Week 2. Consumer Choice: Demand Side of the Market

1. **What is Utility?**

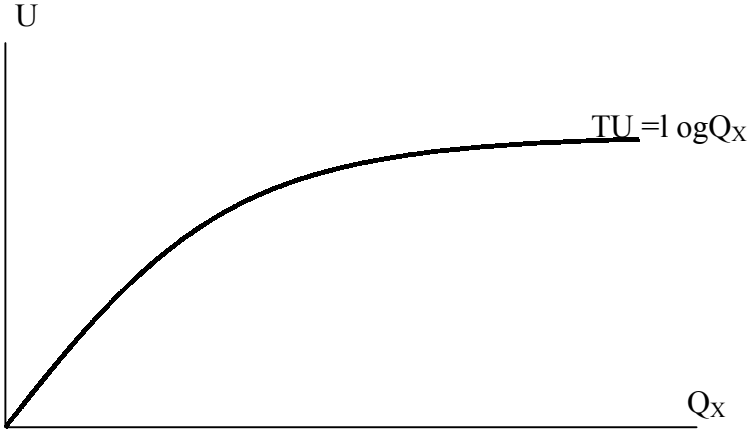
a. **Total Utility** (measured in money terms) is the maximum amount of money that a consumer is willing to give in exchange for a quantity of a good (Q_X).

i) Cardinal utility: It used to be thought that it could be represented by psychological units (*utils*) → unnecessary & impossible.

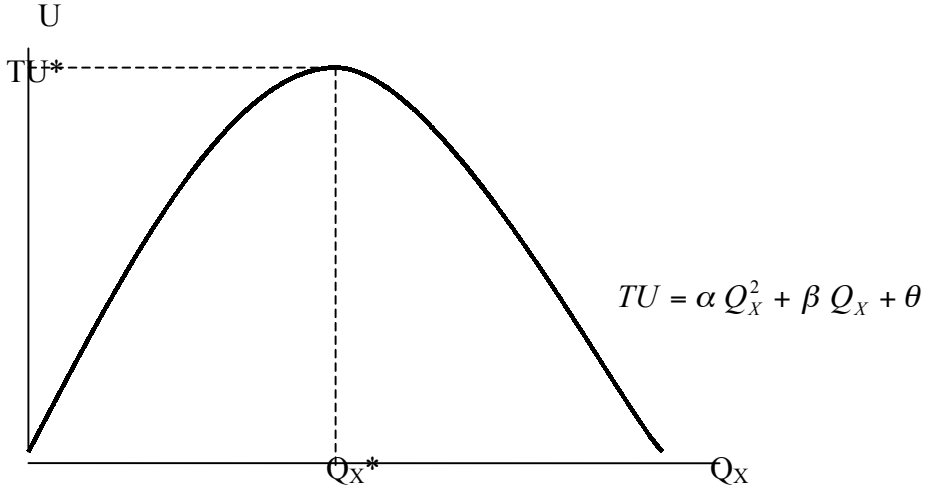
ii) Ordinal utility: Utility can be expressed in terms of another good or money, which suffices to tell which choice is preferred.

b. **Shape of Total Utility**

i) Logarithmic Utility function



ii) Quadratic Utility function



iii) Power Utility function: $U = \dfrac{Q^{1-\gamma} - 1}{1-\gamma}$

iv) Hyperbolic Utility function: $U = H + \dfrac{1-\kappa}{(2-\kappa)A}[AQ + B]^{\frac{2-\kappa}{1-\kappa}}$

b. **Marginal Utility** (measured in money terms) is the maximum amount of money that a consumer is willing to pay for one more unit of a good (X).

$$MU = \frac{\Delta TU}{\Delta Q}, \text{ where } \Delta Q=1$$

MRS_{XY} (**Marginal Rate of Substitution** between **X & Y**): Measured in terms of another good (opportunity cost), **MRS_{XY}** or **MU** refers to how many units of Y a consumer is willing to give up for one more unit of X (MRS_{XY}).

$$MRS_{XY} = \frac{\Delta Y}{\Delta X}, \text{ where } \Delta X=1.$$

Table 2-1.

Qx	TU	MU=deltaTU/deltaQ	Point Fig 2-1
0	0		A
1	6	6	B
2	11.6	5.6	C
3	16	4.4	D
4	19.6	3.6	E
5	21.4	1.8	F
6	22.2	0.8	G
7	22.6	0.4	H
8	22.6	0	

2. **Law of Diminishing Marginal Utility**

a. Additional units of Q_X are worth less and less in money terms. — *i.e.* each additional unit contributes less than its predecessor b/c its use has a lower priority. Therefore, as the individual's consumption increases, MU of each additional unit declines. However, when a commodity is very scarce, it might have a high MU even though it may provide little TU.

