Intro to Economic Analysis: Microeconomics

EC 201 - Day 6 Slides

Connor Wiegand

Department of Economics - University of Oregon

13 October 2021

Logistics

- Official homework 2 due this Saturday at 11:59pm, covering last week's material
- News assignments posted, first one due this Wednesday (October 13)
  - This includes doing 1 news analysis of your choice on Cengage, and
  - Submitting a 1-1.5 page write up on Canvas
- The outline must contain a brief summary of the article you read, as well as responses to the discussion questions that were at the end of your Cengage News Analysis

Recall

- Formally, the price elasticity of demand (PED), denoted e_d, E_d, or, as I will use, ε_D, is computed as

$$\varepsilon_D = \left| \frac{\%\Delta Q_D}{\%\Delta P} \right|$$

where Δ is read "change in"

- Using the midpoint method to calculate percentage change, this is given by

$$\varepsilon_D = \left| \frac{\%\Delta Q_D}{\%\Delta P} \right| = \left| \frac{(Q_2 - Q_1) / [(Q_1 + Q_2)/2]}{(P_2 - P_1) / [(P_1 + P_2)/2]} \right|$$

Exercise 1

- Recall the midpoint method:

$$\Delta x = \frac{x_2 - x_1}{(x_1 + x_2)/2} \cdot 100$$

Exercise 1

- Recall the midpoint method:

$$\%\Delta x = \frac{x_2 - x_1}{(x_1 + x_2)/2} \cdot 100$$

- Suppose the price of a Juul is $8. Your friend tells you that the price of Juul's has risen 25% this year, and is for some reason using the midpoint method when they report the percentage
- Find the new price of a Juul

Solution 1

- So we have

$$\Delta p = \frac{p_2 - 8}{(8 + p_2)/2} \cdot 100 = 25$$
$$\implies \frac{p_2 - 8}{(8 + p_2)} \cdot 2 = \frac{1}{4}$$
$$\implies \frac{p_2 - 8}{p_2 + 8} = \frac{1}{8}$$

Solution 1

- So we have

$$
\begin{aligned}
\Delta p = \frac{p_2 - 8}{(8 + p_2)/2} \cdot 100 &= 25 \\
\implies \frac{p_2 - 8}{(8 + p_2)} \cdot 2 &= \frac{1}{4} \\
\implies \frac{p_2 - 8}{p_2 + 8} &= \frac{1}{8} \\
\implies p_2 - 8 &= \frac{1}{8} p_2 + 1
\end{aligned}
$$

Solution 1

- So we have

$$\begin{aligned}\Delta p = \frac{p_2 - 8}{(8 + p_2)/2} \cdot 100 &= 25 \\ \implies \frac{p_2 - 8}{(8 + p_2)} \cdot 2 &= \frac{1}{4} \\ \implies \frac{p_2 - 8}{p_2 + 8} &= \frac{1}{8} \\ \implies p_2 - 8 &= \frac{1}{8} p_2 + 1 \\ \implies \frac{7}{8} p_2 &= 9\end{aligned}$$

Solution 1

- So we have

$$
\begin{aligned}
\Delta p = \frac{p_2 - 8}{(8 + p_2)/2} \cdot 100 &= 25 \\
\implies \frac{p_2 - 8}{(8 + p_2)} \cdot 2 &= \frac{1}{4} \\
\implies \frac{p_2 - 8}{p_2 + 8} &= \frac{1}{8} \\
\implies p_2 - 8 &= \frac{1}{8} p_2 + 1 \\
\implies \frac{7}{8} p_2 &= 9 \\
\implies p_2 &= \frac{72}{7}
\end{aligned}
$$

$p_2 - 8 = \frac{1}{8}(p_2 + 8)$

Solution 1

- So we have

$$\begin{aligned}
\Delta p = \frac{p_2 - 8}{(8 + p_2)/2} \cdot 100 &= 25 \\
\implies \frac{p_2 - 8}{(8 + p_2)} \cdot 2 &= \frac{1}{4} \\
\implies \frac{p_2 - 8}{p_2 + 8} &= \frac{1}{8} \\
\implies p_2 - 8 &= \frac{1}{8} p_2 + 1 \\
\implies \frac{7}{8} p_2 &= 9 \\
\implies p_2 &= \frac{72}{7}
\end{aligned}$$

- Therefore, $p_2 \approx \$10.29$

PED Interpretation

- Suppose $\varepsilon_D = 2$ for burritos

PED Interpretation

- Suppose $\varepsilon_D = 2$ for burritos
- This says: "if the price of burritos were to increase by 1%, then the quantity demanded for burritos would fall by 2%"

PED Interpretation

- Suppose $\varepsilon_D = 2$ for burritos
- This says: "if the price of burritos were to increase by 1%, then the quantity demanded for burritos would fall by 2%"
- In general, if good x has PED ε_D, then we would say "if the price of x were to increase by 1%, then the quantity demanded for x would fall by ε_D%"

PED Interpretation

- Suppose $\varepsilon_D = 2$ for burritos
- This says: "if the price of burritos were to increase by 1%, then the quantity demanded for burritos would fall by 2%"
- In general, if good x has PED ε_D, then we would say "if the price of x were to increase by 1%, then the quantity demanded for x would fall by ε_D%"
- If $\varepsilon_D < 1$, then x is said to be *inelastic*, and consumers are relatively insensitive to changes in the price of x

PED Interpretation

- Suppose $\varepsilon_D = 2$ for burritos
- This says: "if the price of burritos were to increase by 1%, then the quantity demanded for burritos would fall by 2%"
- In general, if good x has PED ε_D, then we would say "if the price of x were to increase by 1%, then the quantity demanded for x would fall by ε_D%"
- If $\varepsilon_D < 1$, then x is said to be *inelastic*, and consumers are relatively insensitive to changes in the price of x
- If $\varepsilon_D > 1$, then x is said to be *elastic* and consumers are relatively sensitive to changes in the price of x

How PED Affects the Shape of a Demand Curve

- Generally speaking, a steeper demand curve reflects inelastic demand, while a flatter curve reflects elastic demand

[1] In this context, another term for absolute value

How PED Affects the Shape of a Demand Curve

- Generally speaking, a steeper demand curve reflects inelastic demand, while a flatter curve reflects elastic demand
- Consider rewriting the elasticity formula as

$$\varepsilon_D = \left| \frac{\Delta Q_D}{\Delta P} \cdot \frac{(P_1 + P_2)/2}{(Q_1 + Q_2)/2} \right|$$

[1] In this context, another term for absolute value

How PED Affects the Shape of a Demand Curve

- Generally speaking, a steeper demand curve reflects inelastic demand, while a flatter curve reflects elastic demand
- Consider rewriting the elasticity formula as

$$\varepsilon_D = \left| \frac{\Delta Q_D}{\Delta P} \cdot \frac{(P_1 + P_2)/2}{(Q_1 + Q_2)/2} \right|$$

- Note that the absolute value of the slope of a [linear] demand curve is given by $|\Delta P / \Delta Q|$, so one of the terms above represents the reciprocal of the slope

[1] In this context, another term for absolute value

How PED Affects the Shape of a Demand Curve

- Generally speaking, a steeper demand curve reflects inelastic demand, while a flatter curve reflects elastic demand
- Consider rewriting the elasticity formula as

$$\varepsilon_D = \left| \frac{\Delta Q_D}{\Delta P} \cdot \frac{(P_1 + P_2)/2}{(Q_1 + Q_2)/2} \right|$$

