11/01/2021

Humanities - Economics (By Tushar Kanti Nandi)

* Economics - study of the allocation of scarce resources
* The whole course has three parts:

Economics

- **Microeconomics**
  - individual specific
  - eg: → would I sell in local or big market?
  - → would I drink tea or coffee? etc...
- **Macroeconomics**
  - Aggregates.
- **Econometrics**
  - Testing the theories of economics (micro or macro) using statistics and data.

Ceteris Paribus :- ⇒ Holding everything else constant

or

⇒ Keeping other things same.

↳ We use this assumption all the time in economics theories.

Opportunity cost :- Value of best foregone option.

$\underbrace{PV}$ (ret in future) > cost of eduction → OC + EC (Economic cost).

Present value } There is a formula.

$$\text{Opportunity cost} = FO - CO$$

FO : Return on best foregone option

CO : Return on chosen option.

"Return on" simply means income/salary from that opportunity/job.

Microeconomics :-

1. Consumer Behaviour.
2. Production.
3. Market Structure.

1. Consumer choice :- → depends on preference.

Preference Relations follow the following condition:

* Completeness : Suppose there are two goods: A and B.

Rules out indecision
An individual:
(i) preferes A to B.
(ii) " B to A.
(iii) is indifferent b/w A and B.

* Transitivity : if an individual prefers A to B, and prefers B to C, then, she prefers A to C.

* Continuity : if A is preferred to B, then A is also preferred to something close to B.

Utility: Level of satisfaction we obtain by consuming a good (product).

12/01/2021

In the previous class, we set out with a set of postulates / axioms to define rational behaviour:

Preference Relations:

1. Completeness. → This rules out indecision
2. Transitivity. → This rules out inconsistency
3. Continuity. → This rules out abrupt change in preferences.

Together these define rational behaviour.

Note: I'm not digging into details of rational and irrational behaviour.

Utility: Let 'X' be a good. You consume x amount of X.

$$U = f(x)$$

- f has to be a monotonic function} Sorry, wrong point. It may not be monotonic after a while.

Suppose there are two qtys of X : x_1, x_2 with $x_2 > x_1$.

Then, $U(x_2) > U(x_1)$.

Note: $U(x_2) - U(x_1)$ makes no literal sense. The numbers assigned to U doesn't make literal sense, just a qualitative sense.

So, Utility is an ordinal measure.

Marginal Utility:-

If $U = f(x)$

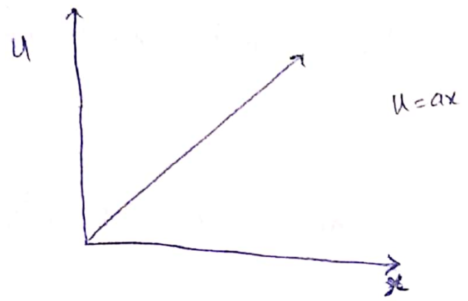
Then, $MU_x = \frac{dU}{dx}$.

But in economics, we won't use $\Delta x \to 0$. We define it in a different way.

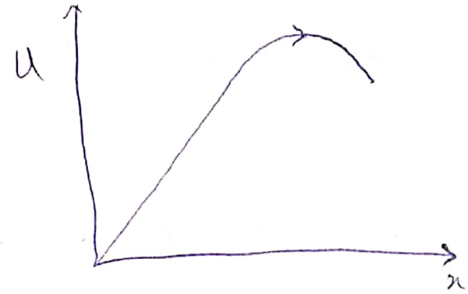
Marginal utility is defined as the additional utility a consumer obtains from consuming an additional unit of the good.

↳ This is the economic interpretation.

↳ ie; $MU_x = U_{(x+1)} - U_{(x)}$.

