

# ECO 610: Lecture 2

Theory of Demand; Elasticity; and  
Marketing and Consumer Behavior

# Theory of Demand; Elasticity; and Marketing and Consumer Behavior: Outline

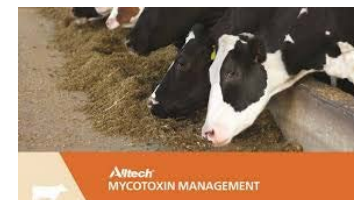
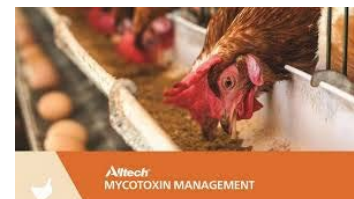
- Demand Theory and Marketing Research
  - Households' demand for final goods and services
  - Firms' demand for factors of production
- Elasticity
  - Own-price elasticity of demand
    - ✓ Calculating elasticity
    - ✓ Own-price elasticity and total revenue
    - ✓ Factors affecting own-price elasticity
  - Income elasticity of demand
  - Cross-price elasticity of demand
- Estimating demand relationships

# Theory of Demand/Marketing/Consumer Behavior

- What is marketing? (versus advertising)
- How does one do marketing research?
- What theoretical framework does one use when doing marketing research?
- Who are the firm's customers? Households or firms? What decision-making process do the firm's customers use when evaluating whether or not to purchase the firm's product?

- Examples:

- Brown Forman and bourbon
- Valvoline and motor oil
- Alltech and animal food supplements



# Households' demand for final goods and services

- Why do households demand final goods and services?
- Because households get **utility** from consuming goods and services.
- Quantity Demanded ( $Q_D$ ): total amount of a commodity that all households wish to purchase.
- Factors affecting  $Q_D$ :
  1. tastes or preferences
  2. income
  3. price of the product
  4. prices of other products
    - a) substitutes in consumption
    - b) complements in consumption
  5. other things?

# Firms' demand for factors of production

- Why do firms demand inputs (factors of production)?
  - Because firms use inputs to produce outputs that can be sold for **profits**.
- Demand for an input is **derived** from the demand for the final good or service the input is used to produce.
- Two key economic factors in a firm's demand for an input:
  - Household demand for the final good or service
  - Extent to which the firm is able to substitute one input for another in its production process

# Marketing research example

- Your team is given the following assignment:
- “PepsiCo Pushes Breakfast in Bid to Heat Up Oatmeal, *WSJ*, 7/28/10.
- <http://ezproxy.uky.edu/login?url=http://search.proquest.com/docview/732571063?accountid=11836>
- Figure out the best way to increase the demand for Quaker Oatmeal.
- Where do you start?
- <https://www.youtube.com/watch?v=UhO1uOC91Yo>
- <https://www.youtube.com/watch?v=31ujStZvEI4>
- <https://www.youtube.com/watch?v=-Tw3AR9ubgw>

# Elasticity

- Demand function: quantity demanded of good X depends consumers' tastes or preferences, incomes, the price of good X, and the prices of other goods (like good Y, a substitute, and good Z, a complement).
- Algebraically:  $X_D = d_x(\text{Tastes, Incomes, } P_x, P_y, P_z)$
- We are interested in the relationship between quantity demanded of X and each of the economic factors which influence it. We have already discussed conceptually the direction of the effect of each variable that affects  $X_D$
- Now we want to consider the magnitude. If the price of X changes by a given amount, by how much will the quantity demanded of X change, i.e. how sensitive is quantity demanded to a change in price?

