

3 Consumer Theory

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References : Baumol & Blinder : Chapter 18.
Awh R. : Chapters 3 & 4.
Glahe & Lee : Chapter 4.
Leung Man Por : Chapters 3, 4, 5, 6, 7.

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I Introduction

The consumer theory is to explain the consumption behaviour of consumers. Starting from the postulates, economists build up a process of logical deduction to form the theory of consumers so as to deduce and explain the so-called law of demand.

In reality a consumer is faced with various kinds of goods under its subjective level of preference and choice. At the same time, he could only be satisfied by the presence of enough money or the effective demand, i.e. sufficient purchasing power.

With an aim of “ utility “ maximization, the consumer will be in an optimum state if and only if the purchasing power of money can effectively bring the consumer to a higher ranking of preference (a state of higher & higher level of satisfaction) until all money income is used up.

From here the consumer behaviour is view from 2 aspects :

- 1 The subjective choice and level of preference are condensed under the concept of indifference curve in the ordinal utility theory.
- 2 The objective purchasing power is revealed by the budget constraint.

These two aspects together give the equilibrium and optimum state of the consumer - **the state of utility maximization.**

From the optimal state of the consumer, the analysis can go further to seek the relation between price and quantity demanded of a consumer within a given price range.

As a result, the law of demand can be examined in detail.

All these form the foundation and tools of microeconomic analysis.

II The Cardinal Approach In Utility Theory

1 The Law of Diminishing Marginal Utility

Based on this theory, utility is the satisfaction of consumer from consumption which can be **measurable** (i.e. be quantified) and **discernible** (i.e. comparable).

From the observation of real life situation, the theory suggests that ,

*the total utility of a consumer will increase through consumption, but for successive units of the goods consumed, the additional or extra units of utility got - the marginal utility will **gradually** (?) diminish.*

The economists at that time (1870s) believed it so the law is in fact an assertion rather than a scientific theory. This is our familiar law of diminishing marginal utility.

When anyone uses the term “ marginal utility “ it already implies that utility is assumed to be measurable. Otherwise the concept of marginality cannot be applied.

2 The Law of Equil-Marginal Utility Per Dollar

It suggests that when a consumer buys more of a good, its marginal utility on the good decreases, but at the same time, other goods will be consumed less if money income is fixed.

The rationale is that as long as the marginal utility of any two or more goods are different, a consumer will try to consume the good with a higher marginal utility.

Example

Given : Income = \$14 ; Price of A = \$1 ; Price of B = \$2.

Quantity	Good A		Good B	
	T U	M U	T U	M U
0	0	/	0	/
1	10	10	24	24
2	19	9	45	21
3	27	8	64	19
4	34	7	80	16
5	40	6	94	14
6	45	5	104	10
7	49	4	110	6
8	52	3	114	4

Possibilities		
Q _A	Q _B	T U of A & B
0	7	0 + 110 = 110
2	6	19 + 104 = 123
4	5	34 + 94 = 128
6	4	45 + 80 = 125
8	3	52 + 64 = 116

Result : $MU \text{ of A} / \text{Price of A} = MU \text{ of B} / \text{Price of B} = 7 \text{ units of utility} / \$ 1$

3 Condition of Consumer Optimum : Utility Maximization

From the example above, the consumer will consume a different quantity of good A and B. The MU (obtained by the last dollar spent) derived from the good A & B will equal so that a state of equilibrium could be reached.

$$MU_X / P_X = MU_Y / P_Y = MU_Z / P_Z \dots (\text{ A state of consumer optimum })$$

If the equation is re-written into another form :

$$MU_X / MU_Y = P_X / P_Y \dots (\text{ The ratio of MU of any two goods = Their relative price })$$

Alfred Marshall accepts the cardinal approach. He further believes that the MU of money is constant. This is a highly controversial assertion but it makes the analysis simpler.

III The Ordinal Approach In Utility Theory

The ordinal theory suggests that utility is only **relatively** discernible but **not** quantifiable. Utility is, in fact, a series of assigned numbers to rank options by the consumer preference. The assigned numbers reveal what is **more** preferred but **cannot** tell how much the difference is. In other words, utility can only be ranked by an order or **a scale of preference** to show the degree of willingness of a consumer. Consumer preference denotes an observation pattern of choice, while utility is an ordinal scale constructed to represent that regular pattern.

