Consumer Behavior

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Introduction (1/2)

4

This chapter focuses on a key question: How do consumers decide which products (and how much of each) to buy?

Chapter Outline:

4.1 The Consumers Preferences and the Concept of Utility
4.2 Indifference Curves
4.3 The Consumers Income and the Budget Constraint
4.4 Combining Utility, Income, and Prices
4.5 Conclusion

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Introduction (2/2)

How do consumers make purchases?

- This chapter introduces a theory of consumer behavior.
- The theory is used to investigate why consumers make purchases.
- Ultimately, consumers are assumed to "optimize" their utility given scarce resources.
- Consumer theory is the basis for the "demand" side of the supply and demand model.

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The Consumers Preferences and the Concept of Utility (1/8)

4.1

Economists assume consumers are rational and able to "optimize" consumption decisions given scarce resources.

Four assumptions about consumer preferences:

1. Completeness and rankability
   - Consumers can compare bundles of goods and rank them based on preference.
2. For most goods, more is better than less
   - Non-satiation and "free disposal"
3. Transitivity
   - Imposes logical consistency on preferences
4. The more a consumer has of a particular good, the less she is willing to give up of something else to get even more of that good.
   - The idea behind this assumption is that consumers like variety.

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The Consumers Preferences and the Concept of Utility (2/8)

4.1

The Concept of Utility

Utility is a measure of how "satisfied" consumers are.

- A measure of happiness or well-being
- It is not a measure of consumer income

A **utility function** mathematically describes the relationship between what consumers actually consume and their level of well-being.

- Represent consumers preferences
- Can take a variety of mathematical forms
- Have to conform to the four assumptions about preferences

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The Consumers Preferences and the Concept of Utility (3/8)

4.1

The Concept of Utility

Consider the utility someone enjoys from seeing a movie in a theater vs. watching a DVD

$$U = U(T,D)$$

where T is the number of movies "consumed" at the theater, and D is the number of DVDs consumed at home. Utility might be represented by

$$U = T^{0.8}D^{0.2}$$

In general, movies consumed in the theater add more utility than those consumed at home because the exponent on movies in the theater (0.8) is larger than that on movies at home (0.2).

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The Consumers Preferences and the Concept of Utility (4/8)

The Concept of Utility

Marginal utility is the additional utility a consumer receives from an additional unit of a good or service.

Continuing the previous example, the marginal utility of theater-movies for this consumer is given by:

$$MU_T = \frac{\Delta U(T,D)}{\Delta T} = \frac{dU(T,D)}{dT}$$

Or with the prescribed parameters:

$$U = T^{0.8}D^{0.2} \qquad MU_T = 0.8T^{-0.2}D^{0.2}$$

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The Consumers Preferences and the Concept of Utility (5/8): Question 1

4.1

The utility George enjoys from consuming a bag of popcorn (P) and a candy bar (C) at a movie is given by the following utility function:

$$U = P^{0.6}C^{0.4}$$

Which of the following statements is true for George?

A. Candy adds more utility than popcorn.
B. Popcorn adds more utility than candy.
C. Popcorn and candy add the same utility.
D. Popcorn adds less utility than candy.

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The Consumers Preferences and the Concept of Utility (5/8): Question 1 – Correct Answer

4.1

The utility George enjoys from consuming a bag of popcorn (P) and a candy bar (C) at a movie is given by the following utility function:

$$U = P^{0.6}C^{0.4}$$

Which of the following statements is true for George?

A. Candy adds more utility than popcorn.
B. Popcorn adds more utility than candy. (correct answer)
C. Popcorn and candy add the same utility.
D. Popcorn adds less utility than candy.

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The Consumers Preferences and the Concept of Utility (6/8): Question 2

4.1

The utility George enjoys from consuming a bag of popcorn (*P*) and a candy bar (*C*) at a movie is given by the following utility function:

$$U = P^{0.6}C^{0.4}$$

Which of the following represents the marginal utility of popcorn (MU_P) for George?

A. $0.6P^{-0.4}C^{-0.6}$
B. $0.4P^{-0.6}C^{0.4}$
C. $0.6P^{-0.4}C^{0.4}$
D. $0.4P^{0.6}C^{-0.6}$

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The Consumers Preferences and the Concept of Utility (7/8): Question 2 – Correct Answer

4.1

The utility George enjoys from consuming a bag of popcorn (P) and a candy bar (C) at a movie is given by the following utility function:

$$U = P^{0.6}C^{0.4}$$

Which of the following represents the marginal utility of popcorn (MU_P) for George?

A. $0.6P^{-0.4}C^{-0.6}$
B. $0.4P^{-0.6}C^{0.4}$
C. $0.6P^{-0.4}C^{0.4}$ (correct answer)
D. $0.4P^{0.6}C^{-0.6}$

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The Consumers Preferences and the Concept of Utility (8/8)

4.1

Comparing Consumption Outcomes

The "rules" for utility allows only for an *ordinal* ranking of consumption bundles.

- An **ordinal** ranking implies bundles can be ranked from best to worse.
- *A* **cardinal** ranking would allow a person to determine how much better one bundle is, compared to another.

Why not cardinal?

- Many questions can be answered with only an ordinal ranking.
  - Ex: Predicting what will be consumed
- There is no real-world measure of *how much more* a consumer likes the bundle of goods A to the bundle of goods B.

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Indifference Curves (1/18)

4.2

Ordinal rankings mean we care about *relative* outcomes.

- Some bundles are better than others; some are worse.
- Start by considering bundles that are relatively equal.

A consumer is **indifferent** between bundles when he or she derives the same utility level from two or more bundles.

An **indifference curve** plots out all of the consumption bundles that provide a consumer with the same level of utility or satisfaction.

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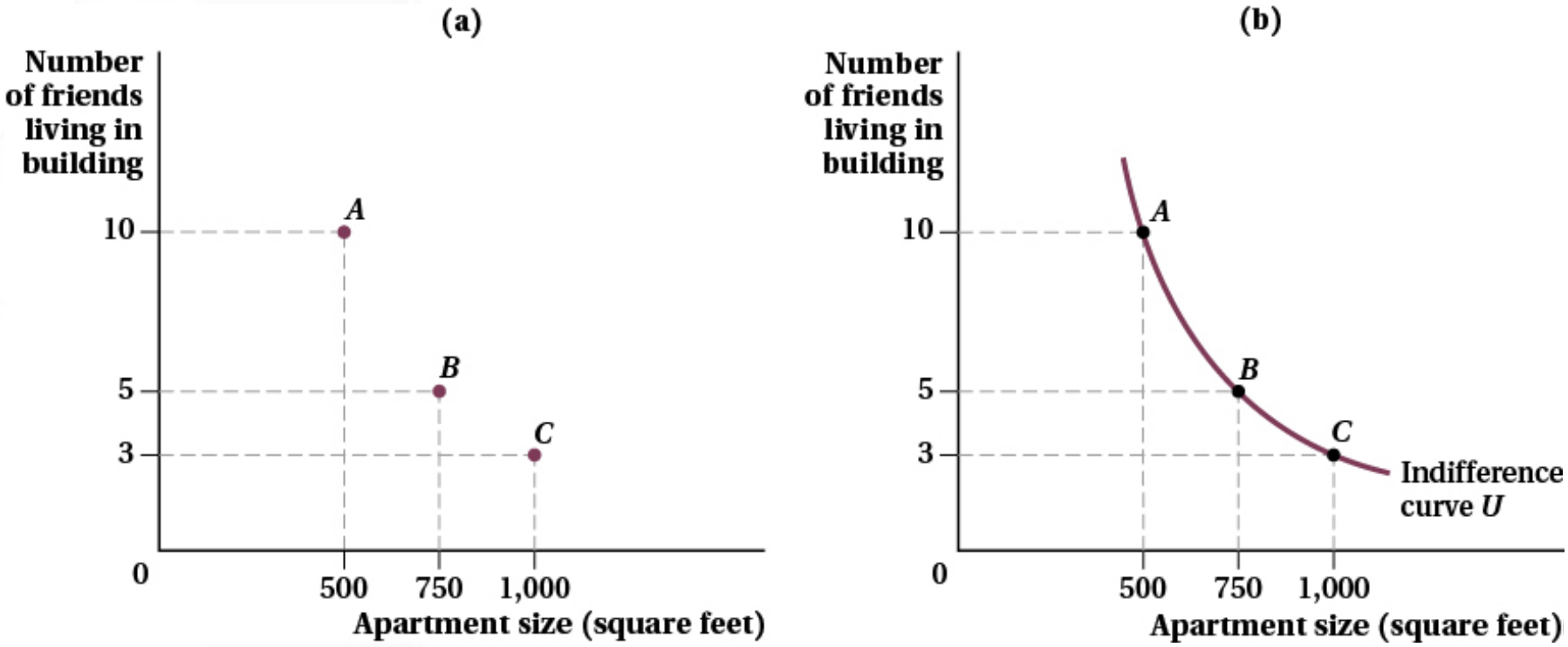
Indifference Curves (2/18)

4.2

Figure 4.1 Building an Indifference Curve



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Indifference Curves (3/18)

4.2

Characteristics of Indifference Curves

The stem from the four assumptions about consumer preferences.

