Consumer Behavior

EE311

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Outline

- How are consumer preferences used to determine demand?
- How do consumers allocate income to the purchase of different goods?
- How do consumers with limited income decide what to buy?
- How to derive an individual demand?
- Income and Substitution Effects
- Applications

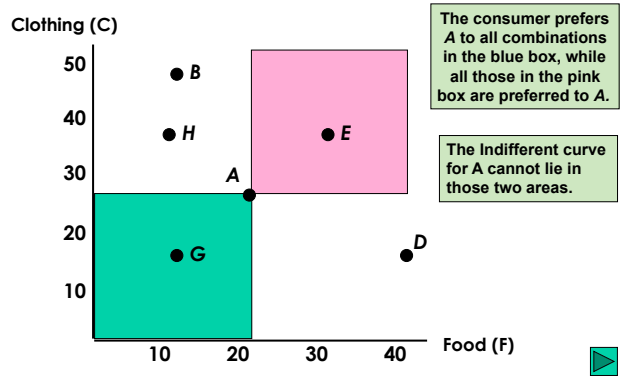
Consumer Preferences – Basic Assumptions

1. Preferences are *complete*.
   - Consumers can rank market baskets; i.e., either prefer A to B, B to A, or indifferent
2. Preferences are *transitive*.
   - If prefer A to B, and B to C, the must prefer A to C
3. Consumers *always prefer more* of any good to less.
   - More is better --> rule out "Bads". This assumption can be relaxed.
4. Variety is preferred to extreme

Consumer Preferences

- Consumer preferences can be represented graphically using *indifference curves or ICs*
- Indifference curves represent all combinations of market baskets that the person is *indifferent to*
  - A person will be equally satisfied with either choice or attain the same utility level

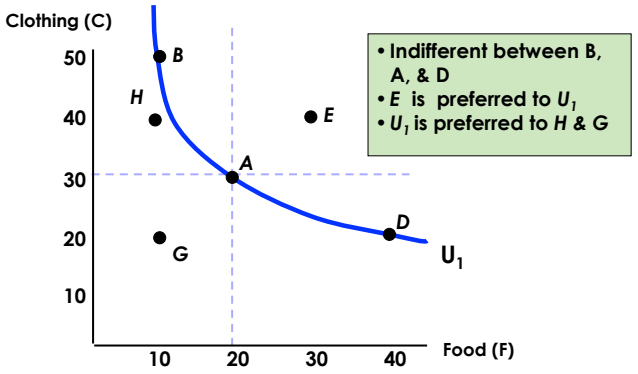
Indifference Curves: An Example



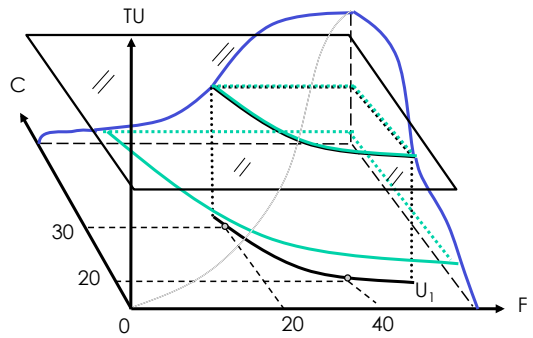
Indifference Curves: An Example

- Points such as B & D have more of one good but less of another compared to A
  - Need more information about consumer ranking
- Consumer may decide they are indifference between B, A and D
  - We can then connect those points with an indifference curve

Indifference Curves: An Example



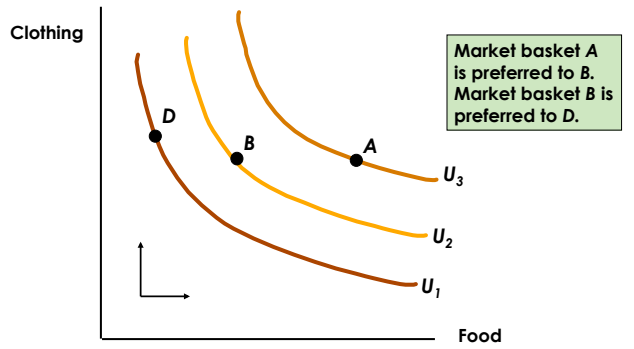
Indifference curves are the contour on the utility hill



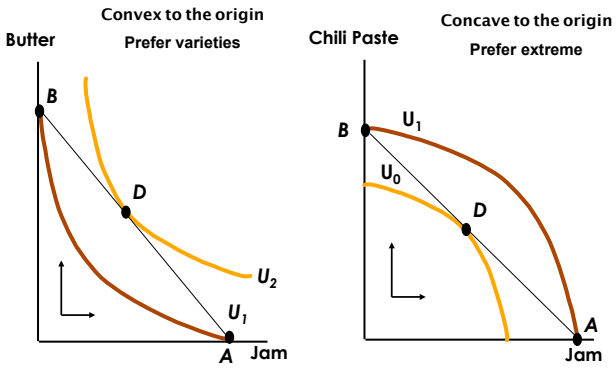
Indifference Curves: Properties

- They slope downward to the right.
  - Goods are substitutable
  - If F rises, C must fall to maintain the same U_1.
- Any basket lying northeast of an IC is preferred to any on the IC
- Convex to the origin
  - Variety is preferred to extreme
- Indifference curves can not cross
- Continuous: no gaps

