Econ Dept, UMR
Presents

The Demand Side of the Market
Starring

- Utility Theory
- Consumer Surplus
- Elasticity
Featuring

- The MU/P Rule
- The Meaning of Value
- Four Elasticities:
  - Price Elasticity of Demand
  - Income Elasticity
  - Cross Price Elasticity
  - Price Elasticity of Supply
- The Elasticity-TR Relationship
In Three Parts

Consumer Choice Theory

Consumer Surplus

Elasticity

A. Price Elasticity of Demand
B. Other Important Elasticities
Elasticity

Measures of Response
This Slide Show Discusses
Income Elasticity; Cross Price
Elasticity of Demand; And
Price Elasticity of Supply

- Price elasticity of demand is discussed in slide show III.A.
Review: A Generic Definition of Elasticity

- $Y = f(x)$

- Elasticity, $\varepsilon$, = $\%\Delta y / \%\Delta x$, where $\Delta$ is read “change in”

- $\%\Delta Y = (\Delta y / y)*100$; $\%\Delta X = (\Delta x / x)*100$

- $(\Delta Y / y) / (\Delta x / x)$, or

- $[(\Delta Y / \Delta x) / (x / y)]$

- In words, elasticity gives us the estimated percentage change in one variable, $y$, in response to a percentage change in another variable, $x$, c.p.
Review: Generic Interpretation of Elasticity

\[ \varepsilon = \frac{\% \Delta Y}{\% \Delta x} = 2 \]

- This means if \( x \) were to change by 1 percent, we would expect \( y \) to change by 2 percent in the \textit{same} direction, \( c.P \)

\[ \varepsilon = \frac{\% \Delta Y}{\% \Delta x} = -2 \]

- This means if \( x \) were to change by 1 percent, we would expect \( y \) to change by 2 percent in the \textit{opposite} direction, \( c.p. \)
Other Important Elasticities

**Income Elasticity**

\[ I = \frac{\% \text{ change } D_x}{\% \text{ change in consumer income}} \]

**Cross-Price Elasticity**

\[ x,z = \frac{\% \text{ change } D_x}{\% \text{ change in the price of another good, } Z} \]

**Price Elasticity of Supply**

\[ S = \frac{\% \text{ change } Q_s}{\% \text{ change in price}} \]
Elasticity Formulas

- **Income elasticity**
  \[ \varepsilon_I = \frac{\% \Delta \text{ in } D}{\% \Delta \text{ in } I} = \frac{\Delta D}{\Delta I} \frac{I}{D} \]

- **Cross price elasticity of demand**
  \[ \varepsilon_{D_1,P_2} = \frac{\% \Delta \text{ in } D_1}{\% \Delta \text{ in } P_2} = \frac{\Delta D_1}{\Delta P_2} \frac{P_2}{D_1} \]

- **Price elasticity of supply**
  \[ \varepsilon_S = \frac{\% \Delta \text{ in } Q_s}{\% \Delta \text{ in } P} = \frac{\Delta Q_s}{\Delta P} \frac{P}{Q} \]
Income Elasticity of Demand

- An estimate of the rate at which the demand for a good changes as consumer incomes change by a given percent
Income Elasticity of Demand

- **Income elasticity of demand** ($I$) - measures the responsiveness of demand to changes in income
  
  \[ I = \frac{\% \Delta \ln D}{\% \Delta \text{ in income}} \]

- Note that the sign IS important!
Normal Goods

- Typically, if our income rises, we buy more and visa versa. These types of goods are called **normal goods**.
- \( I > 0 \) normal good
Inferior Goods

- There are some goods we buy less of as our income grows and more of as our income falls.
- For instance, in college you probably eat a lot of hamburger. But when you get a well-paying job (as all UMR grads do) you will probably buy more steak and less burger.
- If a good’s income elasticity is $< 0$ it is an inferior good.
Calculating Income Elasticity

- $D_X = 100 - 2p_X + 0.5\text{inc}$
- $\Delta D_X / \Delta \text{inc} = 0.5$ thus $X$ is a “normal” good
- Evaluate $I$ at any given income and quantity, e.g.,
- $D = 200$ million units; $\text{Inc} = $600 million
- $I = 0.5(600/200) = 1.5$
Cross Price Elasticity of Demand

- Another type of elasticity is the cross price elasticity. This gets at how changes in price of one good can affect the demand of another.

- Cross price elasticity of demand \((\epsilon_{1,2})\) measures the responsiveness of quantity demanded of good one when the price of good two changes.

