Topic 2 Part II:

Extending the Theory of Consumer Behaviour

1) The Shape of the Consumer's Demand Function

I ____ Effect Substitution Effect Slope of the D ____ Function

2) <u>Consumer Surplus</u>

Marginal Value

The Shape of the Consumer's Demand Function

Recall, consumers have different ______ demand functions and indifference curves for goods.

If the price of a good is <u>increased</u>, some consumers will reduce their ______ of the good by a large amount, while other consumers will reduce their consumption by a modest amount.

This is because consumers have different preferences and income levels.



In order to examine the factors that explain the different responses these differences create, we will decompose the effects into what is referred to as the i <u>effect</u> and the <u>substitution effect</u>.

Introduction:

Suppose the price a good 'X' decreases.

How does the consumer respond?

A price decrease in X can be viewed as a _____ in income formerly used to purchase units of X. These '\$'s' represent an increase in disposable _____that can be used to purchase more of good X or more of other goods. This increase in disposable income can be graphically illustrated as a _____ outward of the budget constraint.

As a result of the shifting budget constraint, the consumer can select a new market basket on a higher _____ curve.

So:

"The change in quantity demanded of good X due to the change in money income is the _____ effect.

But, a price cut also has a **<u>substitution effect</u>** that must be considered.

With a price cut, good X is now cheaper ______ to other goods than before.

The consumer will now demand more units of the cheaper good and fewer units of other goods while remaining at the same level of satisfaction (same indifference curve).

The substitution effect measures the change in the quantity demanded due to a change in the relative price of X holding _____ constant.

Hence we assume the consumer separates the _____ change in the quantity demanded of X caused by a **price** change into these two effects.



The Income Effect: _____ Good



The diagram illustrates how a consumer's consumption choice changes when income has _____.

The initial budget constraint is labelled BL₀.

The consumer consumes market basket A where his indifference curve I_0 is tangent to the budget line.

At this point the MRS = the slope of the budget constraint and the consumer consumes X_0 units of good X.

If the consumer's income increases to BL₁, there will be a parallel _____ outward by budget line.

The consumer can now purchase market bundle B on the higher indifference curve I_1 , which is tangent to the higher budget constraint.

In this case, more of _____ goods are purchased.

When the quantity demanded of a good changes in the _____ direction as the change in income, the good is referred to as a $\underline{n} = \underline{good}$.

Note: For every level of income there is point of tangency between the budget constraint and an indifference curve. By connecting these points, we form what is known as the

_____ curve.

E curve illustrates the relationship between the quantity demanded of good X and the income of the consumer when are held constant.

With a normal good, the Engel curve has a ______ slope.



Examples: Fruit Fresh meat





The diagram illustrates how a consumer's consumption choice changes when **<u>income</u>** has increased.

The initial budget constraint is labelled BL₀.

The consumer consumes market basket A where his indifference curve I_0 is tangent to the budget line.

At this point the MRS = the _____ of the budget constraint and the consumer consumes X_0 units of good X.

If the consumer's income increases to BL_1 , there will be a parallel shift outward by the budget line.

The consumer can now purchase market bundle B on the higher indifference curve I_1 , which is tangent to the higher budget constraint.

In this case, $\underline{\mathbf{l}}$ of good X and more of other goods are purchased.

When the quantity demanded of a good changes in the direction as the change in income, the good is referred to as an $\underline{I} \qquad \underline{good}$.

With an inferior good, the Engel curve has a ______ slope.



This is because the quantity demanded ______ when increases holding _____ constant.

Examples: Hamburger used cars used shoes

Note: Inferior goods are not inferior to all consumers at all income levels.



Income Elasticity of Demand

Income elasticity of demand measures the response of a percentage change in the quantity _____ due to a percentage change in ____.

