Chapter 4: Consumer Theory: Behind Demand

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Learning Objectives

1. Budget Constraint
2. Preferences
3. Utility
4. Constrained Consumer optimal choice
5. Behavioral Economics.

Introduction: What do consumer choice come from

- Objective of consumers is to maximize their satisfaction (happiness) subject to their budget.
- A consumer chooses the ***best*** bundle that he can ***afford***.
- The "best" is determined by his taste and "what he can afford" is determined by market prices and his income
- We will look at consumer's budget constraint first and then consumer's preference

Budget constraint

- **Budget line (or budget constraint):** the bundles of goods that can be bought if the entire budget is spent.
- **Opportunity set:** all the bundles a consumer can buy, including all the bundles inside the budget constraint and on the budget constraint.

Budget constraint

- If all income is spent on Beer and Pizza, Lisa budget equation is given by:

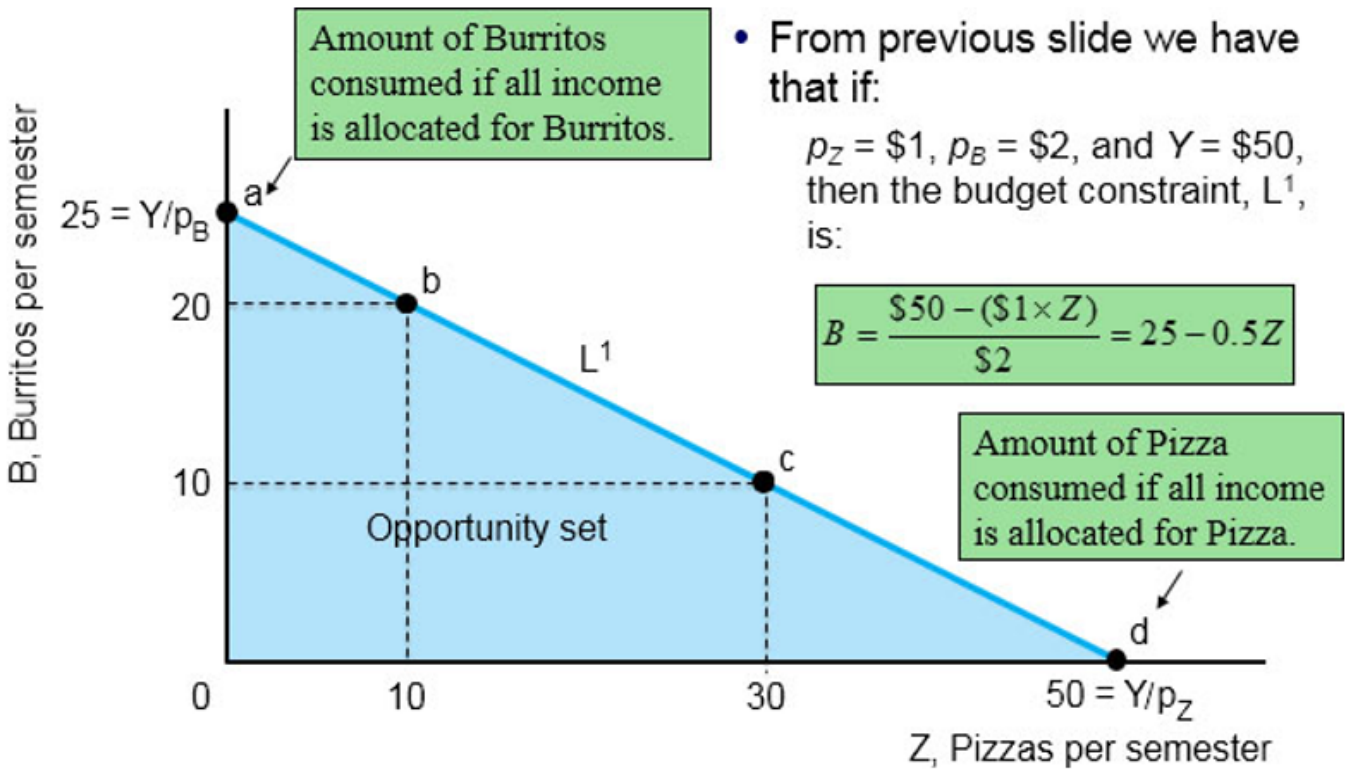
$$\underbrace{P_B B}_{\text{amt spent on } B} + \underbrace{P_Z Z}_{\text{amt spent on } Z} = Y$$

We can rewrite this to find how many unit of B she can buy for every Z:

$$B = \frac{Y}{P_B} - \frac{P_Z}{P_B} Z$$

- When good B is on the y-axis, P_Z/P_B is the slope of the buget line (sometimes called marginal rate of transformation, MRT) and Y/P_B and Y/P_Z are, respectively the y and x-intercepts.

Budget Constraint



- From previous slide we have that if:

  $p_Z = \$1$, $p_B = \$2$, and $Y = \$50$, then the budget constraint, L^1, is:

$$B = \frac{\$50 - (\$1 \times Z)}{\$2} = 25 - 0.5Z$$

Exercise

How does the budget line change for the following changes (ceteris paribus)

1. price of pizza decreases
2. income of Lisa increases
3. Lisa's income and all prices (Pizza and Burritos) double.

Preferennces

- Preferences are relationships between bundles.
- If a consumer would choose bundle $a = (x_1, x_2)$ when $b = (x_1', x_2')$ is available, then it is natural to say that bundle **a** is preferred to **b** by this consumer.
- preferences have to do with the entire bundle of goods, not with individual goods.