From here, it comes the axioms or propositions on the assumption of rationality :

- (1) Consumer is capable of comparison and makes substitution on goods to show his indifference on the goods consumed.
- (2) Consumer must have a scale of preference in mind before he purchases. He is consistent in buying and also clear about his different level of satisfaction (but he **cannot** tell how much) satisfaction can be obtained through the consumption of different goods, i.e. there is the possibility of **transitivity**.
- (3) Utility maximization and a state of optimum are revealed by the very fact that consumer always prefers **more to less**.

1 The Indifference Curve

Based on these assertions, Edgeworth F. Y. (1845 - 1926) first suggested the indifference curve to represent the level of **preference** (satisfaction ?) a consumer have when two goods are consumed with different amount, but each combination of these two goods yields the same **level of preference**.

The properties of the indifference curve include :

- (1) It is the locus of the combination of two goods that are equally satisfied to a consumer, or to which the consumer is indifferent.
- (2) The slope of this curve is negative : there is some degree of substitution between the two goods.
- (3) The curve is convex to the origin, i.e. the marginal rate of substitution of two goods is diminishing.
MRS in consumption $(= \Delta Y / \Delta X)$
= the number of a good Y that had to be given up for each unit of good X to maintain the same level of utility, along any point on the indifference curve.
- (4) A curve further away from the origin means that it stands for a higher level of preference than the one near to the origin. Again, the magnitude between any two indifference curves does **not** matter.
- (5) As a consumer changes his choice in a continuous process, so there must have at least another curve between any two indifference curves, i.e. there may have infinite number of curves for a single consumer on a good.
- (6) There is **no** intersection for any two curves in the indifference map. It is therefore only useful to compare points on the same curve. The marginal rate of substitution in consumption is a measure of change along the curve **only**, not the shift of the curve because different curves represent different levels of preference and cannot be compared.

The different shapes of the indifference curves indicate different degrees of substitution of the good. To a consumer, goods can be closed substituted ; completely substituted or simply no substitution at all.



Budget Constraint Or Budget Line

The objective purchasing power in the form of money income is represented by the budget line between 2 goods.

The slope of the line gives the relative price of any one good. It tells what the consumer must give up in terms of another good in order to buy one good.

The slope of the budget line is called the marginal rate of substitution in exchange $= P_X / P_Y$.

The concept of relative price is important because a rise in relative price would encourage the producer to put more resources in production. The concept also conveys the market information of relative scarcity of those resources.

The budget line rotates when the relative price changes.

The shift of the line means that either the income changes or there is a change in the price of both goods. Both cases also imply a change in the purchasing power of the consumer.

Consumer Optimum

The indifference curve and the budget line together constitute the consumption behaviour.

Graphically speaking, the two curves meet at a point where the indifference curve is tangent by the budget

line to get an **unique** or **internal** solution. This point of tangency represents the highest level of preference obtained by a person given a fixed amount of money income.

This point is also the point of optimum condition or **utility maximization**.

In mathematics, the slopes of the indifference curve and the budget line are the same.

$$\begin{aligned} \text{Slope of the budget line} &= \text{MRS in exchange} &= P_X / P_Y \\ \text{Slope of the indifference curve} &= \text{MRS in consumption} &= \Delta Y / \Delta X \end{aligned}$$

In equilibrium,	$P_X / P_Y = \Delta Y / \Delta X$
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Summary

Consumers typically diversify in consumption. They usually purchase a basket of goods and services. Only with the use of convex indifference curves can we obtain an **interior** solution in the analysis of consumer optimization. It gives results relevant to the real world phenomena.

(Corner solutions are still logically possible.)

2 Derivation of the Money-Income-Constant (Ordinary) Demand Curve

With the analysis above, there are many points of tangency when price changes within a certain range. These points of tangency give the different amounts of quantity bought on a certain price range. The relation between the price range and the quantity demanded **constitutes** the derivation of the ordinary demand curve.