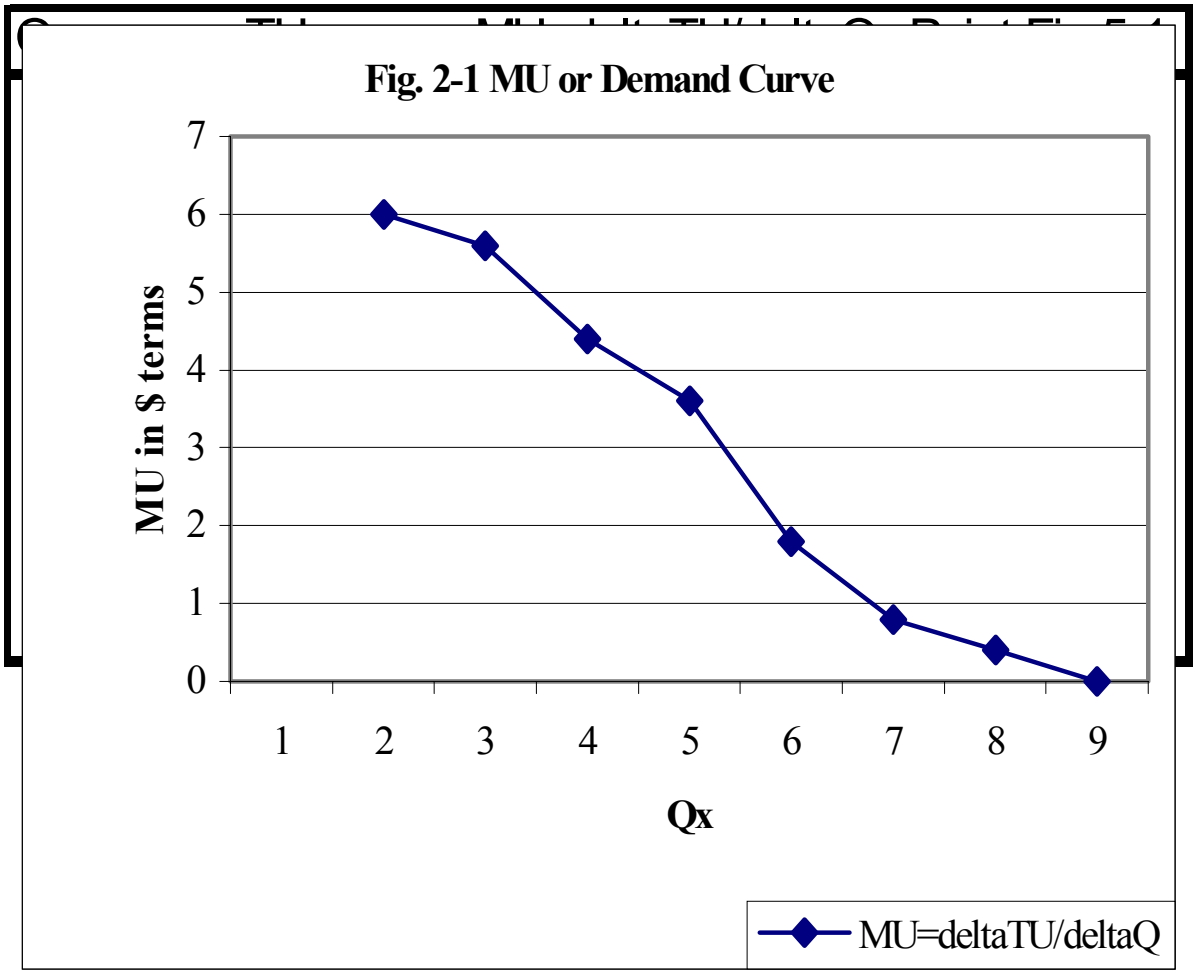
b. Law of diminishing MU implies that D-curves typically slope downward to the right. If P_X is high, consumers will buy only enough for the high-priority uses. When P_X declines, it pays to purchase more of Q_X – enough for some low-priority uses.

3. **Optimization of Consumption (Optimal Purchase Rule)**

a. Assuming logarithmic or quadratic utility, TU is maximized at Q_X*, where $\frac{\partial TU}{\partial Q_X} = MU = 0$, where P or MC is assumed to be 0.

b. Net Marginal Utility = MU – P = 0 → ∴ MU = P.

c. In production theory, this is equivalent to profit maximization condition: MR = MC, which is derived from $Max(\pi = TR - TC) = \frac{\partial TR}{\partial Q} - \frac{\partial TC}{\partial Q} = MR - MC = 0$ (loosely).

