Chapter 3 Consumer Behavior

Read Pindyck and Rubinfeld (2013), Chapter 3

Microeconomics, 8th Edition by
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Adapted by Chairat Aemkulwat for
Econ I: 2900111
CHAPTER 3 OUTLINE

3.1 Consumer Preferences
3.2 Budget Constraints
3.3 Consumer Choice
3.4 Revealed Preference
3.5 Marginal Utility and Consumer Choice
theory of consumer behavior  Description of how consumers allocate incomes among different goods and services to maximize their well-being.

Consumer behavior is best understood in three distinct steps:

1. Consumer preferences
2. Budget constraints
3. Consumer choices
3.1 Consumer Preferences

- **Market Baskets**

  - **Market basket (or bundle)** List with specific quantities of one or more goods.

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<th>TABLE 3.1 ALTERNATIVE MARKET BASKETS</th>
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<td>MARKET BASKET</td>
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To explain the theory of consumer behavior, we will ask whether consumers prefer one market basket to another.
• Some Basic Assumptions about Preferences

1. Completeness: Preferences are assumed to be complete. In other words, consumers can compare and rank all possible baskets.

• Thus, for any two market baskets $A$ and $B$, a consumer
  – will prefer $A$ to $B$,
  – will prefer $B$ to $A$, or
  – will be indifferent between the two. By indifferent we mean that a person will be equally satisfied with either basket.

• Note that these preferences ignore costs. A consumer might prefer steak to hamburger but buy hamburger because it is cheaper.
• Some Basic Assumptions about Preferences

2. **Transitivity**: Preferences are *transitive*. Transitivity means that if a consumer prefers basket \( A \) to basket \( B \) and basket \( B \) to basket \( C \), then the consumer also prefers \( A \) to \( C \). Transitivity is normally regarded as necessary for consumer consistency.

3. **More is better than less**: Goods are assumed to be desirable—i.e., to be *good*. Consequently, *consumers always prefer more of any good to less*. In addition, *consumers are never satisfied or satiated*; *more is always better, even if just a little better*.

• This assumption is made for pedagogic reasons; namely, it simplifies the graphical analysis. Of course, some goods, such as *air pollution*, may be *undesirable*, and consumers will always prefer less. We ignore these “bads” in the context of our immediate discussion.
Describing Individual Preferences

Because more of each good is preferred to less, we can compare market baskets in the shaded areas. Basket $A$ is clearly preferred to basket $G$, while $E$ is clearly preferred to $A$.

However, $A$ cannot be compared with $B$, $D$, or $H$ without additional information.
3.1 CONSUMER PREFERENCES

- Indifference curves

**indifference curve** Curve representing all combinations of market baskets that provide a consumer with the same level of satisfaction.

*Figure 3.2 An Indifference Curve*

The indifference curve $U_1$ that passes through market basket $A$ shows all baskets that give the consumer the same level of satisfaction as does market basket $A$; these include baskets $B$ and $D$.

Our consumer prefers basket $E$, which lies above $U_1$, to $A$, but prefers $A$ to $H$ or $G$, which lie below $U_1$. 
3.1 CONSUMER PREFERENCES

• Indifference Maps

  • indifference map  Graph containing a set of indifference curves showing the market baskets among which a consumer is indifferent.

![An Indifference Map](image-url)

An indifference map is a set of indifference curves that describes a person’s preferences.

Any market basket on indifference curve $U_3$, such as basket $A$, is preferred to any basket on curve $U_2$ (e.g., basket $B$), which in turn is preferred to any basket on $U_1$, such as $D$. 
If indifference curves $U_1$ and $U_2$ intersect, one of the assumptions of consumer theory is violated.

According to this diagram, the consumer should be indifferent among market baskets $A$, $B$, and $D$. Yet $B$ should be preferred to $D$ because $B$ has more of both goods.
• The Marginal Rate of Substitution

- **marginal rate of substitution**  Maximum amount of a good that a consumer is willing to give up in order to obtain one additional unit of another good.

Figure 3.5

**The Marginal Rate of Substitution**

The magnitude of the slope of an indifference curve measures the consumer’s marginal rate of substitution (MRS) between two goods.