- Note that the absolute value of the slope of a [linear] demand curve is given by $|\Delta P / \Delta Q|$, so one of the terms above represents the reciprocal of the slope
- In other terms, a high value for the magnitude[1] of the slope will lead to a low ε_D, *all else equal*

[1] In this context, another term for absolute value

How PED Affects the Shape of a Demand Curve

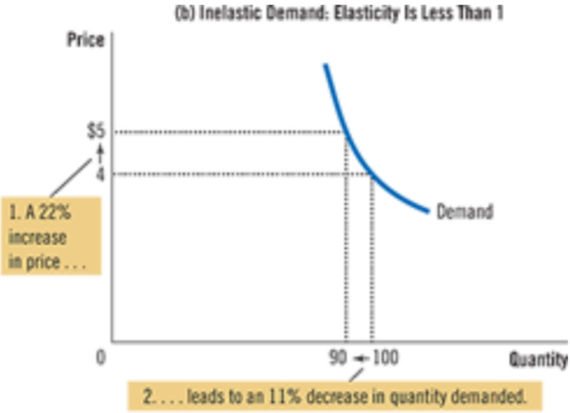
- Generally speaking, a steeper demand curve reflects inelastic demand, while a flatter curve reflects elastic demand
- Consider rewriting the elasticity formula as

$$\varepsilon_D = \left| \frac{\Delta Q_D}{\Delta P} \cdot \frac{(P_1 + P_2)/2}{(Q_1 + Q_2)/2} \right|$$

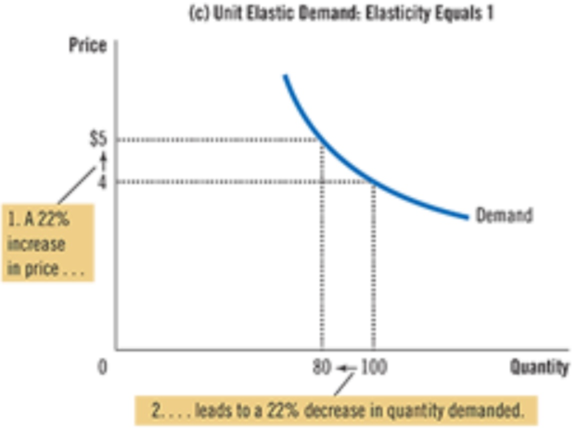
- Note that the absolute value of the slope of a [linear] demand curve is given by $|\Delta P / \Delta Q|$, so one of the terms above represents the reciprocal of the slope
- In other terms, a high value for the magnitude[1] of the slope will lead to a low ε_D, *all else equal*
  - Inelastic demand $\implies$ low ε_D (close to 0) $\implies$ high $1/\varepsilon_D$ $\implies$ high $|\Delta P / \Delta Q|$ $\implies$ steep slope

[1] In this context, another term for absolute value

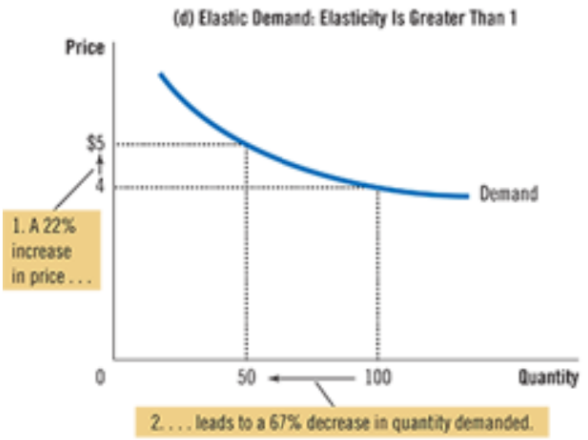
Inelastic Demand



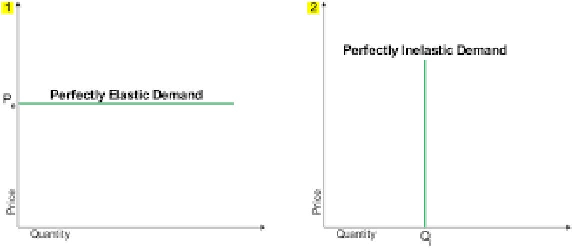
Elastic Demand



Unit-Elastic Demand



Mnemonic Device?



To remember which is which, just note that perfectly <u>i</u>nelastic demand looks like an "I", while perfectly <u>e</u>lastic demand looks (kind of) like an "E"

How PED Affects the Shape of a Demand Curve (cont.)

- Generally speaking, a steeper demand curve reflects inelastic demand, while a flatter curve reflects elastic demand

[2] In this context, another term for absolute value

How PED Affects the Shape of a Demand Curve (cont.)

- Generally speaking, a steeper demand curve reflects inelastic demand, while a flatter curve reflects elastic demand
- In other terms, a high value for the magnitude[2] of the slope will lead to a low ε_D, *all else equal*

[2] In this context, another term for absolute value

How PED Affects the Shape of a Demand Curve (cont.)

- Generally speaking, a steeper demand curve reflects inelastic demand, while a flatter curve reflects elastic demand
- In other terms, a high value for the magnitude[2] of the slope will lead to a low ε_D, *all else equal*
- This "all else equal" statement is particularly important, because we are really trying to hold the midpoints equal

[2] In this context, another term for absolute value

How PED Affects the Shape of a Demand Curve (cont.)

- Generally speaking, a steeper demand curve reflects inelastic demand, while a flatter curve reflects elastic demand
- In other terms, a high value for the magnitude[2] of the slope will lead to a low ε_D, *all else equal*
- This "all else equal" statement is particularly important, because we are really trying to hold the midpoints equal
- Keep this in the back of your mind for later

[2] In this context, another term for absolute value

Portions of the Linear Demand Curve

- Remember rewriting the elasticity formula from earlier? When elasticity is allowed to be negative,

$$\varepsilon_D = \frac{\Delta Q_D}{\Delta P} \cdot \frac{(P_1 + P_2)/2}{(Q_1 + Q_2)/2}$$

Portions of the Linear Demand Curve

- Remember rewriting the elasticity formula from earlier? When elasticity is allowed to be negative,

$$\varepsilon_D = \frac{\Delta Q_D}{\Delta P} \cdot \frac{(P_1 + P_2)/2}{(Q_1 + Q_2)/2}$$

- What happens to that second term?

Portions of the Linear Demand Curve

- Remember rewriting the elasticity formula from earlier? When elasticity is allowed to be negative,

$$\varepsilon_D = \frac{\Delta Q_D}{\Delta P} \cdot \frac{(P_1 + P_2)/2}{(Q_1 + Q_2)/2}$$

- What happens to that second term?
- Consider the simple demand curve given by

$$P = 6 - Q$$

https://www.desmos.com/calculator/2ihmjzo4hm

Portions of the Linear Demand Curve

- Remember rewriting the elasticity formula from earlier? When elasticity is allowed to be negative,

$$\varepsilon_D = \frac{\Delta Q_D}{\Delta P} \cdot \frac{(P_1 + P_2)/2}{(Q_1 + Q_2)/2}$$

- What happens to that second term?
- Consider the simple demand curve given by

$$P = 6 - Q$$

https://www.desmos.com/calculator/2ihmjzo4hm

- Calculate the elasticities between the following points:

$(6,0)$ and $(2,4)$	$(2,4)$ and $(3,3)$
$(3,3)$ and $(4,2)$	$(4,2)$ and $(6,0)$

Portions of the Linear Demand Curve (cont.)