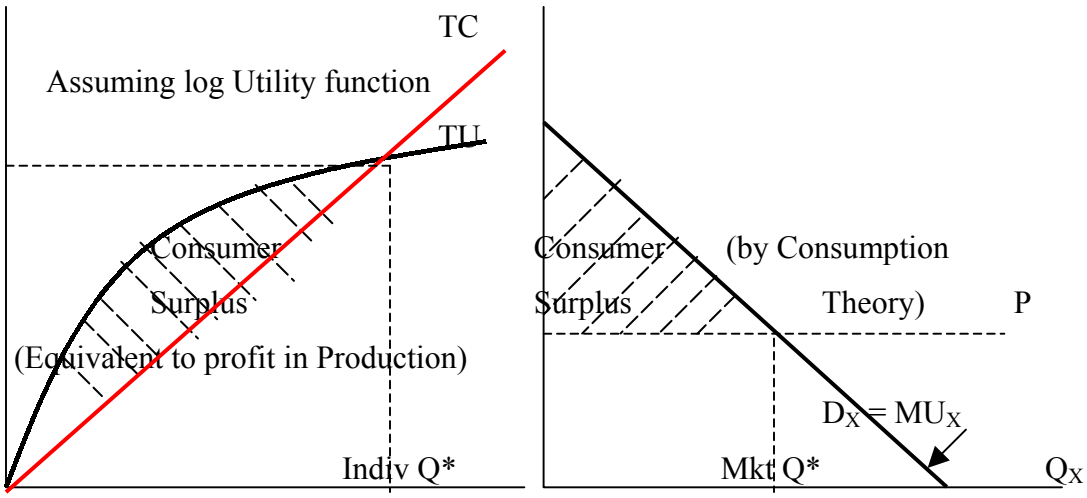


4. **Consumer Surplus**

a. Consumer surplus = TU (in money terms) – TC or MU – MC Area.

TU_X (Individual) P_X (MU_X) (Market)

b.



Buyer must always gain some consumer surplus if he/she buys more than one unit. The last unit bought yields no consumer surplus, b/c MU = P.

c. As a commodity becomes more and more scarce, its MU and its market price rise higher, regardless of the size of TU. B/c so little of the commodity is consumed, its TU is likely to be low, despite its large MU.

5. **Changes in Price, Real Income, and Quantity Demanded**

a. Two effects of Change in Price

i) Income Effect: Proportion of the change in Q_X demanded when P_X changes *eg*) $\uparrow P_X \rightarrow \downarrow$real income $\rightarrow \downarrow Q_X$

ii) Substitution Effect: The change in Q_X resulting from a change in P_X relative to P_Y. *eg*) $\uparrow P_X \rightarrow$ constant real income $\rightarrow \downarrow Q_X$ and $\uparrow Q_Y$.

iii) If X is a normal good, it must have a downward-sloping D-curve, since the income and substitution effects reinforce each other.

iv) Inferior good is a commodity whose Q_D falls when consumer's real income rises, *ceteris paribus* mostly due to income effect. In particular, if the income effect dominates, the D_X-curve will slope upward as income effect causes $D_X \downarrow$. However, if the substitution effect prevails, the D_X-curve slopes downward as $D_X \uparrow$ and $D_Y \downarrow$. The substitution effect generally wins out.

6. **Law of Demand**

a. Individual D-curve usually slopes downward b/c of diminishing MU.

b. Market D-curve also slopes downward b/c market D-curve is an aggregate of individual D-curves.

c. For many commodities, it is the appearance of new customers in the market that $\uparrow Q_D$ when prices are lower, rather than the negative slope of individual D-curves.

d. Exceptions

i) When people judge quality on the basis of price.

ii) Snob appeal

7. **Opportunity Cost**

a. The money that the consumer gives up is only a measure of the true underlying cost. The real cost is the opportunity cost - the other commodities (Q_Y in this case) that the consumer must give up as a result of purchase of Q_X.

Opportunity cost of X in terms of Y can also be expressed as $\mathbf{MRS_{XY}} = \frac{\Delta Y}{\Delta X}$.

b. Consumption today entails giving up consumption tomorrow w/ interest (dividend) accrued through saving/investment. Therefore, another opportunity cost of consumption is saving/investment and vice versa.

c. Optimality requires that the purchase of an additional dollar's worth of X contribute just as much utility as a dollar's worth of Y $\left(\frac{MU_X}{P_X} = \frac{MU_Y}{P_Y}\right)$. The opportunity cost incurred when a consumer spends an additional dollar on X is the utility of the amount of Y that the person would have gained by spending that dollar on Y instead.