# Three elasticities

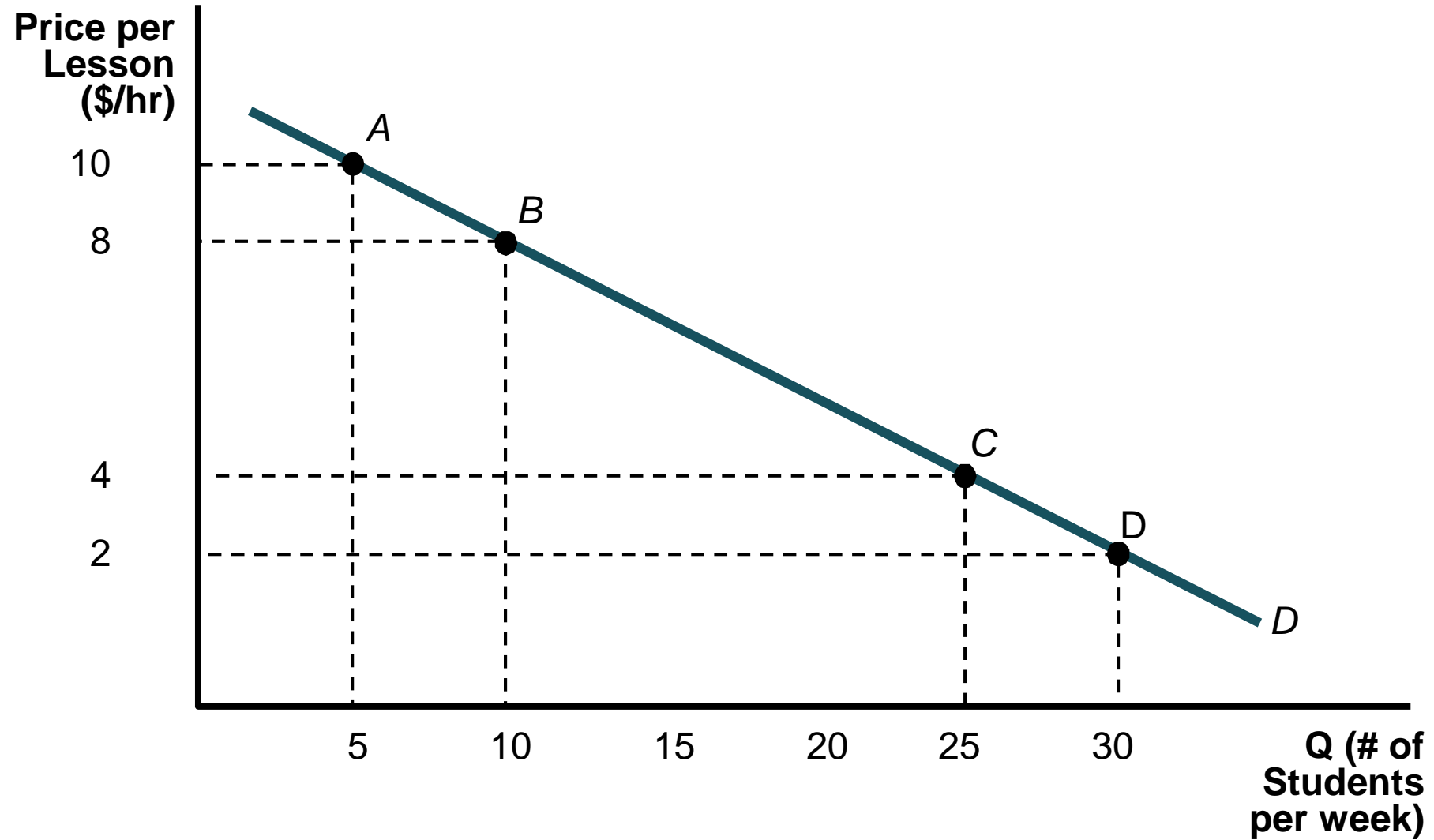
- **Own price elasticity of demand:** measures the sensitivity of quantity demanded of good X to a change in the price of good X
- $\epsilon_{X, P_X} = - (\% \Delta X_D) / (\% \Delta P_X)$
- **Income elasticity of demand:** measures the sensitivity of quantity demanded to a change in income
- $\epsilon_{X, \text{Income}} = (\% \Delta X_D) / (\% \Delta \text{Income})$
- **Cross-price elasticity of demand:** measures the sensitivity of quantity demanded of good X to a change in the price of good Y
- $\epsilon_{X, P_Y} = (\% \Delta X_D) / (\% \Delta P_Y)$



