Intermediate Microeconomics

Lecture 2: Utility and Demand

Agribusiness Teaching Center

Easter Term 2015

Formal Microeconomics

- Consumer theory
  - People ← **Now**
  - Households
  - Applications
- Producer theory
  - Internal organisation
  - Industrial organisation
- Equilibrium
  - Existence
  - Efficiency

Consumer Theory

PEOPLE CHOOSE THE BEST THINGS THEY CAN AFFORD

Consumer Theory

<u>PEOPLE</u> CHOOSE THE most preferred bundle THEY CAN AFFORD

Consumer Theory

A consumer is an economic agent who makes a decision on consumption.

consumers CHOOSE THE most preferred bundle THEY CAN AFFORD

Neoclassical Theory of Consumption

The human or *homo economicus*

- The economic agent
  - Rational
  - Egoistic (self-interested)

Theorem of Debreu

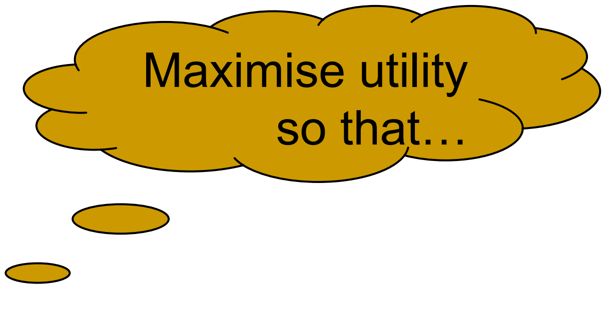
Theorem

Given the assumptions of Rationality and Monotonicity,
$\exists u(\bullet) \;\; s.t. \;\; (x_1, x_2) \succ (y_1, y_2) \iff u(x_1, x_2) > u(y_1, y_2)$.

Proof.

Do not need for this course. $\square$

Consumer Theory

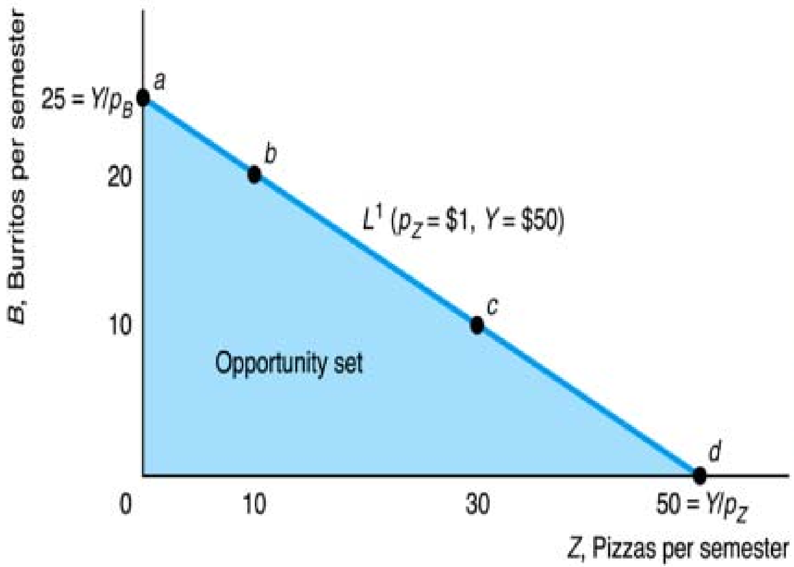


consumers <u>CHOOSE</u> the most preferred bundle THEY CAN AFFORD

Consumer Theory

consumers CHOOSE the most preferred bundle <u>THEY CAN AFFORD</u>

Affordable Bundles



Definition

Budget constraint:
The bundles of goods that can be bought if the entire budget is spent on those goods at given prices.