Notations

Given two bundles of goods say $a = (x_1, x_2)$ and $b = (x_1', x_2')$, we will use the following short hand notations:

- $a \succ b$ means the bundle **a** is strictly preferred to the bundle **b**
- $a \sim b$ means the bundle **a** is regarded as indifferent to bundle **b** (or the consumer is indifferent between bundle **a** and **b**)
- $a \succeq b$ means the bundle **a** is weakly preferred to the bundle **b** or bundle **a** is at least as good as bundle **b**, if not strictly preferred

Properties of Preferences

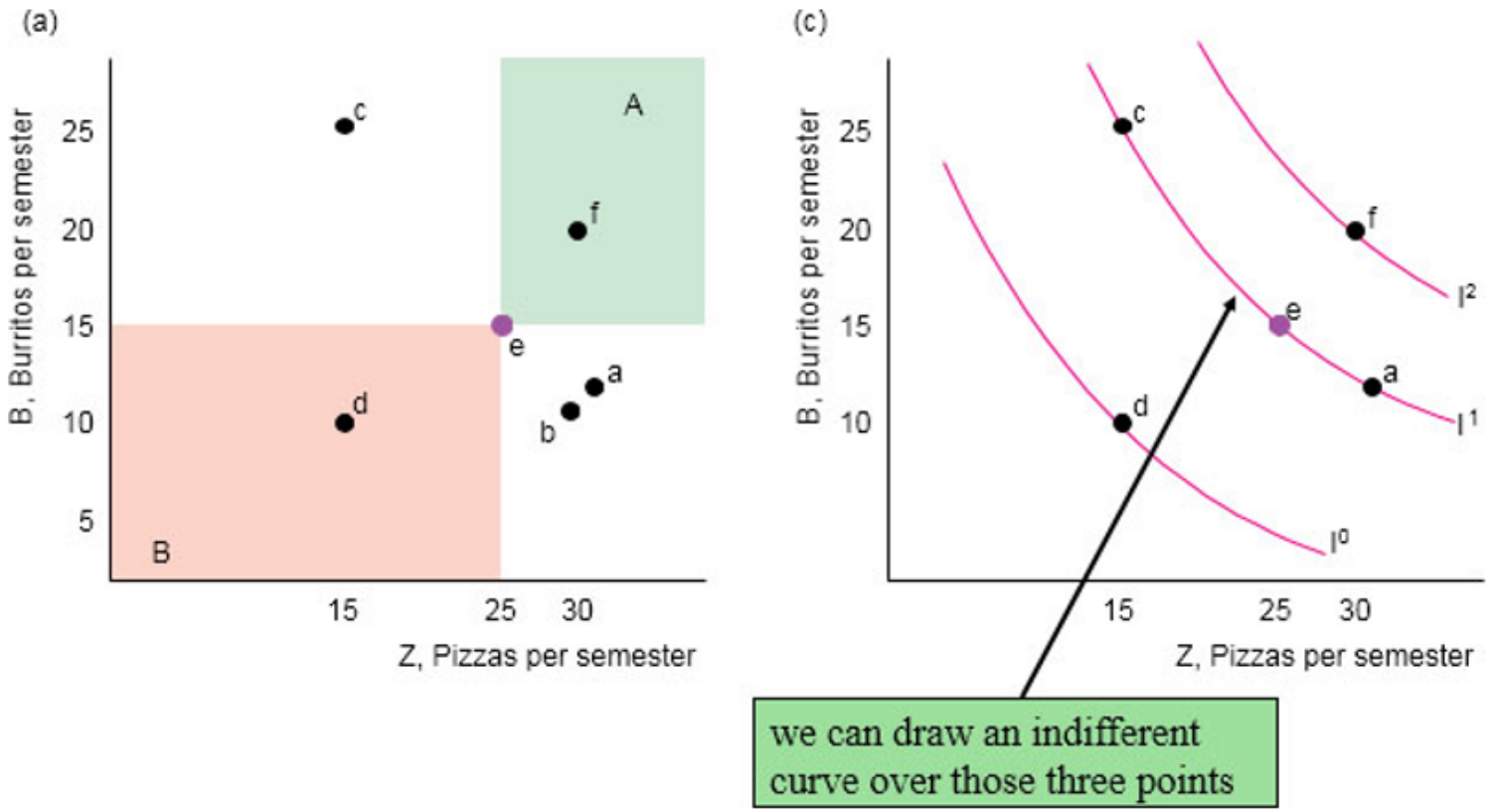
1. **Completeness:** Bundles can be ranked by a consumer (I don't know is not an option). Thus, either $a \succ b$, $b \succeq a$, or $a \sim b$,
2. **Transitivity:** for bundles a, b and c, if $a \succ b$ and $b \succ c$, then $a \succ c$
3. **More Is Better (Non-satiation):** if bundle has at least one more of the goods than another bundle, then it is preferred than the latter.

- **Good:** a commodity for which more is preferred to less, at least at some levels of consumption.
- **Bad:** something for which less is preferred to more, such as pollution.

Indifference Curves and Maps

- **Indifference curve:** the set of all bundles of goods that a consumer views as being equally desirable.
- **Indifference map:** a complete set of indifference curves that summarize a consumer's tastes or preferences.

