ECO 610: Lecture 2

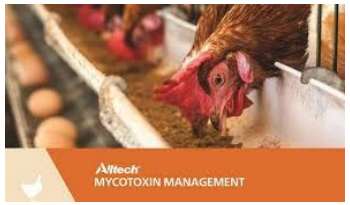
Theory of Demand; Elasticity; and Marketing and Consumer Behavior

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=31ujStZvEl4
- 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
- $\varepsilon_{x,\,Px} = -(\%\Delta X_D) / (\%\Delta P_x)$
- **Income elasticity of demand**: measures the sensitivity of quantity demanded to a change in income
- $\varepsilon_{x,\,Income} = (\%\Delta X_D) / (\%\Delta Income)$
- **Cross-price elasticity of demand**: measures the sensitivity of quantity demanded of good X to a change in the price of good Y
- $\varepsilon_{x,\,Py} = (\%\Delta X_D) / (\%\Delta P_Y)$

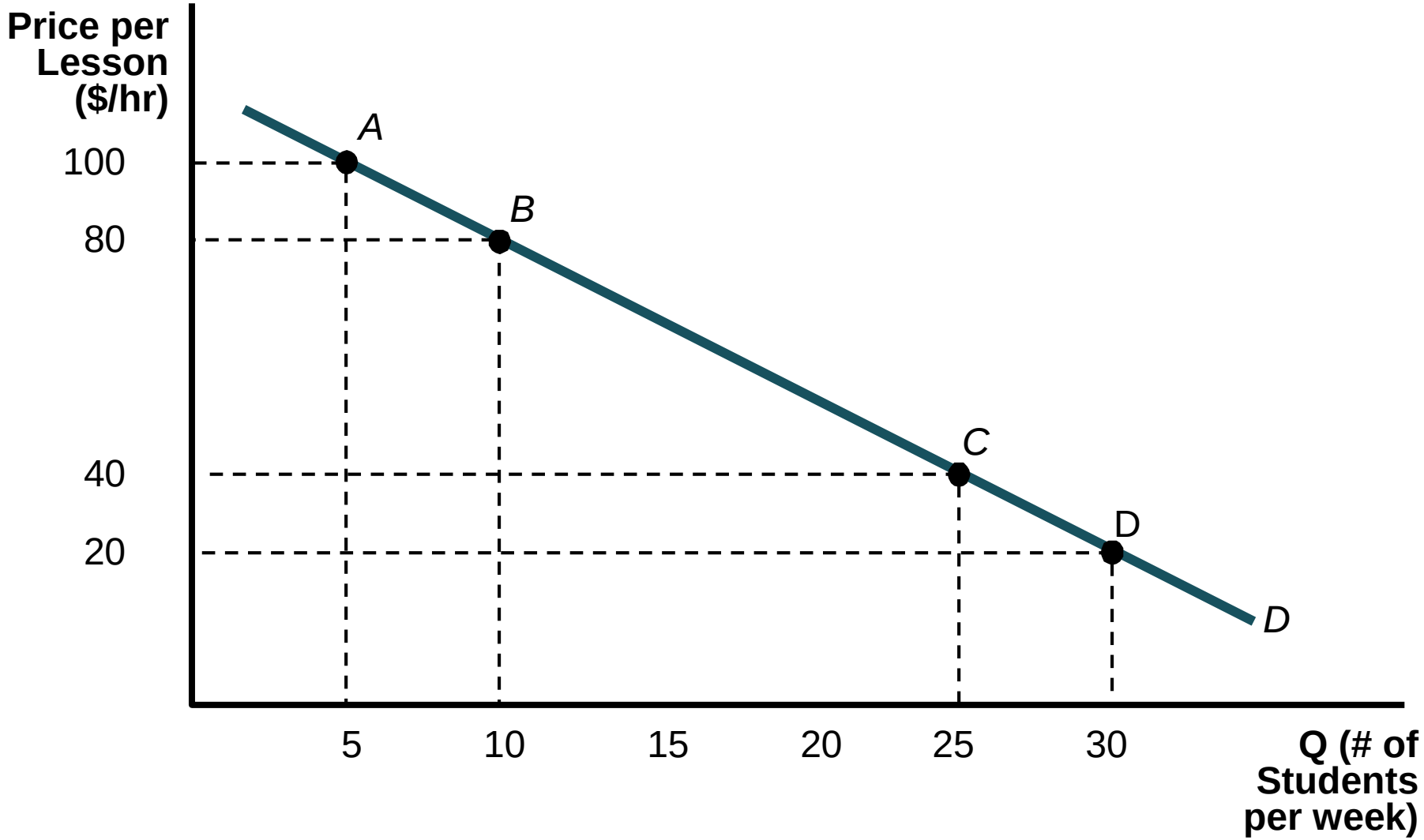
Calculating Own-price Elasticity of Demand: Arc elasticity formula

