Reading for *Theory of Consumer Behaviour*
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Course: Managerial Economics

Part 1. Consumer Preferences

The economic model of consumer behavior is very simple: people choose the best things they can afford. The theory of preference ordering is trying to clarify the economic concept of "best things."

We call the objects of consumer choice consumption bundles. This is a complete list of the goods and services that are involved in the choice problem that we are investigating.

We will use the symbol $\succ$ to mean that one bundle is strictly preferred to another, so that (x1, x2) $\succ$ (y1, y2) should be interpreted as saying that the consumer strictly prefers (x1, x2) to (y1, y2), in the sense that she definitely wants the x-bundle rather than the y-bundle. If the consumer is indifferent between two bundles of goods, we use the symbol $\sim$ and write (x1, x2) $\sim$ (y1, y2).

Language of preferences:

Given the choice between 2 bundles of goods a consumer either,

- Prefers bundle X to bundle Y: $X \succ Y$.
- Prefers bundle Y to bundle X: $X \prec Y$.
- Is indifferent between the two: $X \sim Y$.

<u>Utility Function</u>

A utility function is simply a way to represent or summarize a preference ordering. The numerical magnitudes of utility levels have no intrinsic meaning. It only shows whether one bundle has a higher utility than another—The utility value helps to order consumption bundles.

A utility function is a way of assigning a number to every possible consumption bundle such that more-preferred bundles get assigned larger numbers than less-preferred bundles. That is, a bundle (x1, x2) is preferred to a bundle (y1, y2) if and only if the utility of (x1, x2) is larger than the utility of (y1, y2): in symbols, (x1, x2) (y1, y2) if and only if u(x1, x2) > u(y1, y2).1

Properties of the Single Variate utility function U (X)**:**

Assumption: X is a normal good

1) It can be plotted as a positively sloped graph i.e. the instantaneous rate of change in utility when the concerned good X is increased is positive, i.e. $MU_X = \partial U/\partial X > 0$

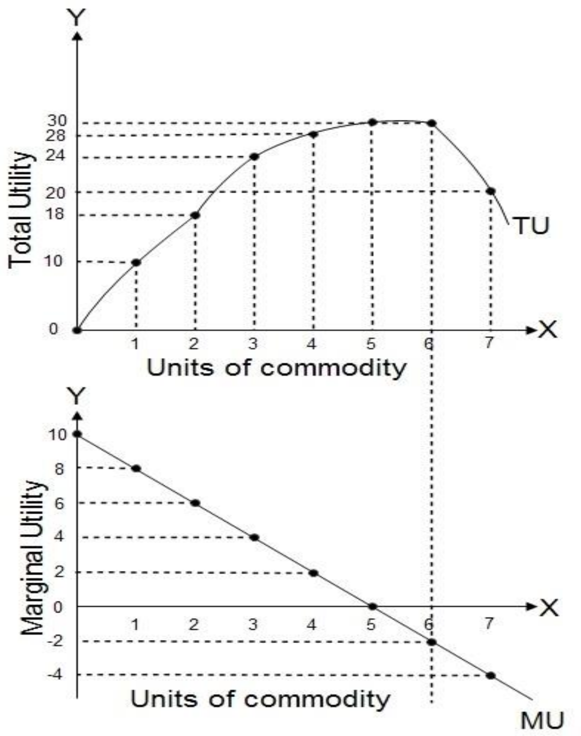
2) The Law of Diminishing Marginal Utility (DMU) says that as X increases, MU_X or the slope falls or, $\partial MU_X/\partial X < 0$

3) Totally differentiating the single-variate utility function, U = U (X),

$dU = MU_X\,dX$

or, $dU/dX = \partial U/\partial X$

When there is a single good, the total derivative becomes same as partial derivative.



Properties of the Multi Variate utility function:

The multivariate utility function is a function of n different commodities (X1, X2,..XN)

We simplify this consumption bundle by taking X1 as a commodity, and all the rest from X2 TO XN as a composite commodity representing all other goods.