Bundles of Pizzas and Burritos Lisa Might Consume

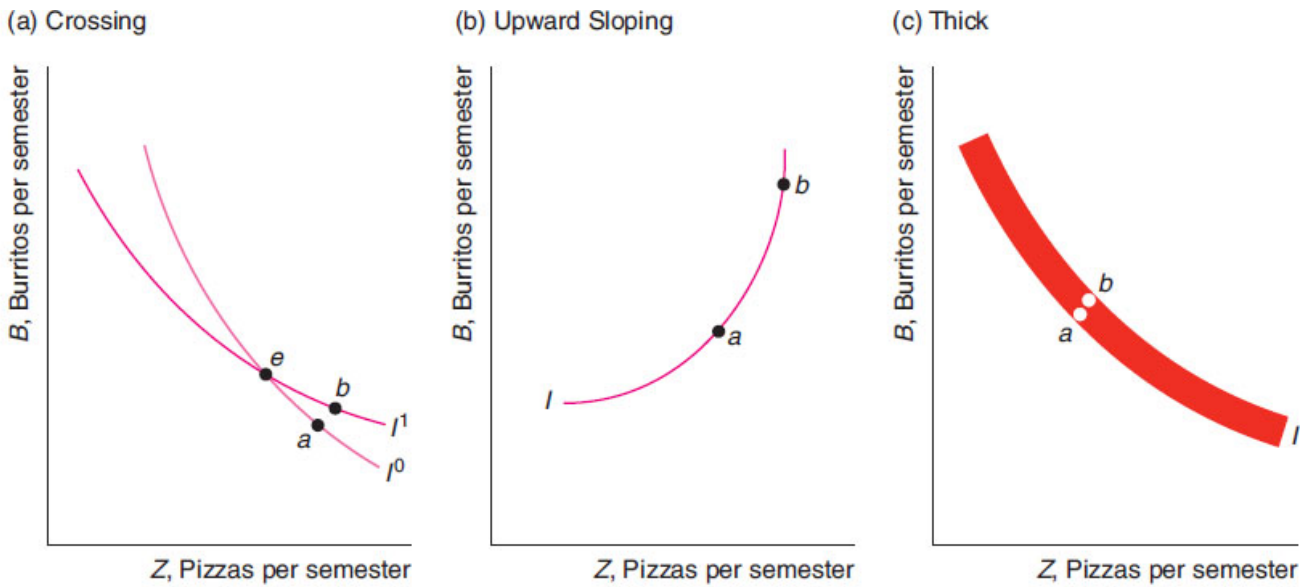


Properties of ICs and Indifference Maps

1. Bundles on indifference curves farther from the origin are preferred to those on indifference curves closer to the origin.
2. An indifference curve goes through every possible bundle (completeness).
3. Indifference curves cannot cross.
4. Indifference curves slope downward.

Exercise: which properties of preferences will be violated when each statement above doesn't hold

Impossible Indifference Curves



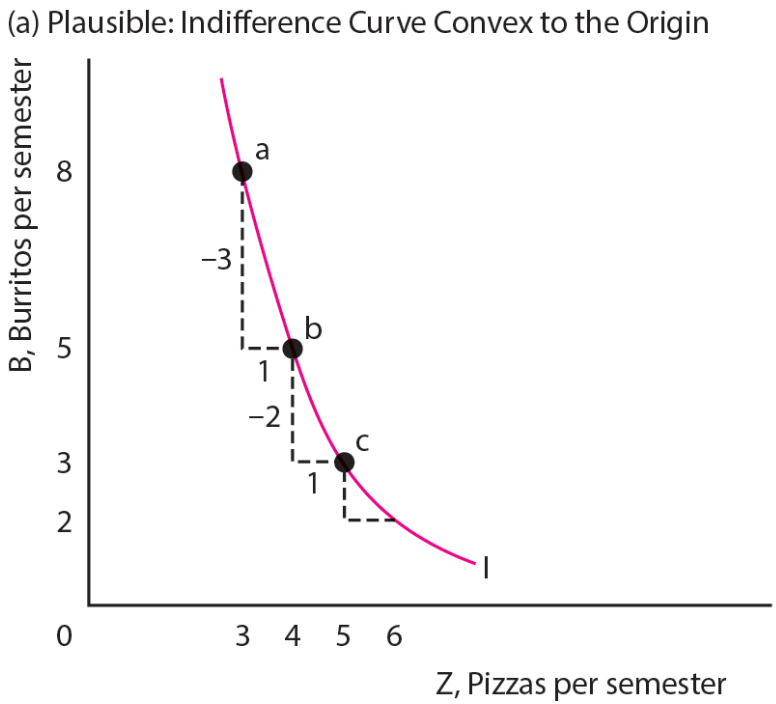
Marginal rate of substitution (MRS)

- **Marginal rate of substitution (MRS):** the maximum amount of one good a consumer will sacrifice to obtain one more unit of another good.
- Lisa's marginal rate of substitution of burritos for pizza is

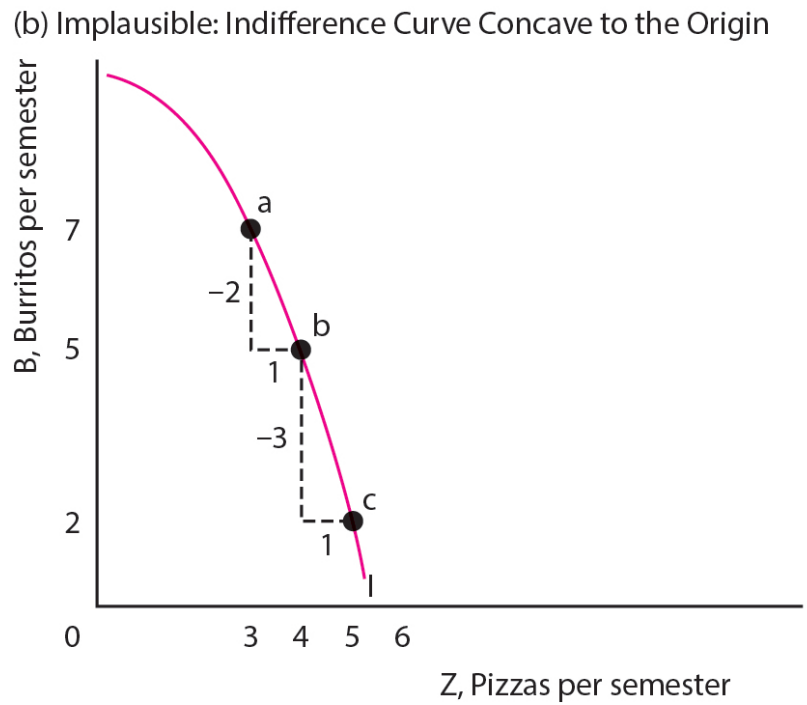
$$MRS_{b,z} = \frac{\Delta B}{\Delta Z}$$