- $\varepsilon_{x,\,Px} = -(\%\Delta X_D) / (\%\Delta P_x)$

- $\varepsilon_{x,\,Px} = -\dfrac{(Q_1 - Q_0)/[\frac{1}{2}(Q_1 + Q_0)]}{(P_1 - P_0)/[\frac{1}{2}(P_1 + P_0)]}$

- $\varepsilon_{x,\,Px} = -\dfrac{\Delta Q/(Q_1 + Q_0)}{\Delta P/(P_1 + P_0)}$

Calculating Price Elasticity of Demand for Tennis Lessons



Examples calculating arc elasticity

- Calculating $\varepsilon_{x,\,Px}$ from point A to point B:

$$\varepsilon_{x,\,Px} = -\frac{(10-5)/[\frac{1}{2}(10+5)]}{(80-100)/[\frac{1}{2}(80+100)]} = \frac{5/15}{20/180} = 3$$

P_0=100, P_1=80, Q_0=5, Q_1=10

- Calculating $\varepsilon_{x,\,Px}$ from point C to point D:

$$\varepsilon_{x,\,Px} = -\frac{(30-25)/[\frac{1}{2}(30+25)]}{(20-40)/[\frac{1}{2}(20+40)]} = \frac{5/55}{20/60} = 3/11$$

P_0=40, P_1=20, Q_0=25, Q_1=30

How to interpret the elasticity coefficient:

- **if $\varepsilon_{x, Px} > 1$ then we say that demand is elastic:**

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

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

- **if $\varepsilon_{x, Px} < 1$ then we say that demand is inelastic:**

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

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

- **if $\varepsilon_{x, Px} = 1$ then we say that demand is unitary elastic:**

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

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 $\varepsilon_{x,\,Px} > 1$, 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 $\varepsilon_{x,\,Px} < 1$, 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 $\varepsilon_{x,\,Px} = 1$, 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 . . .

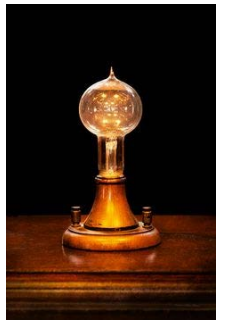
  ✓ **Definition of the product**: the more narrowly defined is the product, the more good close substitutes there are . . .

➢ **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

- $\varepsilon_{x,\ Income} = (\%\Delta X_D) / (\%\Delta Income) = [\Delta Q / (Q_0 + Q_1)] / [\Delta I / (I_0 + I_1)]$
- $\varepsilon_{x,\ Income} > 0$, quantity demanded increases when income increases and vice versa. We call these Normal Goods.
- $\varepsilon_{x,\ Income} < 0$, quantity demanded decreases when income increases and vice versa. We call these Inferior Goods.
- Among normal goods, if $0 < \varepsilon_{x,\ Inc} < 1$, 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 $\varepsilon_{x,\ Inc} > 1$, 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?

pick 3

pick 4

KENTUCKY'S MEGA MILLIONS

KENTUCKY'S POWERBALL POWER PLAY

Cross-price Elasticity of Demand

- $\varepsilon_{x,\,Py} = (\%\Delta X_D) / (\%\Delta P_Y) = [\Delta Q / (Q_0 + Q_1)] / [\Delta P_Y / (P_{Y0} + P_{Y1})]$
- $\varepsilon_{x,\,Py} > 0$ 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.
- $\varepsilon_{x,\,Py} < 0$ when an increase in the price of good Y leads to an 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.

Required Outside readings:

"PepsiCo Pushes Breakfast in Bid to Heat Up Oatmeal," *WSJ*, 7/28/10: imagine that you are named brand manager for this newly acquired product line and are tasked with pumping up demand for Quaker Oats.
http://ezproxy.uky.edu/login?url=http://search.proquest.com/docview/732571063?accountid=11836

"Thrill parks try to boost attendance: Some lower their fees to attract crowds," *Lexington Herald-Leader*, 5/27/06: to increase our revenues, should we raise or lower the price of admission?
http://bit.ly/odthLq

"For Dollar Stores, a Mixed Bag," *WSJ*, 7/11/13: do all companies suffer in a recession?
http://ezproxy.uky.edu/login?url=http://search.proquest.com/docview/1399253185/13FBAC776B7259CDD87/82?accountid=11836

"The Millennial vs. Boomer Stock Smackdown," *WSJ* 6/7/19: trying to decide what stocks to include in your personal retirement account?—how tastes/preferences differ across socio-economic groups and how that affects profitability.
https://search-proquest-com.ezproxy.uky.edu/docview/2236060595/4368C0827FFF4982PQ/81?accountid=11836