Now, the multivariate utility function becomes:

$U = U(X, Y)$

Assumption: X and Y are normal goods. If each of X and Y are 'positive' commodities or goods, $MU > 0$.

As elsewhere in economics, "marginal" just means a derivative. Here, the marginal utility is a partial derivative, since the marginal utility of good 1 is computed holding good 2 fixed.

So the marginal utility of good 1 is just $MU1 = \partial u(x1, x2)/\partial x1 = \lim_{\Delta x1 \to 0} \frac{u(x1 + \Delta x1, x2) - u(x1, x2)}{\Delta x1}$

So the marginal utility of good 2 is just $MU2 = \partial u(x1, x2)/\partial x2 = \lim_{\Delta x2 \to 0} \frac{u(x1, x2 + \Delta x2) - u(x1, x2)}{\Delta x2}$

To capture this 3-dimensional U function on the X-Y axis, we generally keep the utility level constant and plot the values of good 1 and good 2 that satisfy a constant level of utility. This is the indifference curve tool.

Indifference Curve (IC)

An indifference curve defines the combinations of goods X and Y that give the consumer the same level of satisfaction; that is, the consumer is indifferent between any combination of goods along an indifference curve.

- U (X,Y) = k (constant)

The shape of the indifference curve depends on the consumer's preferences. Different consumers generally will have indifference curves of different shapes. One important way to summarize information about a consumer's preferences is in terms of the marginal rate of substitution. The marginal rate of substitution (MRS) is the absolute value of the slope of an indifference curve. The marginal rate of substitution between two goods is the rate at which a consumer is willing to substitute one good for the other and still maintain the same level of satisfaction.

- MRS => Absolute Value of Slope of IC

MRS

We consider making a change (dx_1, dx_2) that keeps utility constant.

Suppose we have the utility function U = $U(x_1,x_2)$.

Totally differentiating, $du = \frac{\partial u(x1,x2)}{\partial x1}\ dx_1 + \frac{\partial u(x1,x2)}{\partial x2}\ dx_2 = U_1\ dx_1 + U_2\ dx_2 = 0$.

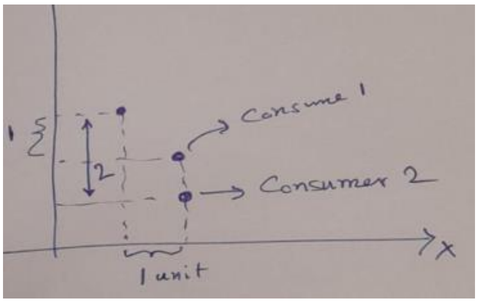
The first term measures the increase in utility from the small change dx1, and the second term measures the increase in utility from the small change dx2. We want to pick these changes so that the total change in utility, du, is zero.

Solving for dx2/dx1 gives us $dx2/dx1 = -\frac{U1}{U2}$ = ratio of Marginal Utilities

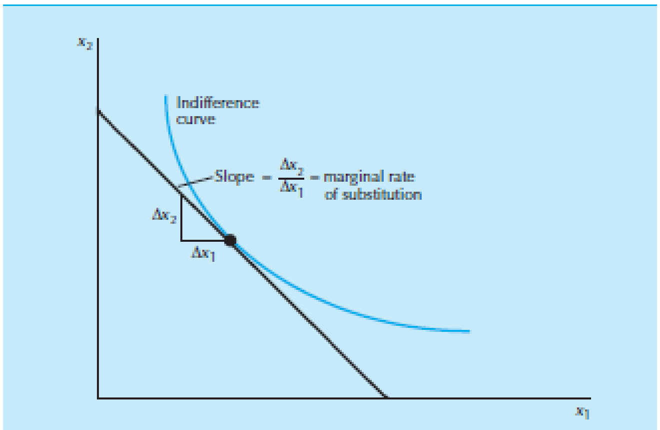
$MRS = \left|-\frac{U1}{U2}\right| = \frac{U1}{U2}$

This gives a useful way to recognize preferences that are represented by different utility functions: given two utility functions, just compute the marginal rates of substitution and see if they are the same. If they are, then the two utility functions have the same indifference curves. If the direction of increasing preference is the same for each utility function, then the underlying preferences must be the same.

