Lecture 5:
Individual and Market Demand

September 29, 2015
Overview

Course Administration

Change in Income and Changes in Consumption

Figuring Out Your Demand Curve

Income and Substitution Effects

Individual Demand to Market Demand
Course Administration

1. Return Problem Set 3
2. Problem Set 5 is posted
3. Email me to post notes if you need them before they are posted
4. Reminder: midterm October 20
   • Two more classes, then the midterm
   • Out of town for work Thursday Oct. 15; will re-schedule office hours for Oct. 19
5. Any questions?
Ripped from the Headlines

As a reminder, next week

Afternoon

Finder       Presenter
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Colette Tano  Lily Robin

Evening

Finder       Presenter
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Elizabeth Krevsky  Alex Severn
Kevin Schoenberger  Claire Viall
Concepts from Last Class

- Utility
- Indifference curves
- Budget constraint
- Utility maximization
Concepts from Last Class

- Utility
- Indifference curves
- Budget constraint
- Utility maximization

\[ MRS_{X,Y} = \frac{P_X}{P_Y} \]
\[ \frac{MU_X}{MU_Y} = \frac{P_X}{P_Y} \]
How do Changes in Income Affect Consumption?

- Income effect $\equiv$ change in consumption due to a change in income
- When income increases, what happens to
  - location of budget constraint?
How do Changes in Income Affect Consumption?

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  - slope of budget constraint?
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  - shape of indifference curves?
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How do Changes in Income Affect Consumption?

• **Income effect** ≡ change in consumption due to a change in income

• When income increases, what happens to
  • location of budget constraint? shifts outward
  • slope of budget constraint? unchanged, since prices haven’t changed
  • shape of indifference curves? nothing!

• The consumer gets more utility with more income
Reminder: Some definitions

- Normal good ≡ good for which consumption increases with income
- Inferior good ≡ good for which consumption decreases with income
- Whether a good is normal or inferior depends on your income. Example?
Normal and Inferior Goods in Pictures

Find the Inferior Good!

Diagram of Vacations and Fancy Meals:
- Income rises from $Q_v$ to $Q'_v$
- Budget constraints $BC_1$ and $BC_2$

Diagram of Quantity of Mac and Cheese:
- Income rises from $Q_{mac}$ to $Q'_{mac}$
- Budget constraints $BC_1$ and $BC_2$
Income Elasticity and Types of Goods

\[ E_I^D = \frac{\% \Delta Q}{\% \Delta I} = \frac{\Delta Q}{\Delta I} \times \frac{I}{Q} \]

- Sign of \( E_I^D \) for inferior goods?

\[ E_I^D < 0 \]

- Sign of \( E_I^D \) for normal goods?

\[ E_I^D > 0 \]

- Necessity goods: \( 0 < E_I^D < 1 \)

- Luxury goods: \( E_I^D > 1 \)

- \( E_I^D = 0 \): Income inelastic
Income Elasticity and Types of Goods

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Income Elasticity and Types of Goods

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- Sign of \( E^D_I \) for inferior goods? \( E^D_I < 0 \)
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Income Elasticity and Types of Goods

\[ E^D_I = \frac{\% \Delta Q}{\% \Delta I} = \frac{\Delta Q}{\Delta I} \times \frac{I}{Q} \]

- Sign of \( E^D_I \) for inferior goods? \( E^D_I < 0 \)
- Sign of \( E^D_I \) for normal goods? \( E^D_I > 0 \)
  - necessity goods: \( 0 < E^D_I < 1 \)
  - luxury goods: \( E^D_I > 1 \)
- \( E^D_I = 0 \): Income inelastic
We want to describe the basket of goods you consume at each possible income level.

Income expansion path ≡ optimal bundles at each income level.

- Normal goods → positive slope
- Inferior goods → negative slope

Note: Skipping Engel curves due to time constraints!
Using Income and Utility to Find Your Demand Curve

- Recall that a demand curve shows the quantity demanded at a given price.
- In other words, what happens to consumption of $X$ as price changes.
- We now have the tools to figure this out for you.
- We draw budget constraints and indifferences curves in $Y$ vs $X$, but we need a $P$ vs $X$ graph for demand.
Using Income and Utility to Find Your Demand Curve
Using Income and Utility to Find Your Demand Curve

\[ Q_Y \]

\[ P \]

\[ Q \]

\[ Q_X \]

\[ X_1 \]
Using Income and Utility to Find Your Demand Curve

The graph shows a demand curve for a good, with the quantity demanded (Q_X) on the horizontal axis and the price (P) on the vertical axis. The quantity supplied (Q_Y) is represented on the vertical axis of another graph. The point X_1 indicates a specific price and quantity demanded relationship.
Using Income and Utility to Find Your Demand Curve
Using Income and Utility to Find Your Demand Curve

\[ Q_Y \]

\[ Q_X \]

\[ X_1 \]

\[ X_2 \]
Using Income and Utility to Find Your Demand Curve
Using Income and Utility to Find Your Demand Curve
Using Income and Utility to Find Your Demand Curve

\[ Q^Y \]

\[ Q^X \]

\[ P \]

\[ X_1 \quad X_2 \]
Using Income and Utility to Find Your Demand Curve
Using Income and Utility to Find Your Demand Curve
What Shifts Your Demand Curve?