In this figure, the MRS between clothing (C) and food (F) falls from 6 (between A and B) to 4 (between B and D) to 2 (between D and E) to 1 (between E and G).

Observe that the MRS falls as we move down the indifference curve.
4. Diminishing marginal rate of substitution:
The decline in the MRS reflects our fourth assumption regarding consumer preferences: a **diminishing marginal rate of substitution**

**CONVEXITY**

When the MRS diminishes along an indifference curve, the curve is convex.

The term *convex* means that the slope of the indifference increases (i.e., less negative) as we move down the curve.
Perfect Substitutes and Perfect Complements

- **perfect substitutes** Two goods for which the marginal rate of substitution of one for the other is a constant.

- **perfect complements** Two goods for which the MRS is zero or infinite; the indifference curves are shaped as right angles.

**Bads**

- **bad** Good for which less is preferred rather than more.
In (a), Bob views orange juice and apple juice as perfect substitutes: He is always indifferent between a glass of one and a glass of the other.

In (b), Jane views left shoes and right shoes as perfect complements: An additional left shoe gives her no extra satisfaction unless she also obtains the matching right shoe.
Preferences for automobile attributes can be described by indifference curves. Each curve shows the combination of acceleration and interior space that give the same satisfaction.

**Figure 3.7**
PREFERENCES FOR AUTOMOBILE ATTRIBUTES

Owners of Ford Mustang coupes (a) are willing to give up considerable interior space for additional acceleration.

The opposite is true for owners of Ford Explorers. They prefer interior space to acceleration (b).
3.1 Utility and Utility Functions

- **utility**: Numerical score representing the satisfaction that a consumer gets from a given market basket.

- **utility function**: Formula that assigns a level of utility to individual market baskets. 

  \[ u(F, C) = FC \]

**Figure 3.8** Utility Functions and Indifference Curves

A utility function can be represented by a set of indifference curves, each with a numerical indicator.

This figure shows three indifference curves (with utility levels of 25, 50, and 100, respectively) associated with the utility function:

\[ u(F, C) = FC \]
A cross-country comparison shows that individuals living in countries with higher GDP per capita are on average happier than those living in countries with lower per-capita GDP.

- **ordinal utility function** Utility function that generates a ranking of market baskets in order of most to least preferred.

- **cardinal utility function** Utility function describing how much one market basket is preferred to another.

**EXAMPLE 3.2 CAN MONEY BUY HAPPINESS?**

**FIGURE 3.9 INCOME AND HAPPINESS**

A cross-country comparison shows that individuals living in countries with higher GDP per capita are on average happier than those living in countries with lower per-capita GDP.
2. Draw indifference curves that represent the following individuals’ preferences for hamburgers and soft drinks. Indicate the direction in which the individuals’ satisfaction (or utility) is increasing.

a) Joe has *convex* preferences and dislikes both hamburgers and soft drinks.

b) Jane loves hamburgers and dislikes soft drinks. If she is served a soft drink, she will pour it down the drain rather than drink it.

c) Bob loves hamburgers and dislikes soft drinks. If he is served a soft drink, he will drink it to be polite.

d) Molly loves hamburgers and soft drinks, but insists on consuming exactly one soft drink for every two hamburgers that she eats.

e) Bill likes hamburgers, but neither likes nor dislikes soft drinks.

f) Mary always gets twice as much satisfaction from an extra hamburger as she does from an extra soft drink.
a) Joe has *convex* preferences and dislikes both hamburgers and soft drinks.

**ANS.** a) Since Joe dislikes both goods, he prefers less to more, and his satisfaction is increasing in the direction of the origin. Convexity of preferences implies his indifference curves will have the normal shape in that they are bowed towards the direction of increasing satisfaction. Convexity also implies that given any two bundles between which the Joe is indifferent, any linear combination of the two bundles will be in the preferred set, or will leave him at least as well off. This is true of the indifference curves shown in the diagram.

b) Jane loves hamburgers and dislikes soft drinks. If she is served a soft drink, she will pour it down the drain rather than drink it.