1. They can be drawn.
    - Completeness and rankability
2. Curves further from the origin represent higher utility.
    - More is better
3. Curves never cross.
    - Transitivity
4. Convex to the origin.
    - Consumers like variety / diminishing marginal utility

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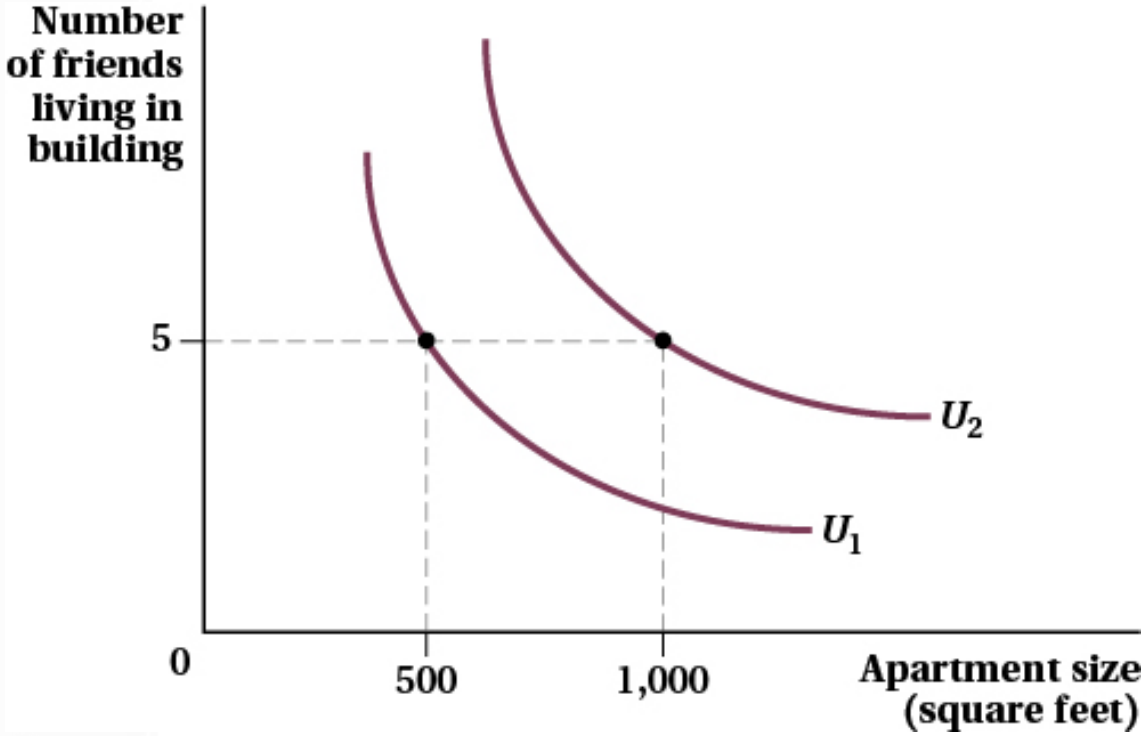
Indifference Curves (4/18)

4.2

Figure 4.2 A Consumers Indifference Curves



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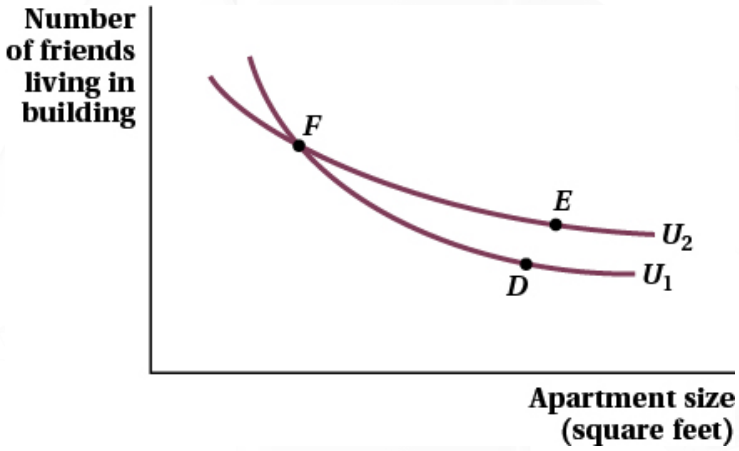
Indifference Curves (5/18)

4.2

Figure 4.3 A Consumers Indifference Curves Cannot Cross



To see why indifference curves cannot cross, consider bundles D and F.

- These bundles are on the same indifference curve, therefore Joe must be indifferent between them.

Now, draw another indifference curve through bundle F that intersects the original curve.

- Implies Joe is also indifferent between points E and F as well as between points F and D

✓ **Why must Joe prefer bundle *E* to bundle *D*?**

– If more is better, at *E* he has more of both.

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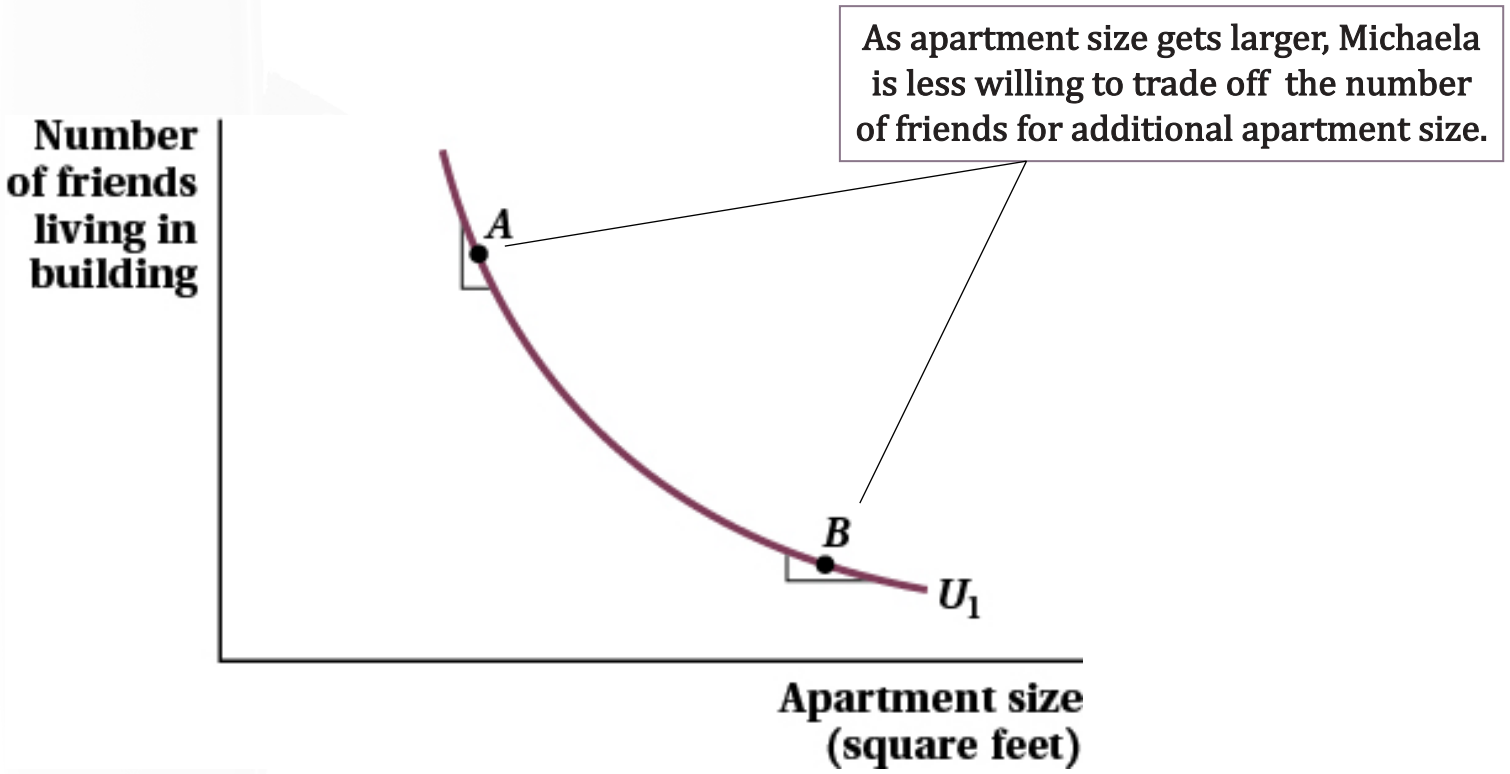
Indifference Curves (6/18)