Example

Budget constraint:

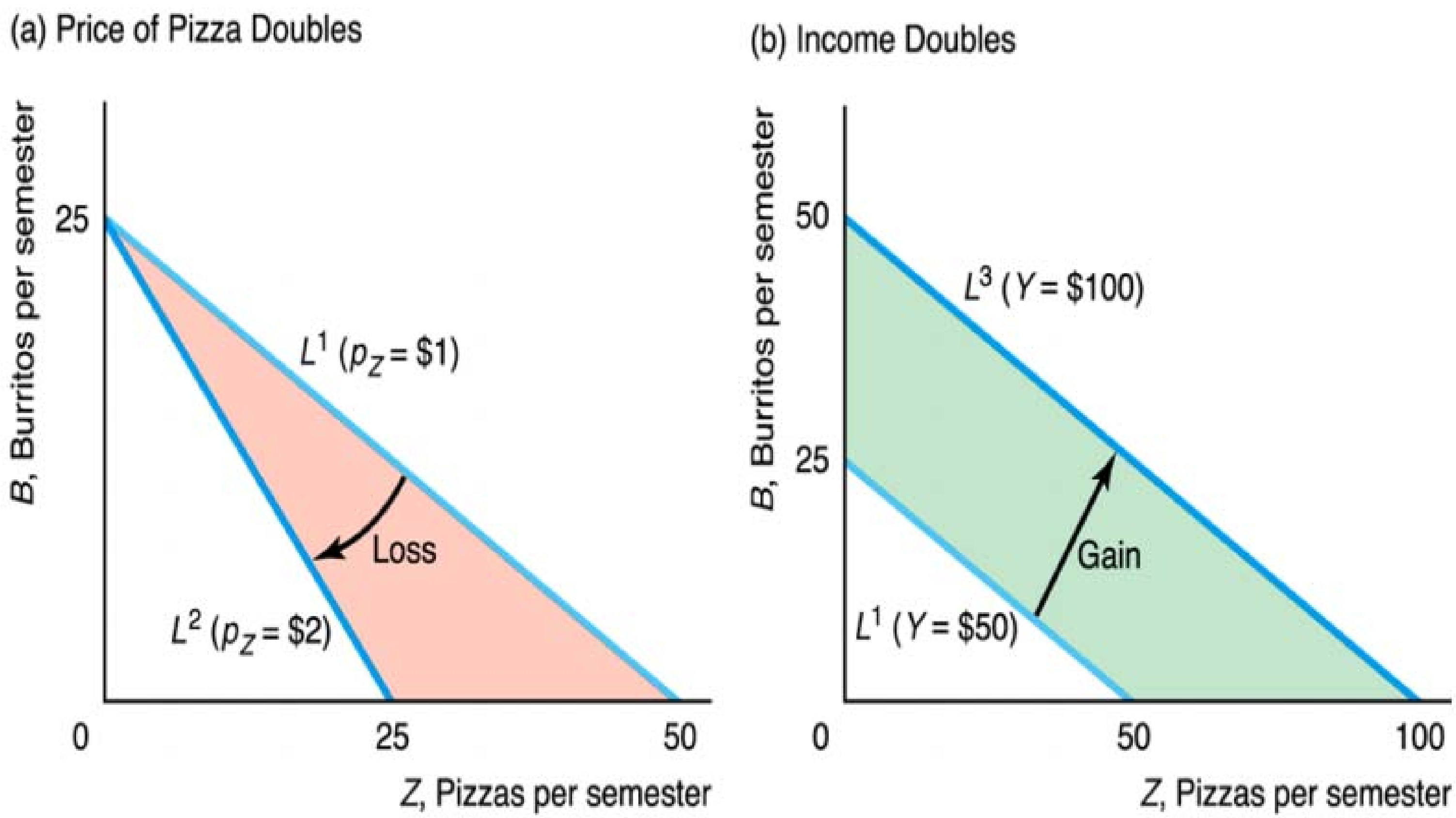
$$p_1 x_1 + p_2 x_2 = m$$

$$x_2 = \underbrace{\frac{m}{p_2}}_{intercept} \underbrace{- \frac{p_1}{p_2}}_{slope} \cdot x_1$$

Fact

The slope of BC = $-\frac{p_Z}{p_B}$.