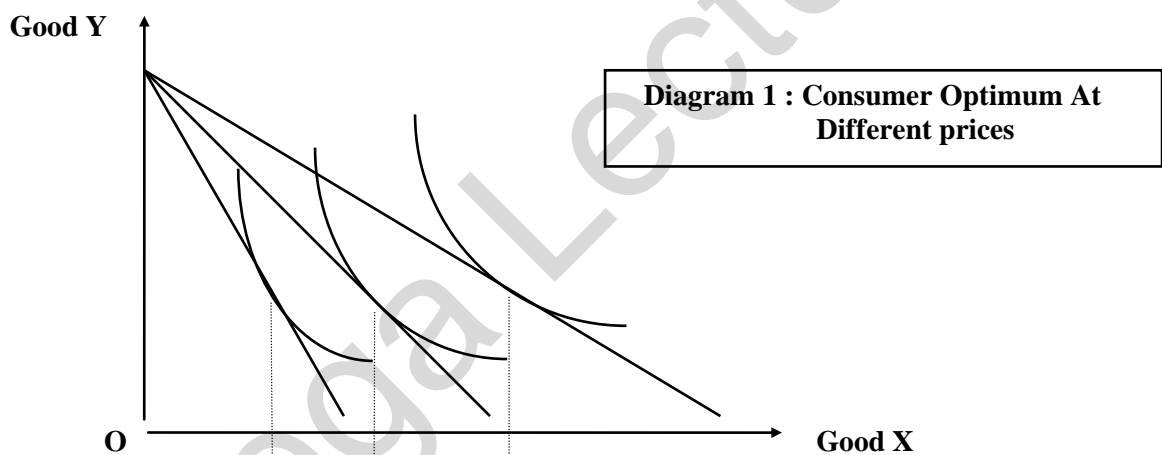


Diagram 1 : Consumer Optimum At Different prices

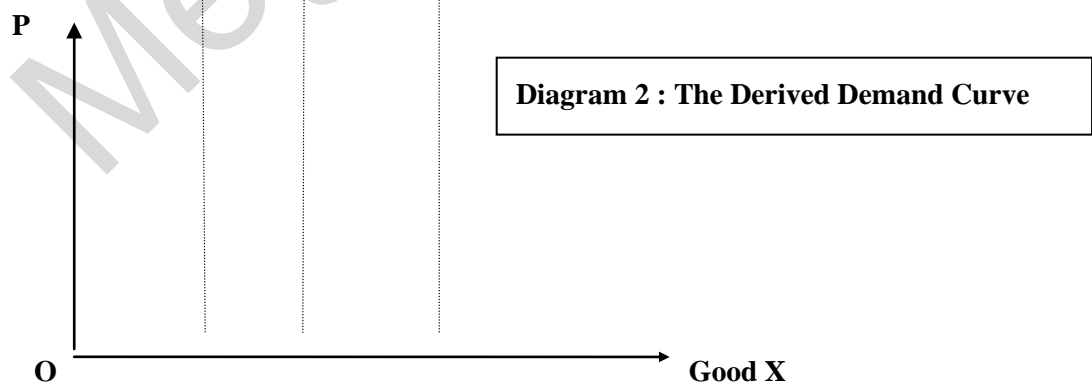


Diagram 2 : The Derived Demand Curve

The demand curve is derived from the logical deduction process based on the concept of the indifference curve and budget line. **It is one of the theoretical conclusion of the deduction process.**

The equilibrium points A, B and C in Diagram 1 show the optimum quantities demanded of a consumer faced with different price levels, ceteris paribus. The change in prices are expressed by the rotation of the budget line.

The demand curve derived represents the different states of utility maximization of a consumer when price changes.

3 Price Consumption Curve (P.C.C.)

- (1) It is the locus of points of contact between the indifference curve and the changing (relative price) budget line, when the budget line rotates from a point on the vertical axis (due to a change in the price of the good represented by the horizontal axis).
- (2) The curvature of the P.C.C. helps to determine the value of the price elasticity of demand, thus describing the degree of response of a consumer on price changes.

Shape of The P.C.C.	The Corresponding Demand Curve
downward sloping	elastic
upward sloping	inelastic
bending back to the vertical axis	denotes an inferior good

The P.C.C. tells in **more detail** than the demand curve about the relation between price and quantity demanded. The implications of a demand curve can be found in a P.C.C.

- (3) When price changes, the P.C.C. also shows the quantity demanded of the other good on the y axis, thus the cross elasticity of demand can be obtained.

Shape of The P.C.C.	Cross Elasticity of Demand	Goods
downward sloping	positive value	substitutes
upward sloping	negative value	complements

The P.C.C. tells the relation between any two goods with price changes. It is likely to slope downward first and upward later and **unlikely** to bend backward in reality.

4 Income Consumption Curve (I.C.C.)

- (1) The I.C.C. is the locus of points of contact between the indifference curve and the constant-slope budget line when the budget line shifts outward due to increases in money income.

Shape of The I.C.C.	Income Elasticity of Demand	Goods
upward sloping	Between 0 to 1	Both are normal
downward sloping	negative value	inferior (X axis)
downward sloping	positive value	superior (Y axis)

Engel Curve

By relating the amount of income or the expenditure spent on a good with the quantity demanded of the good, the Engel curve tells the various quantities purchased at different levels of income.