4.2

Figure 4.4 Tradeoffs along an Indifference Curve



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Indifference Curves (7/18)

4.2

The Marginal Rate of Substitution

Indifference curves describe tradeoffs.

- How much of one good you are willing to give up for one more unit of another good?
- The slope of the indifference curve captures this tradeoff.

We call this slope the **marginal rate of substitution**

$$MRS_{XY} = -\frac{\Delta Y}{\Delta X}$$

Describes the rate at which one is willing to trade off or substitute exactly 1 unit of good ***X*** for more of good ***Y***, and be equally well off

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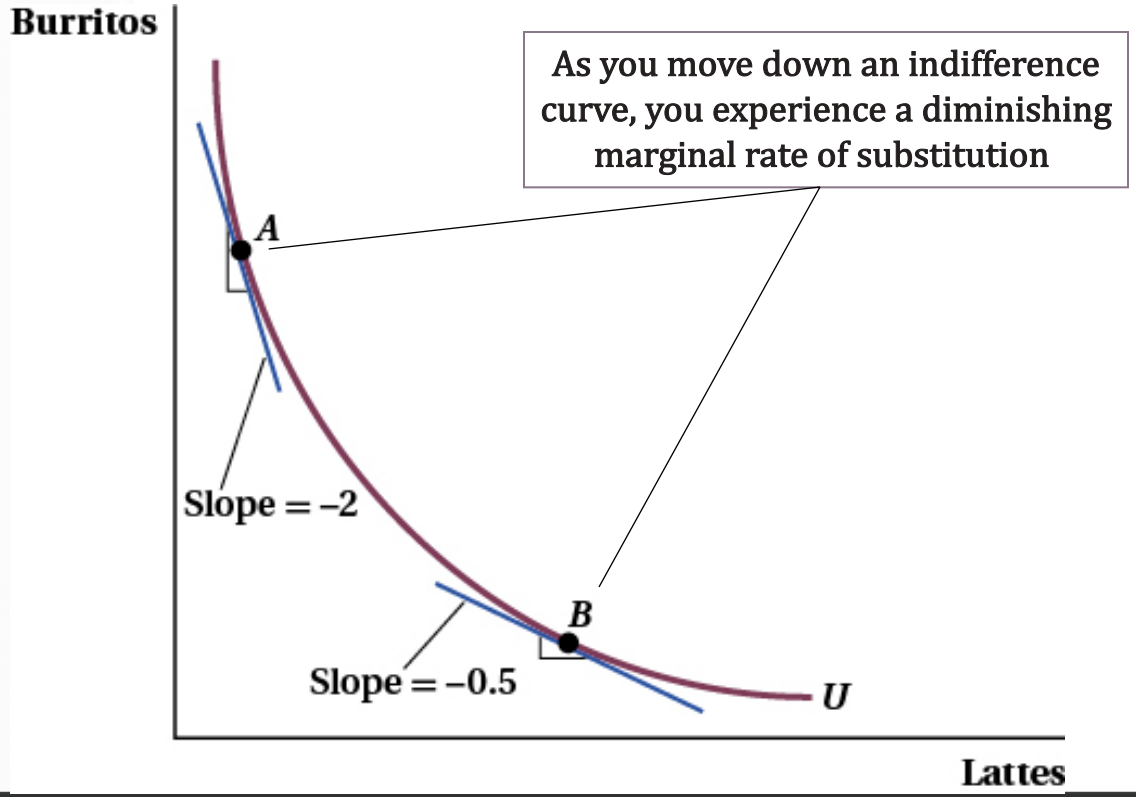
Indifference Curves (8/18)

4.2

Figure 4.5 The Slope of an Indifference Curve is the Marginal Rate of Substitution



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Indifference Curves (9/18)

4.2

The Marginal Rate of Substitution and Marginal Utility

Consider point *A* from the previous figure:

$$MRS_{XY} = -\frac{\Delta Y}{\Delta X} = -\frac{\Delta Q_{\text{burritos}}}{\Delta Q_{\text{lattes}}} = 2$$

Sarah is willing to give up one latte (X) to gain two burritos (Y), and vice versa.

What does this mean in terms of the change in Sarahs level of utility?

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Indifference Curves (10/18)

4.2

The Marginal Rate of Substitution and Marginal Utility

What does this mean in terms of the change in Sarah's level of utility?

$$\Delta U = MU_{lattes} \times \Delta Q_{lattes} + MU_{burritos} \times \Delta Q_{burritos}$$

The change in utility is zero... she is just as well off! Rearranging,

$$-MU_{burritos} \times \Delta Q_{burritos} = MU_{lattes} \times \Delta Q_{lattes} = 0$$

and finally:

$$MRS_{XY} = -\frac{\Delta Q_{\text{burritos}}}{\Delta Q_{\text{lattes}}} = \frac{MU_{\text{lattes}}}{MU_{\text{burritos}}}$$

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Indifference Curves (11/18)

4.2

The Marginal Rate of Substitution and Marginal Utility

The MRS between two goods is equal to the inverse of the goods marginal utilities:

$$MRS_{lb} = -\frac{\Delta Q_{\text{burritos}}}{\Delta Q_{\text{lattes}}} = \frac{MU_{\text{lattes}}}{MU_{\text{burritos}}} \quad or \quad MRS_{XY} = -\frac{\Delta Q_Y}{\Delta Q_X} = \frac{MU_X}{MU_Y}$$

What does the steepness of an indifference curve imply about consumer preferences?

- **Steeper** curves imply the consumer is willing to give up a lot of ***Y*** to get one unit of ***X,*** or could trade 1 unit of ***X*** for a lot of good ***Y.***
- **Flatter** curves imply the consumer would require a large increase in good ***X*** to give up one unit of the good ***Y,*** or could trade 1 unit of ***Y*** for a lot of good ***X.***