The point income elasticity of demand:

$$E_{M} = \frac{\frac{\Delta Q_{x}}{Q_{X}}}{\frac{\Delta Income}{M}} = \frac{\Delta Q_{x}}{\Delta M} \bullet \frac{M}{Q_{X}}$$

The arc income elasticity of demand:

$$E_{M} = \frac{\frac{\Delta Q_{x}}{\left(Q_{X0} + Q_{X1}\right)/2}}{\frac{\Delta Income}{\left(M_{0} + M_{1}\right)/2}} = \frac{\Delta Q_{x}}{\Delta M} \bullet \frac{\left(M_{0} + M_{1}\right)}{\left(Q_{X0} + Q_{X1}\right)}$$

"The arc income elasticity of demand measures the ratio of the change in the quantity demanded relative to the average quantity divided by the change in income relative to the average income."

 $E_{\rm M}$ is ______ for a normal good (I.e. the quantity demanded increases when income increases,) and is ______ for an inferior good. (I.e. quantity demanded decreases when income increases.)

Of course, even if a good is classified to be normal, this does not guarantee that a consumer will continue to spend an increasing proportion of _____ on it as his or her income increases.

This will only occur if the income elasticity of demand is greater than ___.





If the income elasticity of demand is between zero and 1, a good is a _____ good but the consumer spends a decreasing proportion of _____ on it as income rises, assuming that price has remained the same. $0 < E_M < 1$

Examples: food Clothing Soap



Substitution Effect:



The substitution effect reflects how a consumer responds when the *relative* _____ of the good X changes such that his or her level of utility remains the same.

How to determine the _____ of the substitution effect:

If the price of the good X falls, the budget constraint rotates ____ward.

▷We know that the consumer will purchase a different market basket of goods on a _____ indifference curve.

Hence the ______ of the consumer will increase.

But, the **substitution** effect measures the change in the quantity demanded when the relative prices change with *utility held*_____.

In order to keep the consumer on the original indifference curve and maintain the original level of utility, we change money ______ as the price changes by just enough so that the consumer finds a new market basket on the ______ indifference curve where the slope of the new budget constraint equals the slope of the indifference curve.

To illustrate, refer to the diagram on the former page.

Suppose the initial price of good X is P_0 .

The consumer consumes basket A on indifference curve U_0 and purchases X_0 units of X.

When the price of X falls to P_1 , the budget line rotates outward and becomes the dashed budget line BL_1 .

If nothing else changes, the consumer will reach a higher level of satisfaction on a higher indifference curve.

To stop ______ from increasing, we decrease ______ by just enough to shift the budget line back to 'I' until it becomes BL_2 where it is tangent to the indifference curve 'I' at market basket B.

The reduction in the relative price of X causes the consumer to substitute market basket B for market basket A.

The quantity of X demanded increases to X_1 .

Since the relative price of X is lower, budget line BL_2 is flatter than BL_0 .

The consumer's response to a relative price decrease in X is to purchase _____ units of good X and spend less on other goods.

The sign of the substitution effect is ______ because a change in the relative price of X changes the quantity demanded in the ______ direction.

The Income and Substitution Effects

By combining the two effects, we can illustrate how a change in price changes the quantity _____.

The change in the quantity demanded is the sum of the two effects:

Change in		Change in quantity		Change in quantity
quantity	=	demanded due to	+	demanded due to
demanded		the substitution effect		the income effect



The initial budget line is BL_0 when income is M_0 and the price of X is P_0 . The consumer maximizes utility by consuming market basket A. X_0 units of good X is consumed.

When the price of X ______ to P_1 , the budget line rotates and becomes BL_1 . The consumer selects market basket B on his highest attainable indifference curve. X_2 units of X is consumed.

Since the total quantity demanded increases when the price falls, the demand function has a ______ slope.

The increase in the quantity demanded is due to the substitution effect and the income effect.

To isolate the substitution effect, we decrease the relative price of X and change income so that ______ is unchanged.

This is shown as a shift in the budget constraint to BL_2 . (Parallel shift back that is tangent to the original utility curve I_0 .)