• Changes in price move us along the demand curve
• Changes in tastes or income or prices of other goods may shift the demand curve
• How would we change the preferences in the previous example?
What Shifts Your Demand Curve?

- Changes in price move us along the demand curve
What Shifts Your Demand Curve?

- Changes in price move us along the demand curve
- Changes in tastes or income or prices of other goods may shift the demand curve
- How would we change the preferences in the previous example?
Any change in quantity demanded comes from at least one of these two sources

- **Substitution effect** ≡ “change in consumer’s consumption choices due to a change in the relative prices of goods”
- **Income effect** ≡ “change in consumer’s consumption choices due to a change in the consumer’s income”

Note that policymakers can influence both of these margins.
Price Changes and the Total Effect

Total Effect = Substitution Effect + Income Effect
Total Effect = due to price $\Delta$ + due to income $\Delta$

Diagram showing the relationship between rounds of golf and restaurant meals, illustrating the concept of total effect.
Isolating the Substitution Effect

- Change in consumption from $A$ (old) to $B$ (new) due to fall in $P_{\text{meals}}$
- Substitution effect is the change in $Q$ due to a change in the relative price of $X$ and $Y$ holding utility constant
- What would you consume if you were at the old happiness (utility), but prices changed? Call this $A'$
- $A$ to $A'$ is the substitution effect.
- With two normal goods, substitute toward the cheaper good
• Income effect is change in consumption due to change in purchasing power
• With normal goods, you want more of both goods
Isolating the Income Effect

- Income effect is change in consumption due to change in purchasing power
- With normal goods, you want more of both goods
Walking Through Both Effects
Walking Through Both Effects

\[ Q_Y \]

\[ I/P_Y \]

\[ I/P_{Y,\text{old}} \]

\[ I/P_{Y,\text{new}} \]

\[ Q_X \]

\[ I/P_{X,\text{old}} \]

\[ I/P_{X,\text{new}} \]
Walking Through Both Effects

\[ Q_Y \]

\[ \frac{I}{P_Y} \]

\[ \frac{I}{P_{X,old}} \quad \frac{I}{P_{X,new}} \]
Walking Through Both Effects
Walking Through Both Effects

\[ Q_Y \]

\[ I/P_Y \]

\[ I/P_{X,old} \]

\[ I/P_{X,new} \]

\[ Q_X \]
Walking Through Both Effects
Walking Through Both Effects
Walking Through Both Effects

\[
\begin{align*}
Q_Y & \quad I/P_Y \\
\text{subst. effect} & \\
\text{subst. effect} & \\
\text{subst. effect} & \\
\end{align*}
\]
Walking Through Both Effects
Walking Through Both Effects

\[ Q_Y \]
\[ I/P_Y \]
\[ Q_X/P_X, \text{new} \]
\[ I/P_{X,\text{old}} \]
\[ I/P_{X,\text{new}} \]
Walking Through Both Effects

total income substitution
Walking Through Both Effects

\[ Q_Y \]

\[ I/P_Y \]

\[ Q_X \]

\[ I/P_{X,\text{old}} \]

\[ I/P_{X,\text{new}} \]

income substitution

total income substitution
Walking Through Both Effects

\[
\begin{align*}
Q_Y & \quad I/P_Y \\
I/P_{X, old} & \quad I/P_{X, new} \\
Q_X & 
\end{align*}
\]
Substitutes, Complements and Indifference Curves

- Recall indifference curves for perfect complements
- Recall indifference curves for perfect substitutes
- Real-life indifference curves are probably usually between these two extreme cases
- The less curved the indifference curves are, the more substitutable the goods
- Does a price change for \( X \) have a larger or smaller effect if the indifference curves are straighter? Why?
What Determines Size of Income and Substitution Effects?

Substitution Effect

- Depends on the curvature of the indifference curves
- Very curved indifference curves (closer to perfect complements) leads to smaller changes in response to price
- Very flat indifference curves (closer to perfect substitutes) leads to larger changes in response to price
What Determines Size of Income and Substitution Effects?