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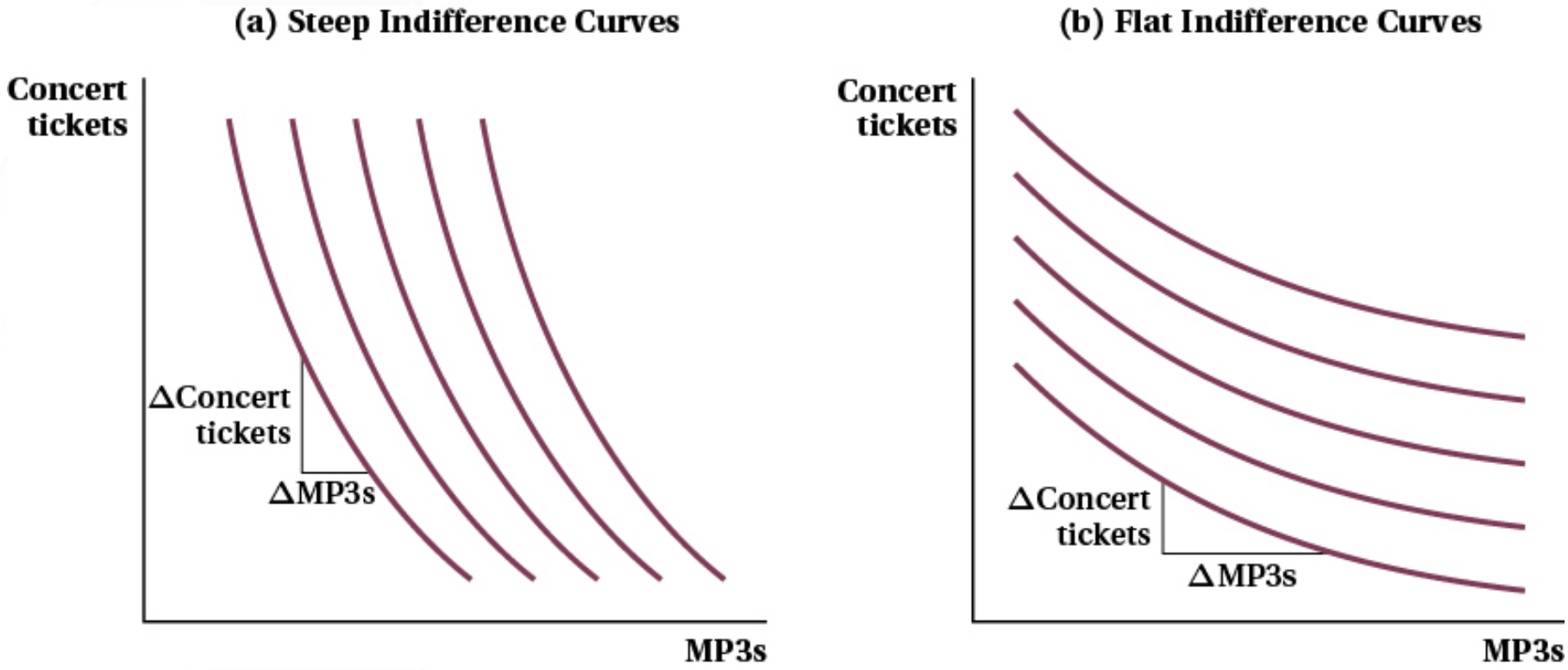
Indifference Curves (12/18)

4.2

Figure 4.6 The Steepness of Indifference Curves



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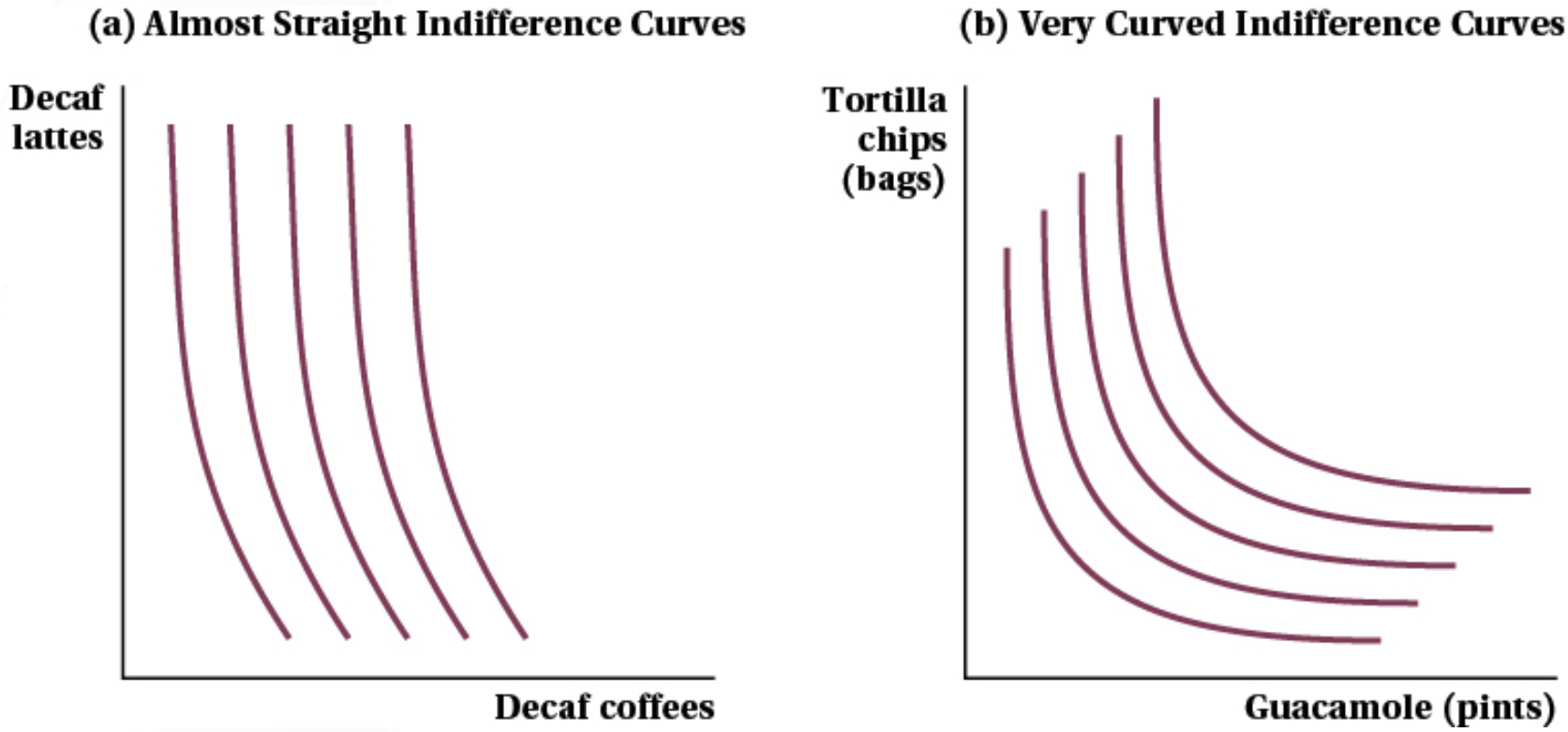
Indifference Curves (13/18)

4.2

Figure 4.8 The Curvature of Indifference Curves



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Indifference Curves (14/18)

4.2

<u>The Curvature of Indifference Curves:</u> Substitutes and Complements

The shape of indifference curves reveals information about the relationship between products.

- Relatively **straight** indifference curves describe goods that are more easily *substitutable* for one another.
- Indifference curves that are more **convex** to the origin describe goods that are more *complementary* to one another.

To illustrate, consider extreme cases:

i. **<u>Perfect substitutes</u>** are goods that the consumer will trade at a fixed rate and receive the same level of utility (MRS is constant).

ii. **<u>Perfect complements</u>** are goods that the consumer must consume in a fixed proportion.

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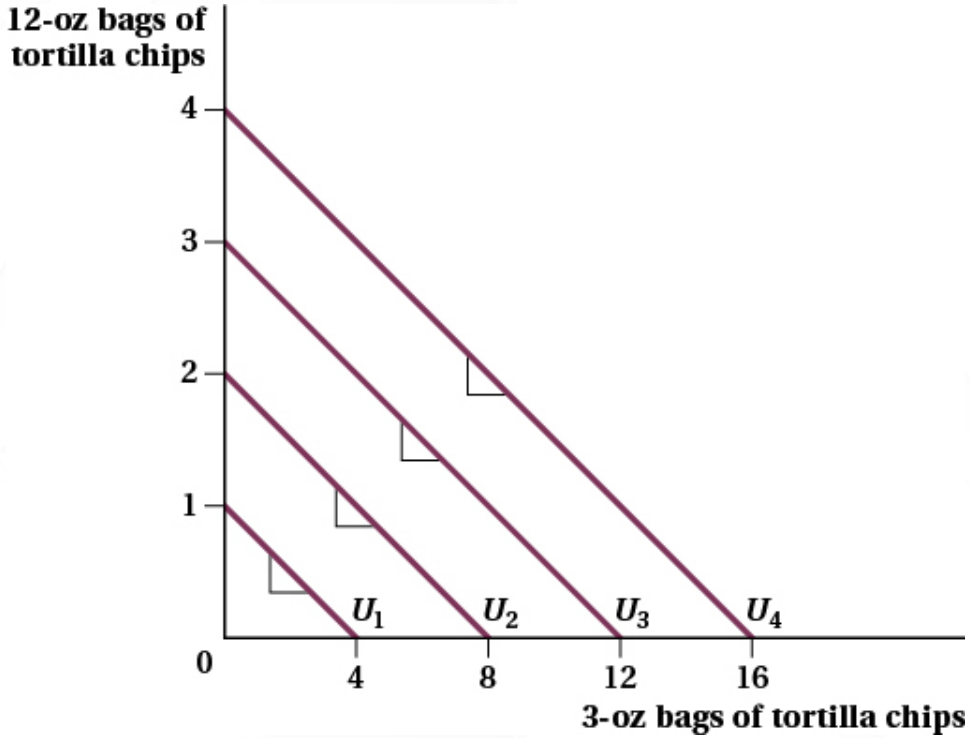
Indifference Curves (15/18)