8. **Budget Line and Indifference Curve**

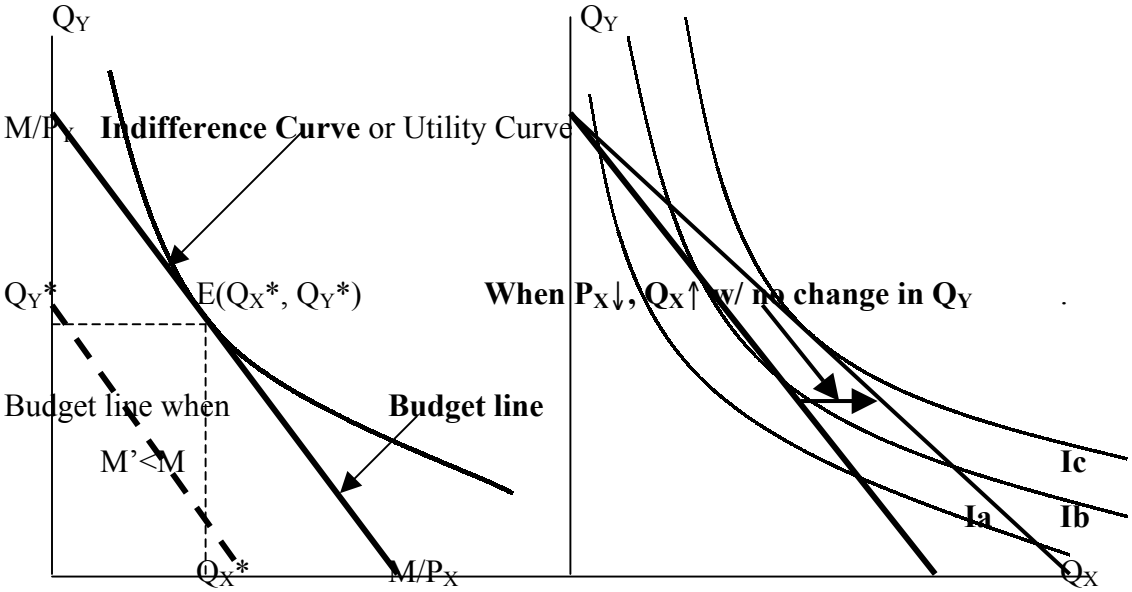
a. The budget line represents all possible combinations of two commodities given P_X, P_Y and some fixed amount of money, M. Also, it represents the maximum amounts of the commodities that the consumer can afford.

i) Assume $P_XQ_X + P_YQ_Y = M$. We can rewrite it in terms of

$$Q_Y = \frac{M}{P_Y} - \frac{P_X}{P_Y}Q_X \text{ or } Q_Y = \alpha - \beta Q_X.$$

ii) Budget line is also the **rate of exchange** btwn X & Y that **the market offers** to the consumer when he/she gives up money in exchange for X & Y.

iii) The slope of the budget line is the amount of Y the market requires an individual to give up in order to obtain one additional unit of X w/o any change in the amount of money spent. ($\beta = P_X/P_Y$ from i) above)



b. Indifference curve is a line connecting all combinations (bundles) of commodities that are equally desirable to the consumer (**subjective exchange rate btwn X & Y**).

i) Every point on a higher indifference curve will be preferred to any point on a lower indifference curve.

ii) Indifference curves never intersect.

iii) Indifference curves have negative slope = $\mathbf{MRS_{XY}}$ (*i.e.* $\frac{\partial Q_Y}{\partial Q_X} = -\frac{P_X}{P_Y}$), which is the opportunity cost of one unit of X in terms of Y.

iv) Bowed-in and flattening-out curvature (convex to origin) indicates that consumers are relatively eager to trade away a commodity which they have in large amount , but reluctant to trade goods they hold in small quantities.

Cobb-Douglas U-fn: $\overline{U} = X^{\alpha}Y^{\beta} \rightarrow Y = \left(\frac{U}{X^{\alpha}}\right)^{\frac{1}{\beta}}$

v) At tangency point E, slope of budget line, $-P_X/P_Y$ = **MRS_{XY}**, slope of indifference curve. → Optimal Consumption Rule between X & Y:

$$\frac{MU_X}{P_X} = \frac{MU_Y}{P_Y} \rightarrow \frac{MU_X}{MY_Y} = \frac{P_Y}{P_X} = MRS_{XY}$$