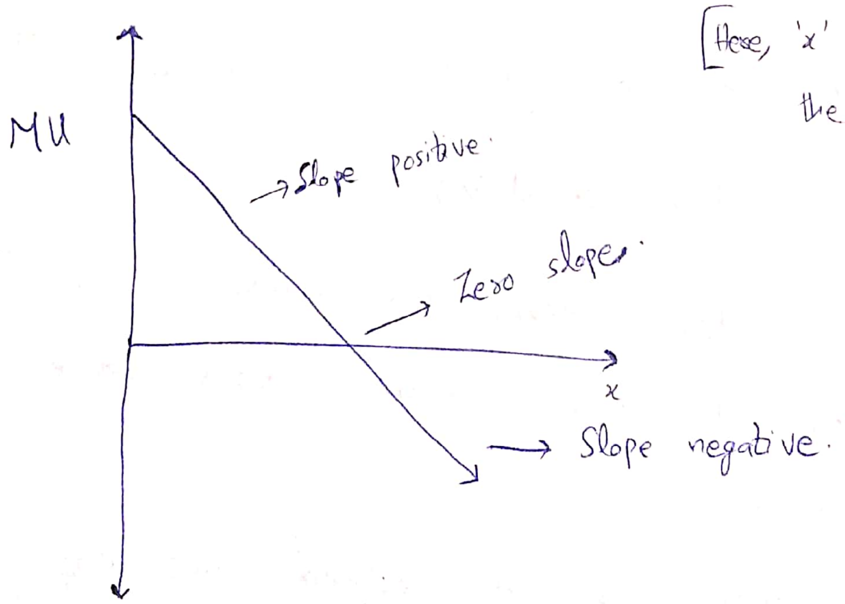


Utility curve
(How it looks initially)



Utility curve
(in general)

[Here, 'x' is the qty of the good 'X'].



Now let's move to the case of two goods (say X and Y).

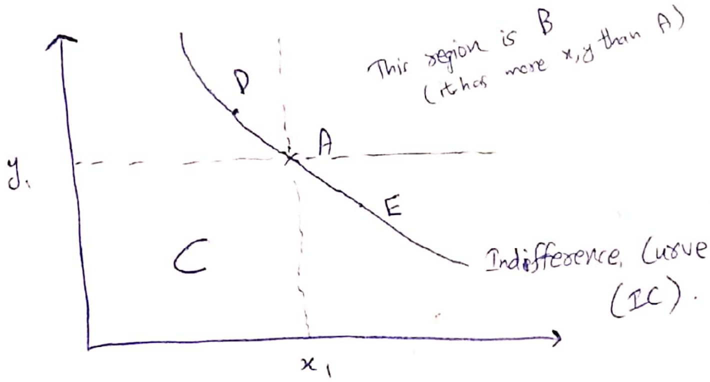
Say (x_1, y_1) and (x_2, y_2) are $\underbrace{\text{two bundles}}$

simply an ordered pair.
People have many terminologies!
Deal with it!

Suppose

$$\begin{cases} U(x_1, y_1) = U(x_2, y_2) \text{ and } x_1 > x_2 \Rightarrow y_1 < y_2. \\ x_1 = x_2 \text{ and } y_1 > y_2 \Rightarrow U_1 > U_2. \end{cases}$$

Note: I'm not considering the latter part where utility decreases, because it doesn't make sense.
If eating 12 rasgullas or more makes me vomit, would I go there?!
If I go there, I'll be wasting my resources, right?
So, there is always an economically feasible range (in this case that range is where the $MU \geq 0$).



$A = (x_1, y_1)$

$U(A) = U(x_1, y_1)$.

$z \in B \Rightarrow U(z) > U(A)$.

$z \in C \Rightarrow U(z) < U(A)$.

So, we find points such that $U(z) = U(A)$.
Eg: D, E.

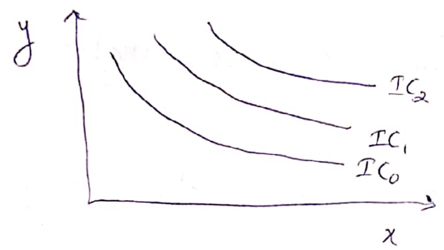
Indifference curve is the locus of points representing different combinations of goods that give the consumer same level of utility.

