CHAPTER 4

The Theory of Individual Behavior
Chapter Outline

• Consumer behavior
• Constraints
  – Budget constraint
  – Changes in income
  – Changes in prices
• Consumer equilibrium
• Comparative statics
  – Price changes and consumer behavior
  – Income changes and consumer behavior
  – Income and substitution effects
• Applications of indifference curve analysis
  – Choices by consumers
  – Choices by workers and managers
• Relationship between indifference curves and demand curves
  – Individual demand
  – Market demand
Introduction

• Chapter 3 focused on quantitatively measuring demand.
  – By how much will a 5 percent increase in price reduce quantity demanded?
  – By how much will a 3 percent decline in income reduce demand for a normal good?

• This chapter examines the theory of consumer behavior that underlies individual and market demand curves.
Consumer Behavior

• Consumer opportunities
  – Set of possible goods and services consumers can afford to consume.

• Consumer preferences
  – Determine which set goods and services will be consumed.
Properties of Consumer Preferences

• Completeness: For any two bundles of goods either:
  – \( A > B \).
  – \( B > A \).
  – \( A \sim B \).

• More is better
  – If bundle \( A \) has at least as much of every good as bundle \( B \) and more of some good, bundle \( A \) is preferred to bundle \( B \).

• Diminishing marginal rate of substitution
  – As a consumer obtains more of good \( X \), the amount of good \( Y \) the individual is willing to give up to obtain another unit of good \( X \) decreases.

• Transitivity: For any three bundles, \( A, B, \) and \( C \), either:
  – If \( A > B \) and \( B > C \), then \( A > C \).
  – If \( A \sim B \) and \( B \sim C \), then \( A \sim C \).
Constraints

• While any decision-making environment faces a host of constraints, the focus of managerial economics is to examine the role prices and income play in constraining consumer behavior.
The Budget Constraint

• Budget constraint
  – Restriction set by prices and income that limits bundles of goods affordable to consumers.
  – Budget set:
    \[ P_X X + P_Y Y \leq M \]
  – Budget line
    \[ P_X X + P_Y Y = M \]
The Budget Constraint In Action

Budget line: \( Y = \frac{M}{P_Y} - \frac{P_X}{P_Y} X \)

Budget set: \( Y \leq \frac{M}{P_Y} - \frac{P_X}{P_Y} X \)

Slope

- Bundle G
- Bundle H

Constraints
The Market Rate of Substitution

Budget line: \( Y = 5 - \frac{1}{2}X \)

Market rate of substitution: \( \frac{(4-3)}{(2-4)} = -\frac{1}{2} \)
Income Changes

Good Y

\[ \frac{M^1}{P_Y} \]

\[ \frac{M^0}{P_Y} \]

\[ \frac{M^2}{P_Y} \]

0

\[ \frac{M^2}{P_Y} \]

\[ \frac{M^0}{P_Y} \]

\[ \frac{M^1}{P_Y} \]

Good X

Constraints

\[ M \downarrow \quad M \uparrow \]
Price Changes

\[
P_X^0 > P_X^1
\]

Constraints

Initial budget line

New budget line

\[
\frac{M}{P_Y} = \frac{M}{P_X^0} = \frac{M}{P_X^1}
\]
The Budget Constraint in Action

• Consider the following budget line:

\[ 100 = 1X + 5Y \]

– What is the maximum amount of X that can be consumed?
– What is the maximum amount of Y that can be consumed?
– What is rate at which the market trades goods X and Y?
The Budget Constraint in Action

• Answers:
  – Maximum X is: \[ X = \frac{100}{1} = 100 \text{ units}. \]
  – Maximum Y is: \[ Y = \frac{100}{5} = 20 \text{ units}. \]
  – Market rate of substitution: \[ -\frac{P_X}{P_Y} = -\frac{1}{5}. \]
Consumer Equilibrium

• Consumer equilibrium
  – Consumption bundle that is affordable and yields the greatest satisfaction to the consumer.
  – Consumption bundle where the rate a consumer *chooses* (marginal rate of substitution) to trade between goods X and Y equals the rate at which these goods are traded in the *market* (market rate of substitution).

\[ MRS = \frac{P_X}{P_Y} \]
Consumer Equilibrium in Action

Consumer equilibrium

Good Y

Good X

0

III

II

I

A

B

C

D
Consumer Equilibrium in Action

• Consider the following consumer market information:
  – $MRS = 2$.
  – $\frac{P_X}{P_Y} = 4$.