The consumer would consume basket C where the slope of the budget line equals the slope of the indifference curve I_0 .

The **substitution effect** is the increase in the quantity demanded from X_0 to X_1 units.

The <u>income effect</u> shifts the budget line outward in a parallel fashion from BL_2 to BL_1 . This is because the price reduction frees up additional income to spend.

The consumer moves from market basket C to market basket B. The income effect increases the quantity demanded by X_2 - X_1 .

Together, the two effects explain why the quantity demanded increases from X_0 to X_2 .

When the good is a normal good, the income effect ______ the substitution effect: when the price falls, the quantity demanded must increase.

If the good is a _____ good, a consumer demands more units at a lower price and so the demand function of the consumer has a _____ slope.

What would the demand function look like for an inferior good? There are two possibilities:

1) The Income effect overwhelms the Substitution Effect



The initial budget line is BL_1 .

The consumer will consumer X_0 units of X in market basket A.

The price of X falls and the budget constraint rotates out to BL₁.

The consumer now consumes market basket B, containing X_2 units of X (less than X_0 .)

The total change from the decrease in the price of good X can be separated into two components:

The **substitution effect** is $X_1 - X_0$. (Opposite direction to the _____ change.)

The **<u>income effect</u>** is X_1 - X_2 . (Same direction as the _____ change.)

The net effect is a _____ in the quantity demanded due to a fall in price.

The consumer's demand function has a **positive** slope. This is because the income effect overwhelms the substitution effect.

When this occurs, we refer to this good as a \underline{G} good.

A Giffen good is an extreme type of <u>inferior</u> <u>good</u>. The negative <u>income effect</u> of changes in price of a Giffen good is actual stronger than the substitution effect. This leads to its bizarre quality: when the price of a Giffen good rises, consumers actually buy more. <u>Veblen goods</u> behave the same way for very different reasons. A Veblen good is a good for which consumers' preference for the good increases as the price increases, and decreases as the price decreases. This is called the Veblen effect. Demand can behave in the same way as for a <u>Giffen Good</u>, but for very different reasons: the types of products, and the effects on demand, can reasonably be regarded as opposites.

Veblen goods are bought, wholly or largely, to show wealth: they are things primarily bought to show-off. If the price decreases, then more people can afford them and they become less

2) The Substitution Effect Overwhelms the Income Effect



In this case, the demand curve will have a negative slope:

The price of X decreases. The substitution effect equals X_1 - X_0 . The income effect equals X_2 - X_1 .

Hence, with a _____ in the price of X, the quantity of X demanded increases because the substitution effect overwhelms the income effect.

The Slope of the Demand Function

The consumer's demand function represents the relationship between the quantity demanded and the price of the good with income and other prices held constant; X=d(P) (Individual Demand Function)

The slope of the demand function is $\frac{\Delta X}{\Delta P}$ and depends on the size of the substitution and income effects.

So, in order to determine whether a price change will result in a large or small change in the quantity demanded, we need to determine the size of the income or substitution effect. Recall, the substitution effect measures the change in the quantity demanded due to a price change holding utility constant.

This can be expressed as: $\frac{\Delta X}{\Delta P}\Big|_{U=C}$

ΔX

 $\overline{\Delta P}$ can be determined by measuring how the quantity demanded changes along an indifference curve as the relative price of the good X changes.

This quantity will always be negative since the consumer demands more units of a good when its price decreases.

The slope of the demand curve also depends on the <u>income</u> <u>effect.</u>

So, when will this effect be large?

It depends on two factors:

- 1) The amount of income that is freed up when the price of the good falls.
- 2) The number of units the consumer *now* demands since income has increased.

The income that becomes available per dollar change in price depends on the number of units the consumer is presently consuming.

When the price of the good falls, the amount of income available to spend on goods is equal to:

$$\Delta M = -(\Delta P)X$$

Looking at this expression, the greater is the change in income the larger is the amount of X the consumer is currently consuming.