Superior good may be different from luxury good. In fact, economists treat the word “luxury” as an adjective which is subjective and carries no economic concept.

For example, we may treat travelling as luxury good but huge medical expenses, if necessary, may be just “necessity”.

Diagram of an Engel curve

5 Review of the Consumer Theory

We may use a table to summarise what concepts are involved in the theory.

$Q_D = f$	(P_X ; Prices of other goods ;		Income ;	Taste)
	↑	↑	↑	↑	
Concept involved	Price elasticity	Cross elasticity	Income elasticity	$MRS_E = MRS_C$	
	↑	↑	↑	↑	
Curve derived	P.C.C.	P.C.C.	I.C.C., Budget line,	Indifference curve	

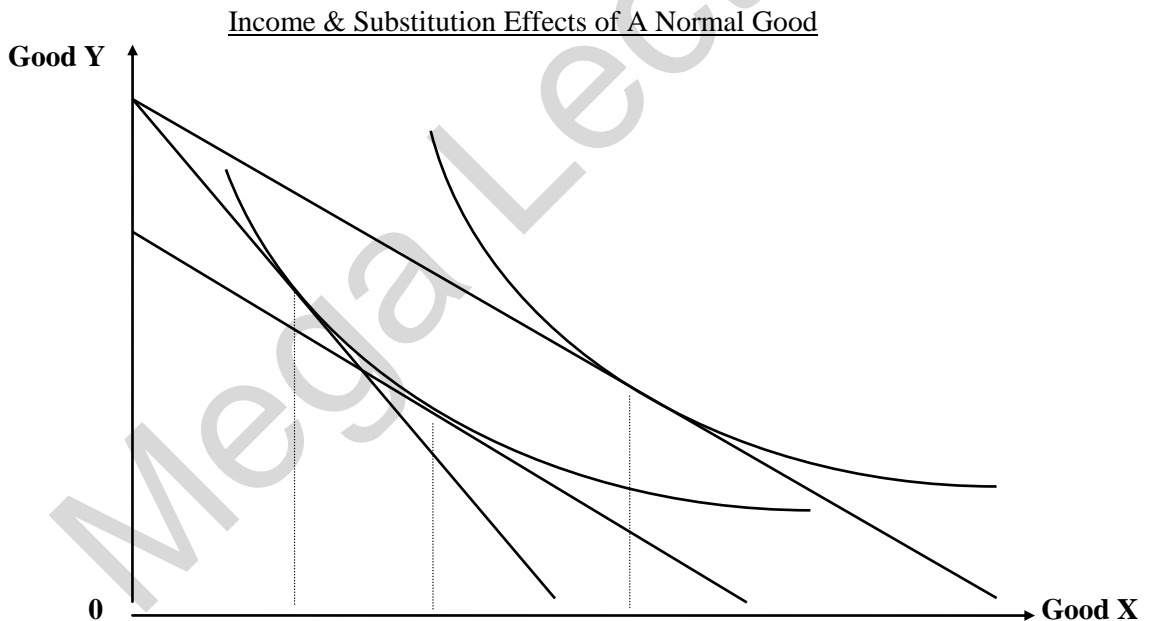
			Engel Curve	
	↑	↑	↑	↑
Implications	Degree of response	Relation of 2 goods	Nature of 2 goods	Subjective choice
Conclusion	Demand curve & Law of demand	With other factors constant.		

6 Decomposition of the Price Effect

In order to give a more detailed and precise theoretical ground for the consumer theory, economists try to decompose the price effect on quantity demanded of a consumer. They suggest that there are two effects constituting the price effect. They are termed **substitution effect** and **income effect**.

Substitution effect : the change in quantity demanded of a consumer, in response to a change in price, due to the substitution of a lower-priced good for a higher-priced good with real purchasing power (or real income) is being held constant.

Income effect : the change in quantity demanded due to a change in real income with the relative price and money income being held constant.



Income & Substitution Effects of A Normal Good

If the price of a good decreases and the prices of all other goods remain the same, all individuals who consume that good will experience an increase in their real income even though their money income will remain constant. By an increase in real income, we simply mean the ability to reach a higher level of preference - a capability that obviously exists if the price of one good declines and all other prices remain constant.

An increase in the consumer's real income will have an effect on the rate at which he or she wishes to consume a particular good ; we refer to this effect as the **income effect**.