Consumers depending on their preferences may have different MRS. Consumer 2, here , has a higher MRS than consumer 1.



MRS measures the rate at which the consumer is just on the margin willing to substitute good 1 for good 2. We could also say that the consumer is just on the margin of being willing to "pay" some of good 2 in order to buy some more of good 1. So sometimes BEHAVIOR OF THE MRS you hear people say that the slope of the indifference curve measures the marginal willingness to pay. If good 2 represents the consumption of "all other goods," and it is measured in currencies that you can spend on other goods, then the marginal willingness-to-pay interpretation is very natural. The marginal rate of substitution of good 2 for good 1 is how many currencies you would just be willing to give up spending on other goods in order to consume a little bit more of good 1. Thus the MRS measures the marginal willingness to give up currencies in order to consume a small amount more of good 1. But giving up those currencies is just like paying currencies in order to consume a little more of good 1.



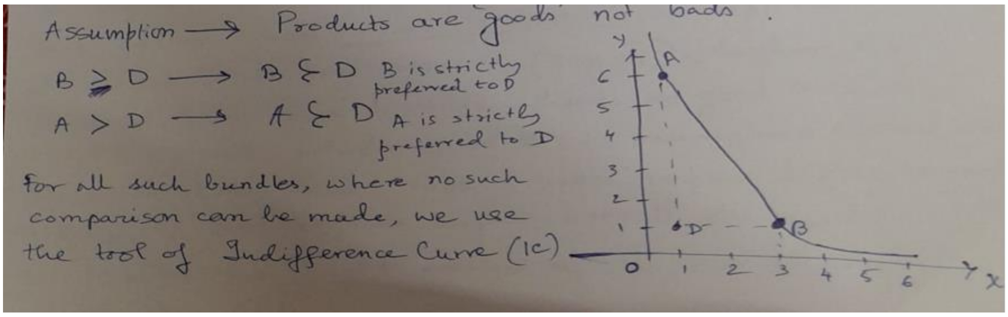
The marginal rate of substitution (MRS). The marginal rate of substitution measures the slope of the indifference curve.

Assumptions about consumer preferences:

Economists usually make some assumptions about the "consistency" of consumers' preferences. The preference ordering is assumed to satisfy four basic properties: completeness, more is better, diminishing marginal rate of substitution, and transitivity.

Completeness: For any two bundles—say, A and B—either A preferred to B, B preferred to A, or A indifferent to B. By assuming that preferences are complete, we assume the consumer is capable of expressing a preference for, or indifference among, all bundles. If preferences were not complete, there might be cases where a consumer would claim not to know whether he or she preferred bundle A to B, preferred B to A, or was indifferent between the two bundles. If the consumer cannot express her or his own preference for or indifference among goods, the manager can hardly predict that individual's consumption patterns with reasonable accuracy

More Is Better: If bundle A has at least as much of every good as bundle B and more of some good, bundle A is preferred to bundle B. If more is better, the consumer views the products under consideration as "goods" instead of "bads."



Why are ICs downward sloping?

The MIB property ensures that if one good is kept constant, for example, amount of good Y is kept constant in the consumtpion bundle, and the amount of the other good, say X, is increased, then, consumer's utility increases due to MIB. But along an indifference curve, utility is constant. In order to remain on the same IC, the consumer has to sacrifice some amount of good Y to compensate for the increase in utility due to an increase in good X. So, along an indifference the change in Y and the change in X always are in opposite direction, ensuring a negative slope along an IC.