- MRS is the slope of the indifference curve

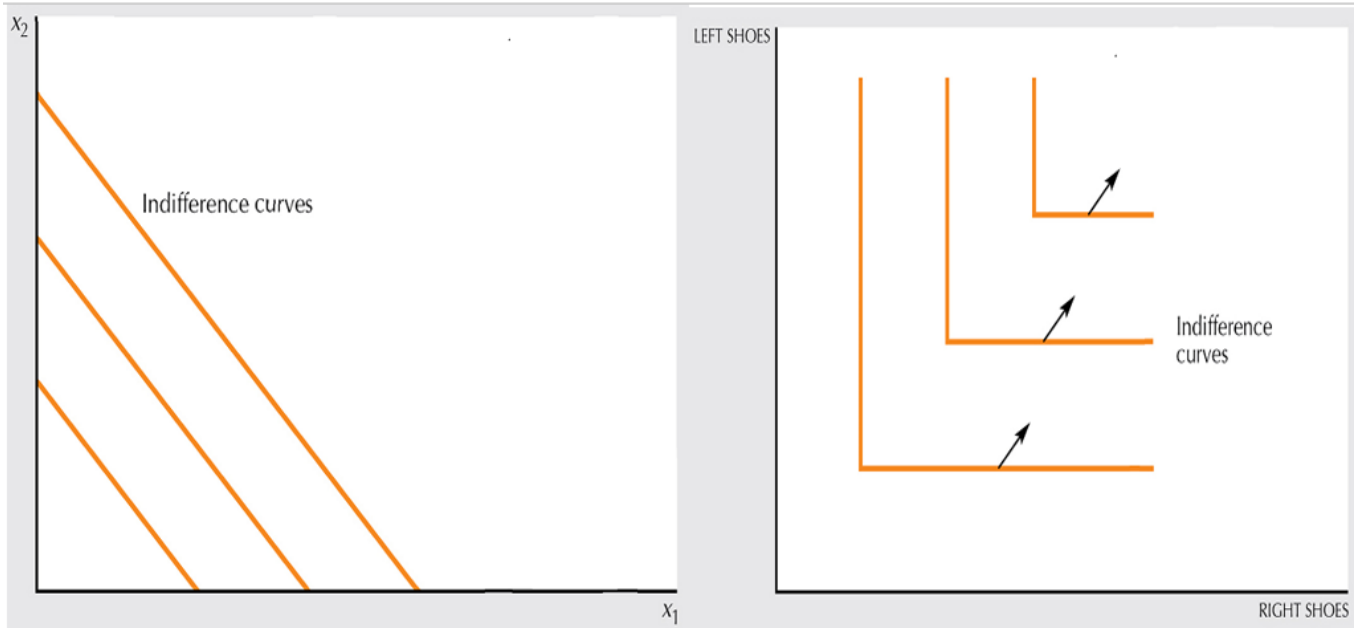
Diminishing Marginal rate of substitution



Concave Indifference curves: anomally



Indifference curves for perfect substitute and completements



utility

- **Utility:** a set of numerical values that reflect the relative rankings of various bundles of goods.
- **Utility function:** the relationship between utility values and every possible bundle of goods.
- Example:

$$U(Z, B) = \sqrt{BZ}$$

Ordinal Preferences

- If we only know a consumer's relative ranking of bundles, the measure of pleasure is **ordinal**.
  - Tells us the relative ranking of two things but not how much more one rank is than another (letter grades).
  - Thus, there are many utility functions representing the same preference
- A **cardinal** measure is one by which absolute comparisons between ranks may be made. Money is a cardinal measure.
  - In this case, the utility function is unique to a given prefernece ordering (this is not required for consumer theory)

Utility and Indifference Curves

- An indifference curve is the set of bundles that give the same level of utility:

$$U(Z, B) = \bar{u}$$

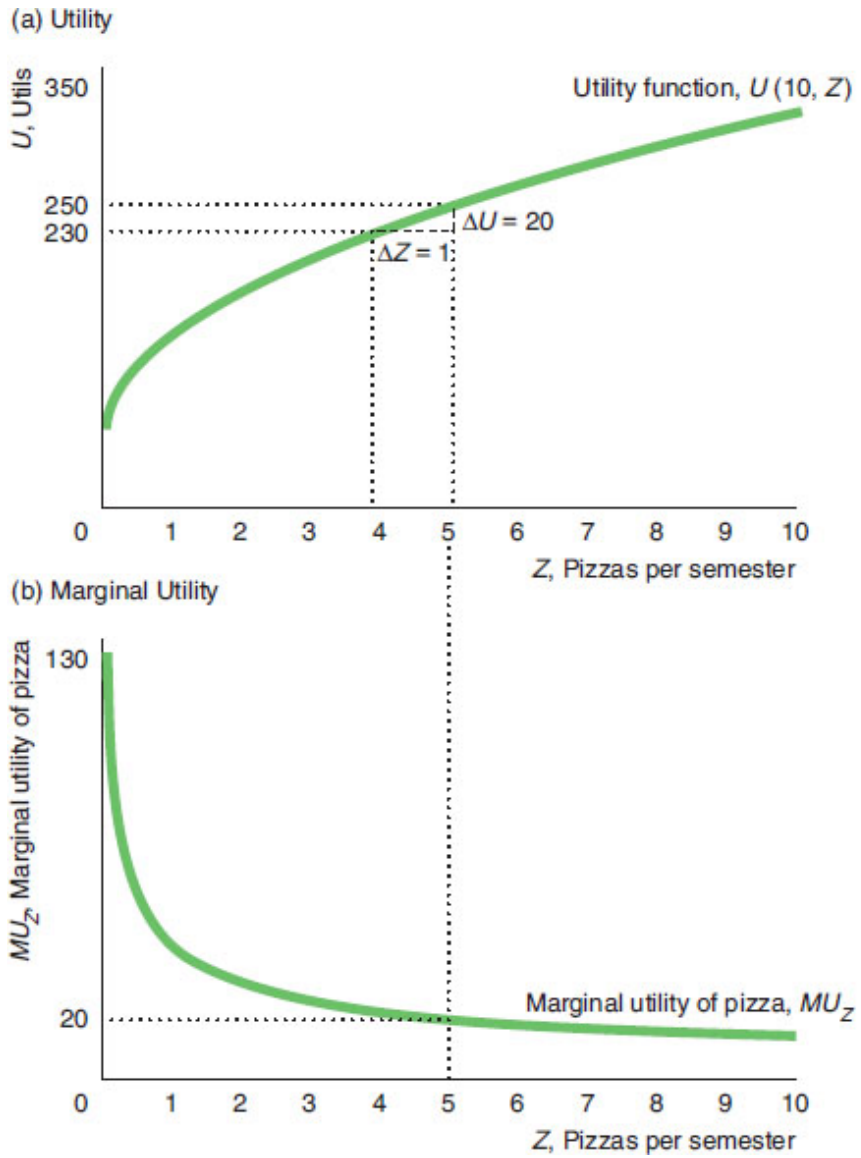
Marginal Utility

- ***Marginal utility***: the extra utility that a consumer gets from consuming the last unit of a good.
  - the slope of the utility function as we hold the quantity of the other good constant.
- Marginal utility of good Z is:

$$MU_Z = \frac{\Delta U}{\Delta Z}$$

- it is partial derivative of U w.r.t Z (when amount of good B fixed)

Marginal Utility



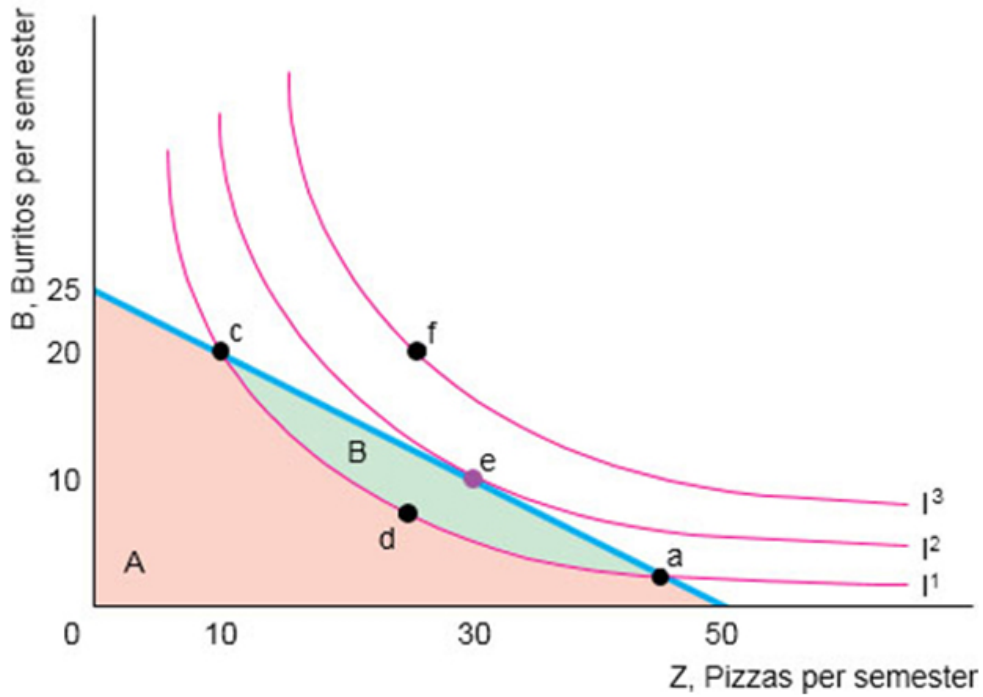
Utility and Marginal Rates of Substitution

- The MRS is the negative of the ratio of the marginal utility of another pizza to the marginal utility of another burrito.
- Formally,

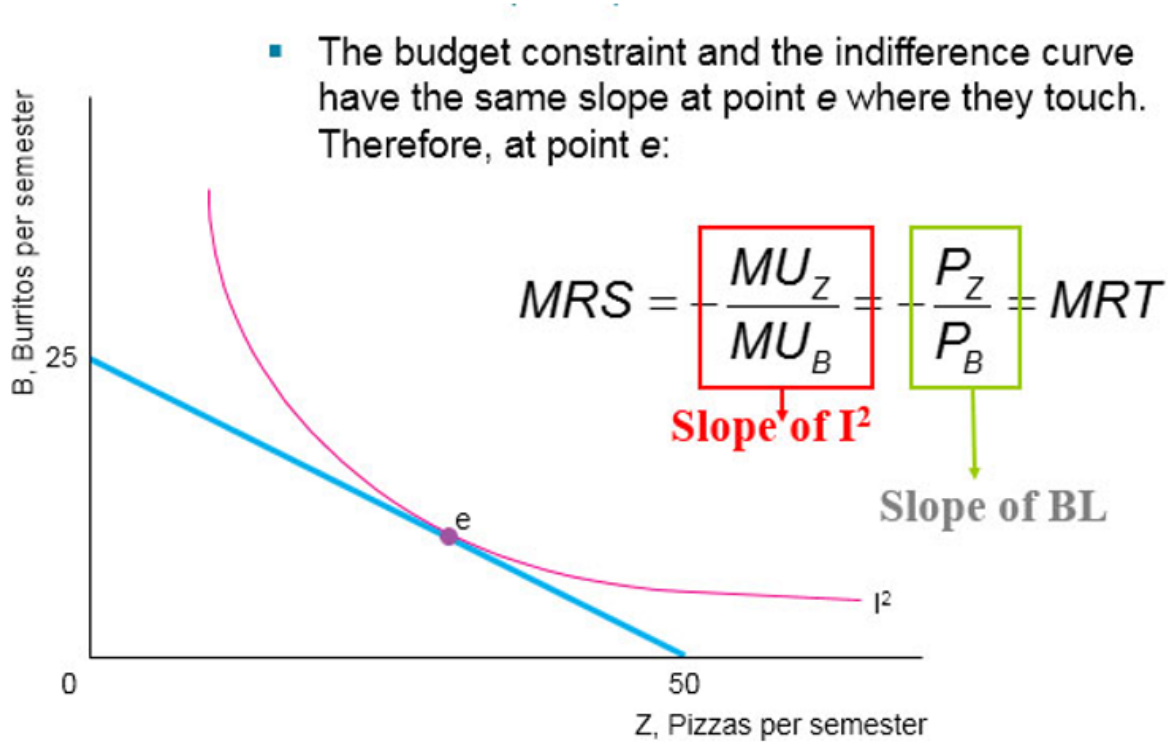
$$MRS_{Z,B} = \frac{\Delta B}{\Delta Z} = \frac{\Delta U/\Delta Z}{\Delta U/\Delta B} = -\frac{MU_Z}{MU_B}$$