Properties of IC :-

① IC is negatively sloped. ($\because$ with the same level of utility, if you want one good more, then you have to give up the other good).

② $U_2 > U_1 > U_0$.

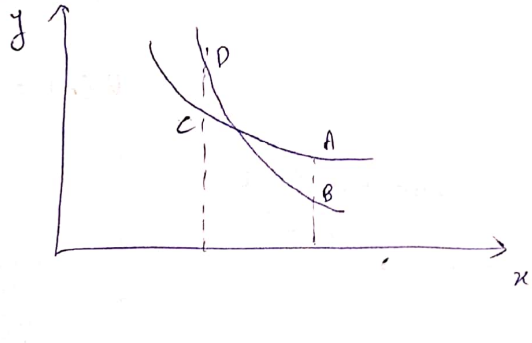
Further the IC from origin, higher is the level of utility.



③ ICs cannot intersect.

Proof: (By Contradiction)

Assume two ICs intersect.



$$U(A) > U(B)$$
$$U(D) > U(C)$$
$$U(A) = U(C) \quad \text{and} \quad U(B) = U(D).$$

$\Rightarrow U(C) > U(B)$

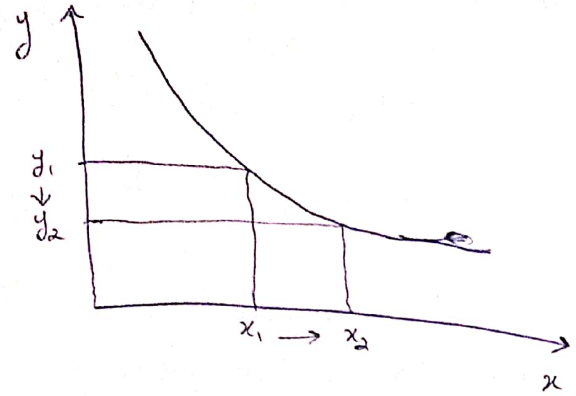
$\Rightarrow U(C) > U(D)$

$\Rightarrow\Leftarrow$

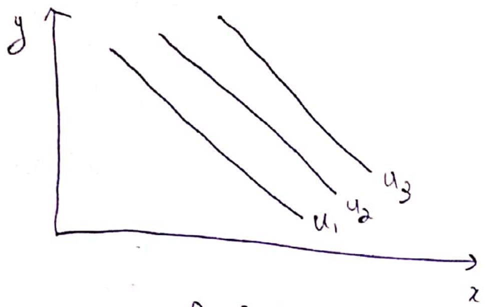
Q.E.D

Scanned with CamScanner

14/01/2021



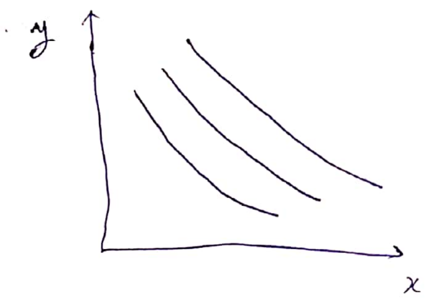
Substitutability (Degree of substitution)



$U_3 > U_2 > U_1$

Perfect Substitutes

If not perfect, then curvature comes in.



$\longrightarrow U = U(x,y) = x^{\alpha} y^{\beta}$

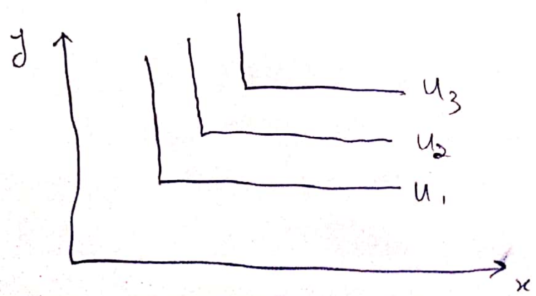
α and β are +ve constants

$\alpha + \beta = 1$.