The change in income per dollar decrease in price equals:

$$\left(\frac{\Delta M}{\Delta P}\right) = -X$$

$\left(\frac{\Delta X}{\Delta M}\right)$ equals the increase in the quantity demanded of X per dollar increase in income.

Thus, the change in the quantity demanded due to the income

effect is $-X \bullet \left(\frac{\Delta X}{\Delta M}\right)$

Recall, the change in the quantity demanded due to a price change is the sum of the changes caused by the substitution effect and the income effect. The slope of the consumer's demand function can be expressed as:

$$\left(\frac{\Delta X}{\Delta P}\right) = \frac{\Delta X}{\Delta P}\Big|_{U=c} - X\left(\frac{\Delta X}{\Delta M}\right)\Big|$$
 Slutsky Equation

<u>Slutsky Equation</u>: the slope of the demand function equals the sum of the substitution and income effects. The sign of the substitution effect is always negative.

When the income effect is negative, the slope of the demand curve is negative due to the fact that the substitution effect is always negative. If the good is a normal good, the income effect is also negative.

 $rightarrow \triangle$ The demand function will have a negative slope.

 $\Rightarrow \triangle$ If the good is an inferior good, the income effect will be positive and the slope of the demand curve can be either positive or negative.

The Size of Each Effect

The Size of the Substitution Effect

The effect is larger when the consumer considers the good to be a close substitute for other products.

If the good is considered a close substitute for other goods, the quantity of the good demanded will increase by a larger amount when its price falls, holding the consumer's utility constant.



Recall, if two goods are close substitutes, the indifference curve is more **linear**.

If two goods are complements the indifference curve is more ' $\underline{L'}$ shaped.

The size of the substitution effect depends on whether the two goods are close **substitutes** or close **complements**.

The Size of the Income Effect

Depends on the two components:

1) When the price of X falls, the consumer has $-(\Delta P)X$ dollars now available for consumption on good X and on other goods.

If X is currently consumed in a large quantity, as the price of X falls, the more income becomes available.

The budget line will shift outward in a parallel manner by a larger amount when the price of X decreases.

2) We must also consider the <u>responsiveness</u> of quantity demanded to a change in income: $(\Delta X / \Delta M)$.

When income increases, a consumer's demand for various products will differ.

I.e. If the income of a consumer increases by 25%, he may choose to consume only 20% more movies. Or a 25% increase in income will induce a 50% increase in housing.

It depends on his income elasticity of demand.

Consumer Surplus

<u>Objective</u>: to demonstrate how **consumer surplus** is derived from the consumer's demand function.

Consumer surplus is the difference between the maximum amount the purchaser would pay to consume a given quantity of a good and the actual amount paid.

It is assumed that the consumer receives a surplus by consuming the good and is willing to pay even more than go without the good.

<u>Marginal Value</u>: is the most that a consumer is willing to pay for each additional unit of a good.

A consumer that maximizes consumer surplus will determine the quantity to buy such that **marginal value equals price**.



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Using Consumer Surplus To Increase Total Revenue

The firm can introduce a price policy that will allow it to increase its **revenue**.

If the owner of a business is aware of the typical demand function of its product, he or she can attempt to capture some of the consumer surplus by charging different **prices** for each unit of the good sold:



The consumer will buy 35 units at \$7.

 \Rightarrow Charge the consumer more than \$10 for units less than 20.

⇒Discriminatory pricing.

Transfer of surplus from consumer to producer!

What About Pricing Policies that generate a loss of consumer surplus?

 \Rightarrow Some policies are designed to protect the producer, but at the <u>expense</u> of the consumer.

By increasing price and restricting output, these policies harm the consumer and generate a loss known as a dead-weightloss.



Dead-weight-loss: represents the decrease in consumer surplus that is not transferred to some other group.



Monopoly: Restrict output and charge higher prices. Not good for the consumer.