Diminishing Marginal Rate of Substitution: As a consumer obtains more of good X, the amount of good Y he or she is willing to give up to obtain another unit of good X decreases. The amount of good Y the consumer is willing to give up to maintain the same satisfaction level decreases as more of good X is acquired. It can be written as:

$$\frac{\partial \mathrm{MRS}}{\partial \mathrm{x}} < 0$$

This assumption implies that indifference curves are convex from the origin.

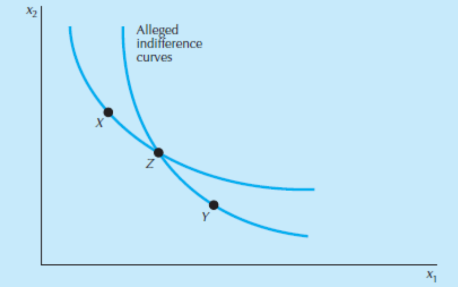
Transitivity: For the three bundles A, B, and C, the transitivity property implies that if $C \succ B$ and $B \succ A$, then $C \succ A$.

The assumption of transitive preferences, together with the more-is-better assumption, implies that indifference curves **do not intersect one another**. It also eliminates the possibility that the consumer is caught in a perpetual cycle in which she or he never makes a choice.

In order to prove this, let us choose three bundles of goods, X, Y , and Z, such that X lies only on one indifference curve, Y lies only on the other indifference curve, and Z lies at the intersection of the indifference curves.

By assumption the indifference curves represent distinct levels of preference, so one of the bundles, say X, is strictly preferred to the other bundle, Y . We know that X ∼ Z and Z ∼ Y , and the axiom of transitivity therefore implies that X ∼ Y . But this contradicts the assumption that X ≻ Y .

This contradiction establishes the result—indifference curves representing distinct levels of preference cannot cross.



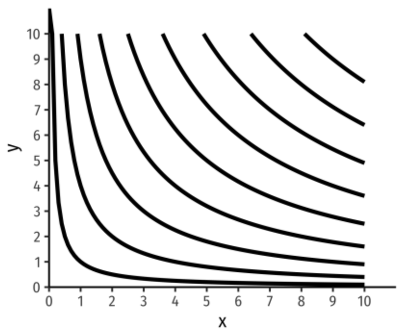
Indifference curves cannot cross. If they did, X, Y, and Z would all have to be indifferent to each other and thus could not lie on distinct indifference curves.

Technique of finding any IC:

First plop your pencil down on the graph at some consumption bundle (x1, x2). Now think about giving a little more of good 1, Δx1, to the consumer, moving him to (x1+Δx1, x2). Now ask yourself how would you have to change the consumption of x2 to make the consumer indifferent to the original consumption point? Call this change Δx2. Ask yourself the question "For a given change in good 1, how does good 2 have to change to make the consumer just indifferent between (x1 +Δx1, x2 +Δx2) and (x1, x2)?" Once you have determined this movement at one consumption bundle you have drawn a piece of the indifference curve.

Different ICs:

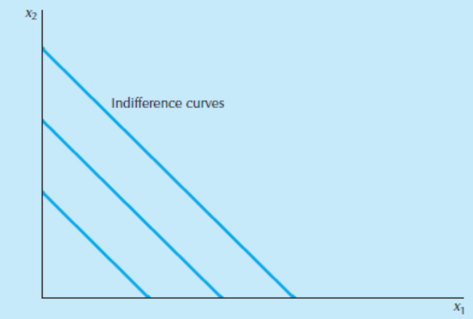
- **Cobb-Douglas Function**: $U = X^{\alpha} Y^{\beta}$



- **Substitutes** : Two goods are perfect substitutes when consumer is willing to substitute one for the other at a constant rate. Linear preferences.

The simplest case of perfect substitutes occurs when the consumer is willing to substitute the goods on a one-to-one basis.

U = x + y = k (constant)



Perfect substitutes. The consumer only cares about the total number of pencils, not about their colors. Thus the indifference curves are straight lines with a slope of −1.

- **Complements**: Perfect complements are goods that are always consumed together in fixed proportions. In some sense the goods "complement" each other. L –shaped IC.