- Using $\varepsilon_D = \left| \frac{\Delta Q_D}{\Delta P} \cdot \frac{(P_1+P_2)/2}{(Q_1+Q_2)/2} \right|$,

Portions of the Linear Demand Curve (cont.)

- Using $\varepsilon_D = \left| \frac{\Delta Q_D}{\Delta P} \cdot \frac{(P_1+P_2)/2}{(Q_1+Q_2)/2} \right|$,
- $(0,6) \rightarrow (2,4)$:
$$\frac{2-0}{|4-6|} \cdot \frac{(4+6)/2}{(2+0)/2} = 1 \cdot \frac{5}{1} = 5$$

Portions of the Linear Demand Curve (cont.)

- Using $\varepsilon_D = \left| \frac{\Delta Q_D}{\Delta P} \cdot \frac{(P_1+P_2)/2}{(Q_1+Q_2)/2} \right|$,
- $(0,6) \rightarrow (2,4)$:
$$\frac{2-0}{|4-6|} \cdot \frac{(4+6)/2}{(2+0)/2} = 1 \cdot \frac{5}{1} = 5$$
- $(2,4) \rightarrow (3,3)$:
$$\frac{1}{|-1|} \cdot \frac{(3+4)/2}{(2+3)/2} = \frac{1}{|-1|} \cdot \frac{3.5}{2.5} = 1 \cdot 1.4 = 1.4$$

Portions of the Linear Demand Curve (cont.)

- Using $\varepsilon_D = \left| \frac{\Delta Q_D}{\Delta P} \cdot \frac{(P_1+P_2)/2}{(Q_1+Q_2)/2} \right|$,
- $(0,6) \to (2,4)$:
$$\frac{2-0}{|4-6|} \cdot \frac{(4+6)/2}{(2+0)/2} = 1 \cdot \frac{5}{1} = 5$$
- $(2,4) \to (3,3)$:
$$\frac{1}{|-1|} \cdot \frac{(3+4)/2}{(2+3)/2} = \frac{1}{|-1|} \cdot \frac{3.5}{2.5} = 1 \cdot 1.4 = 1.4$$
- Notice that the first of these terms is always the inverse of the slope (in absolute value), so I always know between any two points on the curve, the first multiplier is 1

Portions of the Linear Demand Curve (cont.)

- Using $\varepsilon_D = \left| \frac{\Delta Q_D}{\Delta P} \cdot \frac{(P_1+P_2)/2}{(Q_1+Q_2)/2} \right|$,
- $(0,6) \to (2,4)$:
$$\frac{2-0}{|4-6|} \cdot \frac{(4+6)/2}{(2+0)/2} = 1 \cdot \frac{5}{1} = 5$$
- $(2,4) \to (3,3)$:
$$\frac{1}{|-1|} \cdot \frac{(3+4)/2}{(2+3)/2} = \frac{1}{|-1|} \cdot \frac{3.5}{2.5} = 1 \cdot 1.4 = 1.4$$
- Notice that the first of these terms is always the inverse of the slope (in absolute value), so I always know between any two points on the curve, the first multiplier is 1
- I will now eyeball the midpoints for the second term. If you do not feel comfortable with this, go back through and verify these on your own

Portions of the Linear Demand Curve (cont.)

- Using $\varepsilon_D = \left| \frac{\Delta Q_D}{\Delta P} \cdot \frac{(P_1+P_2)/2}{(Q_1+Q_2)/2} \right|$,
- $(0,6) \rightarrow (2,4)$:
$$\frac{2-0}{|4-6|} \cdot \frac{(4+6)/2}{(2+0)/2} = 1 \cdot \frac{5}{1} = 5$$
- $(2,4) \rightarrow (3,3)$:
$$\frac{1}{|-1|} \cdot \frac{(3+4)/2}{(2+3)/2} = \frac{1}{|-1|} \cdot \frac{3.5}{2.5} = 1 \cdot 1.4 = 1.4$$
- $(3,3) \rightarrow (4,2)$:
$$\frac{1}{|-1|} \cdot \frac{2.5}{3.5} = 0.71$$

Portions of the Linear Demand Curve (cont.)

- Using $\varepsilon_D = \left| \frac{\Delta Q_D}{\Delta P} \cdot \frac{(P_1+P_2)/2}{(Q_1+Q_2)/2} \right|$,
- $(0,6) \rightarrow (2,4)$:
$$\frac{2-0}{|4-6|} \cdot \frac{(4+6)/2}{(2+0)/2} = 1 \cdot \frac{5}{1} = 5$$
- $(2,4) \rightarrow (3,3)$:
$$\frac{1}{|-1|} \cdot \frac{(3+4)/2}{(2+3)/2} = \frac{1}{|-1|} \cdot \frac{3.5}{2.5} = 1 \cdot 1.4 = 1.4$$
- $(3,3) \rightarrow (4,2)$:
$$\frac{1}{|-1|} \cdot \frac{2.5}{3.5} = 0.71$$
- $(4,2) \rightarrow (6,0)$:
$$\frac{2}{|-2|} \cdot \frac{1}{5} = 0.2$$

What's happening?

- So, between 4 different sets of points, we have 4 different elasticities

[3] That is, the midpoint between the x and y intercepts

What's happening?

- So, between 4 different sets of points, we have 4 different elasticities
- In fact, while the slope of the line remains constant, the elasticity varies along the curve, since the percentage change calculation is dependent on where you are on the curve

[3] That is, the midpoint between the x and y intercepts

What's happening?

- So, between 4 different sets of points, we have 4 different elasticities
- In fact, while the slope of the line remains constant, the elasticity varies along the curve, since the percentage change calculation is dependent on where you are on the curve
- In general, the portion of a linear demand curve that is above the midpoint is above the midpoint of the line[3] is elastic, while the below the midpoint is inelastic. At the midpoint, the PED is 1

[3] That is, the midpoint between the x and y intercepts

A Subtle Distinction

- Before we dive into this next part, I will note that this is only for completeness, if you care

A Subtle Distinction

- Before we dive into this next part, I will note that this is only for completeness, if you care
  - If you do not, you are welcome to skip to the "Takeaways" slide

A Subtle Distinction

- Before we dive into this next part, I will note that this is only for completeness, if you care
    - If you do not, you are welcome to skip to the “Takeaways” slide
- Wait, if all linear demand curves have elastic and inelastic portions, then why do we say steeper demand curves are more inelastic?

A Subtle Distinction (cont.)

- Wait, if all linear demand curves have elastic and inelastic portions, then why do we say steeper demand curves are more inelastic?

[4] That is, you are calculating the PED between (P_1, Q_1) and (P_2, Q_2), and the midpoint is (3.49, 3.49)

A Subtle Distinction (cont.)

- Wait, if all linear demand curves have elastic and inelastic portions, then why do we say steeper demand curves are more inelastic?
- For recall the *for all else equal* statement that I said to keep in mind earlier

[4] That is, you are calculating the PED between (P_1, Q_1) and (P_2, Q_2), and the midpoint is $(3.49, 3.49)$

A Subtle Distinction (cont.)

- Wait, if all linear demand curves have elastic and inelastic portions, then why do we say steeper demand curves are more inelastic?
- For recall the *for all else equal* statement that I said to keep in mind earlier
- Fact: For two curves going through the same point, the PED at (near) that point is smaller (more inelastic) for the steeper curve, and larger (more elastic) for the smaller curve (hence why we had to keep midpoints constant)

[4] That is, you are calculating the PED between (P_1, Q_1) and (P_2, Q_2), and the midpoint is (3.49, 3.49)

A Subtle Distinction (cont.)