Consumer Optimality Condition

- A consumer chooses that bundle that they can afford that can maximize one's utility.



Consumer Optimality Condition: Convex preferences and interior solution



Numerical Example 1: Strictly Convex Utility

Suppose Hilda has preference for two goods x_1 and x_2 that can be represented by the utility function

$$U = \frac{1}{4} \cdot log(x_1) + \frac{3}{4} \cdot log(x_2).$$

The market price for the two goods are, respectively, $p_1 = 1$ and $p_2 = 2$ and her monthly income is \$100. Find the monthly combination of the amount of the two goods that maximize her utility subject to her budget.

Solution- Set up:

$$\underset{x_1,x_2}{\text{Maximize}} \quad U = \frac{1}{4} \cdot log(x_1) + \frac{3}{4} \cdot log(x_2) \quad s.t. \quad x_1 + 2x_2 = 100$$

Hint:

$$MU_{x_1} = \frac{1}{4x_1} \quad and \quad MU_{x_2} = \frac{3}{4x_2}$$

Monotonic Transformation

- The above objective function is a monotonic (logarithmic in our example) transformation of the $U = x_1^{1/4} x_2^{3/4}$.
- A Monotonic function $f(\cdot)$ is one for which $f'() > 0$ for the relevant range of its argument. Examples: $logx, a + bx, x^2, \sqrt{x}$, etc.
- A monotonic transformation preserves the preference ordering; hence, the optimal bundle under a utility function and under its monotonic transformation are the same!

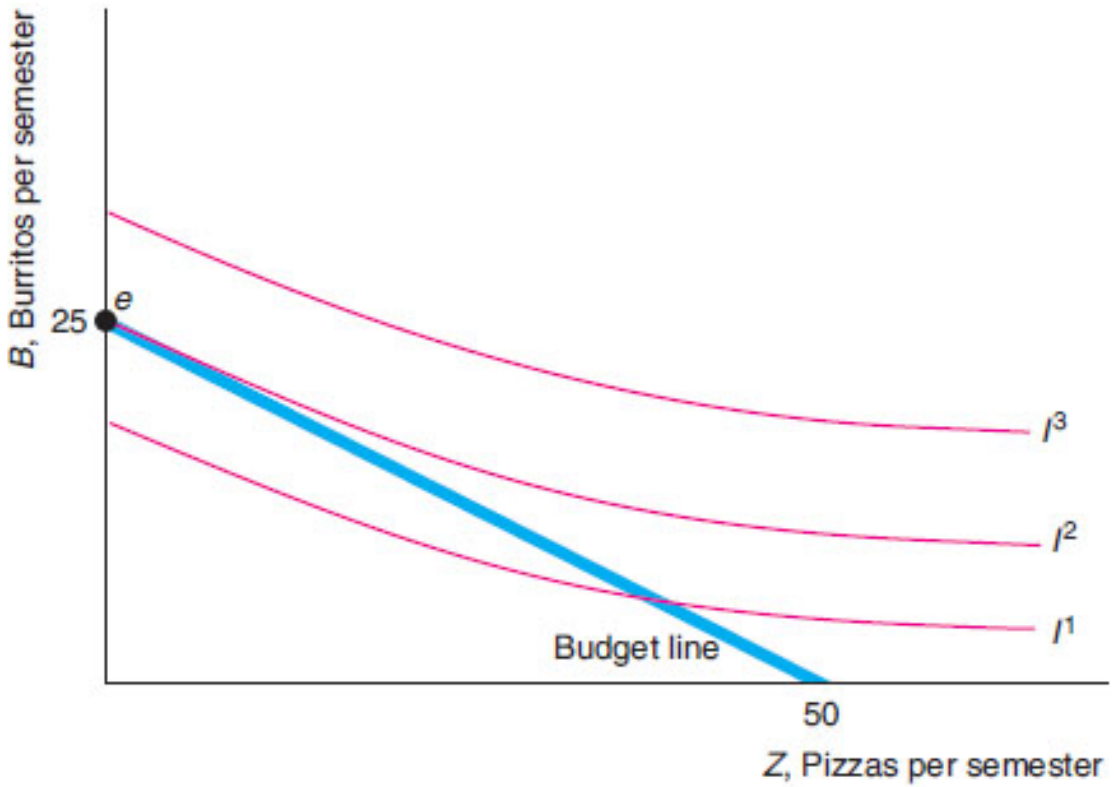
Numerical Example 2: Optimal Bundle

$$\underset{x_1,x_2}{\text{Maximize}} \quad U = x_1^{1/4} x_2^{3/4} \quad s.t. \quad x_1 + 2x_2 = 100$$