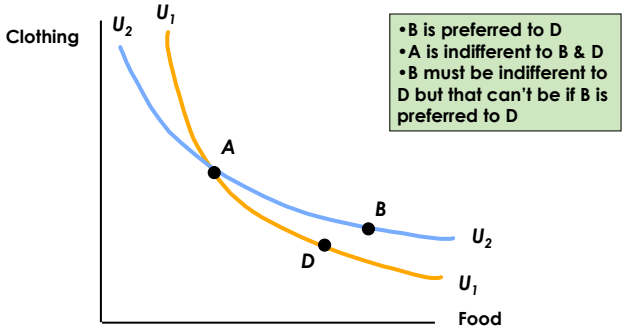
Indifference Map



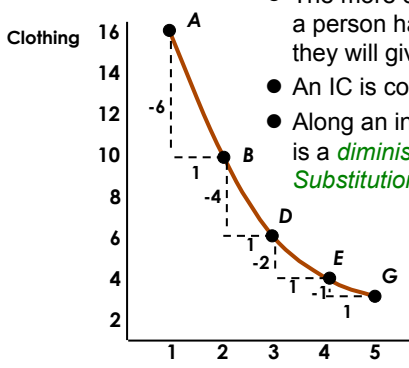
Indifference Map



Crossing Indifference Curves



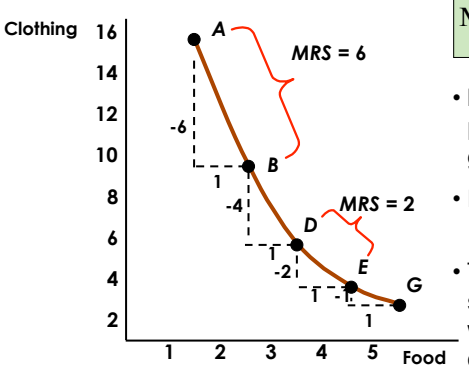
Indifference Curves



- The more clothing and less food a person has, the more clothing they will give up to get more food
- An IC is convex to the origin
- Along an indifference curve there is a *diminishing Marginal Rate of Substitution (MRS)*

Observation: The amount of clothing given up for 1 unit of food decreases from 6 to 1

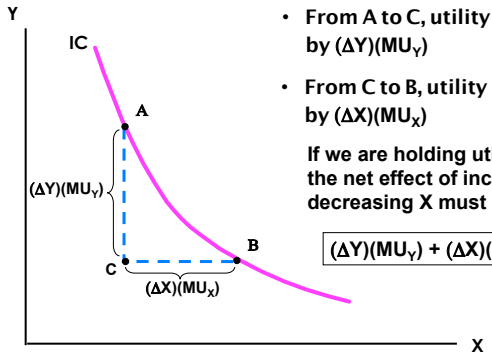
Marginal Rate of Substitution



$$MRS = \frac{\Delta C}{\Delta F}$$

- MRS measures how a person trades one good for another
- It is the slope of the IC
- The willingness to substitute is less as we consume more of one good.

Marginal Rate of Substitution



- From A to C, utility decreases by $(\Delta Y)(MU_Y)$
- From C to B, utility increases by $(\Delta X)(MU_X)$

If we are holding utility constant, the net effect of increasing X and decreasing X must be zero

$$(\Delta Y)(MU_Y) + (\Delta X)(MU_X) = 0$$

Marginal Rate of Substitution

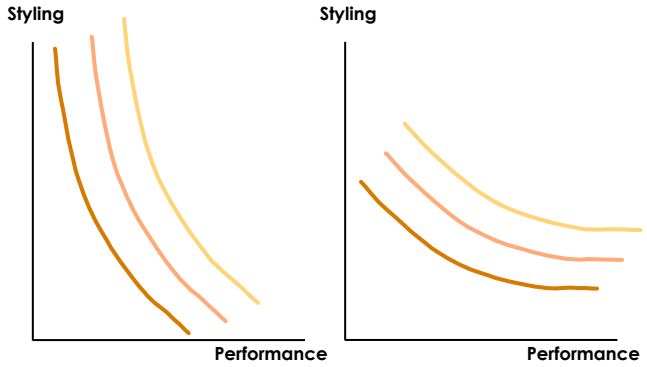
- Rearranging equation, we can see the relationship between MRS and MUs