4.2

Figure 4.9 Indifference Curves for Perfect Substitutes



Consider a typical consumers preferences for 3-oz and 12-oz bags of tortilla chips.

This consumer should be willing to trade one 12-oz bag for four 3-oz bags no matter how much of each he or she has.

MRS is constant in this case.

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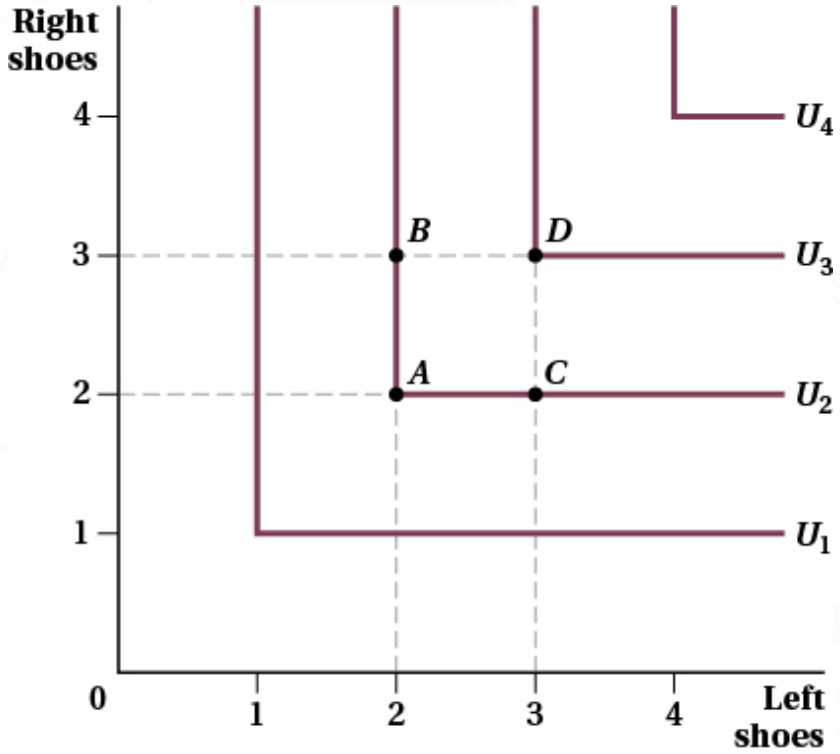
Indifference Curves (16/18)

4.2

Figure 4.10 Indifference Curves for Perfect Complements



Alternatively, consider preferences for right and left shoes.

Most consumers will prefer to consume these goods in constant proportion.

Consider point A; this consumer has two right shoes and two left shoes.

Adding another right shoe (bundle B) will not increase utility.

The consumer needs another left shoe as well (bundle D) if utility is to increase.

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Indifference Curves (17/18): Question 1

4.1

An individuals indifference curves for hot dogs and hot dog buns are most likely:

A. to be L-shaped.
B. to have a constant MRS (marginal rate of substitution).
C. to be differentiable.
D. to have a constant slope.

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Indifference Curves (17/18): Question 1 – Correct Answer

4.1

An individuals indifference curves for hot dogs and hot dog buns are most likely:

A. to be L-shaped. (correct answer)
B. to have a constant MRS (marginal rate of substitution).
C. to be differentiable.
D. to have a constant slope.

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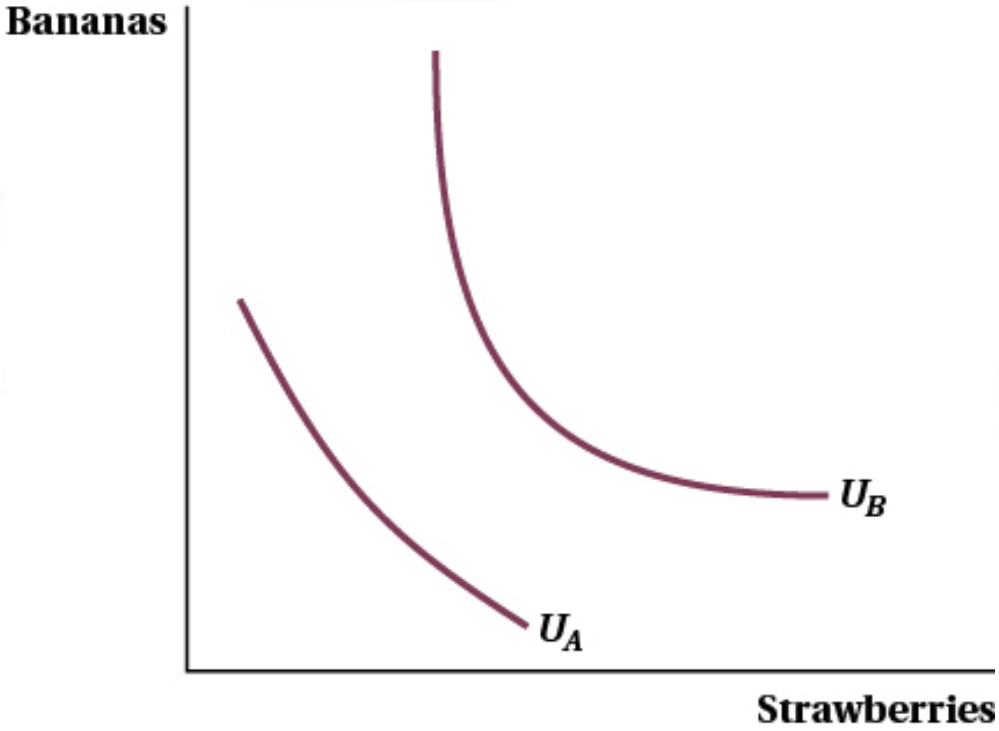
Indifference Curves (18/18)

4.2

Figure 4.11 The Same Consumer Can Have Indifference Curves with Different Shapes



Initially, for low levels of utility (U_A), bananas and strawberries might be substitutes.

As utility increases (U_B), the consumer might prefer a variety of fruit in their diet more than initially.

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The Consumers Income and the Budget Constraint (1/8)

4.3

The **budget constraint** is a curve that describes the entire set of consumption bundles a consumer can purchase when spending all of their income. It is generally plotted alongside indifference curves.

