ECON 311
MICROECONOMICS I

Lecture 1

Consumer Behaviour

(Cardinal and Ordinal Utility Theories of Demand)

– Lecturer: **Dr. Priscilla Twumasi Baffour;**

Department of Economics

Outline

- **Cardinal utility approach**
  - Relationship between total utility and marginal utility
  - Consumer equilibrium
  - Marshall's derivation of the law of demand
  - Criticism of cardinal utility
- **Ordinal Utility Approach To Demand Theory**
  - Assumptions
  - Curvature of indifference curves
  - Impossible indifference curves

Learning Outcome

- After completing this session, you should be able to;
  - Outline the Cardinalists and Ordinalist concept of consumer theory
  - Explain the law of diminishing marginal utility
  - Distinguish between total utility and marginal utility and describe the relationship between them.
  - Derive the marginal utility curve from the total utility curve
  - Derive Marshal's demand curve based on the law of diminishing marginal utility
  - Identify impossible ICs

Reading List

- Chapter 4 – Jeffery M. Perfloff (2012). Microeconomics (Sixth edition), Pearson Education Ltd.

- Chapter 3 – Hal R. Varian (2011). Intermediate Microeconomics, W. W. Norton and Company.

Cardinal Utility Approach

- According to the Cardinalists, utility is measureable in units called utils.
- Basic concept in this discussion are;
  - The consumer,
  - Utility
  - Measurement of utility,
  - Total and marginal utility
  - The law of diminishing return
- The consumer is the one that uses the commodity. The consumer is the decision maker with regards to the commodities involved. The consumer is considered rational, thus always wants to achieve the highest satisfaction and can choose between good and bad.

Cardinal Utility Approach

- Utility is the satisfaction derived from consuming a commodity on service relative to other alternatives. Thus utility is not absolute but relative, this means it depends on who is consuming the commodity.

  Note:

  – the satisfaction one derives from consuming a commodity depends on the person's desire for the commodity.

- Measurability of utility; as indicated earlier, the cardinalist believe utility can be measured in units called **utils.** Just like weight and volume, they believe utility is quantitative and thus can be measured.

  Thus, the consumer can place values on satisfaction derived from consuming a commodity, as such, the higher the value, the higher the satisfaction.

Cardinal Utility Approach

- Total utility is the total benefit or satisfaction derived from all the units of a particular commodity consumed. This depends on the level of consumption, the more you consume, the more your total utility. Note however that, this may not always be the case [will discuss more of this later].

- Marginal utility is the additional utility derived from the consumption of an extra unit of a good (slope of Total Utility). It is a reflection of the law of diminishing marginal utility which we will discuss in the next slide.
- Marginal utility is derived mathematically as;

$$A = \frac{Change\ in\ total\ utility}{Change\ in\ quantity} = \frac{\Delta TU}{\Delta Q}$$