Suppose X and Y ~~are~~ are complementary goods, ie; you have to buy them together.

Eg: (0) Keyboard and Mouse.

(1) Left shoe, right shoe.



L-shaped

Perfect complements.

$U = U(x,y) = \alpha x + \beta y$ } For perfect substitutes.
α and β are positive constants.

$U = U(x,y) = \min.(\alpha x, \beta y)$ } For perfect complements
α, β are positive constants

↳ ie; by buying more of y than $y = x$ amt. doesn't give you extra utility. (ie; Utility remains the same irrespective of whether I buy 2 left shoes and 2 right shoes or 2 left shoes and 3 right shoes).

*Slope of indifference curve is called marginal rate of substitution (MRS_{xy}).

ie;
$$MRS = \frac{dy}{dx}$$

We can show that:

$$MRS_{xy} = \frac{-MU_x}{MU_y}$$ (Ratio of two marginal utilities).

The indifference curve is given by:

$U(x,y) = c$ where c is a constant.

Since U is constant, it creates an implicit relationship between x and y (by Implicit Function Theorem) : $y = g(x)$.

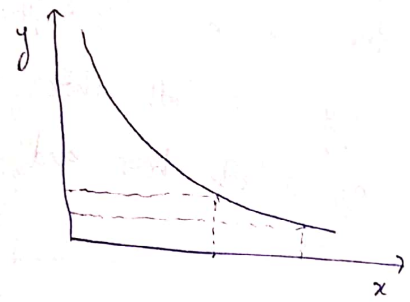
$$U(x,y) = c \Rightarrow U(x, g(x)) = c \Rightarrow \frac{\partial U}{\partial x} + \frac{\partial U}{\partial x}\frac{\partial g(x)}{\partial x} = 0$$

$$\Rightarrow \frac{\partial U}{\partial g(x)} \cdot \frac{\partial g(x)}{\partial x} = \frac{-\partial U}{\partial x} \qquad \boxed{y = g(x)}$$

$$\Rightarrow \frac{dy}{dx} = \frac{-\frac{\partial U}{\partial x}}{\frac{\partial U}{\partial y}} = \frac{-MU_x}{MU_y}$$

~~Hence~~ Q.E.D

Additional Note:



This shape of the IC makes sense.

It says that if you have more x and less y, then y is more valuable to you (as it is rarer). So, to give away one y, you would take back a lot of x in exchange.

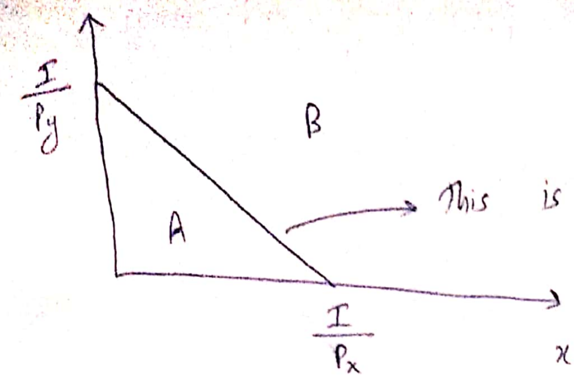
~~Suppose Income = I, and the prices of x amt of x and y amt. of Y be P_x and P_y respectively.~~

Suppose Income = I and the price of one unit of X and Y be P_x and P_y respectively.

Then,

$$P_x \cdot x + P_y \cdot y \leq I$$

$\mapsto$ Budget constraint.



Below, the Budget line, we have region A.

Region A is called the Feasible set (or Budget set). (ie; you can afford it).

(Feasible set includes the line too) ①.

* Region B will put you in debt, lol!