- This elasticity is very important in antitrust cases.
Cross Price Elasticity of Demand

- The % change in the demand for one good divided by the % change in the price of another good.
- Substitutes - as price of A rises so does the demand for B.
- Complements - as price of A rises the demand for B decreases.
- Unrelated - as the price of A rises there is no change in the demand for B.
Cross Price Elasticity of Demand

\[ e_{1,2} = \frac{\% \Delta \text{In D of good 1}}{\% \Delta \text{in P of good 2}} \]

- Note that the sign DOES matter for this elasticity also!
  - If \( e_{1,2} > 0 \) goods one and two are substitutes
  - If \( e_{1,2} < 0 \) goods one and two are complements
Substitute Goods

- Consider coke and Pepsi. If the price of coke goes up, what would you expect to happen to the demand for Pepsi?
  - It will rise, since people will buy less coke and more Pepsi. Thus the demand for Pepsi will rise.

- So the bottom of the elasticity fraction is positive and the top of the elasticity fraction is positive, $\epsilon_{1,2} > 0$. 

Complement Goods

- Consider washing machines and dryers. If the price of washing machines goes up, what would you expect to happen to the demand for dryers?
  - It will fall, since people will buy less washers at the new price, they will need less dryers.
- So the bottom of the elasticity fraction is positive and top of the elasticity fraction is negative, \( \varepsilon_{1,2} < 0 \).
Calculating Cross Price Elasticity

- \( D_x = 100 - 2p_x + 0.5 \text{inc} - 8000P_w + 4000P_z \)
- \( \Delta D_x / \Delta P_w = -8000 \) thus \( X \) and \( W \) are complements
- \( \Delta D_x / \Delta P_z = 4000 \) thus \( X \) and \( Z \) are substitutes
- Evaluate \( x_w \) or \( x_z \) at any given price of \( W \) or \( Z \) and quantity, e.g.,
- \( D = 20 \) million units; \( P_w = $100; P_z = $50 \)
  - \( x_w = -8000(100/20m) = -0.04 \)
  - \( x_z = 4000(50/20m) = 0.01 \)
### Demand Elasticities for Alcoholic Beverages

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<tr>
<th></th>
<th>Beer</th>
<th>Wine</th>
<th>Spirits</th>
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<tbody>
<tr>
<td>$\epsilon_B$</td>
<td>0.23</td>
<td>0.40</td>
<td>0.25</td>
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<tr>
<td>$\epsilon_{BW}$</td>
<td>0.31</td>
<td>0.16</td>
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<tr>
<td>$\epsilon_{Bsp}$</td>
<td>0.15</td>
<td>0.10</td>
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$I$: Income; $B$: Beer; $W$: Wine; $Sp$: Spirits; $\epsilon_{B(W)(Sp)}$: Price elasticity of beer (wine, spirits); $\epsilon_{xz}$: Cross Price Elasticity of $X$ with respect to $Z$, that is the % change in the demand for $X$ divided by the % change in the price of $Z$; $\epsilon_{xI}$: Income Elasticity of $X$.

Notes on Estimated Demand Elasticities for Alcoholic Beverages

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- Notice Beer, Wine, and Spirits are substitutes as defined by economists.
- Which two are closest substitutes? Appears beer for wine.
- Which is more sensitive to changes in income? Looks like Wine.
- Notice Beer is an “inferior” good.
Elasticity of Supply

- This one is the same as price elasticity of demand, except we substitute the word supply for demand and drop the negative sign in the definition.

- Elasticity of supply, \( E_s \), measures the responsiveness of quantity supplied to changes in price of the good.
Elasticity of Supply

\[ s = \frac{\% \Delta \ln Q_s}{\% \Delta \ln P} \]

- The tendency of supply tells us this number is generally positive.
Calculating Price Elasticity of Supply

- $S_X = -100 + 2p_X$
- $\Delta S_X / \Delta P_X = 2.0$
- Evaluate $s$ at any given price and quantity, e.g.,
  - $S = 200$ units; $P_X = $60
  - $s = 2(60/200) = 0.6
Estimates of Labor Supply Elasticity

- $E_h$ of annual hours for males is estimated at -0.1 (a 10% increase in wages is predicted to reduce annual hours of males by 1%)
- $E_s$ of annual hours for women is 0.2
- $E_{fWh}$ female hours/$E_{hWh}$ husband’s wage, estimated at 0.17
- $E_{flfpr Wh}$ female labor force participation rate/$E_{hWh}$ husband’s wage, estimated at 0.53
Determinants of Elasticity of Supply

- If supply is getting more (or less) elastic, we are saying that the sellers can change supply in larger (or smaller) quantities when price changes.
- Generally, *anything* that can effect a seller’s ability to change production will effect the elasticity of supply.
Determinants of Elasticity of Supply

- The time period: the longer the period, the more elastic supply.
- Availability of alternatives: the more alternatives, or an improvement in the attractiveness of alternatives, the more elastic supply.
The End