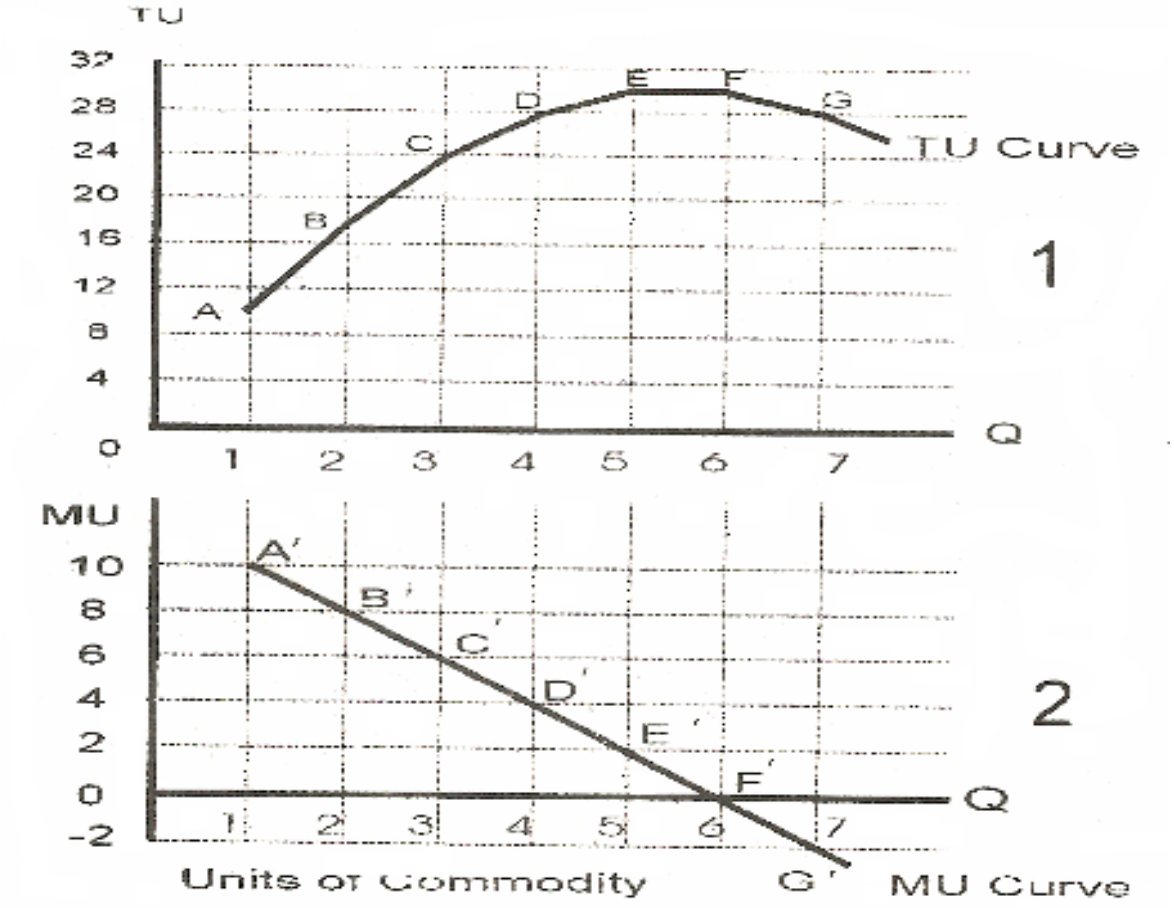
Relationship between Total Utility and Marginal Utility

- MU is the rate of change in TU
- When the MU decreases, TU increases at a decreasing rate.
- When MU becomes zero, TU is at a maximum. It is a saturation point.
- When MU becomes negative, TU declines

The Table below is an illustration of the relationship between total utility and marginal utility.

Quantity	Total Utility	Marginal Utility
1	10	10
2	18	8
3	24	6
4	28	4
5	30	2
6	30	0
7	28	-2

Relationship between Total Utility (TU) and Marginal Utility (MU)



Cardinal Utility Approach

- The law of diminishing marginal utility states that as more of a commodity is consumed, the addition to total utility (marginal utility) declines. That is, the consumer has a diminishing marginal utility from consuming successive units of a good.

- Thus, the addition to total utility of an additional commodity is less than the addition to total utility when the previous unit was consumed.
- **The law however holds only under certain conditions**;
  - The units of the commodities in question must be standard. Example, a pair of shoes, a cup of coffee etc.
  - The consumer should not change his/her taste and preferences during the time of consumption.

Cardinal Utility Approach

- There must be continuity in consumption.
- The consumer must be in a normal state of mind. That is, should not be intoxicated and mentally unstable.

Based on the above, the utility function of a consumer of different goods is expressed as

$$U = f(X_1, X_2, \ldots\ldots\ldots X_n)$$

Hence total utility of the commodities is given as

$$U_n = U_1(X_1) + U_2(X_2) + \ldots\ldots\ldots U_n\,(X_n)$$

Equilibrium of the Consumer

Consumer equilibrium is achieved based on consideration of the price and utility derived.

One commodity case;

$MU_x = P_x$ or $MU_x = \lambda P_x$

- Where λ is the (constant) utility of money

- A) If $MU_x < P_x$, (disequilibrium, what should the consumer do?
- B) If $MU_x > P_x$, (disequilibrium, what should the consumer do?)

