like lower the speed limit.

So consumers will have time to adjust

For the **long-run elasticity**, need to compare cases where prices have been different a long time.

## Long Run Elasticity: CASE STUDY

Let's take a look at [Reading 2](#) "Fuel Consumption in Europe and the U.S."

Europe has long taxed gasoline. What we pay here at the pump for gas would't pay the tax in the Europe

The tax here is (per gallon):

- Federal                    18.4 cents
- State (MN)                28.6
- Total (MN)                47.0  
    (34.8 cents more in CA)

# Long Run Elasticity: CASE STUDY

We want to study long run elasticity:

- To make our comparison, we need to examine two different populations that have experienced substantially different prices of gas over long periods of time.
- For the comparison to be valid, we have to argue that the two populations are similar in other characteristics.
- That is difficult to do, as we will see.
- But we will do our best and will have something interesting to say.
- Let's compare the U.S. and Norway



# Long Run Elasticity: CASE STUDY

Country	Average Price \$US per Gallon	Consumption Per Capita Gallons Per Day	Per Capita GDP (\$1,000)
United States	2.80	1.29	45.5
<b>Selected Countries in Europe</b>			
Norway	7.00*	.30	51.9
United Kingdom	6.90	.28	35.7
Germany	6.88	.25	34.3
France	6.37	.15	32.7
Spain	5.13	.15	31.6
Italy	6.50	.21	30.4
<b>Some Other Countries</b>			
Japan	4.49	.33	33.6
Mexico	2.45	.29	14.0
China	2.29	.04	5.3

# Price and Per Capita Quantity Consumed of Gasoline The United States and Norway in 2007

<b>Time Period</b>	<b>Per Capita Daily Consumption of Motor Gasoline</b>	<b>Average Price Per Gallon in Dollars</b>
<b>United States (the "now")</b>	1.29	<b>2.80</b>
<b>Norway (the "future")</b>	.30	<b>7.00</b>
<b>Δ</b>	-.99	<b>4.20</b>
<b>Average of Both Periods</b>	.80	<b>4.90</b>
<b>%Δ</b>	<b>-1.24</b>	<b>.86</b>

So: **Elasticity(long run)**  
 $= \% \Delta Q / \% \Delta P$   
 $= 1.24 / .86 = 1.44$

## As before is this valid? (shift along the D curve)

1. Is the Supply Curve shifting between these two countries?

- Certainly. The gas tax is much higher in Norway.
- Recall gas is an input in for example the distribution of gasoline.
- This increase suppliers costs and shifts the supply curve to the left.

2) Is Demand Curve staying fixed?

A) Income:

Average income in Norway is similar to the U.S. So in the comparison, we can regard income as being held fixed.

## (2) Is Demand Curve staying Fixed?

B) Price of Substitutes: **Oops**. Public transit is more convenient in Norway, it is a better option

- The availability of a substitute shifts the demand for gas down and to the left. So our simple analysis gives the higher price too much of the credit for the lower consumption in Norway. Demand for gas in Norway is lower both because the price of gas is higher and because public transit is better.
- Public transport is better contributing to a lower consumption in gas in Norway

So the actual elasticity is lower than the 1.44 estimate above.

- Instead of saying a 1% increase in price causes a 1.44% decrease in quantity, some of that decrease in quantity is due to availability of substitutes and not just because of the 1% price increase)

## As before is this valid? (shift along the D curve)

### C) Other Factors:

Population density impacts gasoline demand.

- Population density is lower in the US than Europe and that is one reason demand for gas is higher in US.
  - Think of the following comparison: Wyoming consumes substantially more gas per capita than New York state, because people in Wyoming are more likely to drive 30 miles to a Wal-Mart to purchase a gallon of milk compared to people who live in New York City
- But Norway is less dense than most European countries, one reason demand for gas is lower in Norway
- so Norway and U.S. comparison is not as bad.

## Bottom Line of Long Run Price Elasticity

- In the Long Run, people have more time to adjust for changes in price.
- In the Long Run the demand is more elastic: quantity demanded is more responsive to changes in the price.
- Example: International comparison of Gas prices (taxes) US vs Norway
- We estimated the demand of gas (elastic - higher than 1)
- We showed it was a valid analysis:
  - due to a change in the supply (change in price of input)
  - income was held constant, population analysis is not as bad, and
  - we pointed out there are more substitutes of cars in Norway (elasticity might be over estimated)

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### 2. What makes the demand more elastic?

# What makes the demand more elastic?

1. Long Run horizon (from our previous analysis):
  - If taxes of gasoline are high for a long period of time, like in Europe, as gas buzzed cars get old, consumers will tend to replace them with fuel efficient cars.
  - People will move closer to their work, and other adjustments that take time
  - So demand is more elastic in the LR than in the SR
2. When goods are Luxury (as opposed to necessity where demand is inelastic)
3. When products are defined more narrowly so there exist closer substitutes. (Hard to define substitutes for broad categories)



## Example: food - inelastic good

To illustrate points (2) and (3) Lets look at **food**:

(A) Food is a necessity so as a group, price elasticity is low (**inelastic**)  
its hard to substitute away from food

- So if all prices increase 10%, quantity falls less than 10%
- so spending on food goes up
- from the concepts introduced in short run elasticity: for inelastic goods  $\uparrow P \Rightarrow \uparrow \text{total expenditure}$

Price of food goes up overall, you still need to eat.

## Example: food - narrowing the group - elastic good

(B) But now suppose look at one kind of food, meat

- Suppose there was an increase in the price of meat while other food prices are fixed

we are narrowing the group - closer substitutes- we expect more elastic

- Some possibilities for substitution: fish, cheese, bread, etc...

C) Now look at raising price of Johnsonville Brats 10%

- Can easily substitute a different brand of brat, so very responsive to changes in price.

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### 3. Income Elasticity of Demand

# Income Elasticity of Demand: Application Health Care

Health Care (a necessity)

(At country level)

We will look at this data on health care spending as percent of GDP (gross domestic product) for various countries Data from, Uwe E. Reinhardt,

Peter S. Hussey and Gerard F. Anderson, "U.S. Health Care Spending In An International Context," Health Affairs, 23, no. 3 (2004): 10-25  
<http://content.healthaffairs.org/cgi/content/full/23/3/10>

## Income Elasticity of Demand: Application Health Care

Country	GDP per Capita	Health Spending Share
US	35.2	13.9
Switzerland	29.9	11.1
Norway	36.4	9.0
Germany	26.2	10.7
Canada	28.8	9.7
<b>Average Rich</b>	<b>31.3</b>	<b>10.9</b>
Hungary	13.4	6.8
Slovak Rep	12.0	5.7
Mexico	8.9	6.0
Turkey	5.7	4.8
<b>Average Poor</b>	<b>10.0</b>	<b>5.8</b>

So health care at the country level is clearly an **income elastic** good.

Richer countries tend to spend a higher share of income on health care.

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"ECON LAND"