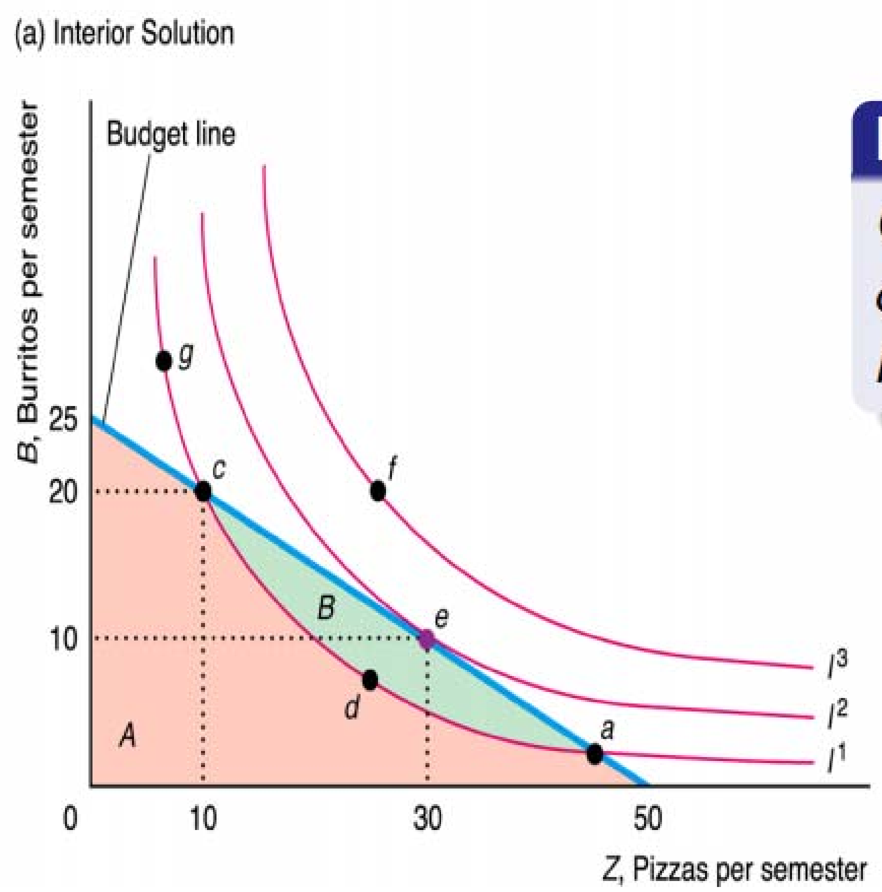
Budget Constraint



Consumer Theory

consumers CHOOSE the most preferred bundle from their consumption set

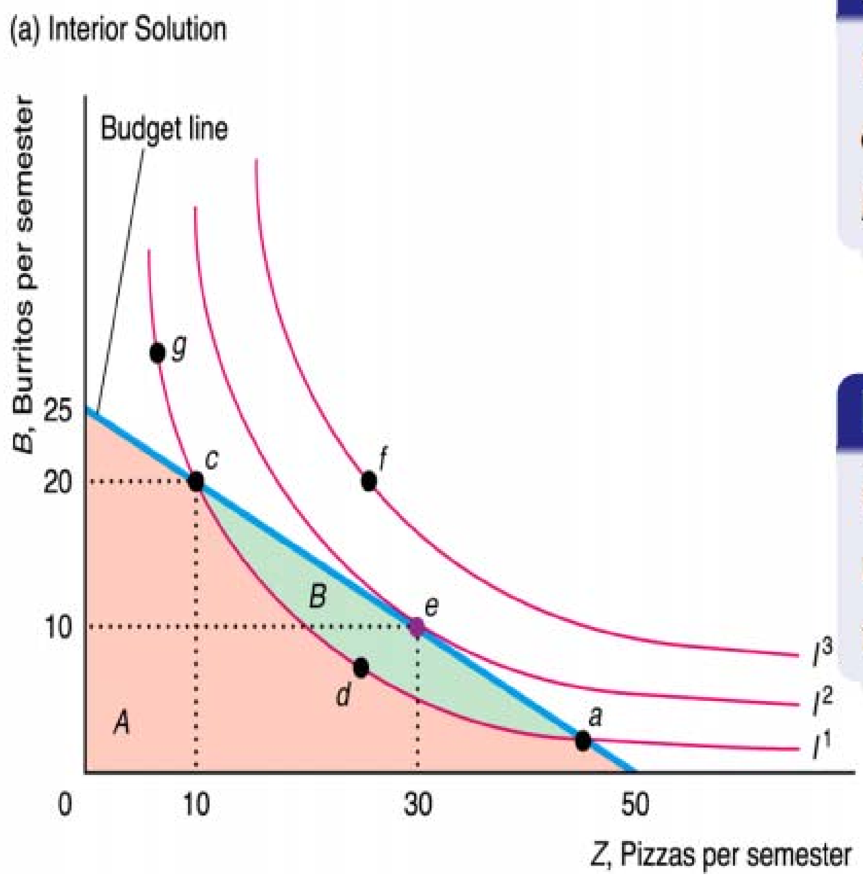
Consumer's choice



Fact