Equilibrium of the Consumer

- In scenario A, less will be consumed, by consuming less, marginal utility increases to establish equilibrium between marginal utility and price.

- In scenario B, more will be consumed, consuming more means marginal utility will decrease to establish equilibrium between marginal utility and price.

Equilibrium of the Consumer

- In two or more commodity case, equality of the ratios of the marginal utilities of the individual commodities to their prices result in equilibrium.
- $\frac{MU_x}{P_X}$=1 and $\frac{MU_y}{P_y}$=1 the two equations can be rewritten as
- $\frac{MU_x}{P_X}$ = 1 = $\frac{MU_y}{P_y}$ or
- $\frac{MU_x}{P_X}$ = $\frac{MU_y}{P_y}$
- In multiple commodities, equality of the ratios of the marginal utilities of the individual commodities to their prices result in equilibrium.
- $\frac{MU_x}{P_X}$ = $\frac{MU_y}{P_y}$= ..... $\frac{MU_n}{P_n}$

Derivation of Demand

Based on the axiom of diminishing marginal utility;

- An increase in P_x (results in $P_x > M_{ux}$)

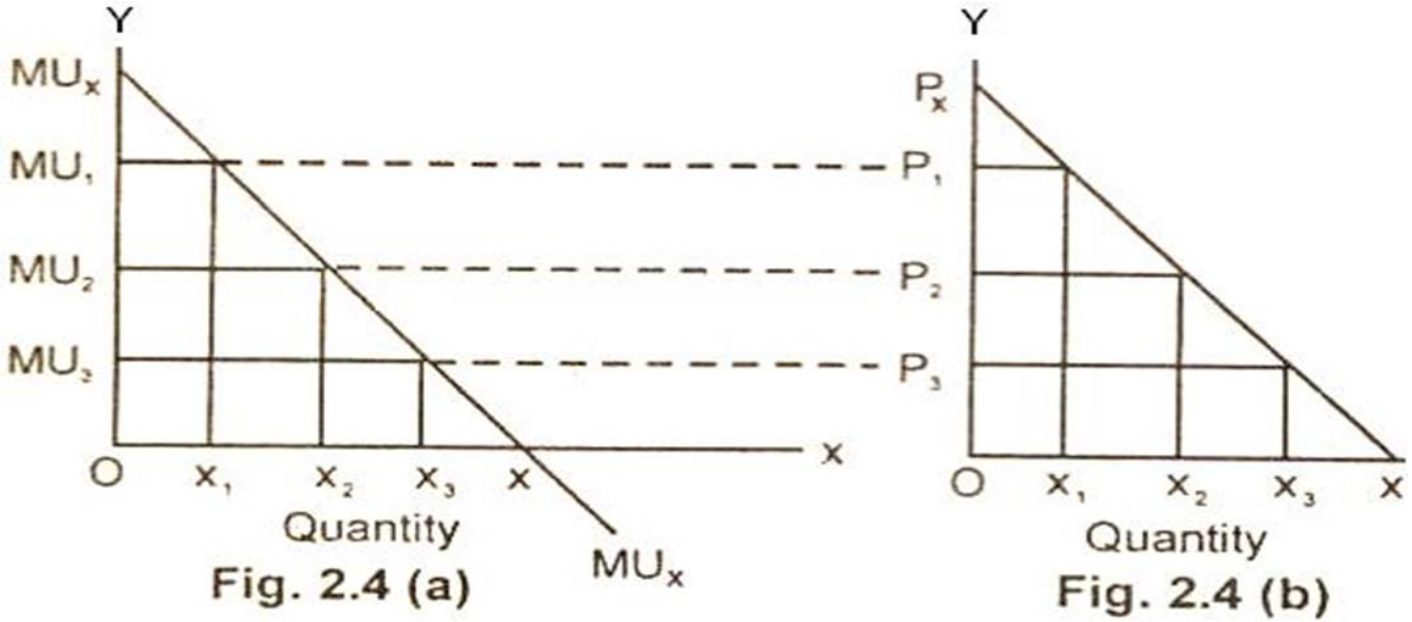
  To restore equilibrium, M_{ux} must increase, this happens only when less of x is consumed.