- For two goods (X and Y), mathematically:

$$\text{Income} = P_X Q_X + P_Y Q_Y$$

To find the slope of the budget constraint, solve for Q_Y

$$Q_Y = \frac{\text{Income}}{P_Y} - \frac{P_X}{P_Y} Q_x$$

Returning to the burrito/latte example, and setting income to \$50, the price of lattes to \$5, and the price of burritos to \$10 yields:

$$Q_Y = 5 - 1/2 Q_X$$

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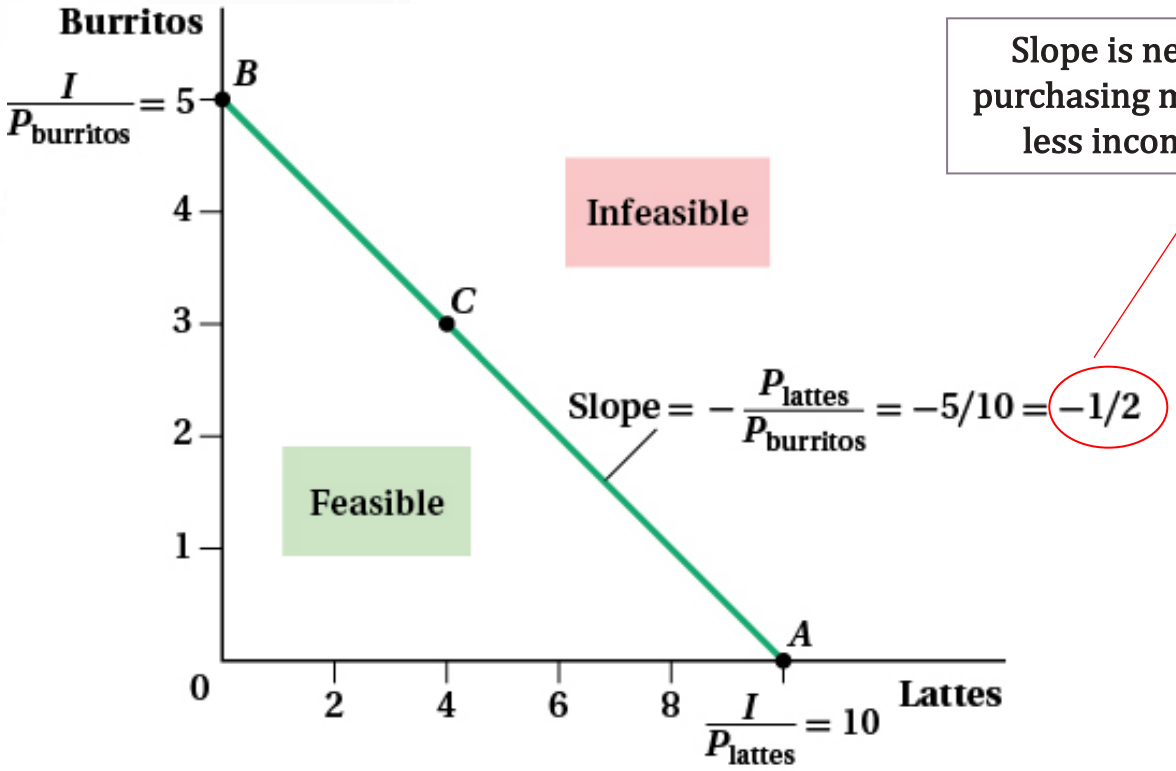
The Consumers Income and the Budget Constraint (2/8)

4.3

Figure 4.14 The Budget Constraint



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The Consumers Income and the Budget Constraint (3/8)

4.3

Factors that Affect the Budget Constraints Position

The *slope* and *position* of the budget constraint are a function of two factors: income and relative prices.

1. Change in income *shifts* the budget constraint by changing the intercepts.
2. Change in the price of one good *pivots* the budget constraint by changing the slope.

Consider, again, the budget constraint for burritos and lattes. The graphs on the next slide represent the following changes:

(a) Doubling of the price of lattes

(b) Doubling of the price of burritos

(c) Reduction in income by 1/2

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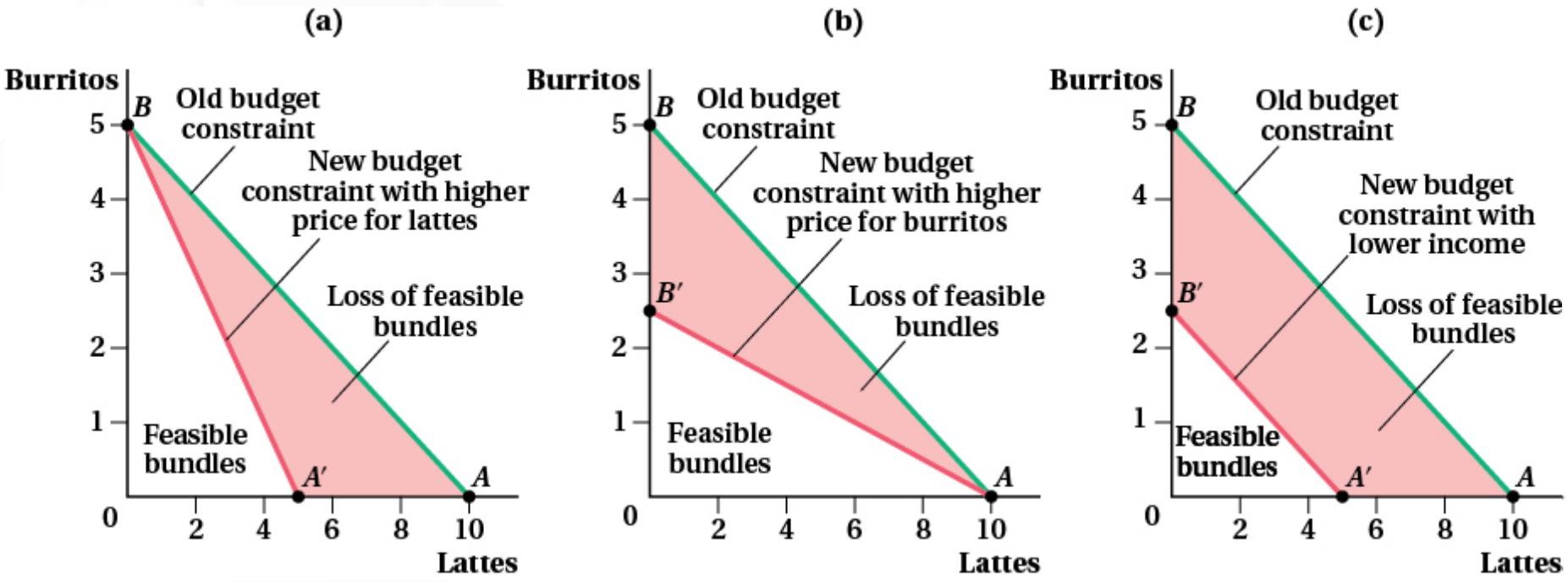
The Consumers Income and the Budget Constraint (4/8)

4.3

Figure 4.15 The Effects of Price or Income Changes on the Budget Constraint



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The Consumers Income and the Budget Constraint (5/8)

4.3

Nonstandard Budget Constraints

Quantity discounts

- Sometimes, consumers may secure a discounted price if a minimum quantity of a good is purchased (e.g., buy two, get one free).
- This results in a **kink** in the budget constraint.

Ex: Income = \$100; P_{pizza} = \$10 and P_{minute} = \$0.10

- Initially, the consumer could consume 10 pizzas or 1,000 phone minutes if they spent all of their income on either product; result is normal linear budget constraint.
  - Introduce a quantity discount of \$.05 per minute for every minute used over 600.
    - **Result is a kink at 600 minute (and 4 pizzas) because every minute over 600 now only costs \$0.05 compared to \$0.10 originally**