- Wait, if all linear demand curves have elastic and inelastic portions, then why do we say steeper demand curves are more inelastic?
- For recall the *for all else equal* statement that I said to keep in mind earlier
- Fact: For two curves going through the same point, the PED at (near) that point is smaller (more inelastic) for the steeper curve, and larger (more elastic) for the smaller curve (hence why we had to keep midpoints constant)
    - Example: both (1) $P = 24 - 6Q$ and (2) $P = 4 - \frac{1}{6}Q$ go through the point (3.49,3.49)

[4] That is, you are calculating the PED between (P_1, Q_1) and (P_2, Q_2), and the midpoint is $(3.49, 3.49)$

A Subtle Distinction (cont.)

- Wait, if all linear demand curves have elastic and inelastic portions, then why do we say steeper demand curves are more inelastic?
- For recall the *for all else equal* statement that I said to keep in mind earlier
- Fact: For two curves going through the same point, the PED at (near) that point is smaller (more inelastic) for the steeper curve, and larger (more elastic) for the smaller curve (hence why we had to keep midpoints constant)
  - Example: both (1) $P = 24 - 6Q$ and (2) $P = 4 - \frac{1}{6}Q$ go through the point (3.49,3.49)
  - If you calculate the PED for each of these curves such that $(3.49, 3.49)$ is the midpoint of your two points[4], you will get an elasticity of

$$\varepsilon_{D_1} = \frac{1}{6} \qquad \varepsilon_{D_2} = 6$$

respectively

[4] That is, you are calculating the PED between (P_1, Q_1) and (P_2, Q_2), and the midpoint is $(3.49, 3.49)$

A Subtle Distinction (cont.)

- Therefore, it is more "shorthand" than technically correct to call steep curves inelastic and flat curves elastic

[5] If this is not enough, hold tight for taxes, it will make more sense calling steep curves inelastic is okay.

A Subtle Distinction (cont.)

- Therefore, it is more "shorthand" than technically correct to call steep curves inelastic and flat curves elastic
- However, since elasticity is related to slope, it is still common for economists to refer to steep demand curves as "inelastic", and flat demand curves as "elastic", even though elasticity varies along the curve

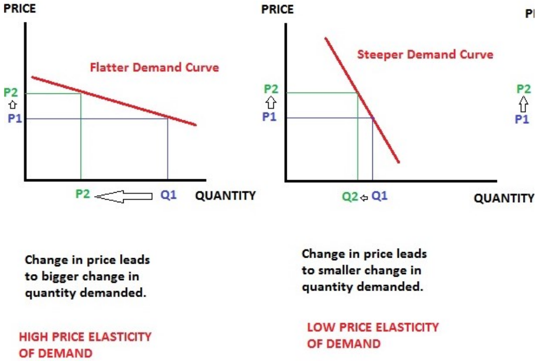
[5] If this is not enough, hold tight for taxes, it will make more sense calling steep curves inelastic is okay.

A Subtle Distinction (cont.)

- Therefore, it is more "shorthand" than technically correct to call steep curves inelastic and flat curves elastic
- However, since elasticity is related to slope, it is still common for economists to refer to steep demand curves as "inelastic", and flat demand curves as "elastic", even though elasticity varies along the curve
- To see why this is still okay, recall the diagram in the next slide[5]

[5] If this is not enough, hold tight for taxes, it will make more sense calling steep curves inelastic is okay.

Graphical Understanding



Note that the same level of price change leads to larger responses in flat curves than in steep curves. Therefore, when comparing more or less “similar” curves, it makes sense to call one elastic and one inelastic, based on slope.

Takeaways

- If the above notes didn't make sense to you, I really just want you to

Takeaways

- If the above notes didn't make sense to you, I really just want you to
  1. Know how to calculate PED – this is most important

Takeaways

- If the above notes didn't make sense to you, I really just want you to
  1. Know how to calculate PED – this is most important
  2. Know that PED varies along the demand curve, and know which portions are elastic/inelastic

Takeaways

- If the above notes didn't make sense to you, I really just want you to
  1. Know how to calculate PED – this is most important
  2. Know that PED varies along the demand curve, and know which portions are elastic/inelastic
  3. Know that when someone says "inelastic demand", they generally mean a relatively steep demand curve; when someone says "elastic demand", they generally mean a relatively flat curve

Takeaways

- If the above notes didn't make sense to you, I really just want you to
  1. Know how to calculate PED – this is most important
  2. Know that PED varies along the demand curve, and know which portions are elastic/inelastic
  3. Know that when someone says "inelastic demand", they generally mean a relatively steep demand curve; when someone says "elastic demand", they generally mean a relatively flat curve
     - And don't worry too much about the numerical elasticity when someone says this

Takeaways

- If the above notes didn't make sense to you, I really just want you to
  1. Know how to calculate PED – this is most important
  2. Know that PED varies along the demand curve, and know which portions are elastic/inelastic
  3. Know that when someone says "inelastic demand", they generally mean a relatively steep demand curve; when someone says "elastic demand", they generally mean a relatively flat curve
     - And don't worry too much about the numerical elasticity when someone says this
- Mankiw: "The following rule of thumb is a useful guide: The flatter the demand curve passing through a given point, the greater the price elasticity of demand. The steeper the demand curve passing through a given point, the smaller the price elasticity of demand."

Definition of Total Revenue

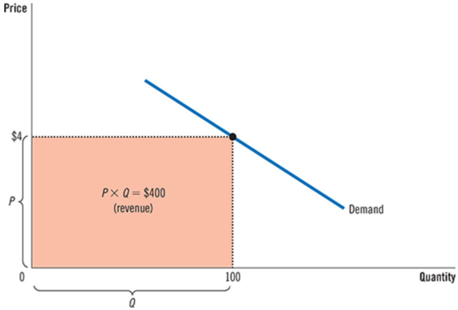
- Definition of Total Revenue (TR): $TR = P \cdot Q$

Definition of Total Revenue

- Definition of Total Revenue (TR): $TR = P \cdot Q$
- Let's go back to a world without the supply curve; just suppose that I am picking a price to sell at, and then the consumers in the market show up to buy.

Definition of Total Revenue

- Definition of Total Revenue (TR): $TR = P \cdot Q$
- Let's go back to a world without the supply curve; just suppose that I am picking a price to sell at, and then the consumers in the market show up to buy.
- My total revenue, PQ, is visualized in the following diagram:



Effects from Raising Prices

- Suppose I raise the price of the good, from \$4 to \$5. Two things happen:

Effects from Raising Prices

- Suppose I raise the price of the good, from \$4 to \$5. Two things happen:
    - Price effect: each sale occurs at a higher price than before, raising revenues

Effects from Raising Prices

- Suppose I raise the price of the good, from \$4 to \$5. Two things happen:
  - Price effect: each sale occurs at a higher price than before, raising revenues
  - Quantity effect: since the price is higher and we are under the law of demand, I will sell less units, lowering revenues

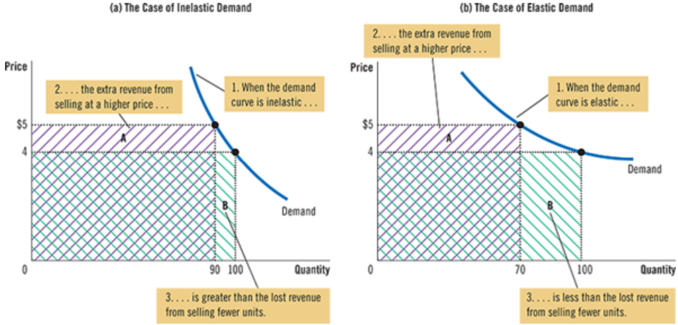
Effects from Raising Prices

- Suppose I raise the price of the good, from \$4 to \$5. Two things happen:
  - Price effect: each sale occurs at a higher price than before, raising revenues
  - Quantity effect: since the price is higher and we are under the law of demand, I will sell less units, lowering revenues
- Therefore, whichever of these effects is greater determines whether my TR increases or decreases