An increase in real income will cause an increase in the desired consumption of a normal good and a decrease in the desired consumption of an inferior good. In the case of a normal good, the income effect is said to be **positive** ; in the case of an inferior good, the income effect is **negative**.

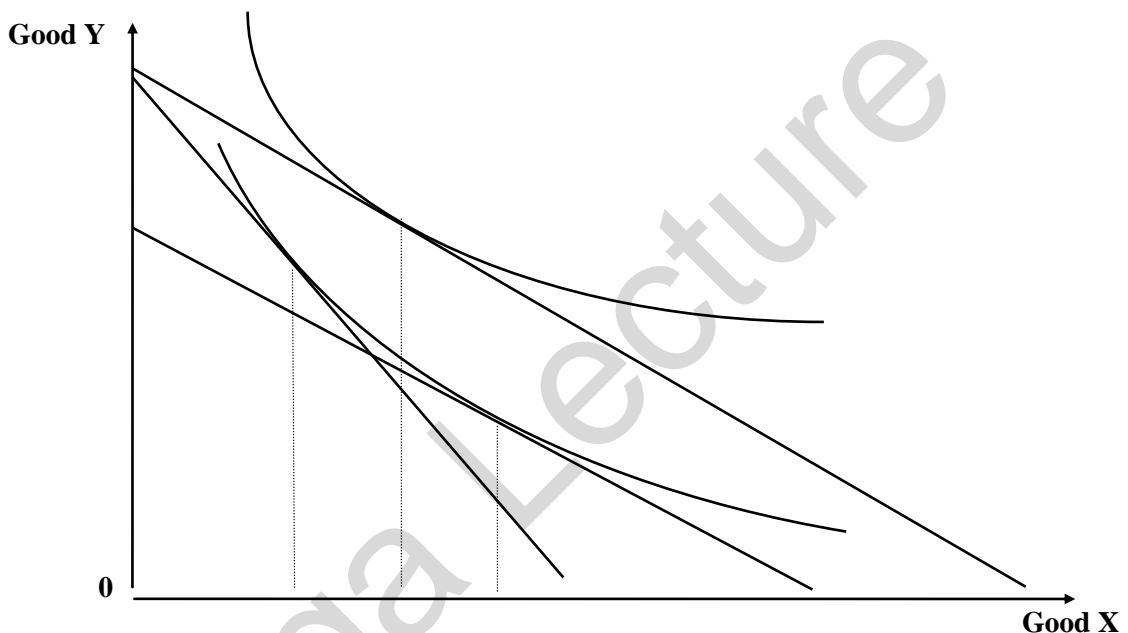
Independent of the income effect is the fact that a decrease in the price of one good will reduce the price of that good **relative** to the price of **all** other goods, if all other prices remain constant.

This makes it less costly to substitute the good whose price has declined for other goods and, as we will see, always has the effect of increasing the consumption of the good that is cheaper.

This effect is referred to as the **substitution effect**.

The substitution effect is always negative because, if we consider only this effect, a decrease (increase) in price causes an increase (decrease) in desired consumption.

Income & Substitution Effects of An Inferior Good



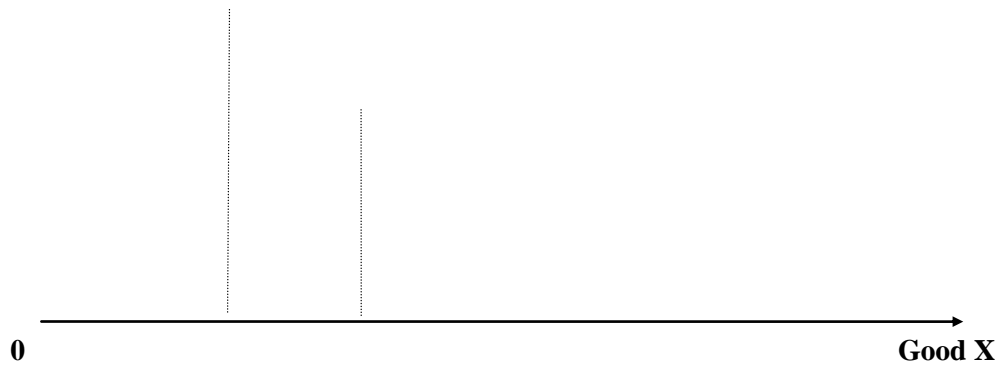
A Giffen good must be an inferior good so that the income effect will be negative. But if we are dealing with a good that comprises only a small percentage of the consumer's budget, an increase in the price of this good will have an insignificant effect on the consumer's real income. In such a case, the negligible negative income effect will do little to offset the negative substitution effect.