$$(\Delta Y)(MU_Y) + (\Delta X)(MU_X) = 0$$

$$(\Delta Y)(MU_Y) = -(\Delta X)(MU_X)$$

$$\frac{\Delta Y}{\Delta X} = -\frac{(MU_X)}{(MU_Y)} = MRS$$

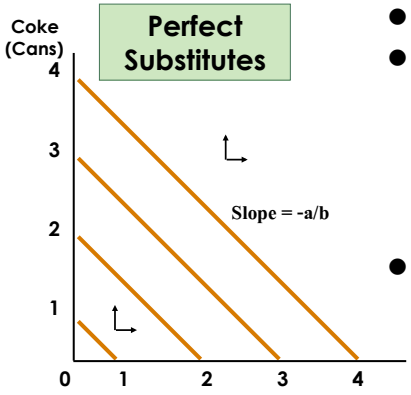
MRS and Preferences



Shapes of the IC and types of goods

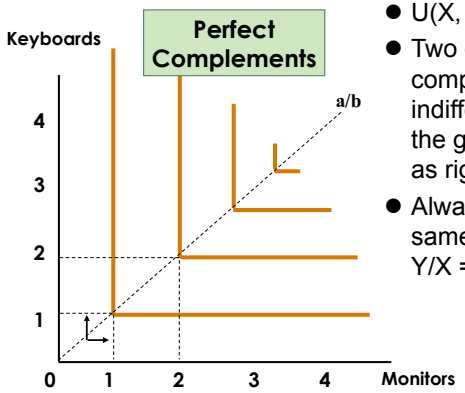
- Indifference curves with different shapes imply a different willingness to substitute
- Two polar cases are of interest
  - Perfect substitutes
  - Perfect complements
- Other types
  - Neuters
  - Bads

Consumer Preferences



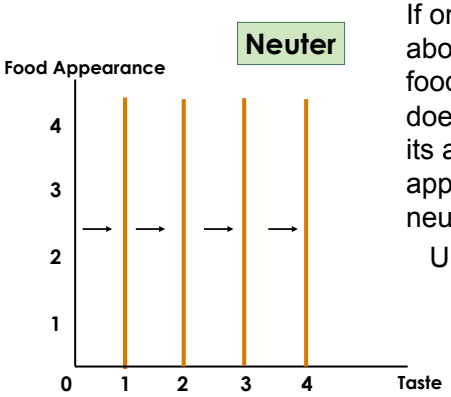
- U(X, Y) = aX + bY
- Two goods are perfect substitutes when the marginal rate of substitution of one good for the other is constant.
- Note: MRS needs not to be 1.

Consumer Preferences



- U(X, Y) = Min {aX, bY}
- Two goods are perfect complements when the indifference curves for the goods are shaped as right angles.
- Always consume in the same proportion Y/X = a/b.

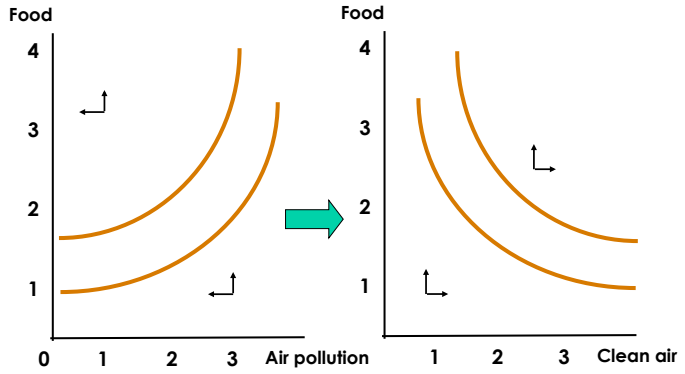
Consumer Preferences



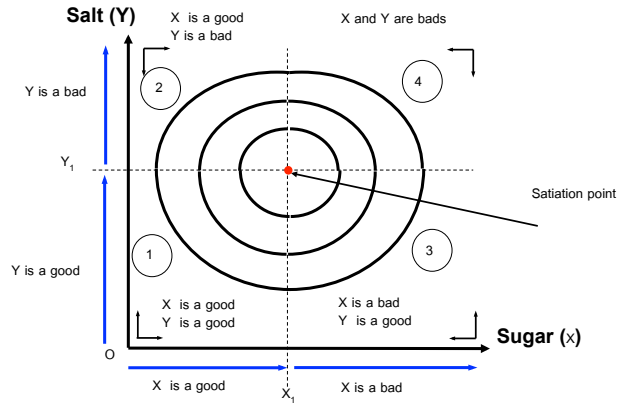
If one care only about the taste of the food he eats, but does not care about its appearance, the appearance is a neuter to him.

$U(Y) = aX$

Bads are commodities we don't want more of; e.g., air pollution, stress



Satiation or Bliss point



Cardinal versus Ordinal Preferences

- The theory of consumer behavior does not required assigning a numerical value to the level of satisfaction
- Although ranking of market baskets are good, sometimes numerical value are useful
- Utility: A numerical score representing the satisfaction that a consumer gets from a given market basket.