- When x is consumed, total utility increases but at a decreasing rate, reaches maximum and declines. Thus, MUx decreases continuously and after a certain point becomes negative.

- The demand curve is the **positive segment** of the MU curve.

Marshall's Derivation of the Law of Demand

- According to the Cardinalists, a consumer who consumes one commodity is in equilibrium at the point where $MU_x = P_x$, based on this, the demand curve of the individual for the product can be derived as in figure 2.4(a) and 2.4(b).



Criticisms of Cardinal Utility

- Measureable utility is unrealistic. This has been questioned due the subjective nature of utility.
- Constant utility of money has been questioned. The value of money has been argued to vary and not constant.
- Demand curve is derived based on ceteris paribus assumption. Therefore ignores income and substitution effects.
- Lack of empirical evidence of the law of diminishing marginal utility.

Ordinal Utility Approach To Demand Theory

Assumptions

- Ordinal utility-the consumer ranks his preferences based on satisfaction derived from each good.
- The consumer is rational: **More is always preferred to less:** If bundle A is strictly larger than B, then the consume will always **APB**
- Completeness

Axiom of Completeness:

- ✓ Consumer knows whether **APB**, **BPA** or **AIB**
- ✓ Only one of the alternatives is true for any two bundles **A** and **B**.

- Transitivity and Consistency of choice

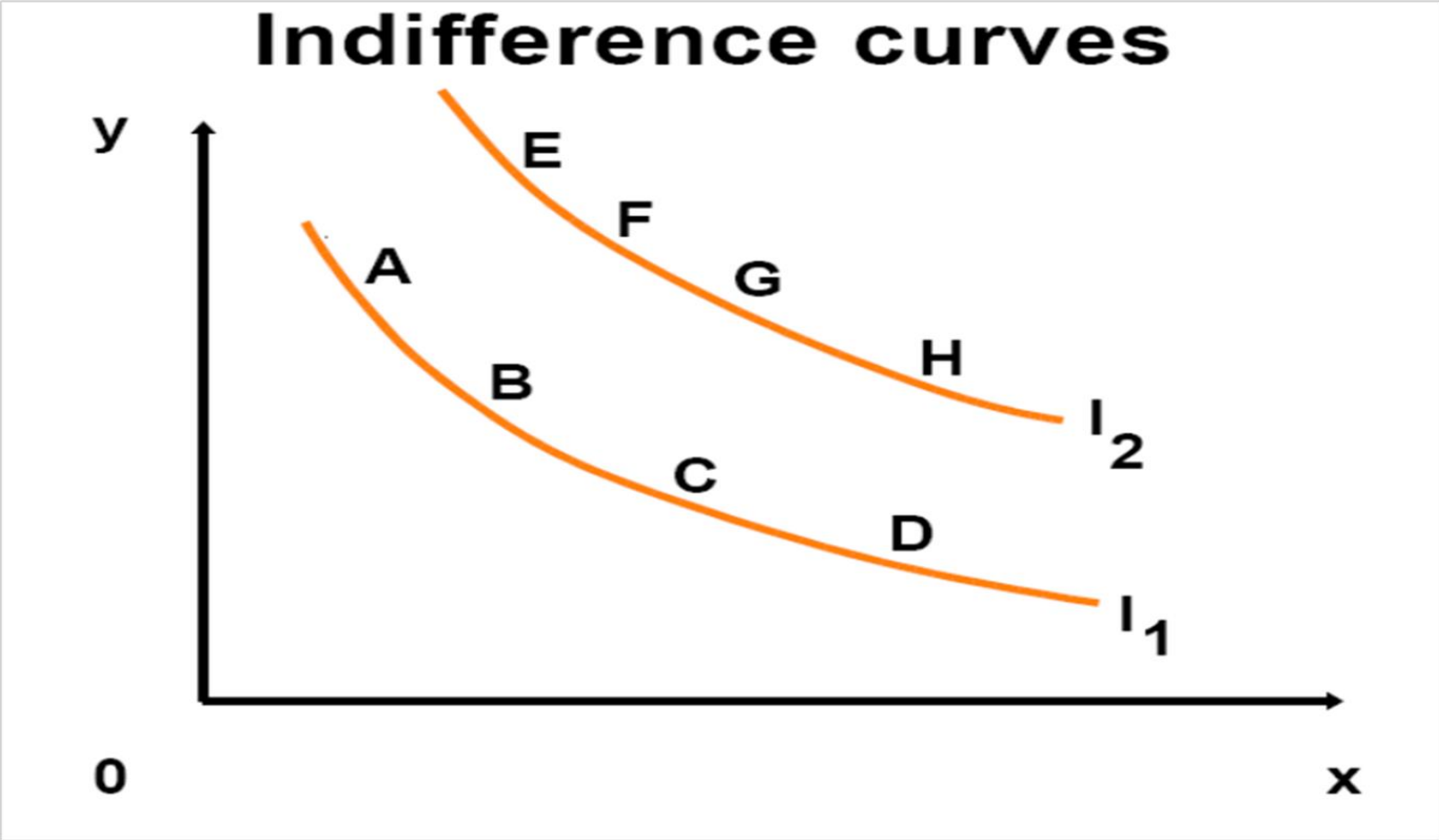
Axiom of Transitivity or Consistency:

- ✓ **if APB**, **BPC** then **APC**
- ✓ **If AIB**, **BIC** then **AIC**

Indifference Curve

- IC is the locus of points-bundle of goods- that yield the same level of satisfaction.
- An indifference curve defines the substitution between goods X and Y that is acceptable in the mind of the consumer.
- Indifference map shows all ICs which rank the consumer's preference.

Indifference Curve



Indifference Curve

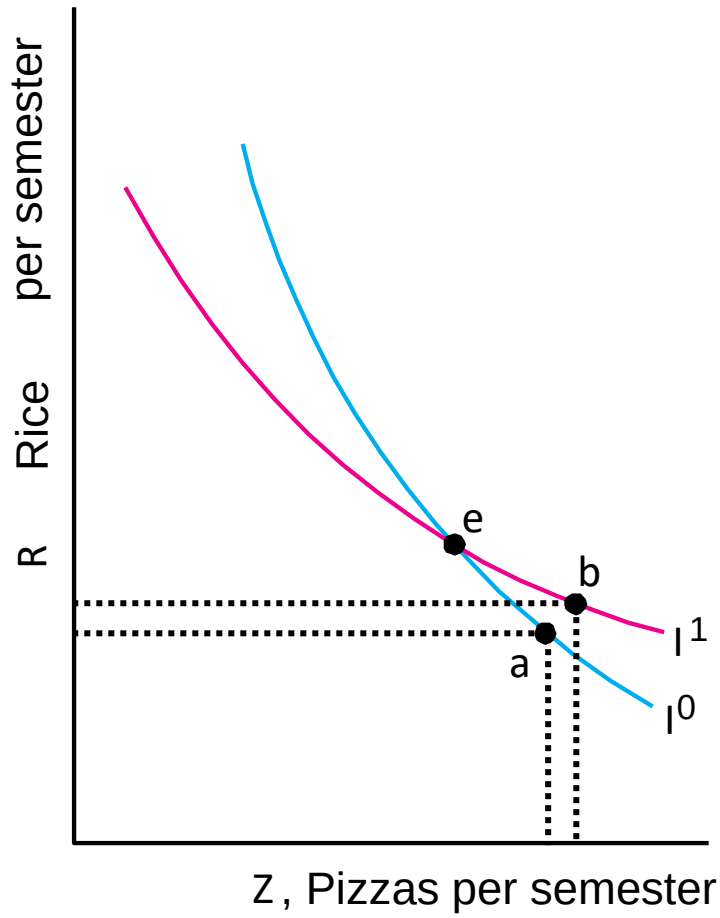
- IC is convex to the origin. The convex shape indicates as you move towards the southeast along a typical IC, the consumer gives up **less and less of Y** for an extra unit of X. In other words what is sacrificed for an extra unit of X diminishes.
- The negative of the slope of IC is the **marginal rate of substitution.**
- The rate of substitution declines along an IC (diminishing marginal rate of substitution)
  - IC is convex to the origin
  - Slope of IC decreases