**ANS.** b) Since Jane can freely dispose of the soft drink if it is given to her, she considers it to be a neutral good. This means she does not care about soft drinks one way or the other. With hamburgers on the vertical axis, her indifference curves are horizontal lines. Her satisfaction increases in the upward direction.

c) Bob loves hamburgers and dislikes soft drinks. If he is served a soft drink, he will drink it to be polite.

**ANS.** c) Since Bob will drink the soft drink in order to be polite, it can be thought of as a “bad”. When served another soft drink, he will require more hamburgers at the same time in order to keep his satisfaction constant. More soft drinks without more hamburgers will worsen his utility. More hamburgers and fewer soft drinks will increase his utility, so his satisfaction increases as we move upward and to the left.
d) Molly loves hamburgers and soft drinks, but insists on consuming exactly one soft drink for every two hamburgers that she eats.

**Ans.** d) Molly wants to consume the two goods in a fixed proportion so her indifference curves are L-shaped. For a fixed amount of one good, she gets no extra satisfaction from having more of the other good. She will only increase her satisfaction if she has more of both goods.

e) Bill likes hamburgers, but neither likes nor dislikes soft drinks.

**Ans.** e) Like Jane, Bill considers soft drinks to be a neutral good. Since he does not care about soft drinks one way or the other we can assume that no matter how many he has, his utility will be the same. His level of satisfaction depends entirely on how many hamburgers he has, so his satisfaction increases in the upward direction only.

f) Mary always gets twice as much satisfaction from an extra hamburger as she does from an extra soft drink.

**Ans.** f) How much extra satisfaction Mary gains from an extra hamburger or soft drink tells us something about the marginal utilities of the two goods and about her MRS. If she always receives twice the satisfaction from an extra hamburger, then her marginal utility from consuming an extra hamburger is twice her marginal utility from consuming an extra soft drink. Her MRS, with hamburgers on the vertical axis, is 1/2 because she will give up one hamburger only if she receives two soft drinks. Her indifference curves are straight lines with a slope of -1/2.
6. Suppose that Jones and Smith have each decided to allocate $1000 per year to an entertainment budget in the form of hockey games or rock concerts. They both like hockey games and rock concerts and will choose to consume positive quantities of both goods. However, they differ substantially in their preferences for these two forms of entertainment. **Jones prefers hockey games** to rock concerts, while **Smith prefers rock concerts to hockey games**.

a. Draw a set of indifference curves for Jones and a second set for Smith (place rock concerts on the vertical axis).

b. Using the concept of marginal rate of substitution, explain why the two sets of curves are different from each other.
6.a) Draw a set of indifference curves for Jones and a second set for Smith (place rock concerts on the vertical axis).

ANS. Given they each like both goods and they will each choose to consume positive quantities of both goods, we can assume their indifference curves have the normal convex shape. However since Jones has an overall preference for hockey and Smith has an overall preference for rock concerts, their two sets of indifference curves will have different slopes. Suppose that we place rock concerts on the vertical axis and hockey games on the horizontal axis, Jones will have a larger $MRS$ than Smith. Jones is willing to give up more rock concerts in exchange for a hockey game since he prefers hockey games. Thus, indifference curves for Jones will be steeper than the indifference curves for Smith.

6.b) Using the concept of marginal rate of substitution, explain why the two sets of curves are different from each other.

ANS. At any combination of hockey games and rock concerts, Jones is willing to give up more rock concerts for an additional hockey game, whereas Smith is willing to give up fewer rock concerts for an additional hockey game. Since the $MRS$ is a measure of how many of one good (rock concerts) an individual is willing to give up for an additional unit of the other good (hockey games), the $MRS$, and hence the slope of the indifference curves, will be different for the two individuals.
3.2 Budget Constraints

- budget constraints  Constraints that consumers face as a result of limited incomes. (eg. $80)

- The Budget Line

- budget line  All combinations of goods for which the total amount of money spent is equal to income.

\[ P_F F + P_C C = I \]  \hspace{1cm} (3.1)