Utility

- *Utility function*
  - Formula that assigns a level of utility to individual market baskets
  - If the utility function is

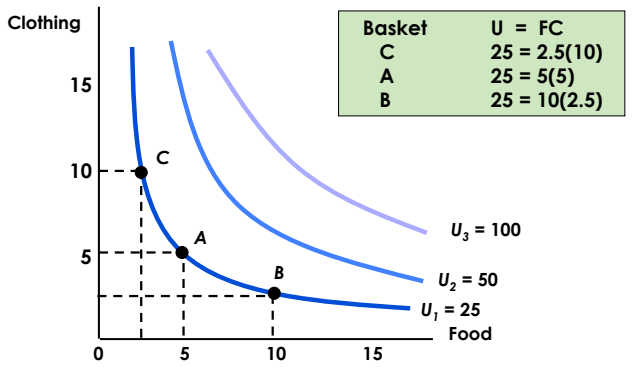
$$U(F,C) = F + 2C$$

A market basket with 8 units of food and 3 units of clothing gives a utility of

$$14 = 8 + 2(3)$$

F and C are perfect substitutes

Utility - Example: Cobb-Douglas



Utility

- Although we numerically rank baskets and indifference curves, numbers are ONLY for ranking
- A utility of 4 is not necessarily twice as good as utility of 2
- The actual unit of measurement for utility is not important.
- An ordinal ranking is sufficient to explain how most individual decisions are made.

Budget Constraints

- The Budget Line
  - Indicates all combinations of two commodities for which total money spent equals total income.
  - We assume only 2 goods are consumed, so we do not consider savings for the time being

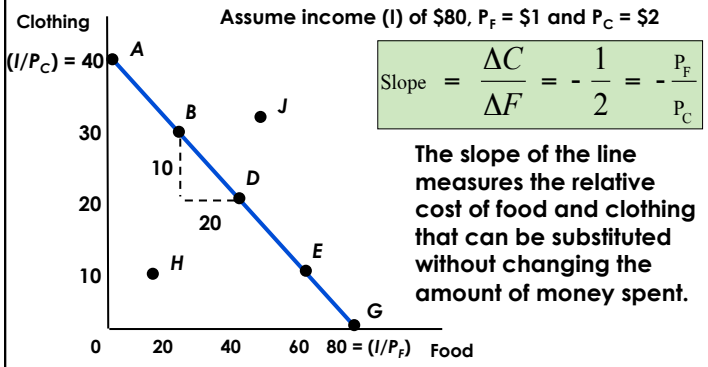
The Budget Line

- A consumer chooses food (F) and Clothing (C)
- Price of food = PF and price of clothing = PC
- The budget line then can be written:

$$P_F F + P_C C = I$$

All income is allocated to food (F) and/or clothing (C)

The Budget Line



$$\text{Slope} = \frac{\Delta C}{\Delta F} = -\frac{1}{2} = -\frac{P_F}{P_C}$$

The slope of the line measures the relative cost of food and clothing that can be substituted without changing the amount of money spent.

The Budget Line

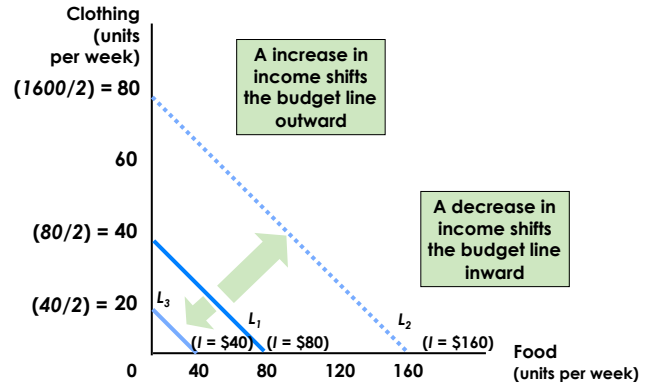
$$I = P_F F + P_C C$$

$$P_C C = I - P_F F$$

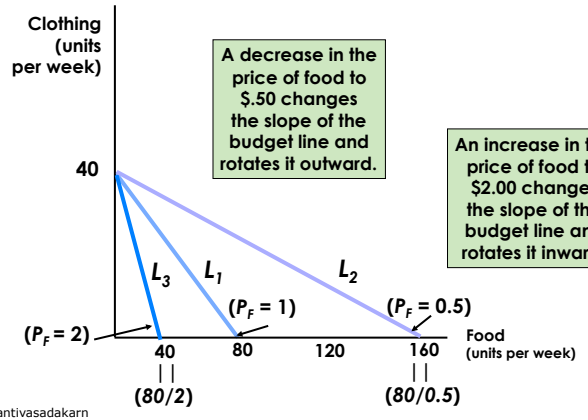
$$C = \frac{I}{P_C} - \frac{P_F}{P_C} F$$