Second order condition

- Slope of IC ie. $MRS_{x,y} = -\frac{dy}{dx} = \frac{MU_x}{MU_y}$
- Essentially ensures that the utility curve is convex.

$$\frac{\mathbf{d}\left[\frac{dy}{dx}\right]}{\mathbf{d}x} > 0$$

Impossible Indifference Curves



- Lisa is indifferent between ***e*** and ***a***, and also between ***e*** and ***b***…
  - so by transitivity she should also be indifferent between ***a*** and ***b***…
  - but this is impossible, since ***b*** must be preferred to ***a*** given it has more of both goods.

Impossible Indifference Curves (cont.)

- Lisa is indifferent between ***b*** and ***a*** since both points are on the same indifference curve…
  - But this contradicts the "more is better" assumption. **Can you tell why?**
  - Yes, ***b*** has more of both and hence it should be preferred over ***a***.

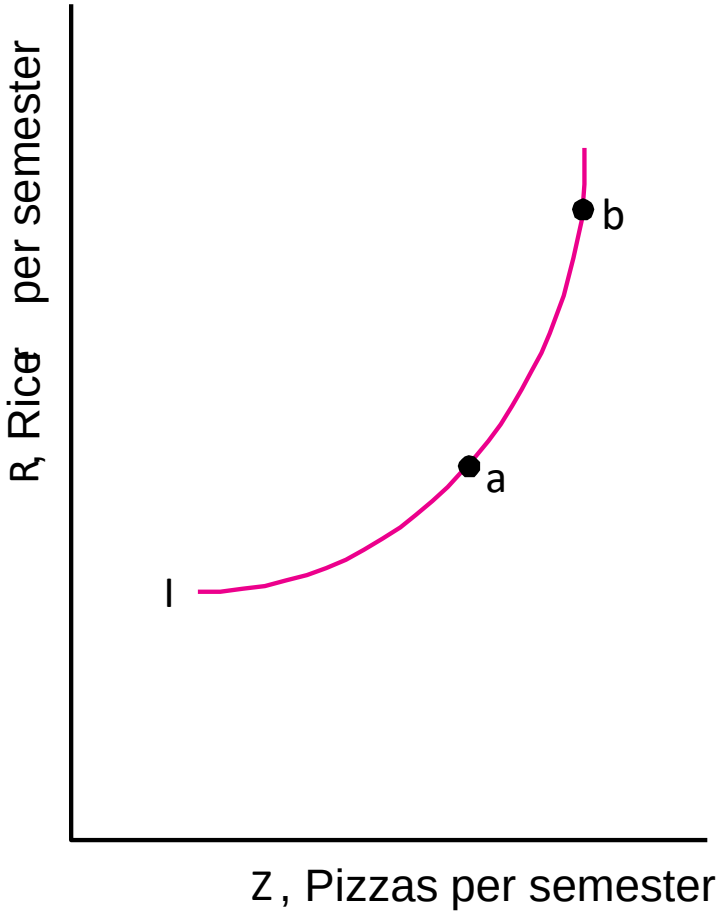
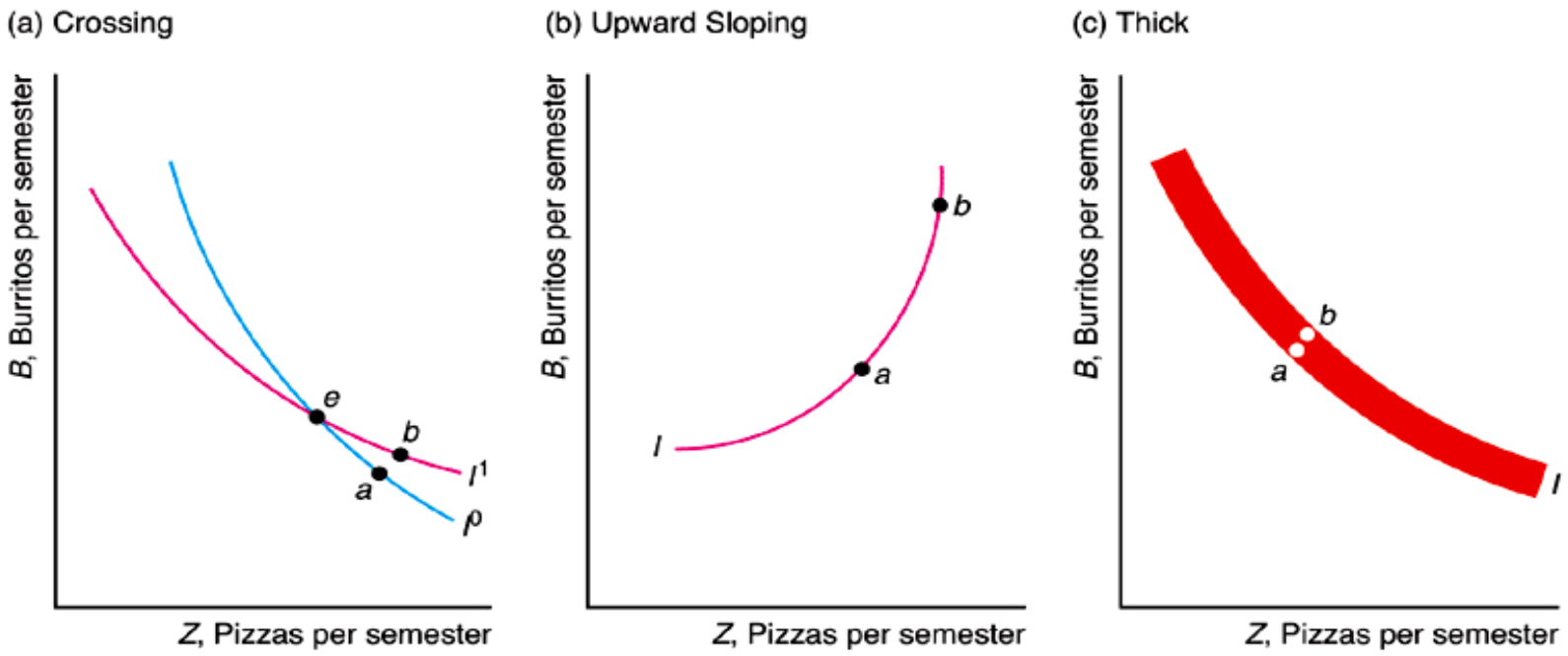