Consumers' choice is a combo of their preferences and budget.

Consumer's choice



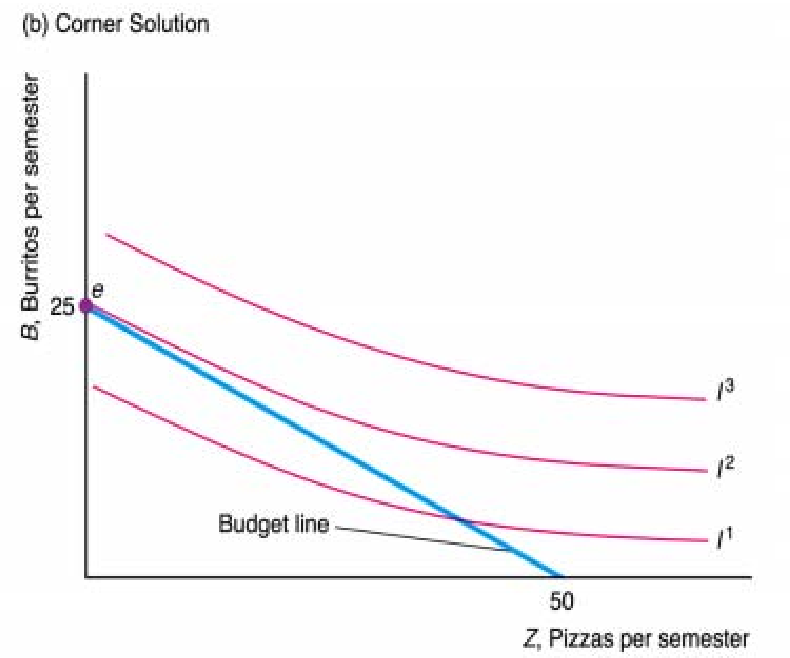
Fact

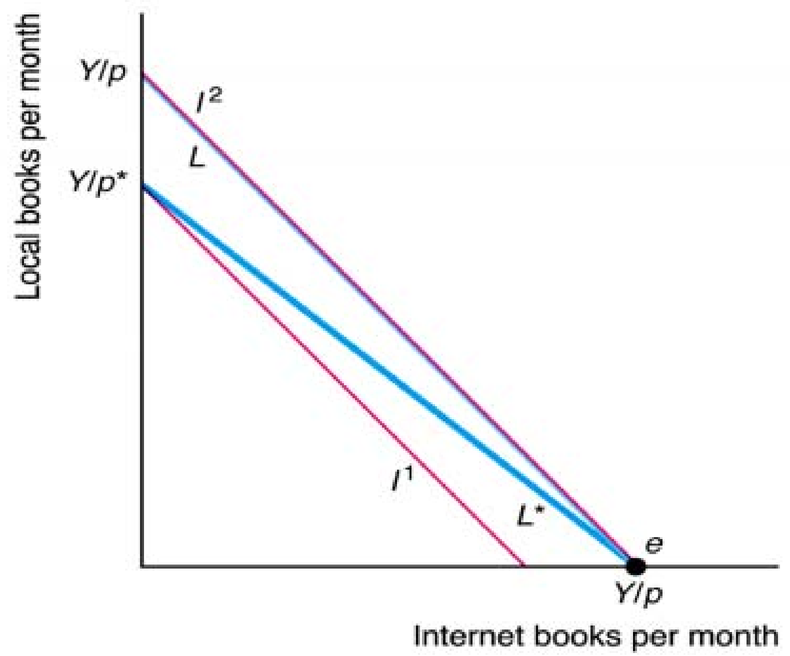
Consumers' choice is a combo of their preferences and budget.