Effects from Raising Prices

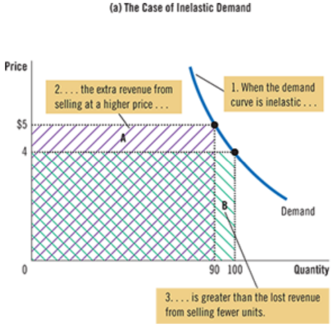
- Suppose I raise the price of the good, from $4 to $5. Two things happen:
  - Price effect: each sale occurs at a higher price than before, raising revenues
  - Quantity effect: since the price is higher and we are under the law of demand, I will sell less units, lowering revenues
- Therefore, whichever of these effects is greater determines whether my TR increases or decreases
- Some general rules:
  - When demand is inelastic (a price elasticity less than one), price and total revenue move in the same direction: If the price increases, total revenue also increases.
  - When demand is elastic (a price elasticity greater than one), price and total revenue move in opposite directions: If the price increases, total revenue decreases.
  - If demand is unit elastic (a price elasticity exactly equal to one), total revenue remains constant when the price changes

Effects from Raising Prices, Visually



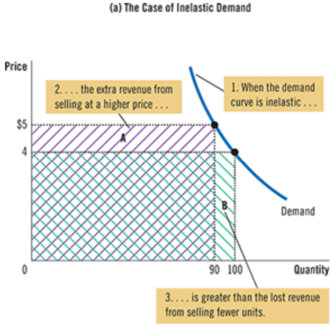
- "A" represents the price effect: I am selling goods at a higher price, raising revenue. "B" represents the quantity effect: I am selling less goods overall, lowering revenue

Effects from Raising Prices, Visually



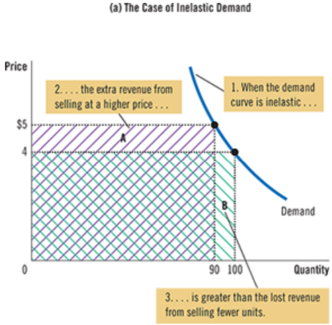
- "A" represents the price effect: I am selling goods at a higher price, raising revenue. "B" represents the quantity effect: I am selling less goods overall, lowering revenue
- Change in total revenue (ΔTR) is given by $A - B$. Thus, if $A - B > 0$, i.e. if $A > B$, then $\Delta TR >$ 0

Effects from Raising Prices, Visually (cont.)



- In (a), $A = 1\,(90) = 90$ and $B = 4\,(10) = 40$. In (b), $A = 1\,(70) = 70$ and $B = 4\,(30) = 120$

Effects from Raising Prices, Visually (cont.)



- In (a), $A = 1\,(90) = 90$ and $B = 4\,(10) = 40$. In (b), $A = 1\,(70) = 70$ and $B = 4\,(30) = 120$
- When demand is inelastic and people are insensitive to the price, $A > B$, so TR increases. When demand is elastic and people are sensitive to prices, $B > A$, so TR decreases

PED and Total Revenue

- Some general rules:

PED and Total Revenue

- Some general rules:
  - When demand is inelastic (a price elasticity less than one), price and total revenue move in the same direction: If the price increases, total revenue also increases.
  - When demand is elastic (a price elasticity greater than one), price and total revenue move in opposite directions: If the price increases, total revenue decreases.
  - If demand is unit elastic (a price elasticity exactly equal to one), total revenue remains constant when the price changes
- Keep in mind that total revenue <u>is not</u> the same as profit. This does not factor in the costs to the supplier, it is simply meant to demonstrate a relationship between changes in price and changes in revenues

Other Elasticises of Demand

- Recall that the price-elasticity of demand is given by

$$\varepsilon_D = \left| \frac{\%\Delta Q_D}{\%\Delta P} \right|$$

Other Elasticises of Demand

- Recall that the price-elasticity of demand is given by

$$\varepsilon_D = \left| \frac{\%\Delta Q_D}{\%\Delta P} \right|$$

- This gives the sensitivity of quantity demanded when there is a change in price. But what about the sensitivity in quantity demanded when we change something other than price?

Other Elasticises of Demand

- Recall that the price-elasticity of demand is given by

$$\varepsilon_D = \left| \frac{\%\Delta Q_D}{\%\Delta P} \right|$$

- This gives the sensitivity of quantity demanded when there is a change in price. But what about the sensitivity in quantity demanded when we change something other than price?
- We could certainly put a lot of different things in for change in price, but there are only a few that are common enough to talk about

Income Elasticity of Demand

- The first is the **Income Elasticity of Demand**, which is defined as

$$\varepsilon_I = \frac{\%\Delta Q_D}{\%\Delta I}$$

Income Elasticity of Demand

- The first is the **Income Elasticity of Demand**, which is defined as

$$\varepsilon_I = \frac{\%\Delta Q_D}{\%\Delta I}$$

- Note that ε_D^I is common, and has the advantage of clearly communicating that this is a demand elasticity

Income Elasticity of Demand

- The first is the **Income Elasticity of Demand**, which is defined as

$$\varepsilon_I = \frac{\%\Delta Q_D}{\%\Delta I}$$

- Note that ε_D^I is common, and has the advantage of clearly communicating that this is a demand elasticity
  - I omit the subscript-D here to avoid cluttered notation

Income Elasticity of Demand

- The first is the **Income Elasticity of Demand**, which is defined as

$$\varepsilon_I = \frac{\%\Delta Q_D}{\%\Delta I}$$

- Note that ε_D^I is common, and has the advantage of clearly communicating that this is a demand elasticity
  - I omit the subscript-D here to avoid cluttered notation
  - Recall that you can replace ε with e or E, if you'd like

Income Elasticity of Demand

- The first is the **Income Elasticity of Demand**, which is defined as

$$\varepsilon_I = \frac{\%\Delta Q_D}{\%\Delta I}$$

- Note that ε_D^I is common, and has the advantage of clearly communicating that this is a demand elasticity
  - I omit the subscript-D here to avoid cluttered notation
  - Recall that you can replace ε with e or E, if you'd like
- This measures how sensitive the quantity demanded in a market is when consumers experience a change in *income*

Interpretation of Income Elasticity of Demand

- ε_I measures how sensitive the quantity demanded in a market is when consumers experience a change in *income*

Interpretation of Income Elasticity of Demand

- ε_I measures how sensitive the quantity demanded in a market is when consumers experience a change in *income*
- Note that this is still tied to a single good/market at a time

Interpretation of Income Elasticity of Demand

- ε_I measures how sensitive the quantity demanded in a market is when consumers experience a change in *income*
- Note that this is still tied to a single good/market at a time
- The interpretation of ε_I is similar to PED: when consumers' income rise by by 1%, the quantity demanded for good x changes by ε_I%

Interpretation of Income Elasticity of Demand

- ε_I measures how sensitive the quantity demanded in a market is when consumers experience a change in *income*
- Note that this is still tied to a single good/market at a time
- The interpretation of ε_I is similar to PED: when consumers' income rise by by 1%, the quantity demanded for good x changes by ε_I%
- What sign should the sign of ε_I be?