Market baskets associated with the budget line $F + 2C = $80

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<tr>
<th>TABLE 3.2</th>
<th>MARKET BASKETS AND THE BUDGET LINE</th>
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<td>MARKET BASKET</td>
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<tr>
<td>B</td>
<td>20</td>
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<td>D</td>
<td>40</td>
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<td>E</td>
<td>60</td>
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<td>G</td>
<td>80</td>
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3.2 BUDGET CONSTRAINTS

• The Budget Line

Figure 3.10

A Budget Line

A budget line describes the combinations of goods that can be purchased given the consumer’s income and the prices of the goods. Line AG (which passes through points B, D, and E) shows the budget associated with an income of $80, a price of food of $P_F = $1 per unit, and a price of clothing of $P_C = $2 per unit.

The slope of the budget line (measured between points B and D) is $-P_F/P_C = -10/20 = -1/2$. 
3.2 BUDGET CONSTRAINTS

- The Effects of Changes in Income and Prices

Figure 3.11

Effects of a Change in Income on the Budget Line

**Income changes** A change in income (with prices unchanged) causes the budget line to shift parallel to the original line ($L_1$).

When the income of $80$ (on $L_1$) is increased to $160$, the budget line shifts outward to $L_2$.

If the income falls to $40$, the line shifts inward to $L_3$. 
3.2 BUDGET CONSTRAINTS

- The Effects of Changes in Income and Prices

Figure 3.12

Effects of a Change in Price on the Budget Line

**Price changes** A change in the price of one good (with income unchanged) causes the budget line to rotate about one intercept.

When the price of food falls from $1.00 to $0.50, the budget line rotates outward from $L_1$ to $L_2$.

However, when the price increases from $1.00 to $2.00, the line rotates inward from $L_1$ to $L_3$. 
8. Anne has a job that requires her to travel three out of every four weeks. She has an annual travel budget and can travel either by train or by plane. The airline on which she typically flies has a frequent-traveler program that reduces the cost of her tickets according to the number of miles she has flown in a given year.

- When she reaches 25,000 miles, the airline will reduce the price of her tickets by 25 percent for the remainder of the year.
- When she reaches 50,000 miles, the airline will reduce the price by 50 percent for the remainder of the year.

Graph Anne’s budget line, with train miles on the vertical axis and plane miles on the horizontal axis.

Ans. The typical budget line is linear (with a constant slope) because the prices of the two goods do not change as the consumer buys more or less of each good. In this case, the price of airline miles changes depending on how many miles Anne purchases. As the price changes, the slope of the budget line changes. Because there are three prices, there will be three slopes (and two kinks) to the budget line. Since the price falls as Anne flies more miles, her budget line will become flatter with every price change.
The maximizing market basket must satisfy two conditions:

1. *It must be located on the budget line.*

2. *It must give the consumer the most preferred combination of goods and services.*
A consumer maximizes satisfaction by choosing market basket $A$. At this point, the budget line and indifference curve $U_2$ are tangent. No higher level of satisfaction (e.g., market basket $D$) can be attained.

At $A$, the point of maximization, the MRS between the two goods equals the price ratio. At $B$, however, because the MRS $[-(-10/10) = 1]$ is greater than the price ratio $(1/2)$, satisfaction is not maximized.
Satisfaction is maximized (given the budget constraint) at the point where $\text{MRS} = \frac{P_F}{P_C}$.

- **marginal benefit**: Benefit from the consumption of one additional unit of a good.
- **marginal cost**: Cost of one additional unit of a good.

Using these definitions, we can then say that satisfaction is maximized when the **marginal benefit**—the benefit associated with the consumption of one additional unit of food—is equal to the **marginal cost**—the cost of the additional unit of food. The marginal benefit is measured by the MRS.
Different preferences of consumer groups for automobiles can affect their purchasing decisions. Following up on Example 3.1, we consider two groups of consumers planning to buy new cars.