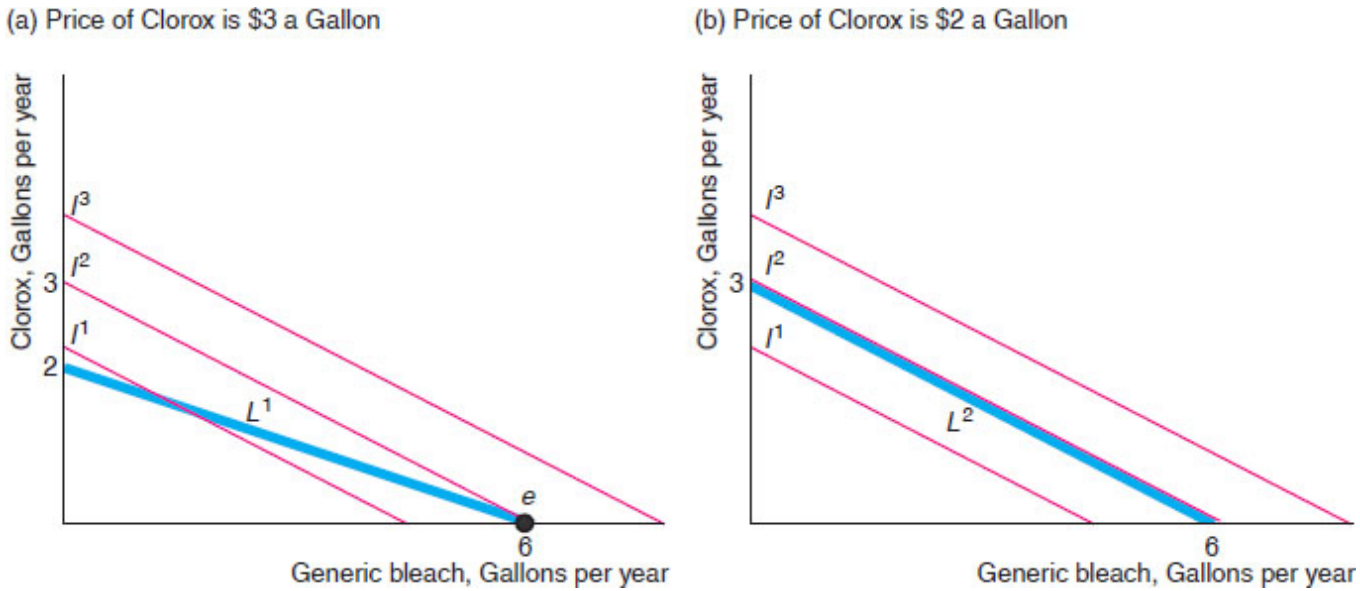
Hint:

$$MU_{x_1} = \frac{1}{4} x_1^{-3/4} x_2^{3/4} \quad \textit{and} \quad MU_{x_2} = \frac{3}{4} x_1^{1/4} x_2^{-1/4}$$

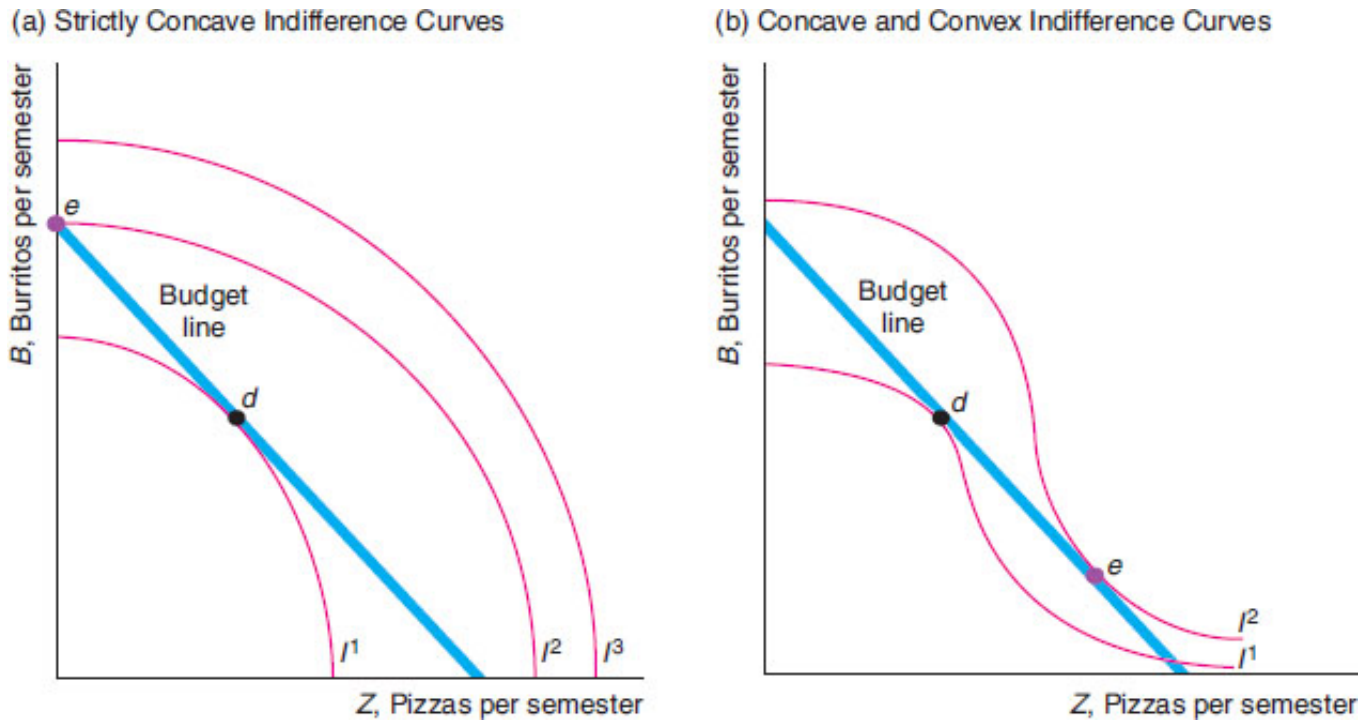
Consumer Maximization, Corner Solution



Consumer Maximization, Corner Solution (Perfect Substitutes)