Interpretation of Income Elasticity of Demand

- ε_I measures how sensitive the quantity demanded in a market is when consumers experience a change in *income*
- Note that this is still tied to a single good/market at a time
- The interpretation of ε_I is similar to PED: when consumers' income rise by by 1%, the quantity demanded for good x changes by ε_I%
- What sign should the sign of ε_I be?
  - Recall that when income rises, we often expect quantity demanded for a good to rise, in response

Interpretation of Income Elasticity of Demand

- ε_I measures how sensitive the quantity demanded in a market is when consumers experience a change in *income*
- Note that this is still tied to a single good/market at a time
- The interpretation of ε_I is similar to PED: when consumers' income rise by by 1%, the quantity demanded for good x changes by ε_I%
- What sign should the sign of ε_I be?
  - Recall that when income rises, we often expect quantity demanded for a good to rise, in response
  - So, this number will often be positive

Interpretation of Income Elasticity of Demand

- ε_I measures how sensitive the quantity demanded in a market is when consumers experience a change in *income*
- Note that this is still tied to a single good/market at a time
- The interpretation of ε_I is similar to PED: when consumers' income rise by by 1%, the quantity demanded for good x changes by ε_I%
- What sign should the sign of ε_I be?
  - Recall that when income rises, we often expect quantity demanded for a good to rise, in response
  - So, this number will often be positive
  - However, we also briefly mentioned in a previous lecture that an increase in income can lead to a drop in Q_D, *for certain goods*

Interpretation of Income Elasticity of Demand

- ε_I measures how sensitive the quantity demanded in a market is when consumers experience a change in *income*
- Note that this is still tied to a single good/market at a time
- The interpretation of ε_I is similar to PED: when consumers' income rise by by 1%, the quantity demanded for good x changes by ε_I%
- What sign should the sign of ε_I be?
  - Recall that when income rises, we often expect quantity demanded for a good to rise, in response
  - So, this number will often be positive
  - However, we also briefly mentioned in a previous lecture that an increase in income can lead to a drop in Q_D, *for certain goods*
    - These goods are called *inferior*, and they cause ε_I to be negative

Interpretation of Income Elasticity of Demand

- ε_I measures how sensitive the quantity demanded in a market is when consumers experience a change in *income*
- Note that this is still tied to a single good/market at a time
- The interpretation of ε_I is similar to PED: when consumers' income rise by by 1%, the quantity demanded for good x changes by ε_I%
- What sign should the sign of ε_I be?
  - Recall that when income rises, we often expect quantity demanded for a good to rise, in response
  - So, this number will often be positive
  - However, we also briefly mentioned in a previous lecture that an increase in income can lead to a drop in Q_D, *for certain goods*
    - These goods are called *inferior*, and they cause ε_I to be negative
    - Ex: Top ramen, public transit, payday loans, house-brand items, etc.

Interpretation of Income Elasticity of Demand

- ε_I measures how sensitive the quantity demanded in a market is when consumers experience a change in *income*
- Note that this is still tied to a single good/market at a time
- The interpretation of ε_I is similar to PED: when consumers' income rise by by 1%, the quantity demanded for good x changes by ε_I%
- What sign should the sign of ε_I be?
  - Recall that when income rises, we often expect quantity demanded for a good to rise, in response
  - So, this number will often be positive
  - However, we also briefly mentioned in a previous lecture that an increase in income can lead to a drop in Q_D, *for certain goods*
    - These goods are called *inferior*, and they cause ε_I to be negative
    - Ex: Top ramen, public transit, payday loans, house-brand items, etc.
- Since ε_D (PED) was always negative, it was fine to throw absolute values on it; since ε_I can be positive or negative, we ought to report it's true sign

Income Elasticity of Demand, by numbers

- A good is said to be *inferior* if $\varepsilon_I < 0$

Income Elasticity of Demand, by numbers

- A good is said to be *inferior* if $\varepsilon_I < 0$
- A good is said to be *normal* if $0 \leq \varepsilon_I \leq 1$

Income Elasticity of Demand, by numbers

- A good is said to be *inferior* if $\varepsilon_I < 0$
- A good is said to be *normal* if $0 \leq \varepsilon_I \leq 1$
- A good is said to be a *luxury* (or *superior*) if $\varepsilon_I > 1$

Income Elasticity of Demand, by numbers

- A good is said to be *inferior* if $\varepsilon_I < 0$
- A good is said to be *normal* if $0 \leq \varepsilon_I \leq 1$
- A good is said to be a *luxury* (or *superior*) if $\varepsilon_I > 1$
  - This means that $\%\Delta Q_D > \%\Delta I$: the percent change in quantity demanded exceeds the percent change in I

Income Elasticity of Demand, by numbers

- A good is said to be *inferior* if $\varepsilon_I < 0$
- A good is said to be *normal* if $0 \leq \varepsilon_I \leq 1$
- A good is said to be a *luxury* (or *superior*) if $\varepsilon_I > 1$
  - This means that $\%\Delta Q_D > \%\Delta I$: the percent change in quantity demanded exceeds the percent change in I
  - Straightforward examples include yachts, wagyu steak, tailored suits, etc. However, goods such as movies, meals at restaurants, and airline travel can also all be luxury goods

Exercise 2

- Consider the following table for mushrooms

Price (dollars per unit)	Quantity demanded (units per day)	
	Income \$2,000	Income \$3,000
10	500	550
20	400	450
30	300	350
40	200	250
50	100	150

Exercise 2

- Consider the following table for mushrooms

Price (dollars per unit)	Quantity demanded (units per day) Income \$2,000	Income \$3,000
10	500	550
20	400	450
30	300	350
40	200	250
50	100	150

- Find the income elasticity [of demand] when $p = \$30$. Are mushrooms inferior, normal, or superior?

Solution 2

- The income elasticity when $p = \$30$ is given by

$$
\begin{aligned}
\varepsilon_I &= \frac{(350 - 300) / [(350 + 300) / 2]}{(3000 - 2000) / [(2000 + 3000) / 2]} \\
&= \frac{50/325}{1000/2500} \\
&= \frac{2/13}{2/5} \\
&= \frac{5}{13} \approx 0.39
\end{aligned}
$$

Solution 2

- The income elasticity when $p = \$30$ is given by

$$\begin{aligned}\varepsilon_I &= \frac{(350-300)\,/\,[(350+300)\,/2]}{(3000-2000)\,/\,[(2000+3000)\,/2]} \\ &= \frac{50/325}{1000/2500} \\ &= \frac{2/13}{2/5} \\ &= \frac{5}{13} \approx 0.39\end{aligned}$$

- When consumers' income rises by 1%, we expect the quantity demanded for mushrooms to rise by 0.39%

Solution 2

- The income elasticity when $p = \$30$ is given by

$$\begin{aligned}
\varepsilon_I &= \frac{(350 - 300) / [(350 + 300)/2]}{(3000 - 2000) / [(2000 + 3000)/2]} \\
&= \frac{50/325}{1000/2500} \\
&= \frac{2/13}{2/5} \\
&= \frac{5}{13} \approx 0.39
\end{aligned}$$

- When consumers' income rises by 1%, we expect the quantity demanded for mushrooms to rise by 0.39%
- Thus, the mushrooms are normal

Solution 2

- The income elasticity when $p = \$30$ is given by

$$\varepsilon_I = \frac{(350-300)\,/\,[(350+300)\,/2]}{(3000-2000)\,/\,[(2000+3000)\,/2]} = \frac{50/325}{1000/2500} = \frac{2/13}{2/5} = \frac{5}{13} \approx 0.39$$