**Figure 3.14**
**CONSUMER CHOICE OF AUTOMOBILE ATTRIBUTES**

The consumers in (a) are willing to trade off a considerable amount of interior space for some additional acceleration. Given a budget constraint, they will choose a car that emphasizes acceleration. The opposite is true for consumers in (b).
3.3 CONSUMER CHOICE

- Corner Solutions
  - **corner solution** Situation in which the marginal rate of substitution for one good in a chosen market basket is not equal to the slope of the budget line.

Figure 3.15

A Corner Solution

When a corner solution arises, the consumer maximizes satisfaction by consuming only one of the two goods.

Given budget line $AB$, the highest level of satisfaction is achieved at $B$ on indifference curve $U_1$, where the MRS (of ice cream for frozen yogurt) is greater than the ratio of the price of ice cream to the price of frozen yogurt.

$$\text{MRS} > \frac{P_I}{P_Y}$$
When given a college trust fund that must be spent on education, the student moves from $A$ to $B$, a corner solution. If, however, the trust fund could be spent on other consumption as well as education, the student would be better off at $C$. 
15. Jane receives utility from days spent traveling on vacation domestically (D) and days spent traveling on vacation in a foreign country (F), as given by the utility function $U(D,F) = 10DF$. In addition, the price of a day spent traveling domestically is $100, the price of a day spent traveling in a foreign country is $400, and Jane’s annual travel budget is $4000.

a) Illustrate the indifference curve associated with a utility of 800 and the indifference curve associated with a utility of 1200.

b) Graph Jane’s budget line on the same graph.

c) Can Jane afford any of the bundles that give her a utility of 800? What about a utility of 1200?

d) Find Jane’s utility maximizing choice of days spent traveling domestically and days spent in a foreign country.
a) Illustrate the indifference curve associated with a utility of 800 and the indifference curve associated with a utility of 1200.

\[ I = P_D D + P_F F \]
\[ 4000 = 100D + 400F \]

ANS. The indifference curve with a utility of 800 has the equation \(10DF = 800\), or \(D = 80/F\). To plot it, find combinations of \(D\) and \(F\) that satisfy the equation (such as \(D = 8\) and \(F = 10\)). Draw a smooth curve through the points to plot the indifference curve, which is the lower of the two on the graph to the right. The indifference curve with a utility of 1200 has the equation \(10DF = 1200\), or \(D = 120/F\). Find combinations of \(D\) and \(F\) that satisfy this equation and plot the indifference curve, which is the upper curve on the graph.
b) Graph Jane’s budget line on the same graph.

ANS. If Jane spends all of her budget on domestic travel she can afford 40 days. If she spends all of her budget on foreign travel she can afford 10 days. Her budget line is 100D + 400F = 4000, or D = 40 - 4F. This straight line is plotted in the graph above.

c) Can Jane afford any of the bundles that give her a utility of 800? What about a utility of 1200?

ANS. Jane can afford some of the bundles that give her a utility of 800 because part of the U = 800 indifference curve lies below the budget line. She cannot afford any of the bundles that give her a utility of 1200 as this indifference curve lies entirely above the budget line.

d) Find Jane’s utility maximizing choice of days spent traveling domestically and days spent in a foreign country.

ANS. The optimal bundle is where the ratio of prices is equal to the MRS, and Jane is spending her entire income. The ratio of prices is , and . Setting the two equal and solving for D, we get D = 4F. Substitute this into the budget constraint, 100D + 400F = 4000, and solve for F. The optimal solution is F = 5 and D = 20. Utility is 1000 at the optimal bundle, which is on an indifference curve between the two drawn in the graph above.
In Section 3.3, we saw how preferences given budget constraints, determine choices.

Can this process be reversed? If we know the choices that a consumer has made, can we determine his or her preferences.

**Basic Idea**

*If a consumer chooses one market basket over another, and if the chosen market basket is more expensive than the alternative, then the consumer must prefer the chosen market basket.*
If an individual facing budget line $l_1$ chose market basket $A$ rather than market basket $B$, $A$ is revealed to be preferred to $B$.

Likewise, the individual facing budget line $l_2$ chooses market basket $B$, which is then revealed to be preferred to market basket $D$.