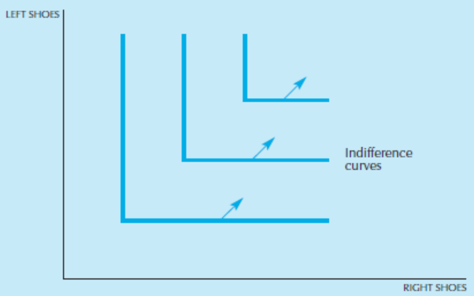
A nice example is that of right shoes and left shoes. The consumer likes shoes, but always wears right and left shoes together. Having only one out of a pair of shoes doesn't do the consumer a bit of good.

Let us draw the indifference curves for perfect complements. Suppose we pick the consumption bundle (10, 10). Now add 1 more right shoe, so we have (11, 10). By assumption this leaves the consumer indifferent to the original position: the extra shoe doesn't do him any good. The same thing happens if we add one more left shoe: the consumer is also indifferent between (10, 11) and (10, 10).

U = min {aX, bY}

The simplest case of perfect complements occurs when the consumer is consuming the goods on a one-to-one basis.

U = min {X, Y}



Perfect complements. The consumer always wants to consume the goods in fixed proportions to each other. Thus the indifference curves are L-shaped.

- **Bads**: A good consumer doesn't like. Pollution, risk, tenacious work, and illness are some examples of bads.

Pick a bundle (x1, x2) consisting of some good, quick transport, and some bad "car pollution". If we give the consumer more pollution, what do we have to do with the quick transport to keep him on the same indifference curve? Clearly, we have to give him some extra quicker transport to compensate him for having to put up with. Thus this consumer must have indifference curves that slope up.

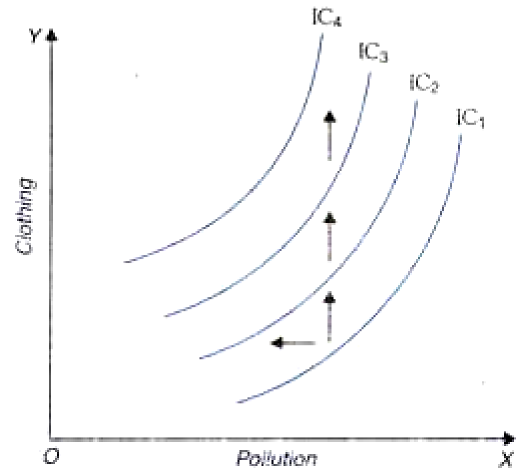
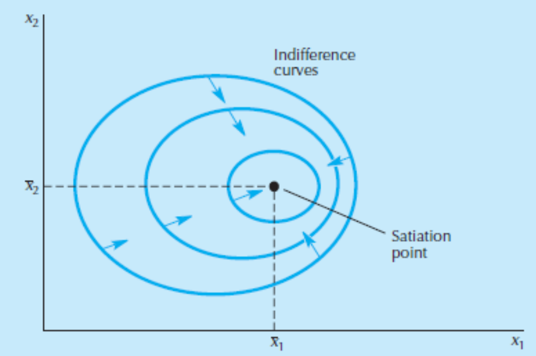


Fig. 8.9. *Indifference, Curves between 'Bad' and 'Good'*

- Depending on the level of consumption, a good can become a bad after certain levels of both commodities. Satiation point.

When he has too much of one of the goods, it becomes a bad—reducing the consumption of the bad good moves him closer to his "bliss point" or satiation point. If he has too much of both goods, they both are bads, so reducing the consumption of each moves him closer to the bliss point.



Satiated preferences. The bundle $(\overline{x}_1, \overline{x}_2)$ is the satiation point or bliss point, and the indifference curves surround this point.

Suppose, for example, that the two goods are chocolate cake and ice cream. There might well be some optimal amount of chocolate cake and ice cream that you would want to eat per week. Any less than that amount would make you worse off, but any more than that amount would also make you worse off.