- When consumers' income rises by 1%, we expect the quantity demanded for mushrooms to rise by 0.39%
- Thus, the mushrooms are normal
- Note: I didn't specify whether income went up or down. In this case, it does not matter which direction you chose, as long as you were consistent (I did 2000 $\to$ 3000, so 300 $\to$ 350; 3000 $\to$ 2000 would mean 350 $\to$ 300)

Cross-Price Elasticity of Demand

- The other demand elasticity we will talk about is the **Cross-Price Elasticity of Demand** (CPED)[6]

[6] As an aside, the existence of cross-price elasticity of demand leads some economists to refer to the price elasticity of demand as the "*Own* price elasticity of demand"

[7] You can write Q_{D_x}, if you would like

Cross-Price Elasticity of Demand

- The other demand elasticity we will talk about is the **Cross-Price Elasticity of Demand** (CPED)[6]
- For this elasticity, we need two goods: X and Y

[6] As an aside, the existence of cross-price elasticity of demand leads some economists to refer to the price elasticity of demand as the "*Own* price elasticity of demand"

[7] You can write Q_{D_X}, if you would like

Cross-Price Elasticity of Demand

- The other demand elasticity we will talk about is the **Cross-Price Elasticity of Demand** (CPED)[6]
- For this elasticity, we need two goods: X and Y
- Important: The Cross-Price Elasticity of Demand *for good* x *with respect to good* x is defined as

$$\varepsilon_{xy} = \frac{\%\Delta Q_x}{\%\Delta P_y}$$

[6] As an aside, the existence of cross-price elasticity of demand leads some economists to refer to the price elasticity of demand as the "*Own* price elasticity of demand"

[7] You can write Q_{D_x}, if you would like

Cross-Price Elasticity of Demand

- The other demand elasticity we will talk about is the **Cross-Price Elasticity of Demand** (CPED)[6]
- For this elasticity, we need two goods: X and Y
- Important: The Cross-Price Elasticity of Demand *for good x with respect to good x* is defined as

$$\varepsilon_{xy} = \frac{\%\Delta Q_x}{\%\Delta P_y}$$

- The important part here is the order, as it is easy to get confused which good goes on the top versus which one goes on the bottom

[6] As an aside, the existence of cross-price elasticity of demand leads some economists to refer to the price elasticity of demand as the "*Own* price elasticity of demand"

[7] You can write Q_{D_x}, if you would like

Cross-Price Elasticity of Demand

- The other demand elasticity we will talk about is the **Cross-Price Elasticity of Demand** (CPED)[6]
- For this elasticity, we need two goods: X and Y
- Important: The Cross-Price Elasticity of Demand *for good x with respect to good x* is defined as

$$\varepsilon_{xy} = \frac{\%\Delta Q_x}{\%\Delta P_y}$$

- The important part here is the order, as it is easy to get confused which good goes on the top versus which one goes on the bottom
- Here, Q_x is still taken to be the quantity demanded (Q_D) of x, but I have omitted D to avoid clutter[7]

[6] As an aside, the existence of cross-price elasticity of demand leads some economists to refer to the price elasticity of demand as the "*Own* price elasticity of demand"

[7] You can write Q_{D_x}, if you would like

Interpretation of CPED

- The textbook defines CPED as the "measure of how much the quantity demanded of one good responds to a change in the price of another good, computed as the percentage change in quantity demanded of the first good divided by the percentage change in price of the second good"

Interpretation of CPED

- The textbook defines CPED as the "measure of how much the quantity demanded of one good responds to a change in the price of another good, computed as the percentage change in quantity demanded of the first good divided by the percentage change in price of the second good"
- In a similar style to the other elasticities, if the cross price elasticity of x with respect to y is given by ε_{xy}, then we say that if the price of y rises by 1%, then the quantity demanded for good x changes by ε_{xy}%

Purpose of CPED

- The reason we use CPED is to determine whether two goods are complements or substitutes – let's think about which sign should be which

Purpose of CPED

- The reason we use CPED is to determine whether two goods are complements or substitutes – let's think about which sign should be which
- When y is a substitute for x, we expect that an increase in the price of y leads to a(n)...

Purpose of CPED

- The reason we use CPED is to determine whether two goods are complements or substitutes – let's think about which sign should be which
- When y is a substitute for x, we expect that an increase in the price of y leads to a(n)...
  - increase in the quantity demanded of x, meaning ε_{xy} should be...

Purpose of CPED

- The reason we use CPED is to determine whether two goods are complements or substitutes – let's think about which sign should be which
- When y is a substitute for x, we expect that an increase in the price of y leads to a(n)...
  - increase in the quantity demanded of x, meaning ε_{xy} should be...
  - positive

Purpose of CPED

- The reason we use CPED is to determine whether two goods are complements or substitutes – let's think about which sign should be which
- When y is a substitute for x, we expect that an increase in the price of y leads to a(n)...
  - increase in the quantity demanded of x, meaning ε_{xy} should be...
  - positive
- Likewise, when y is a complement to x, we expect that an increase in the price of y leads to a decrease in the quantity demanded of x, so ε_{xy} should be negative

CPED, by numbers

Goods x and y are said to be...

- *complements* if $\varepsilon_{xy} < 0$

CPED, by numbers

Goods x and y are said to be...

- *complements* if $\varepsilon_{xy} < 0$
  - *perfect complements* if $\varepsilon_{xy} = -\infty$

CPED, by numbers

Goods x and y are said to be...

- *complements* if $\varepsilon_{xy} < 0$
  - *perfect complements* if $\varepsilon_{xy} = -\infty$
    - Close example: left and right shoes

CPED, by numbers

Goods x and y are said to be...

- *complements* if $\varepsilon_{xy} < 0$
  - *perfect complements* if $\varepsilon_{xy} = -\infty$
    - Close example: left and right shoes
- *unrelated* if $\varepsilon_{xy} = 0$

CPED, by numbers

Goods x and y are said to be...

- *complements* if $\varepsilon_{xy} < 0$
  - *perfect complements* if $\varepsilon_{xy} = -\infty$
    - Close example: left and right shoes
- *unrelated* if $\varepsilon_{xy} = 0$
- *substitutes* if $\varepsilon_{xy} < 0$

CPED, by numbers

Goods x and y are said to be...

- *complements* if $\varepsilon_{xy} < 0$
  - *perfect complements* if $\varepsilon_{xy} = -\infty$
    - Close example: left and right shoes
- *unrelated* if $\varepsilon_{xy} = 0$
- *substitutes* if $\varepsilon_{xy} < 0$
  - *perfect substitutes* if $\varepsilon_{xy} = \infty$

CPED, by numbers

Goods x and y are said to be...

- *complements* if $\varepsilon_{xy} < 0$
  - *perfect complements* if $\varepsilon_{xy} = -\infty$
    - Close example: left and right shoes
- *unrelated* if $\varepsilon_{xy} = 0$
- *substitutes* if $\varepsilon_{xy} < 0$
  - *perfect substitutes* if $\varepsilon_{xy} = \infty$
    - Close example: any goods which are similar enough for you to only care about price: two brands of butter, triple sec, cheap coffee, etc.

An Obscure Aside

- Q: Is the CPED symmetric? I.e., does $\varepsilon_{xy} = \varepsilon_{yx}$?

An Obscure Aside

- Q: Is the CPED symmetric? I.e., does $\varepsilon_{xy} = \varepsilon_{yx}$?
    - An increase in the price of a gaming console means less video games will get consumed, but does that mean that if video games get more expensive, people will reduce their console consumption by a similar amount?