• Does this information constitute a consumer equilibrium?
  – No!

• Propose a solution to bring the consumer to an equilibrium point.
  – Trade consumption of X for more Y.
  – Total utility *can* increase.
Comparative Statics

• Price and income changes impact a consumer’s budget set and level of satisfaction that can be achieved.
  – This implies that price and income changes will lead to consumer equilibrium changes.

• This section explores how price and income changes impact consumer equilibrium.
Price Changes and Consumer Equilibrium

• Price increases (decreases) reduce (expand) a consumer’s budget set.

• The new consumer equilibrium resulting from a price change depends on consumer preferences:
  – Goods X and Y are:
    • substitutes when an increase (decrease) in the price of X leads to an increase (decrease) in the consumption of Y.
    • complements when an increase (decrease) in the price of X leads to a decrease (increase) in the consumption of Y.
Price Changes and Consumer Equilibrium in Action

Point A: Initial consumer equilibrium
Price of good $X$ decreases: $P_X \downarrow$
Point B: New consumer equilibrium
Since $Y_1 < Y_0$ when $P_X \downarrow$:
Conclude that goods $X$ and $Y$ are substitutes
Income Changes and Consumer Equilibrium

• Income increases (decreases) expands (reduces) a consumer’s budget set.

• The new consumer equilibrium resulting from an income change depends on consumer preferences:
  – Good X is:
    • a normal good when an increase (decrease) in income leads to an increase (decrease) in the consumption of X.
    • an inferior good when an increase (decrease) in income leads to a decrease (increase) in the consumption of X.
Income Changes and Consumer Equilibrium in Action

Point A: Initial consumer equilibrium
Income increases: $M \uparrow$

Point B: New consumer equilibrium
Since more of both goods are consumed when $M \uparrow$: Conclude that goods $X$ and $Y$ are normal goods.
Substitutions and Income Effects

• Moving from one equilibrium to another when the price of one good changes can be broken down into two effects:
  – Substitution effect
  – Income effect
Substitution and Income Effects in Action

Point A: Initial consumer equilibrium
Price of good X increases: $P_X \uparrow$
Point C: new consumer equilibrium
$X_M - X_0$: substitution effect
$X_1 - X_M$: income effect
**Consumer Choice with a Gift Certificate**

Point A: Initial consumer equilibrium
Receive a $10 gift certificate for good $X$: $M + $10

Point B: higher utility holding $Y$ consumption at initial level

Point C: new consumer equilibrium when $X$ and $Y$ are normal goods
Labor-Leisure Choice Model

Applications of Indifference Curves

Income (per day)

Leisure (hours per day)

Worker equilibrium

16 hours of leisure  8 hours of work

16 hours of leisure  8 hours of work
Labor-Leisure Budget Set in Action

• What is the budget set for a worker who receives $7 per hour of work and a fixed payment of $70? Let $E$ denote the worker’s total earnings and $L$ the number of leisure hours in a 24-hour day.

\[
E = 70 + 7(24 - L) = 238 - 7L
\]
Indifference and Demand Curves

• The indifference curves and consumers’ reactions to changes in prices and income are the basis of the demand functions in chapters 2 and 3.
From Indifference Curves to Individual Demand

The Relationship Between Indifference Curve Analysis and Demand Curves
From Individual to Market Demand

The Relationship Between Indifference Curve Analysis and Demand Curves
Conclusion

• Indifference curve properties reveal information about consumers’ preferences between bundles of goods.
  – Completeness
  – More is better
  – Diminishing rate of substitution
  – Transitivity

• Indifference curves along with price changes determine individuals’ demand curves.

• Market demand is the horizontal summation of individuals’ demands.