Y intercept — slope

The Budget Line: Changes in income



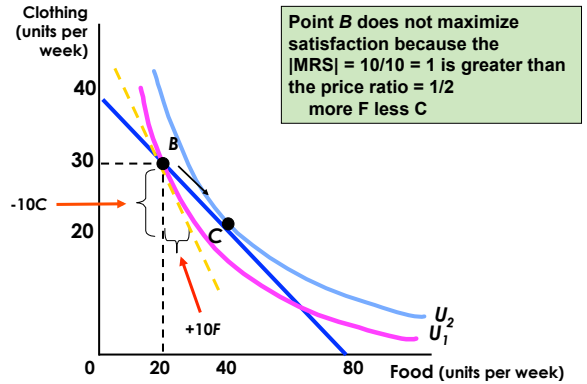
The Budget Line: Changes in a price



Consumer Choice

- Optimal consumption point is where MRS = the relative prices
- MRS = the rate that the consumer is willing to sacrifice some clothing to get 1 unit of food
- P_F/P_C = cost of additional unit of food in terms of clothing

Consumer Choice



Consumer Choice

- If $|MRS| \neq P_F/P_C$ then individuals can reallocate basket to increase utility
- If $|MRS| > P_F/P_C$ -> Consumer is willing to give up clothing for food more than what the market requires
  - Will increase food and decrease clothing until $|MRS| = P_F/P_C$
- If $|MRS| < P_F/P_C$
  - Will increase clothing and decrease food until $|MRS| = P_F/P_C$

Optimal condition

Max U(X,Y) such that $I = P_X X + P_Y Y$

Since $I = P_X X + P_Y Y$ implies

$Y = I/P_Y - XP_X/P_Y$.

Substituting this gives

Max $U(X, I/P_Y - XP_X/P_Y)$

$MU_X - MU_Y P_X/P_Y = 0$

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

Optimal condition: Lagrange approach

Max U(X,Y) such that $I = P_X X + P_Y Y$

$L = U(X,Y) + \lambda(I - P_X X - P_Y Y)$

$dL/dX = MU_X - \lambda P_X = 0$

$dL/dY = MU_Y - P_Y = 0$ $\Big\} \Longrightarrow MRS = \frac{MU_X}{MU_Y} = \frac{P_X}{P_Y}$

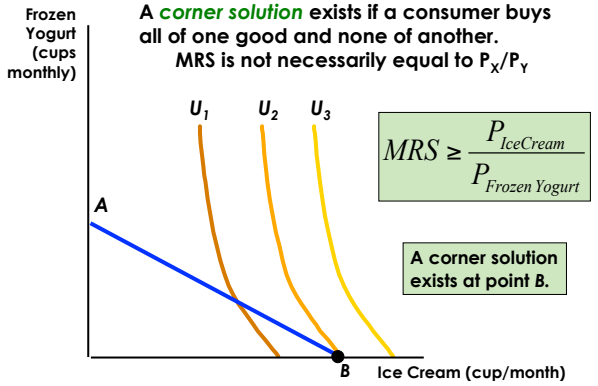
$dL/dl = I - P_X X - P_Y Y = 0$

$\lambda = MU_X/P_X = MU_Y/P_Y$ It is the marginal utility per baht. It is also equal to the shadow price of money or the marginal utility of money

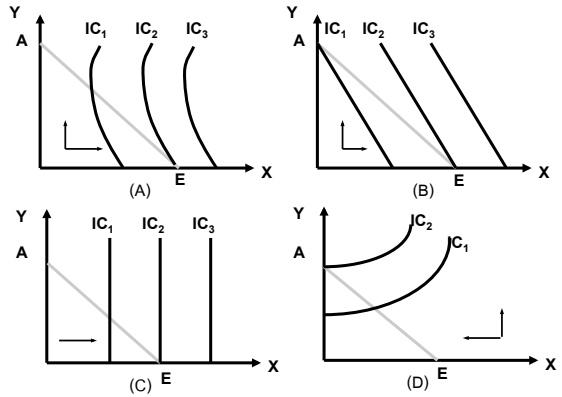
Consumer Choice

- Normally MRS should equal P_X/P_Y and the equilibrium is call an interior solution
- A *corner solution* exists if a consumer buys in extremes, and buys all of one category of good and none of another.
  - MRS is **not** necessarily equal to P_X/P_Y