An Obscure Aside

- Q: Is the CPED symmetric? I.e., does $\varepsilon_{xy} = \varepsilon_{yx}$?
  - An increase in the price of a gaming console means less video games will get consumed, but does that mean that if video games get more expensive, people will reduce their console consumption by a similar amount?
  - Alternatively, do you think that a change in the price of sprite will affect the demand for coke in the exact same way that a change in the price of coke will affect the demand for sprite?

An Obscure Aside

- Q: Is the CPED symmetric? I.e., does $\varepsilon_{xy} = \varepsilon_{yx}$?
  - An increase in the price of a gaming console means less video games will get consumed, but does that mean that if video games get more expensive, people will reduce their console consumption by a similar amount?
  - Alternatively, do you think that a change in the price of sprite will affect the demand for coke in the exact same way that a change in the price of coke will affect the demand for sprite?
- A: Probably not, so an interesting fact of CPEDs is that they are not necessarily symmetric

An Obscure Aside

- Q: Is the CPED symmetric? I.e., does $\varepsilon_{xy} = \varepsilon_{yx}$?
  - An increase in the price of a gaming console means less video games will get consumed, but does that mean that if video games get more expensive, people will reduce their console consumption by a similar amount?
  - Alternatively, do you think that a change in the price of sprite will affect the demand for coke in the exact same way that a change in the price of coke will affect the demand for sprite?
- A: Probably not, so an interesting fact of CPEDs is that they are not necessarily symmetric
- Any interesting examples you can think of?

Exercise 3

- Suppose that when berries rise in price by 16%, the demand for cream falls from 20 oz to 18 oz

Exercise 3

- Suppose that when berries rise in price by 16%, the demand for cream falls from 20 oz to 18 oz
- However, when the price of cream rises by 16%, the demand for berries falls from 30 oz to 20 oz

Exercise 3

- Suppose that when berries rise in price by 16%, the demand for cream falls from 20 oz to 18 oz
- However, when the price of cream rises by 16%, the demand for berries falls from 30 oz to 20 oz
- Calculate ε_{bc} and ε_{cb}. Are berries and cream substitutes, complements, or neither?

Solution 3

- $$\varepsilon_{bc} = \frac{[(20 - 18)/19] \cdot 100}{16} = \frac{10.53}{16} = 0.658$$

Solution 3

- $$\varepsilon_{bc} = \frac{\left[\left(20 - 18\right)/19\right] \cdot 100}{16} = \frac{10.53}{16} = 0.658$$

- $$\varepsilon_{cb} = \frac{\left[\left(30 - 20\right)/25\right] \cdot 100}{16} = \frac{40}{16} = 2.5$$

Solution 3

- $$\varepsilon_{bc} = \frac{[(20 - 18)/19] \cdot 100}{16} = \frac{10.53}{16} = 0.658$$
- $$\varepsilon_{cb} = \frac{[(30 - 20)/25] \cdot 100}{16} = \frac{40}{16} = 2.5$$
- The goods are complements, note that they are asymmetric

Elasticity and Ceteris Paribus

- Recall my ceteris paribus example:

Elasticity and Ceteris Paribus

- Recall my ceteris paribus example:
  - You want to find the impact that time of year has on gas prices, so you decide to compare gas price averages across different months: Jan-Jan, Feb-Feb, etc. Your sample years are 2020 and 2021

Elasticity and Ceteris Paribus

- Recall my ceteris paribus example:
  - You want to find the impact that time of year has on gas prices, so you decide to compare gas price averages across different months: Jan-Jan, Feb-Feb, etc. Your sample years are 2020 and 2021
- Picking 2020 and 2021 will not give you an accurate measure of how time of year impacts gas, because COVID had such large impacts on everything

Elasticity and Ceteris Paribus

- Recall my ceteris paribus example:
  - You want to find the impact that time of year has on gas prices, so you decide to compare gas price averages across different months: Jan-Jan, Feb-Feb, etc. Your sample years are 2020 and 2021
- Picking 2020 and 2021 will not give you an accurate measure of how time of year impacts gas, because COVID had such large impacts on everything
- In the same spirit, what would happen if the price of good x changed between the two data points you were using to calculate income elasticity?

Elasticity and Ceteris Paribus (cont.)

Price (dollars per unit)	Quantity demanded (units per day)	
	Income \$2,000	Income \$3,000
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
30	300	[illegible]
40	[illegible]	250
[illegible]	[illegible]	[illegible]

I have two points with different Q_D and I. Can you calculate income elasticity using these two data points? What about PED?

Elasticity and Ceteris Paribus (cont.)

- Suppose you land a job at Amazon, and are tasked with calculating the price elasticity of demand for soda

Elasticity and Ceteris Paribus (cont.)

- Suppose you land a job at Amazon, and are tasked with calculating the price elasticity of demand for soda
- After a year of market research, you find the price elasticity of demand for Dr. Pepper 0.82

Elasticity and Ceteris Paribus (cont.)

- Suppose you land a job at Amazon, and are tasked with calculating the price elasticity of demand for soda
- After a year of market research, you find the price elasticity of demand for Dr. Pepper 0.82
- However, you neglected to notice that Pibb Xtra (Mr. Pibb) was running huge sales all year. Is that a big deal?

Elasticity and Ceteris Paribus (cont.)

- Suppose you land a job at Amazon, and are tasked with calculating the price elasticity of demand for soda
- After a year of market research, you find the price elasticity of demand for Dr. Pepper 0.82
- However, you neglected to notice that Pibb Xtra (Mr. Pibb) was running huge sales all year. Is that a big deal?
- A: **yes**. There are problems with all of these. Without keeping everything else constant, we have no way to separate out the effects from different price and income movements

Elasticity and Ceteris Paribus (cont.)

- Suppose you land a job at Amazon, and are tasked with calculating the price elasticity of demand for soda
- After a year of market research, you find the price elasticity of demand for Dr. Pepper 0.82
- However, you neglected to notice that Pibb Xtra (Mr. Pibb) was running huge sales all year. Is that a big deal?
- A: **yes**. There are problems with all of these. Without keeping everything else constant, we have no way to separate out the effects from different price and income movements
  - You can't know that a 1% increase in price decreases demand for Dr. Pepper by 0.82%, because, for all you know, most of the demand decrease you saw came from Mr. Pibb sales

Elasticity and Ceteris Paribus (cont.)

- Suppose you land a job at Amazon, and are tasked with calculating the price elasticity of demand for soda
- After a year of market research, you find the price elasticity of demand for Dr. Pepper 0.82
- However, you neglected to notice that Pibb Xtra (Mr. Pibb) was running huge sales all year. Is that a big deal?
- A: **yes**. There are problems with all of these. Without keeping everything else constant, we have no way to separate out the effects from different price and income movements
    - You can't know that a 1% increase in price decreases demand for Dr. Pepper by 0.82%, because, for all you know, most of the demand decrease you saw came from Mr. Pibb sales
    - Likewise, the decrease in the demand for mushrooms could very well have been from the price increase (we actually know it is, because we found mushrooms to be a normal good earlier). Moreover, the income change increase could have stunted this observation about price elasticity

Takeaway

- To effectively calculate elasticities, you have to have other relevant factors held constant

Takeaway

- To effectively calculate elasticities, you have to have other relevant factors held constant
- This is the tough task of many experimental and data-driven economists: finding data and using techniques such that you can isolate meaningful results that you are confident in

Comments

- I will cover 5-2 on Monday
- Read 5-3 on your own
- You can start the homework, but you may want to wait until after Monday before you get too far