Additional Note on the application of Implicit Function Theorem:

We used implicit Function theorem in case of proving:

$$MRS_{xy} = \frac{-MU_x}{MU_y}.$$

For this theorem to be applied, we require $\frac{\partial U}{\partial y} \neq 0$.

However, this is true since we already said that our study lies at the economically feasible region.

So, we don't look at high level ~~utility~~ utility values where saturation point is reached.

As mathematicians say, we are looking at those points where the function is "nice".

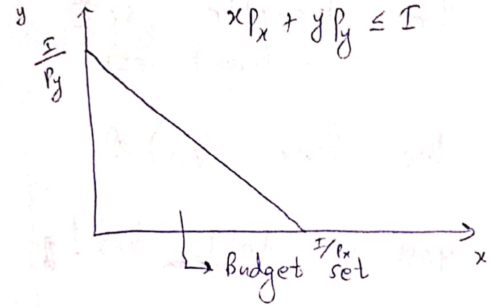
Utility function is order-preserving for any monotonic transformation.

18/01/2021

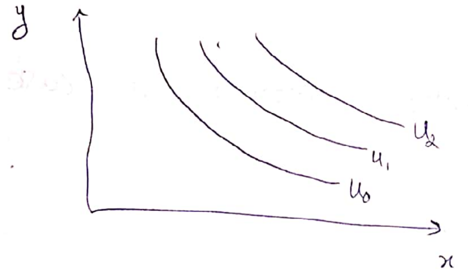
Maximisation of Utility:-

On one side, we have the budget line:

$$xP_x + yP_y \leq I$$



On the other side, we have the preference:

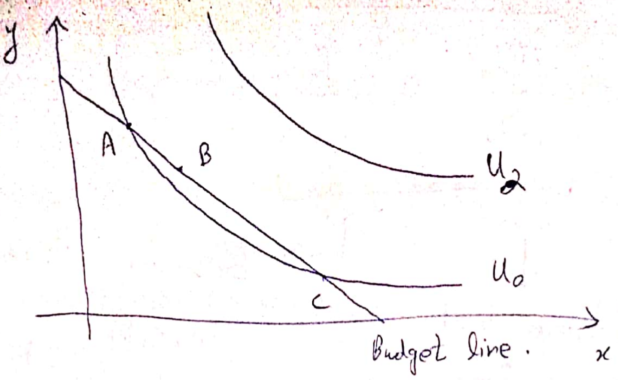


$$MRS = \frac{-MU_x}{MU_y}$$

$$P_y y = I - P_x x \quad \text{(Budget Line)}$$

$$\Rightarrow \frac{dy}{dx} = -\frac{P_x}{P_y} \quad \text{(Slope of the budget line).}$$

Now, let's try to maximise utility within the budget line.



Consume will exhaust all money once he picks A or C.

B gives more utility and is affordable.

U_2 is not affordable by the consumer.

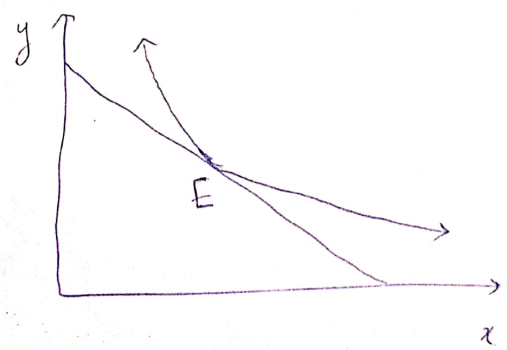
<u>Note:</u> I was thinking how can we do this. Numbers assigned to utility doesn't make sense, but the budget plot is something that actually makes sense. So, how can we plot like this and make sense out of it?
The answer simply is that we are not looking the values of utility, rather we look at the entries that give same utility.

Now come back to the curve,

$\exists$ E which is the point of optimality.

$\Rightarrow$ utility is maximized.