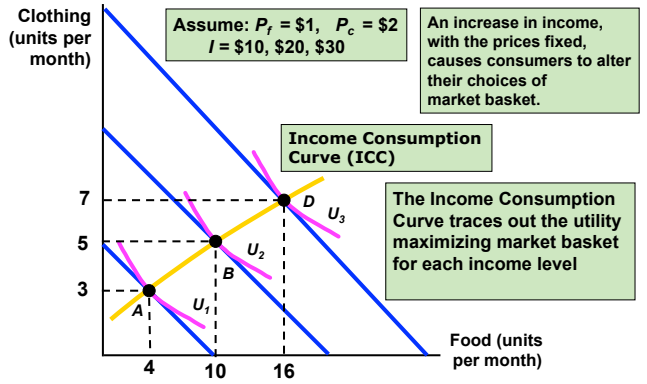
A Corner Solution



Corner Solutions



Effects of Income Changes



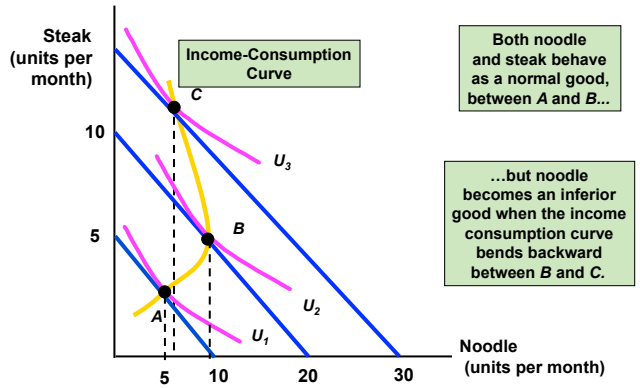
Individual Demand

- Income Changes
  - When the income-consumption curve moves from left to right as income increases:
    - The quantity demanded increases with income.
    - The income elasticity of demand is positive.
    - The good on the X axis is a **normal good**.

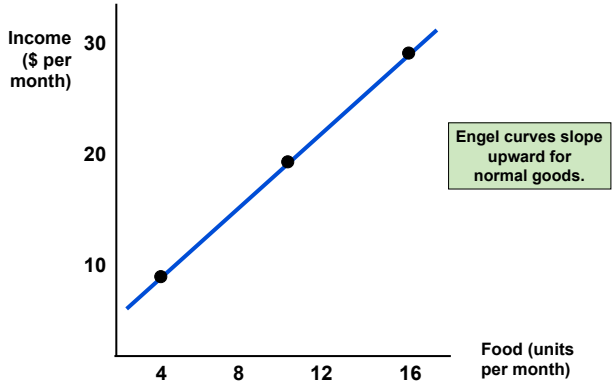
Individual Demand

- Income Changes
  - When the income-consumption curve move from right to left as income increases:
    - The quantity demanded decreases with income.
    - The income elasticity of demand is negative.
    - The good on the X axis is an **inferior good**.

An Inferior Good



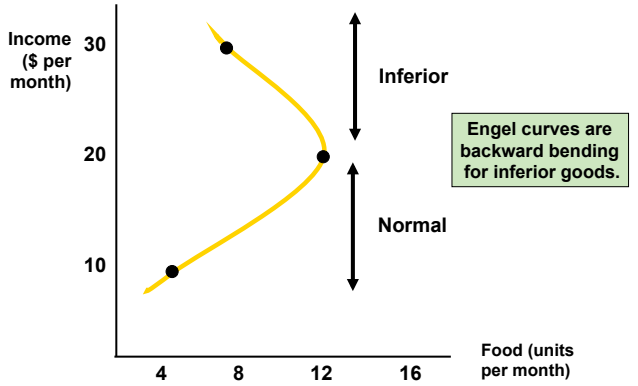
Engel Curves



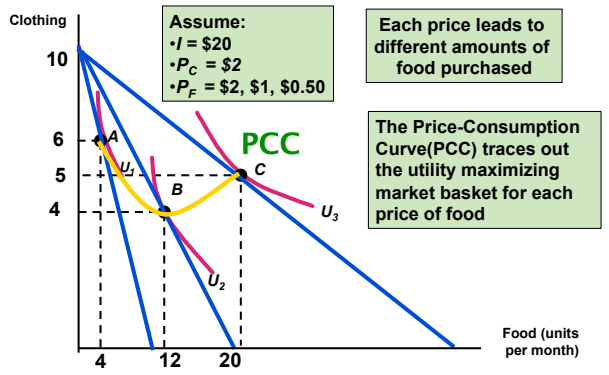
Individual Demand

- Engel Curves
  - Engel curves relate the quantity of good consumed to income.
  - If the good is a normal good, the Engel curve is upward sloping.
  - If the good is an inferior good, the Engel curve is downward sloping.