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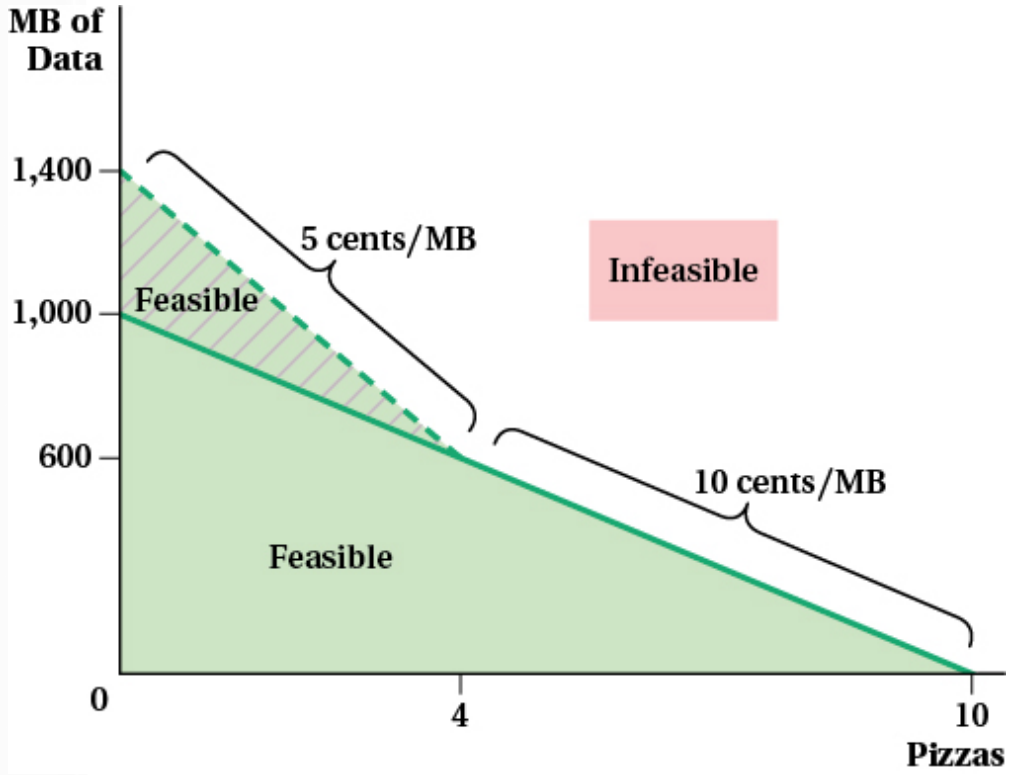
The Consumers Income and the Budget Constraint (6/8)

4.3

Figure 4.16 Quantity Discounts and the Budget Constraint



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The Consumers Income and the Budget Constraint (7/8)

4.3

Nonstandard Budget Constraints

Quantity limits

- Alternatively, there may be limits on how much of a good can be purchased (e.g., gasoline in the 1970s).

Ex: Income = \$100; P_{pizza} = \$10 and P_{minute} = \$0.10

- Now, instead of a discount after 600 minutes, the phone company puts a cap at 600 minutes so his phone will not work after the 600th minute.
  - **Result is a kink in the opposite direction as before at 600 minutes**

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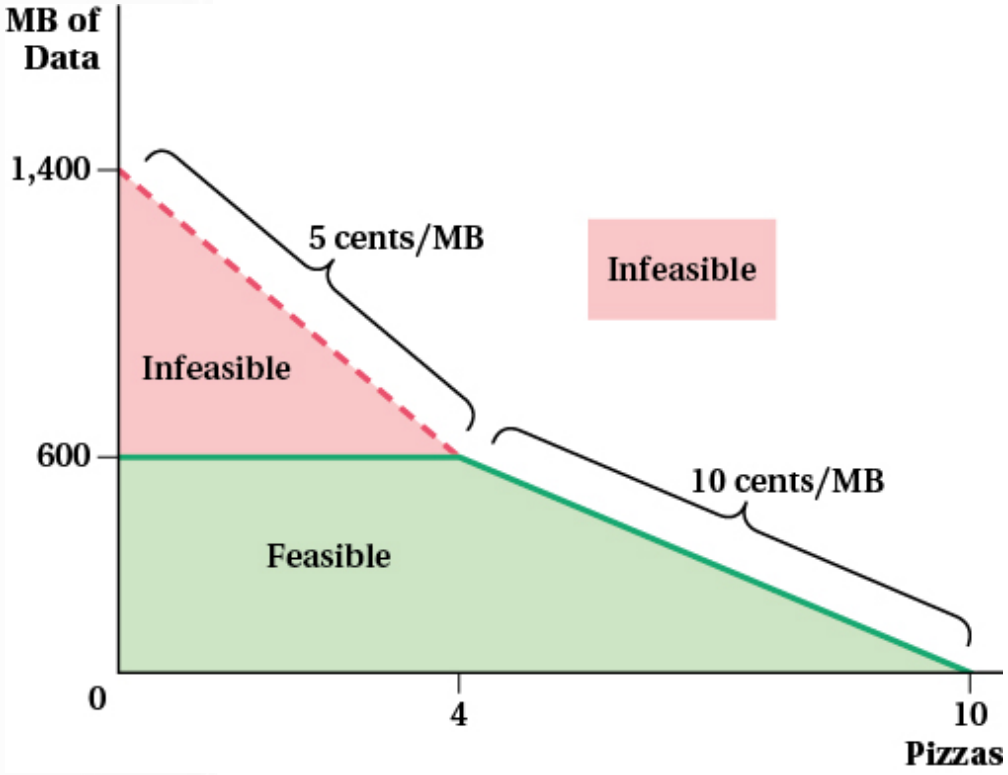
The Consumers Income and the Budget Constraint (8/8)

4.3

Figure 4.17 Quantity Limits and the Budget Constraint



When there is a limit on how much of a good a person can consume, a budget constraint will be kinked.

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Combining Utility, Income, and Prices: What Will the Consumer Consume? (1/8)

4.4

The concepts of utility and indifference curves describe consumer preferences; the budget constraint describes which bundles are feasible.

Combining these concepts, we can begin to understand consumer choices.

Solving the Consumers Optimization Problem

Consumers face a *constrained optimization* problem.

- Maximize utility, subject to income and market prices.

The optimal choice can be interpreted most easily using a graph.

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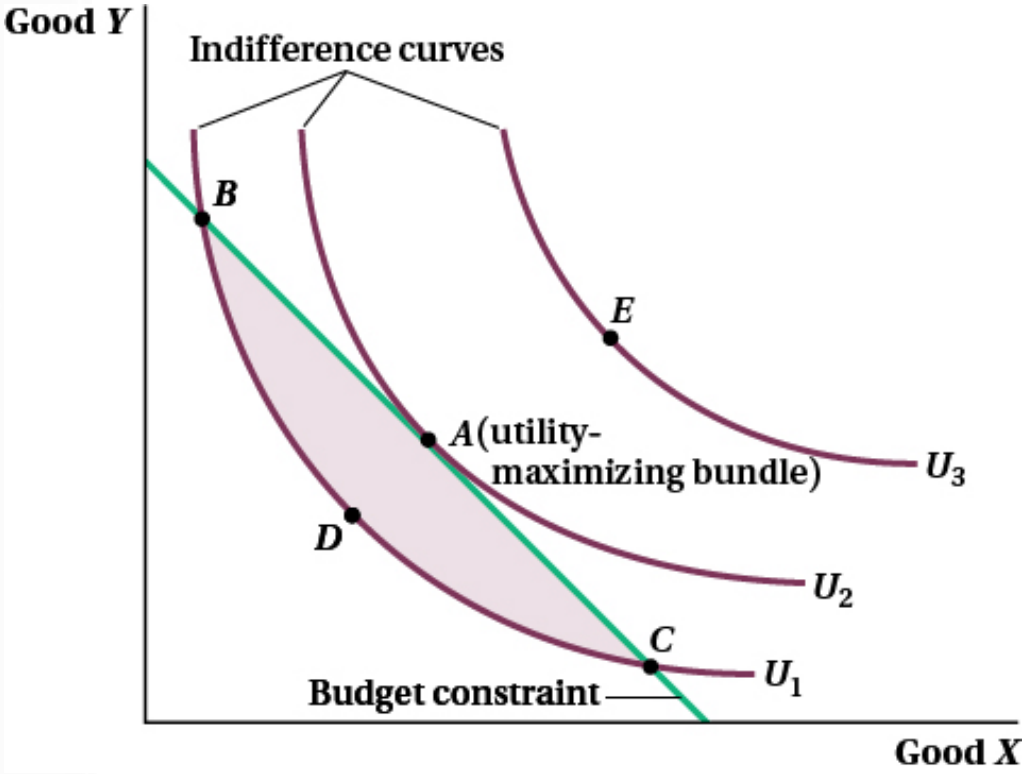
Combining Utility, Income, and Prices: What Will the Consumer Consume? (2/8)

4.4

Figure 4.18 The Consumers Optimal Choice



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Combining Utility, Income, and Prices: What Will the Consumer Consume? (3/8)

4.4

Tangency is the key to finding the optimal bundle, and occurs:

- where the slope of the indifference curve is equal to the slope of the budget constraint
  - i.e. when the marginal rate of substitution is equal to the price ratio

Mathematically,

Slope of indifference curve = Slope of budget constraint

$$-MRS_{XY} = -\frac{MU_X}{MU_Y} = -\frac{P_X}{P_Y}$$

$$\frac{MU_X}{MU_Y} = \frac{P_X}{P_Y}$$

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Combining Utility, Income, and Prices: What Will the Consumer Consume? (4/8)

What does this imply? Rewriting the tangency condition yields

$$\frac{MU_X}{MU_Y} = \frac{P_X}{P_Y} \Rightarrow \frac{MU_X}{P_X} = \frac{MU_Y}{P_Y}$$

The consumer finds the consumption bundle that provides the most benefit on a cost-adjusted basis

- Occurs when marginal utility per dollar spent is *equalized* across all products

What does it imply if $\frac{MU_X}{P_X} > \frac{MU_Y}{P_Y}$ *?*

  - Marginal Utility per dollar spent on good *X* is more than good *Y*.
    - Getting more utility per dollar from *X* so you should consume more of good *X* until the MU_X decreases until the ratio is equal

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Combining Utility, Income, and Prices: What Will the Consumer Consume? (5/8)

4.4

Implications of Utility Maximization

What if two consumers have different preferences?