Lemma

Consumer chooses the bundle where the indiference curve is tangent to the budget line.

Consumer's choice





Consumer Optimisation Problem

Calculus Approach

Problem

$$\max_{x_1, x_2} U(x_1, x_2),$$

$$s.t. \qquad p_1 x_1 + p_2 x_2 = m$$

Problem (Lagrange function)

$$\max_{x_1, x_2, \lambda} \mathcal{L} = U(x_1, x_2) + \lambda (m - p_1 x_1 - p_2 x_2)$$

Consumer Optimisation Problem

Calculus Approach

Problem

$$\max_{x_1, x_2, \lambda} \mathcal{L} = U(x_1, x_2) + \lambda (m - p_1 x_1 - p_2 x_2)$$

Solution

First order conditions:

$$\frac{\partial \mathcal{L}}{\partial x_1} = 0 : \frac{\partial U(x_1, x_2)}{\partial x_1} - \lambda p_1 = 0 \quad (1)$$

$$\frac{\partial \mathcal{L}}{\partial x_2} = 0 : \frac{\partial U(x_1, x_2)}{\partial x_2} - \lambda p_2 = 0 \quad (2)$$

$$\frac{\partial \mathcal{L}}{\partial \lambda} = 0 : m - p_1 x_1 - p_2 x_2 = 0 \quad (3)$$

Consumer Optimisation Problem

Calculus Approach

Problem

Solution

From (1) and (2):

$$\left[\frac{MU_{x_1}}{MU_{x_2}} =\right] \frac{\frac{\partial U(x_1,x_2)}{\partial x_1}}{\frac{\partial U(x_1,x_2)}{\partial x_2}} = \frac{p_1}{p_2} \tag{4}$$

Equations (3) and (4) give the solution: $x_1^*\left(p_1, p_2, m\right)$ *and* $x_2^*\left(p_1, p_2, m\right)$

Definition

The pair $\left(x_1^*, x_2^*\right)$ is the optimal choice of the consumer.

Definition

Demand function: $x = x\left(p_1, p_2, m\right)$

Consumer Optimisation Problem

Full derivative of the utility function $U(x_1, x_2)$:

$$dU = \frac{\partial U}{\partial x_1} \cdot dx_1 + \frac{\partial U}{\partial x_2} \cdot dx_2 \tag{5}$$

Fact

The indifference curve is the utility function on a fixed level.

So (5) can be rewritten as:

$$\frac{\frac{\partial U(x_1, x_2)}{\partial x_1}}{\frac{\partial U(x_1, x_2)}{\partial x_2}} = -\frac{dx_2}{dx_1} \tag{6}$$

Corollary

From (4) and (6) we have:

$$MRS = \frac{p_1}{p_2} \tag{7}$$

Fact

The internal rate of change is equal to the external rate of change.

Consumer Optimisation Problem

Necessary Condition

$$
\begin{aligned}
MRS &= \frac{p_1}{p_2} \\
\textit{internal RCh} &= \textit{external RCh} \\
\textit{slope IC} &= \textit{slope BC} \\
\begin{array}{c}\textit{benefit} \text{ of consuming} \\ x_1 \text{ as } \textit{opposed} \text{ to } x_2\end{array} &= \begin{array}{c}\textit{opportunity} \text{ cost of} \\ x_1 \text{ in } \textit{terms} \text{ of } x_2\end{array}
\end{aligned}
$$