# Calculating Own-price Elasticity of Demand: Arc elasticity formula

- $\epsilon_{X, P_X} = - (\% \Delta X_D) / (\% \Delta P_X)$
- $\epsilon_{X, P_X} = - \frac{(Q_1 - Q_0) / [\frac{1}{2}(Q_1 + Q_0)]}{(P_1 - P_0) / [\frac{1}{2}(P_1 + P_0)]}$
- $\epsilon_{X, P_X} = - \frac{\Delta Q / (Q_1 + Q_0)}{\Delta P / (P_1 + P_0)}$

# Calculating Price Elasticity of Demand for Tennis Lessons



# Examples calculating arc elasticity

- Calculating  $\epsilon_{x, P_x}$  from point A to point B:

$$P_0=10, P_1=8, Q_0=5, Q_1=10$$

$$E_d = -\frac{\frac{10-5}{5+10}}{\frac{8-10}{10+8}} = -\frac{\frac{5}{15}}{\frac{-2}{18}} = \left(\frac{5}{15}\right)\left(\frac{18}{2}\right) = \left(\frac{1}{3}\right)9 = 3$$

- Calculating  $\epsilon_{x, P_x}$  from point C to point D:

$$P_0=4, P_1=2, Q_0=25, Q_1=30$$

$$E_d = -\frac{\frac{30-25}{25+30}}{\frac{2-4}{4+2}} = -\frac{\frac{5}{55}}{\frac{-2}{6}} = \left(\frac{5}{55}\right)\left(\frac{6}{2}\right) = \left(\frac{1}{11}\right)3 = \frac{3}{11}$$

# How to interpret the elasticity coefficient:

- if  $\epsilon_{x, p_x} > 1$  then we say that demand is **elastic**

$$\frac{\% \Delta Q}{\% \Delta P} > 1$$

$$\% \Delta Q > \% \Delta P$$

or  $\% \Delta Q > \% \Delta P$ . This occurs when consumers are relatively responsive to a change in the price of good X.

- if  $\epsilon_{x, p_x} < 1$  then we say that demand is **inelastic**

$$\frac{\% \Delta Q}{\% \Delta P} < 1$$

$$\% \Delta Q < \% \Delta P$$

or  $\% \Delta Q < \% \Delta P$ . This occurs when consumers are relatively unresponsive to a change in the price of good X.

- if  $\epsilon_{x, p_x} = 1$  then we say that demand is **unitary elastic**

$$\frac{\% \Delta Q}{\% \Delta P} = 1$$

$$\% \Delta Q = \% \Delta P$$

or  $\% \Delta Q = \% \Delta P$ .

# Own-price elasticity and total revenue

- “Thrill parks try to boost attendance: Some lower their fees to attract crowds,” *Lexington Herald-Leader*, 5/27/06. <http://bit.ly/odthLq>
- <https://www.cedarpoint.com/play/rides-coasters>
- Case study: you own and operate an amusement park. Your costs are primarily fixed—once you decide on a schedule your costs do not vary much with the number of patrons in the park.
- Challenge is to maximize total revenues, in so doing you will maximize profits.
- If you want to increase total revenues, should you raise price or lower the price of admission?



- Suppose you raise price by 5% and the number of customers falls by 10% in response. What is own-price elasticity of demand? Does total revenue go up or down?
- Suppose you lower price by 5% and the number of customers increases by 10% in response. What is own-price elasticity of demand? Does total revenue go up or down?
- Suppose you raise price by 10% and the number of customers falls by 5% in response. What is own-price elasticity of demand? Does total revenue go up or down?
- Suppose you lower price by 10% and the number of customers increases by 5% in response. What is own-price elasticity of demand? Does total revenue go up or down?

# General principles:

- If  $\varepsilon_{x, P_x} > 1$ , i.e. demand is **elastic**, then  $(\% \Delta X_D) > (\% \Delta P_x)$ . An increase in price will cause total revenue to fall and a decrease in price will cause total revenue to rise.
- If  $\varepsilon_{x, P_x} < 1$ , i.e. demand is **inelastic**, then  $(\% \Delta X_D) < (\% \Delta P_x)$ . An increase in price will cause total revenue to rise and a decrease in price will cause total revenue to fall.
- If  $\varepsilon_{x, P_x} = 1$ , i.e. demand is **unitary elastic**, then  $(\% \Delta X_D) = (\% \Delta P_x)$ . Total revenue will stay the same after either a price increase or price decrease.