Engel Curves



Effect of a Price Change

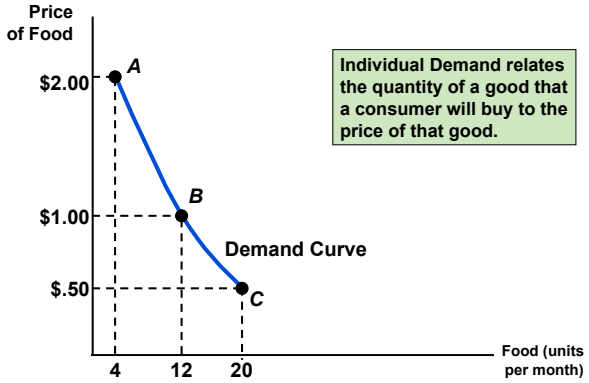


Assume:
- I = \$20
- P_C = \$2
- P_F = \$2, \$1, \$0.50

Each price leads to different amounts of food purchased

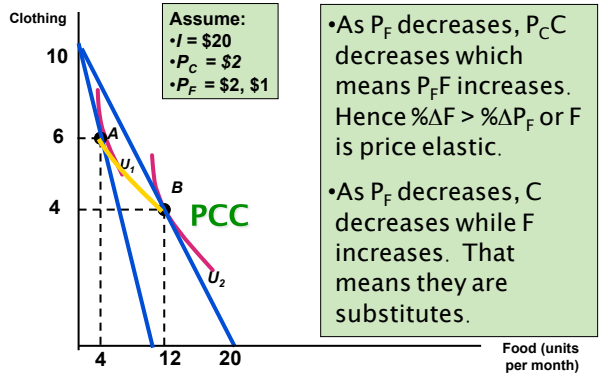
The Price-Consumption Curve(PCC) traces out the utility maximizing market basket for each price of food

Effect of a Price Change



Individual Demand relates the quantity of a good that a consumer will buy to the price of that good.

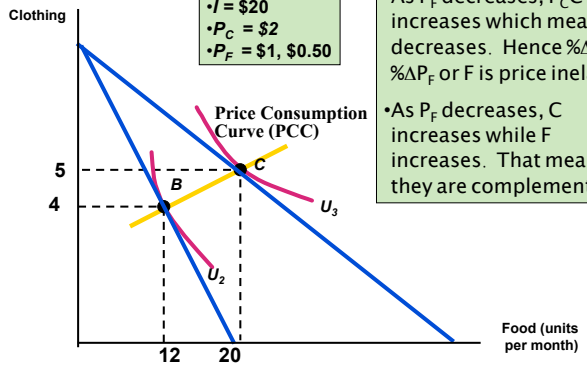
Decreasing PCC



Assume:
- I = \$20
- P_C = \$2
- P_F = \$2, \$1

- As P_F decreases, $P_C C$ decreases which means $P_F F$ increases. Hence $\%\Delta F > \%\Delta P_F$ or F is price elastic.
- As P_F decreases, C decreases while F increases. That means they are substitutes.

Effect of a Price Change



Assume:
- I = \$20
- P_C = \$2
- P_F = \$1, \$0.50

- As P_F decreases, $P_C C$ increases which means $P_F F$ decreases. Hence $\%\Delta F < \%\Delta P_F$ or F is price inelastic.
- As P_F decreases, C increases while F increases. That means they are complements.

Substitutes & Complements

- If the price consumption curve is downward-sloping, the two goods are considered substitutes.
- If the price consumption curve is upward-sloping, the two goods are considered complements.
- They could be both.

Income and Substitution Effects

- Substitution Effect
  - Relative price of a good changes when price changes
  - Consumers will tend to buy more of the good that has become relatively cheaper, and less of the good that is relatively more expensive.
- Income Effect
  - Consumers experience an increase in real purchasing power when the price of one good falls.

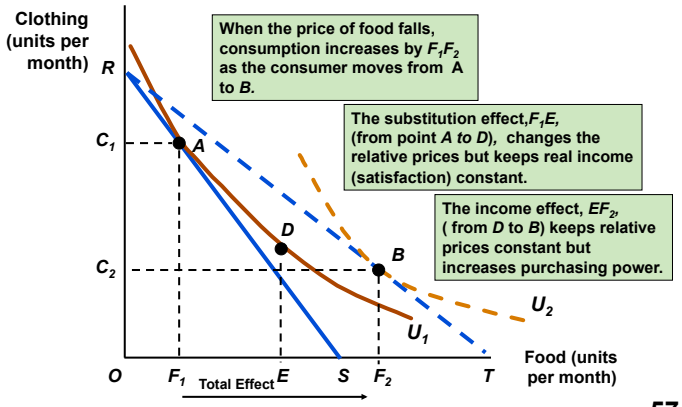
Income and Substitution Effects

- Substitution Effect
  - The substitution effect is the change in an item's consumption associated with a change in the price of the item, with **the level of utility held constant**.
  - When the price of an item declines, the substitution effect always leads to an increase in the quantity demanded of the good.

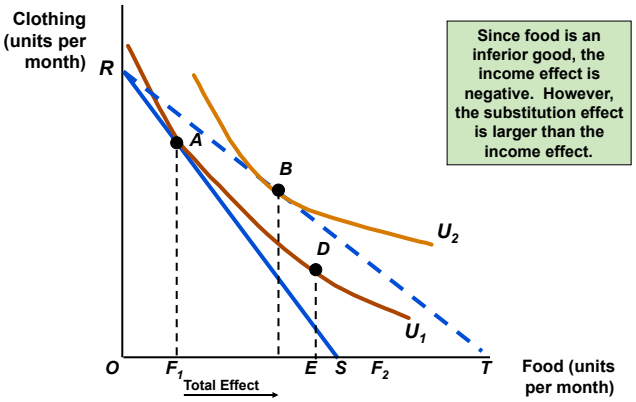
Income and Substitution Effects

- Income Effect
  - The income effect is the change in an item's consumption brought about by the change in purchasing power, with the **price of the item held constant**.
  - When a person's income increases, the quantity demanded for the product may increase or decrease.
  - Even with inferior goods, the income effect is rarely large enough to outweigh the substitution effect.