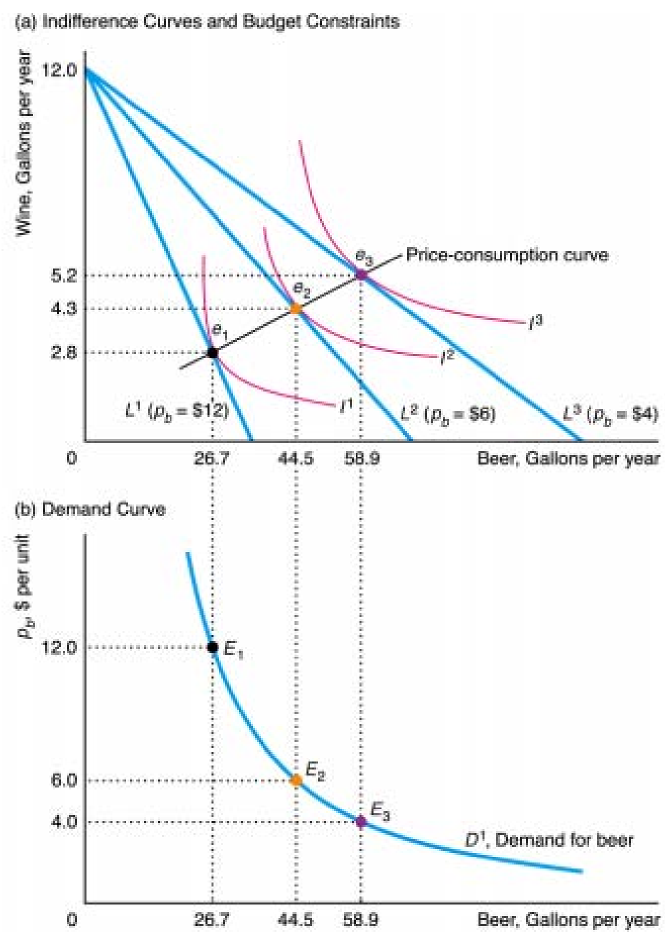
Demand Function

Definition

Demand:
The quantity demanded at each possible price.

- Demand function:

$$x_1 = x_1 \left(p_1, \bar{p}_2, \bar{m} \right)$$



Demand Function

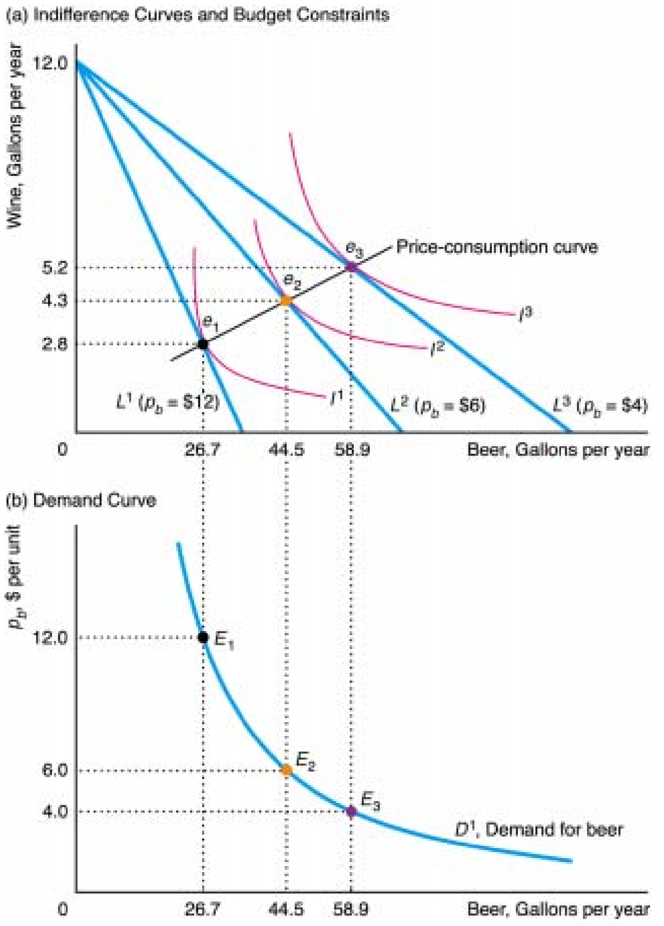
Definition

Demand:
The quantity demanded at each possible price.