At E, $\frac{-P_x}{P_y} = MRS \Rightarrow \frac{P_x}{P_y} = \frac{MU_x}{MU_y}$



$\therefore$ At E,

$\boxed{E : (x, y)}$

$$\boxed{\underbrace{\frac{MU_x}{MU_y}} = \underbrace{\frac{P_x}{P_y}}}$$

Exchange based on preference

Exchange based on market price.

This intuitively makes sense.

$$\frac{P_x}{P_y} = 2 \Rightarrow P_x = 2P_y$$

$$\frac{MU_x}{MU_y} = 2 \Rightarrow MU_x = 2MU_y$$

ie; In your preference, your valuation of x is twice the valuation of y.

Note that $\frac{P_x}{P_y}$ doesn't depend on x and y, ie; it doesn't depend on amt. of goods of X and Y.

However, $\frac{MU_x}{MU_y}$ does.

So, basically, we change (x, y) so that $MRS(x, y) = \frac{-P_x}{P_y}$.

Of course there might be many such (x, y).

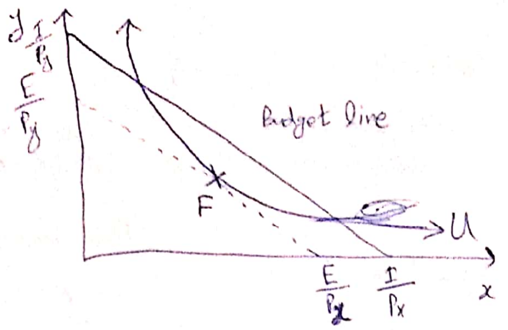
Then, just find which (x, y) gives maximum utility to get E.

This is because $E \Rightarrow \frac{MU_x}{MU_y} = \frac{P_x}{P_y}$ but the converse may not be true.

Scanned with CamScanner

Expenditure Minimization:-

We want to find out, given a fixed utility how can be minimize expenditure.



Say 'U' is the fixed utility.

F is the required point.

In short,

Maximisation problem: Max. $U(x,y)$ s.t

$P_x x + P_y y = I$

Minimisation problem: Min. $E = P_x x + P_y y$

s.t $U(x,y) = U$.

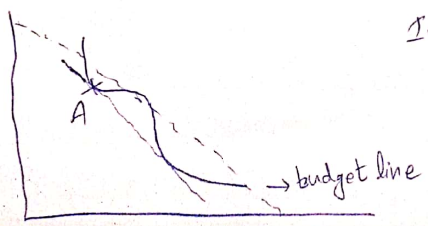
Both these can be solved using <u>Lagrange Multiplier method</u>.

Note that, at F: $MRS = \frac{-P_x}{P_y}$

$\Downarrow$

$$\boxed{\frac{MU_x}{MU_y} = \frac{P_x}{P_y}}$$

<u>Note:</u> We assumed that ICs are convex. If we don't assume ~~that~~, then we may have:



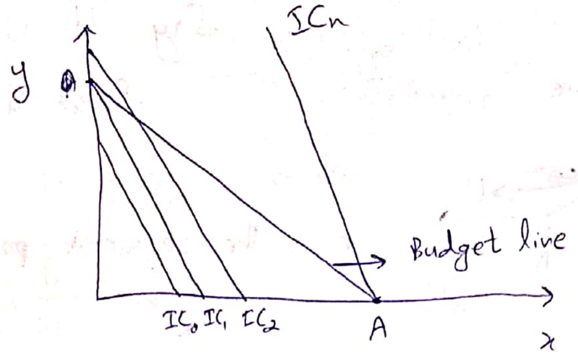
In this case, A is not the point of max. utility in the budget line.

However, in practical, most ICs are convex. So, our assumption is "good".

Scanned with CamScanner

Now, let's see two cases where the point of tangency may not be important.