Income and Substitution Effects: Normal Good



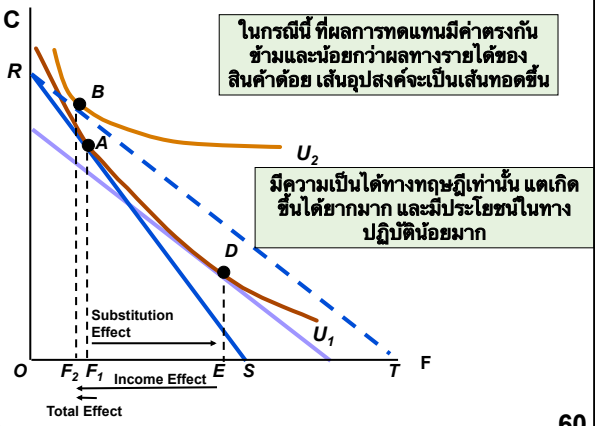
Income and Substitution Effects: Inferior Good



Income and Substitution Effects

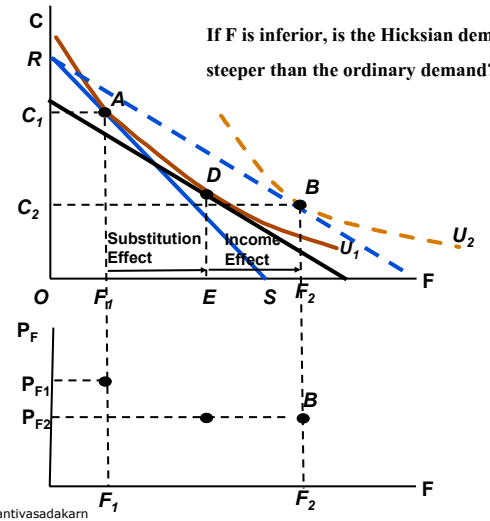
- A Special Case--The Giffen Good
  - The income effect may theoretically be large enough to cause the demand curve for a good to slope upward.
  - This rarely occurs and is of little practical interest.

Income and Substitution Effects: Giffen Good



Compensated demand curve

- Ordinary demand or Marshallian demand always has income effect
  - Derive by fixing income.
  - It may slope upward if it is a Giffen good.
- Compensated demand of Hicksian demand excludes income effect or compensated for income
  - Derive by fixing utility
  - It always slopes downward.
  - It is used for calculating welfare change.

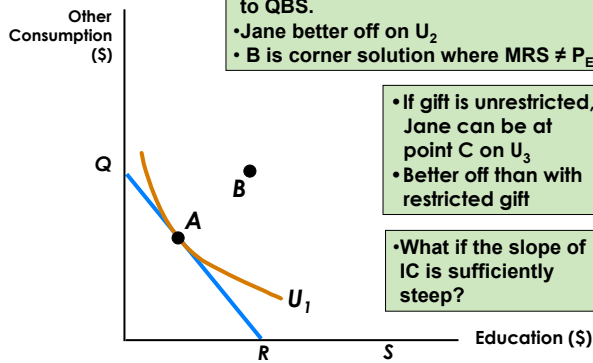


If F is inferior, is the Hicksian demand still steeper than the ordinary demand? Why?

Application: Cash or Gifts

- Suppose Jane Doe's parents set up a trust fund for her college education.
- The money must be used only for education.
- Original budget line, QR, with a market basket, A, of education and other goods
- Trust fund shifts out the budget line as long as trust fund, QB, spent on education
- Jane increases satisfaction moving to higher indifference curve, U_2
- Although a welcome gift, an unrestricted gift might be better since she can get U_3

Application: Cash or Gifts

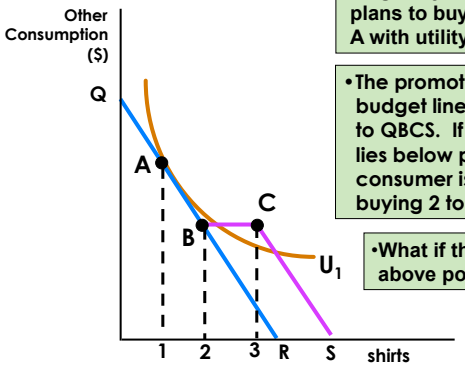


- The gift changes the budget line from QR to QBS.
- Jane better off on U_2
- B is corner solution where MRS ≠ P_E/P_{OG}

- If gift is unrestricted, Jane can be at point C on U_3
- Better off than with restricted gift

- What if the slope of IC is sufficiently steep?

Application: Buy two, get one free



- Originally, this consumer plans to buy 1 shirt at point A with utility U_1.
- The promotion causes the budget line QR to change to QBCS. If the original IC lies below point C, this consumer is better off buying 2 to get 1 more shirt.
- What if the original IC is above point C?