- Demand function:

$$x_1 = x_1\left(p_1, \bar{p}_2, \bar{m}\right)$$

- Comparative statics
  - Shifts in m.
  - Shifts in p_1.
  - Shifts in p_2.

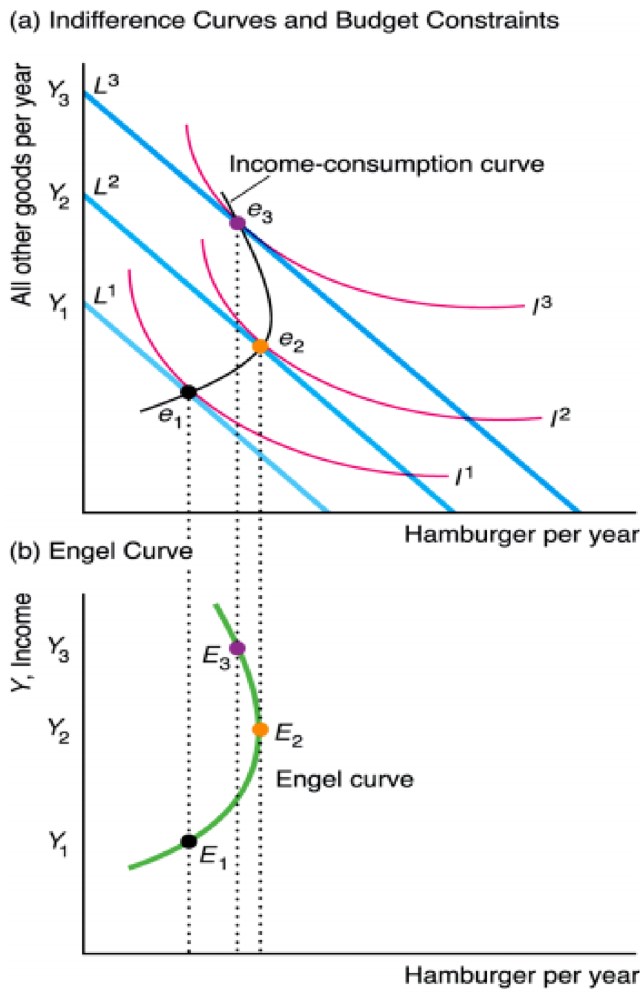


Income and Engel Curve

- Income expansion path
  - Bundles demanded at different income levels
  - Income-consumption curve
- Engel curve

$$x_1 = x_1(\bar{p}_1, \bar{p}_2, m)$$

  - Demand as a function of income only!



Engel Curve and Income Elasticity

Definition

The income elasticity of demand (or income elasticity) is the precentage change in the quantity demanded in response to a given percentage change in income.

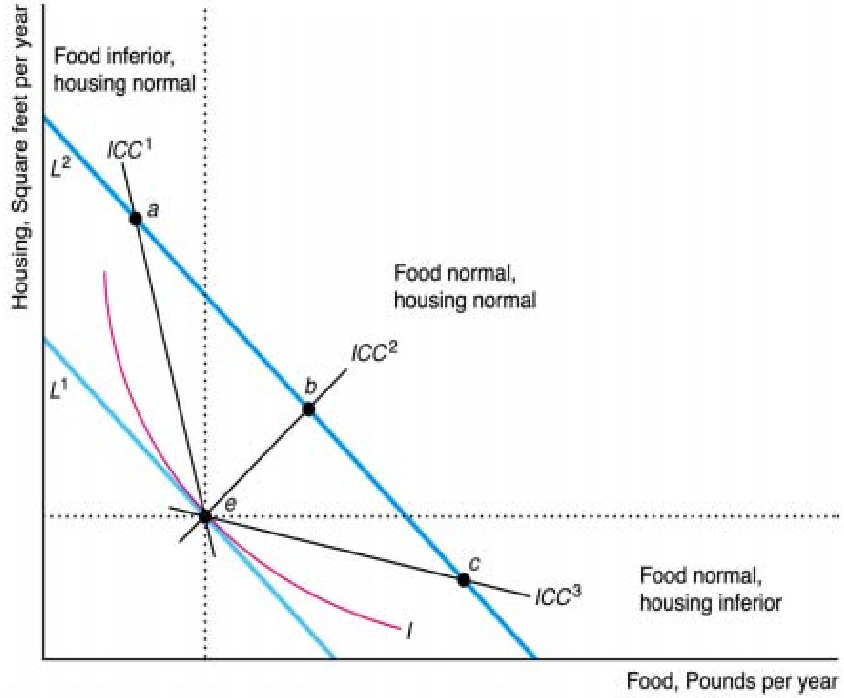
$$\begin{aligned}\varepsilon_M &= \frac{\%\Delta x_1}{\%\Delta m} \\ &= \frac{\frac{\Delta x_1}{x_1}}{\frac{\Delta m}{m}} = \frac{\frac{x_1' - x_1}{x_1}}{\frac{m' - m}{m}} \\ &= \frac{\partial x_1}{\partial m} \cdot \frac{m}{x_1}\end{aligned}$$