Whereas $A$ is preferred to all market baskets in the green-shaded area, all baskets in the pink-shaded area are preferred to $A$. 
Facing budget line $l_3$, the individual chooses $E$, which is revealed to be preferred to $A$ (because $A$ could have been chosen).

Likewise, facing line $l_4$, the individual chooses $G$, which is also revealed to be preferred to $A$.

Whereas $A$ is preferred to all market baskets in the green-shaded area, all market baskets in the pink-shaded area are preferred to $A$. 

FiguRe 3.19 REVEALED PREFERENCE: FOUR BUDGET LINES
REVEALED PREFERENCE FOR RECREATION

Figure 3.20
REVEALED PREFERENCE FOR RECREATION

When facing budget line $l_1$, an individual chooses to use a health club for 10 hours per week at point $A$.

When the fees are altered, she faces budget line $l_2$.

She is then made better off because market basket $A$ can still be purchased, as can market basket $B$, which lies on a higher indifference curve.
Marginal Utility and Consumer Choice

- **marginal utility (MU)**  Additional satisfaction obtained from consuming one additional unit of a good.

- **diminishing marginal utility**  Principle that as more of a good is consumed, the consumption of additional amounts will yield smaller additions to utility.

\[
0 = MUF(\Delta F) + MUC(\Delta C)
\]

\[-(\Delta C / \Delta F) = MUF / MUC\]

\[\text{MRS} = MUF / MUC\]  \hspace{1cm} (3.5)

\[\text{MRS} = P_F / P_C\]  \hspace{1cm} (3.6)

\[MUF / MUC = P_F / P_C\]

or

\[MUF / P_F = MUC / P_C\]  \hspace{1cm} (3.7)

- **equal marginal principle**  Principle that utility is maximized when the consumer has equalized the marginal utility per dollar of expenditure across all goods.
EXAMPLE 3.7  MARGINAL UTILITY AND HAPPINESS

What, if anything, does research on consumer satisfaction tell us about the relationship between happiness and the concepts of utility and marginal utility?

FIGURE 3.21  MARGINAL UTILITY AND HAPPINESS

A comparison of mean levels of satisfaction with life across income classes in the United States shows that happiness increases with income, but at a diminishing rate.
INEFFICIENCY OF GASOLINE RATIONING

When a good is rationed, less is available than consumers would like to buy. Consumers may be worse off. Without gasoline rationing, up to 20,000 gallons of gasoline are available for consumption (at point $B$).

The consumer chooses point $C$ on indifference curve $U_2$, consuming 5000 gallons of gasoline.

However, with a limit of 2000 gallons of gasoline under rationing, the consumer moves to $D$ on the lower indifference curve $U_1$. 
Some consumers will be worse off, but others may be better off with rationing. With rationing and a gasoline price of $1.00, she buys the maximum allowable 2000 gallons per year, putting her on indifference curve $U_1$.

Had the competitive market price been $2.00 per gallon with no rationing, she would have chosen point $F$, which lies below indifference curve $U_1$.

However, had the price of gasoline been only $1.33 per gallon, she would have chosen point $G$, which lies above indifference curve $U_1$. 
9. Upon merging with the West German economy, East German consumers indicated a preference for Mercedes-Benz automobiles over Volkswagens. However, when they converted their savings into deutsche marks, they flocked to Volkswagen dealerships. How can you explain this apparent paradox?

ANS. There is no paradox. Preferences do not involve prices, and East German consumers preferred Mercedes based solely on product characteristics. However, Mercedes prices are considerably higher than Volkswagen prices. So, even though East German consumers preferred a Mercedes to a Volkswagen, they either could not afford a Mercedes or they preferred a bundle of other goods plus a Volkswagen to a Mercedes alone. While the marginal utility of consuming a Mercedes exceeded the marginal utility of consuming a Volkswagen, East German consumers considered the marginal utility per dollar for each good and, for most of them, the marginal utility per dollar was higher for Volkswagens. As a result, they flocked to Volkswagen dealerships to buy VWs.
CHAPTER 3 RECAP

- Consumer Preferences
- Budget Constraints
- Consumer Choice
- Revealed Preference
- Marginal Utility and Consumer Choice