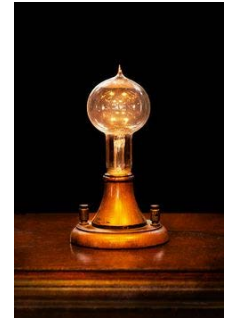
# Determinants of Price Elasticity

- Are there economic characteristics of the product that might help us predict whether demand will be elastic or inelastic? Under what conditions will consumers be sensitive or insensitive to a change in price?
- **Availability of substitutes:** if there are many good close substitutes for a product and its price increases, then consumers will . . .
  - ✓ **Definition of the product:** the more narrowly defined is the product, the more good close substitutes there are . . .
- **Share of the budget:** the greater the share of their budget consumers spend on an item, the . . . sensitive they will be to a price change.
- **Time to adjust:** the more time that consumers have to adjust to a price change, the . . . sensitive they will be to a price change.



# Examples using own-price elasticity

- Residential demand for electricity—availability of substitutes. Lighting? Space heating?



- Forecasting energy demand for KU/LG&E—short run vs. long run?



- Supermarket advertising and loss leaders—milk or salt?



- How to set excise taxes if the goal is to raise revenue—excise tax on cigarettes? Sales tax on thoroughbreds at Keeneland?



# Income Elasticity of Demand

- $\epsilon_{x, \text{Income}} = (\% \Delta X_D) / (\% \Delta \text{Income}) = [\Delta Q / (Q_0 + Q_1)] / [\Delta I / (I_0 + I_1)]$
- $\epsilon_{x, \text{Income}} > 0$  , quantity demanded increases when income increases and vice versa. We call these **Normal Goods**.
- $\epsilon_{x, \text{Income}} < 0$  , quantity demanded decreases when income increases and vice versa. We call these **Inferior Goods**.
- Among normal goods, if  $0 < \epsilon_{x, \text{Inc}} < 1$  , i.e. consumption of a good increases when income increases, but less than proportionate to the increase in income, we call this type of a good a **Necessity**.
- Among normal goods, if  $\epsilon_{x, \text{Inc}} > 1$  , i.e. consumption of a good increases when income increases, but more than proportionate to the increase in income, we call this type of a good a **Luxury Good**.



Picante Beef



# Examples using Income Elasticity of Demand

- Kentucky Lottery Commission: what are your products? Who are your customers, i.e. what is the income elasticity of demand for the different products you sell? How would you market the different products?
- Instant scratch-off games?
- Daily numbers games?
- Lotto games: e.g. Pick Six, Powerball?
- How would you go about estimating income elasticity of demand for different lottery products?



# Cross-price Elasticity of Demand

- $\epsilon_{X, P_Y} = (\% \Delta X_D) / (\% \Delta P_Y) = [\Delta Q / (Q_0 + Q_1)] / [\Delta P_Y / (P_{Y0} + P_{Y1})]$
- $\epsilon_{X, P_Y} > 0$  when an increase in the price of good Y leads to an increase in the demand for good X and vice versa. Goods X and Y are **Substitutes**.
- $\epsilon_{X, P_Y} < 0$  when an increase in the price of good Y leads to a decrease in the demand for good X and vice versa. Goods X and Y are **Complements**.
- How do we interpret the magnitude of the cross-price elasticity? i.e. what is the cross-price elasticity between Coke and Pepsi? Coke and Snapple iced tea? Coke and Dean's chocolate milk? Coke and Bud Lite?



# Marketing Research—Estimating Demand

- Suppose we want to quantify the relationship between quantity demanded of a product and various economic factors that affect it.
- There are various ways to collect empirical data on demand:
  - Consumer interviews and surveys
  - Controlled market studies
  - Uncontrolled market data
- Examples:
  - Frito-Lay comes up with new low-calorie potato chip and wants to know what price point to introduce it at. \$500,000 research budget.
  - Can Lexington support a minor-league baseball team? \$50,000 budget.