- Note:

$$\varepsilon_M \neq \frac{\Delta x_1}{\Delta m}$$

Engel Curve and Income Elasticity

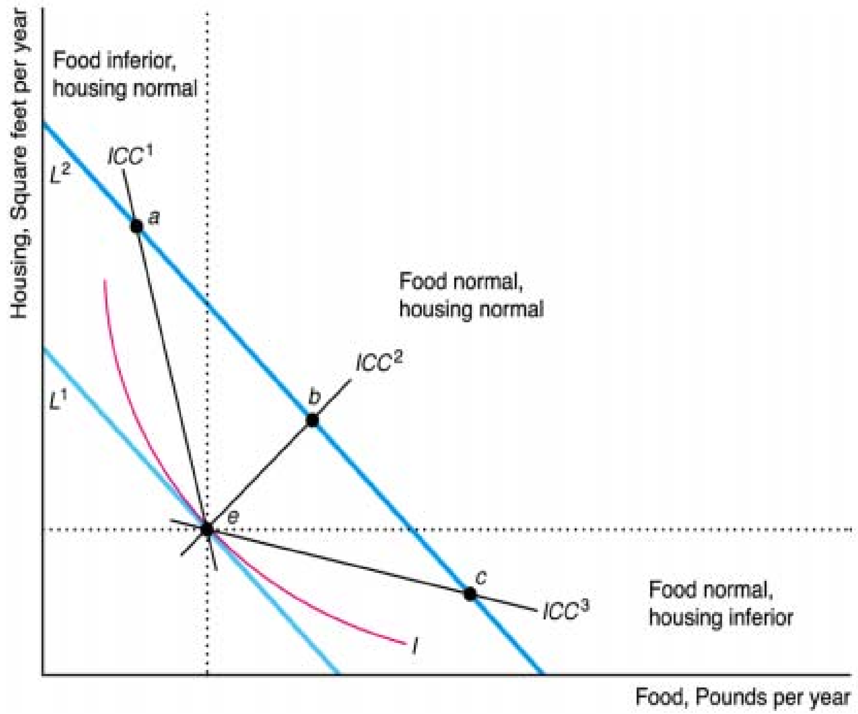
- Normal good : $\varepsilon > 0$
- Inferior good: $\varepsilon < 0$
- Quasilinear: $\varepsilon = 0$



Engel Curve and Income Elasticity

- Normal good : $\varepsilon > 0$
- Inferior good: $\varepsilon < 0$
- Quasilinear: $\varepsilon = 0$

- Luxury goods: $\varepsilon > 1$
- Necessities: $\varepsilon < 1$
- Homothetic: $\varepsilon = 1$



Indifference curves

Suppose Absurdistani people have 2 left feet and 1 right foot. We want to derive a utility function for a Absurdistani person who has L left shoes and R right shoes.

1. Draw the indifference curves.
2. Is it:
   1. rational
   2. monotonic
   3. convex
      1. strictly convex
      2. weakly convex