The substitution effect will not be influenced by the percentage of income spent on the good. Therefore, to be a Giffen good, a good must be an inferior good on which the consumer spends a major percentage of his or her income. This leads us to conclude that the Giffen paradox may apply only to very poor consumers (only a poor consumer would spend a large proportion of income on an inferior good).

This is the reasoning behind what economists most commonly accept as a plausible example of a Giffen good.

Income & Substitution Effects of A Giffen Good





Normal good	Income effect reinforces the substitution effect.
Inferior good	Income effect offsets the substitution effect.
Giffen good	Income effect outweighs the substitution effect.

The Marshallian Demand Curve & Hicksian Demand Curve

- (1) The cardinal approach derives a demand curve based on the concept of diminishing marginal utility, i.e. the equi-marginal utility per dollar principle : $MU_X / MU_Y = P_X / P_Y$.
To make the analysis simple, the marginal utility of money is assumed to be constant. The demand curve derived is criticised. This approach is less convincing and the explanatory power is not enough.
- (2) The ordinal approach derives two different types of demand curves.
Compared with the cardinal approach, the ordinal approach does not need to consider the utility of money.
The decomposition of price effect helps to derive a money-income-constant demand curve (also called ordinary demand curve or Marshallian demand curve).
The equilibrium state is given by : $MRS \text{ in exchange} = P_X / P_Y$.

Implications of The Theoretical Possibility of A Price Change

- (1) The decomposition of price effect of a good distinguishes three types of goods : normal ; inferior ; or Giffen goods.
- (2) All the three cases above allow economists to derive a demand curve. The first two cases give a downward-sloping demand curve and the last case gives an upward-sloping demand curve, ceteris paribus. In other words, only the first two cases **support** the “law” of demand and the last case **rejects** the law.
- (3) But economists deny the existence of Giffen good in reality up to now. The law of demand is **asserted to be valid** although it **cannot be consistently** derived in pure theoretical basis.
- (4) If the real income is held constant and only the substitution effect is considered, i.e. income effect is neglected, we can obtain a downward-sloping demand curve - the so-called **Hicksian real-income-constant demand curve**.

*The utility theory has shown how an economic theory is built and developed.
It also forms the micro-foundation of consumer theory in economics.*

IV Relevant concepts In Consumer Theory

1 Consumer’s Surplus & The Concept of Welfare

A demand curve shows the maximum willingness to pay by a consumer for a given quantity of good. Alternatively it shows the maximum amount of a good purchased by a consumer given a certain range of price.

Graphically speaking, the area under the demand curve at a given price shows the consumer's maximum willingness to pay. With a market and a market price, the total payment is smaller than the area under a downward-sloping demand curve. The difference is called the consumer's surplus.

O D E Q : Maximum willingness to pay
for the Q units of good X

O P E Q : Actual payment with the
market price at P.

P D E : Consumer's Surplus



Welfare & Compensation

Assume a person has an amount of income (Y_0) with an indifference curve U_0 such that points like Y_0 or B along the curve U_0 give him the same level of utility. The person is indifferent between the point Y_0 (holding all money income Y_0 with zero unit of good X) or point B (holding Y_3 amount of income and X_1 units of good X).

Suppose a market exists and the person learns about the market price of good X ($= Y_0 / X_0$).

In order to get X_1 units of the good, he needs to pay ($Y_0 - Y_2$); i.e. the vertical distance on the vertical axis.

In the absence of a market, the person is willing to pay ($Y_0 - Y_3$) to get X_1 units.

The difference ($= Y_2 - Y_3$) is his willingness to pay in excess of the actual payment, i.e. his consumer's surplus.

If for some reasons, the person is asked to give up X_1 units of the good in return for a compensation of money, the answer is not just to go to point Y_0 by giving him/her ($Y_0 - Y_2$).

The minimum compensation needed is $Y_1 - Y_2$.

Total Revenue & The Elasticity of Demand

- (1) If the price range is on the elastic portion of a straight-line downward-sloping demand curve, a lower price implies a relatively greater rate of change of the quantity demanded by a consumer. The consumer will find that he pays more than before.
- (2) The opposite case happens if the price range is on the inelastic portion of a similar demand curve.

However, such a result is applied to infinitely small changes in price and quantity demanded only. The mathematical proof is based on the use of Calculus.

The simple relation between total revenue and the elasticity of demand could be shown on a diagram.

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Mega Lecture