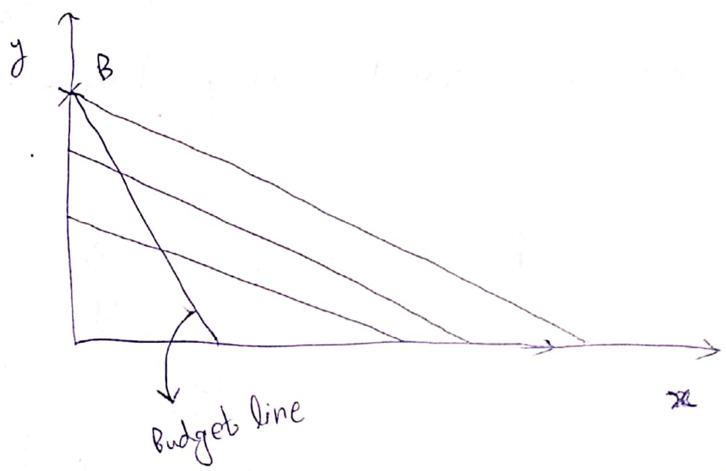
Let X, Y be perfect substitutes.



At A, we buy only X, not Y for maximisation of utility.

So, A is called a corner solution which is in general, not practical.

What if Budget line is steeper than ICs?



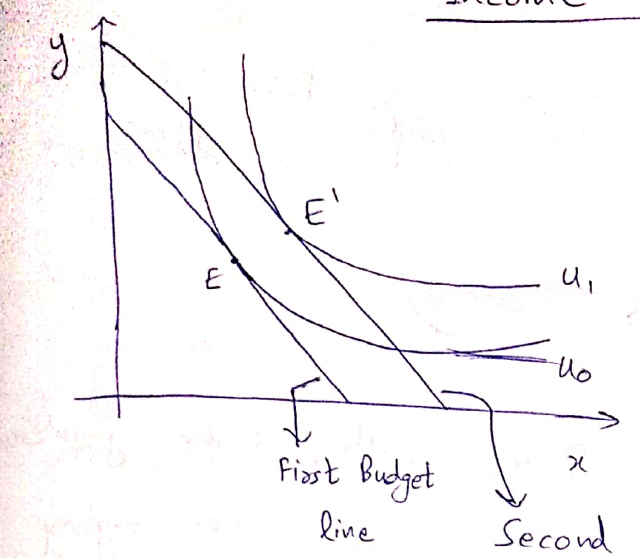
B is the point of maximisation (only Y, no X).

In these two cases, $MRS = \frac{P_x}{P_y}$ doesn't hold.

What would be the case of perfect complements.

19/01/2021

Income Increase



If income increases, budget line shifts right-word. New budget line is tangent to a higher indifference curve. Consume buys more of both commodities. (if it is a normal good).

Normal good :- If income increases, ~~and~~ you buy more of these goods.

Inferior good :- If income increases, you buy lesser of these goods.