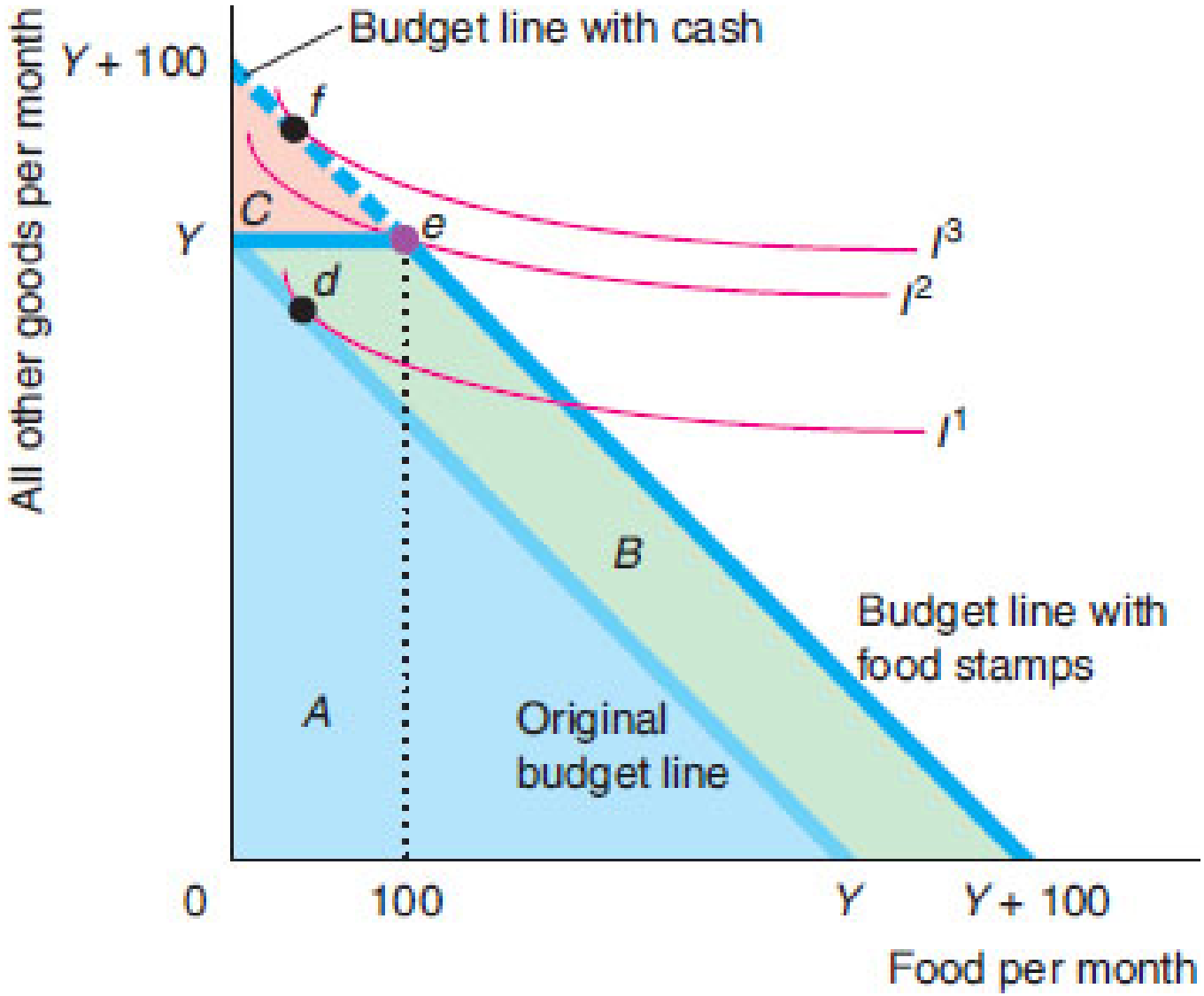
Optimal Bundles on Convex Sections of Indifference Curves



Application: Food Stamps

- The U.S. Food Stamp Plan started in 1939.
- Renamed to Supplemental Nutrition Assistance Program (SNAP) in 2008.
- 44 million people receive food stamps at a cost of $67 billion in early 2016.
- The average benefits were $125 per person per month or $4.12 per day.

Food Stamps Versus Cash



Behavioral Economics

- By adding insights from psychology and empirical research on human cognition and emotional biases to the rational economic model, economists try to better predict economic decision making.
- **Test of Transitivity:**
  - Adults tend to make transitive choices.
  - Children are less likely to make transitive choices.

Endowment Effect

- People place a higher value on a good if they own it than they do if they are considering buying it.
- Consumer choice theory assumes a consumer's endowment does not affect the indifference curve map.
- Research has shown that experience significantly reduces the endowment effect.

Salience and Bounded Rationality

- People are more likely to consider information if it is presented in a way that grabs their attention or if it takes relatively little thought or calculation to understand.
    - For example, tax salience is awareness of a tax.
- When a store's posted prices exclude the sales tax, consumers are much less likely to react to a change in the price.
- Tax is not salient and some consumers ignore taxes.

Bounded rationality: people have a limited capacity to anticipate, solve complex problems, or enumerate all options.

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