- Will they have the same MRS at their optimal bundles?

  Yes! Because they face the same ratio of prices!

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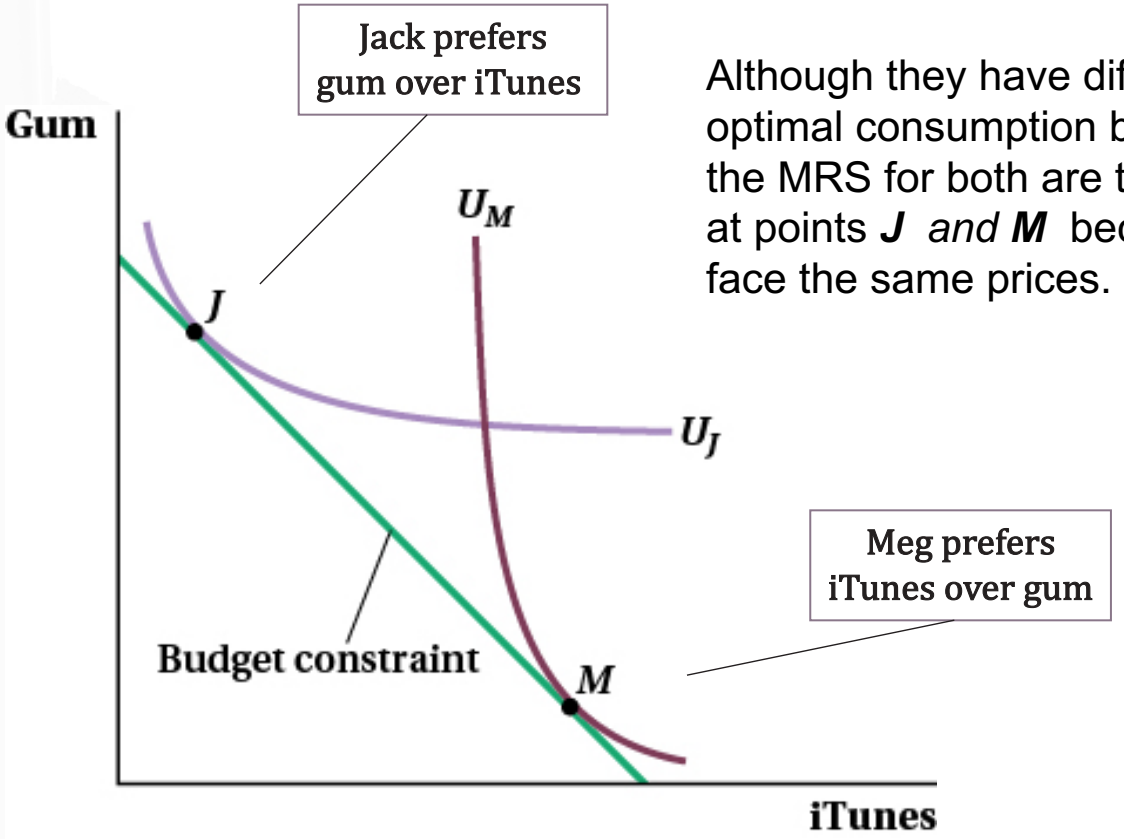
Combining Utility, Income, and Prices: What Will the Consumer Consume? (6/8)

4.4

Figure 4.19 Two Consumers Optimal Choices



Although they have different optimal consumption bundles, the MRS for both are the same at points ***J*** *and* ***M*** because they face the same prices.

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Combining Utility, Income, and Prices: What Will the Consumer Consume? (7/8)

4.4

Corner Solutions: A Special Case

So far, we have considered situations in which the consumer optimally consumes some of both goods – called interior solutions.

Interior solution: a utility-maximizing bundle that contains positive quantities of both goods

Depending on consumers preferences and relative prices, in some cases a consumer will not want to spend any of their money on a good.

Corner solution: a utility-maximizing bundle located at the "corner" of the budget constraint where the consumer purchases only one of two goods.

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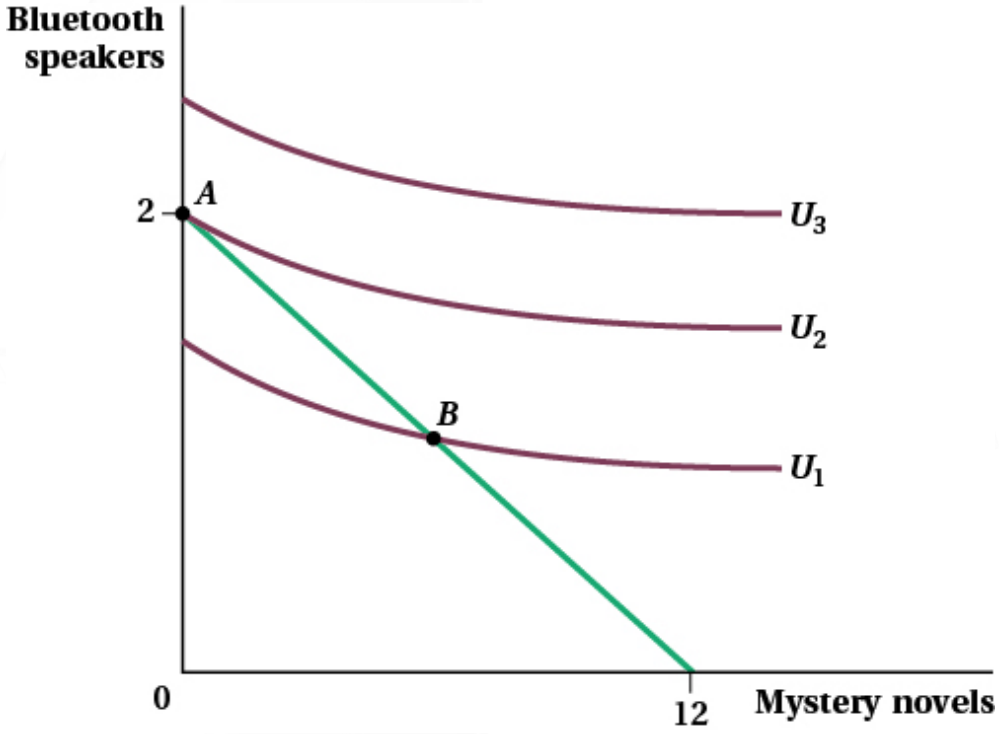
Combining Utility, Income, and Prices: What Will the Consumer Consume? (8/8)

4.4

Figure 4.20 A Corner Solution



Given the consumers income and relative prices of mystery novels and Bluetooth speakers, the optimal consumption bundle is *A*.

All other feasible bundles (such as *B*) correspond to lower levels of utility than point *A*.

The consumer cannot afford consumption bundles at higher utility levels such as U_3.

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Conclusion (1/1)

4.5

This chapter introduced the underlying mechanisms behind consumer choice.

- Preferences
- Prices and income

In **Chapter 5**, we make the link between consumer behavior and individual and market demand.

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