Figure 4.2 Impossible Indifference Curves



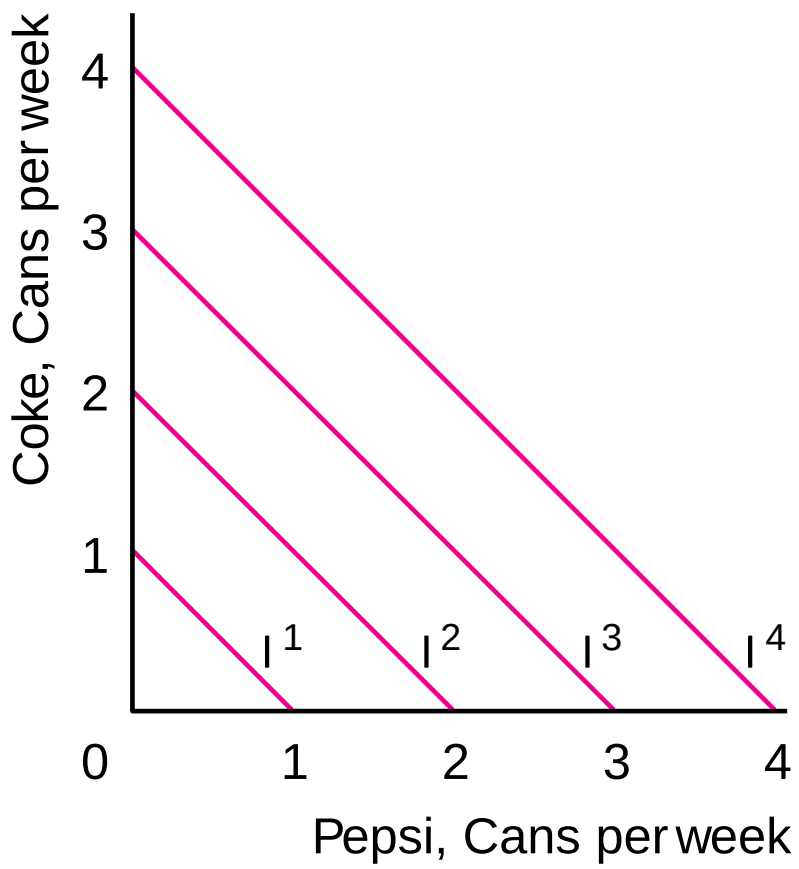
Curvature of Indifference Curves

- In general, by observation most consumers' indifference curves are **convex.**

- **Special Cases:**
  - **Perfect substitutes -** goods that a consumer is completely indifferent as to which to consume.

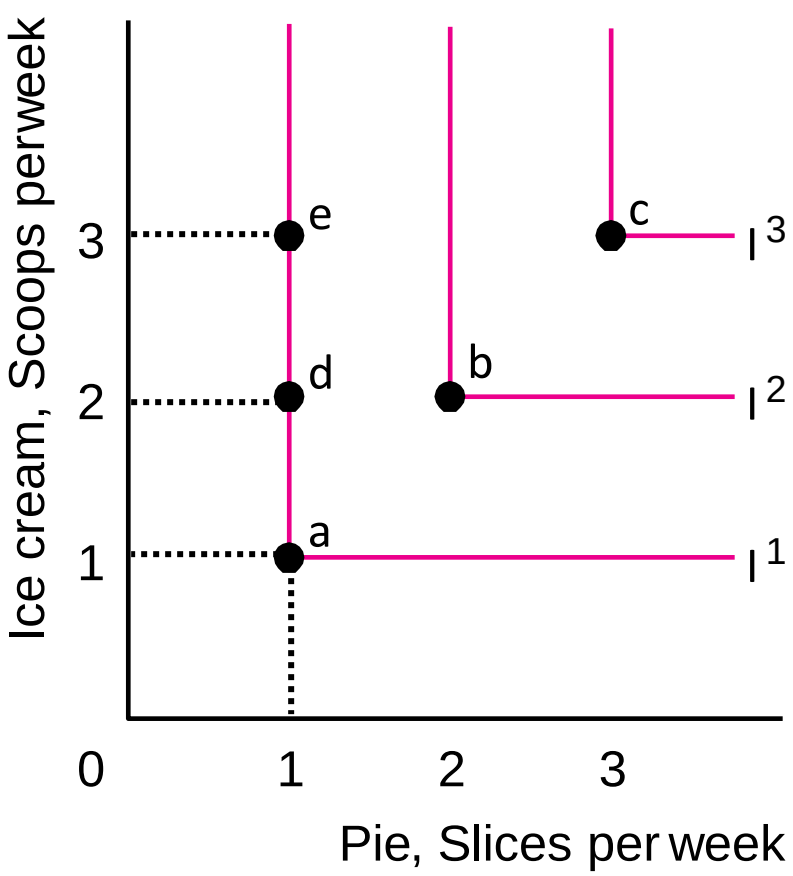
  - **Perfect complements -** goods that a consumer is interested in consuming only in fixed proportions.

Figure 4.4(a): Perfect Substitutes



- Bill views Coke and Pepsi as perfect substitutes: **can you tell how his indifference curves would look like?**
  - Straight, parallel lines with an MRS (slope) of −1.
  - Bill is willing to exchange one can of Coke for one can of Pepsi.

Figure 4.4(b): Perfect Complements



- If she has only one piece of pie, she gets as much pleasure from it and one scoop of ice cream, *a*,
  - as from it and two scoops, *d*,
  - or as from it and three scoops, *e*.

Summary

- Cardinalists and Ordinalist concept of consumer theory
- The law of diminishing marginal utility
- Distinguished between TU and MU and describe the relationship between them.
- Derive Marshal's demand curve based on the law of diminishing marginal utility
- Identify impossible ICs
- Curvature of ICs