Substitution Effect
- Depends on the curvature of the indifference curves
- Very curved indifference curves (closer to perfect complements) leads to smaller changes in response to price
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Income Effect
- Related to the quantity of each good consumer purchases before price change
- The more you spent on the good before the price change, the greater the effect of the price change on your budget
- → Effect is largest for goods that make up the largest share of the budget
Try It Out Yourself

Monika eats chips and crackers.

- Income is $20
- \( P_{\text{chips}} = 1, \ P_{\text{crackers}} = 2 \)
- Her optimal choice at these prices is 16 bags of chips and 2 bags of crackers
- When \( P_{\text{crackers,new}} = 1 \), Monika eats 8 bags of chips and 12 bags of crackers

Questions

1. Draw the budget constraint and utility curves consistent with this description; put crackers on the x-axis
2. Find the income and substitution effects for crackers. Which is larger?
3. Are crackers a normal or inferior good? Chips?
Monika’s Eating Habits

Graph 1: Monika's Demand Choices
- **Chips** vs. **Crackers**
- **Total effect**
- **Substitution effect**
- **Income effect**

Graph 2: Budget Constraint
- **Chips** vs. **Crackers**
- **Budget constraint rotation**
- **Income and substitution effects**

**Monika's Income and Price Changes**
- **Original Prices:**
  - Chips: $2
  - Crackers: $1
- **New Prices:**
  - Chips: $1
  - Crackers: $2

**Monika's Consumption Change**
- **Initial Consumption:**
  - Chips: 12 bags
  - Crackers: 8 bags
- **New Consumption:**
  - Chips: 16 bags
  - Crackers: 8 bags

**Monika’s Demand Analysis**

1. **For inferior goods,** the substitution and income effects move in opposite directions.
   - **Substitution effect:**
     - **Substitution effect** holds utility constant, moving from bundle $A$ to bundle $A'$.
   - **Income effect:**
     - **Income effect** holds consumption constant, moving from bundle $A$ to bundle $A'$.

2. **H. Giffen Goods**
   - **Giffen good**
     - When the price of a good falls, the quantity demanded increases.

3. **Crackers:**
   - Normal good (purchasing power increases, demand increases)
   - Inferior good (purchasing power increases, demand decreases)

**Additional Figures**
- **Figure 5.3:**
  - **Figure it out**

**Solution:**
- **Price Impact:**
  - When the price of chips falls, Monica's income increases, allowing her to purchase more chips.
  - When the price of crackers falls, Monica's purchasing power increases, allowing her to purchase more crackers.

**Conclusion:**
- **Giffen good**
  - Monika consumes more of the inferior good (crackers) when her income increases.
Finally, Getting to Market Demand!

- Market demand is the sum of all individual demands
- Add individual demands horizontally
- For any price, add the quantities
Adding Horizontally
Using Algebra To Do This

Suppose we have two demand curves

- $Q_{Joe} = 5 - 0.05P$
- $Q_{Jack} = 13 - 0.25P$

This is a piece-wise linear function. What are the pieces?
Using Algebra To Do This

Suppose we have two demand curves

- $Q_{Joe} = 5 - 0.05P$
- $Q_{Jack} = 13 - 0.25P$

This is a piece-wise linear function. What are the pieces?

- At $P > $52, Jack doesn’t want any more
- At $P > $100, Joe doesn’t want any more
In Pictures

Joe’s Demand

P

100

52

Q

5

13

Joe
In Pictures

Jack’s Demand

Joe

Jack

Q

P

100

52

5

13
The Algebra of Demand Curve Addition

- Note that no one wants to pay more than $100
- The maximum total quantity demanded is $Q = 18$
The Algebra of Demand Curve Addition

- Note that no one wants to pay more than $100
- The maximum total quantity demanded is \( Q = 18 \)

We write this as

\[
Q_M = \begin{cases} 
Q_{Joe} + Q_{Jack} = 18 - 0.3P & \text{if } 0 < P \leq 52 \\
Q_{Joe} = 5 - 0.05P & \text{if } 52 < P \leq 100
\end{cases}
\]
Market Demand in Pictures

- The blue curve represents the total market demand.
- The curve kinks at $P=52$, $Q=2.4$.
- At $P=52$, the market demand curve transitions, indicating a change in consumer behavior or market conditions.
In a very small town, only Jim and Alice want gasoline. Jim’s demand is \( Q_J = 15 - 3P \) and Alice’s is \( Q_A = 30 - 5P \).

1. Find the equation for the market demand for gas
2. Draw the demand curve in a chart
 Recap of Today

• Changes in Income and Utility Maximization
• Changes in Prices and Utility Maximization
• Income and Substitution Effects
• Market Demand
Next Class

- Problem Set 4
- Producers! GLS, Chapter 6