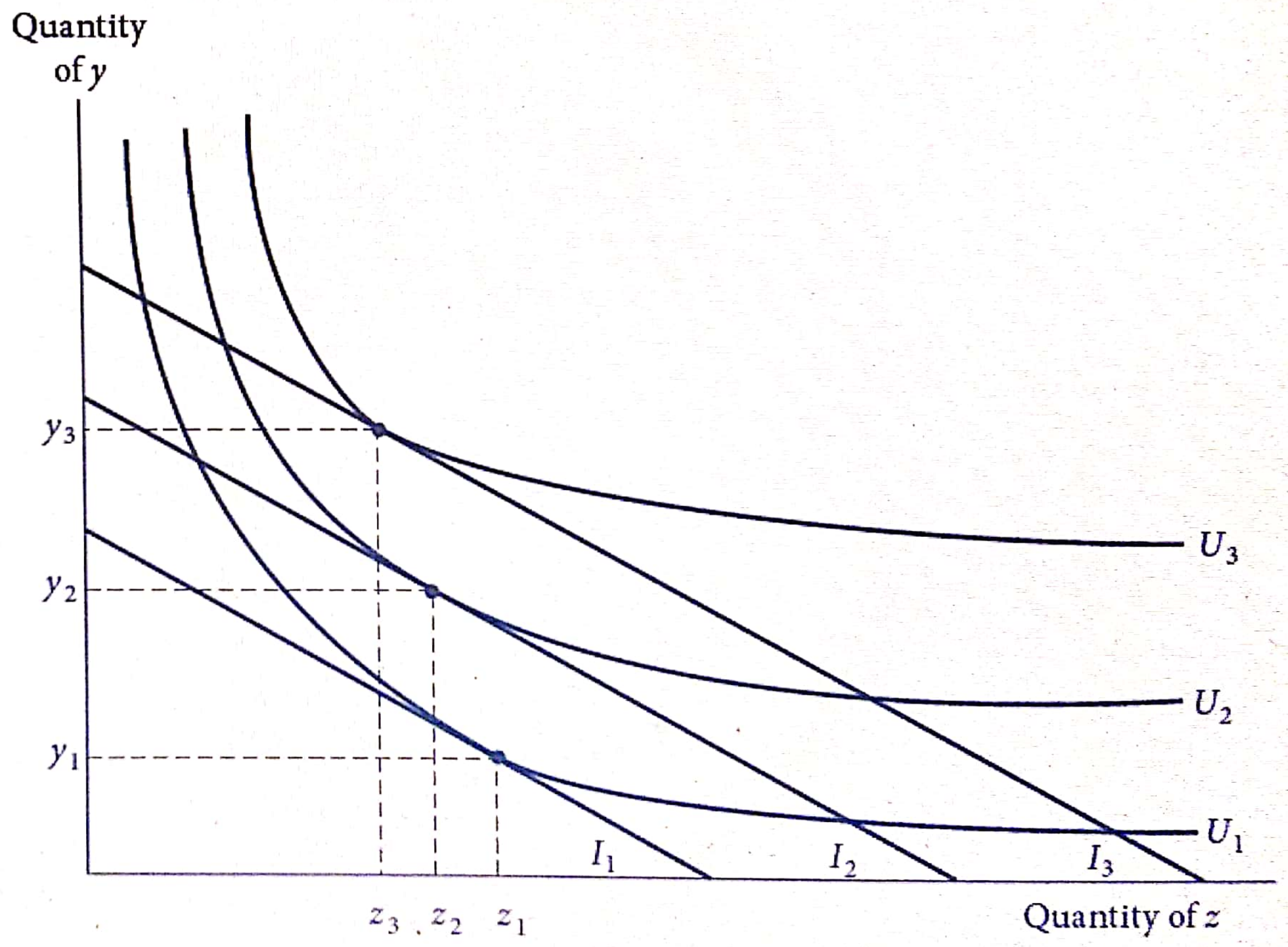
Eg: Firewood, cheap cars, Old mobile phones.

* See "Reference book" for a graph where an inferior good is on x-axis and normal good on y-axis. (Pg : 144, Fig 5.2).

FIGURE 5.2

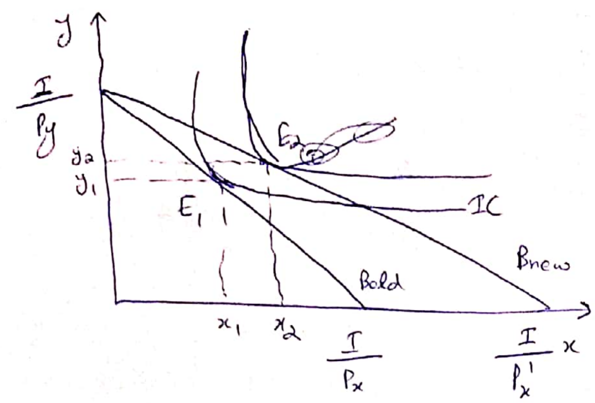
An Indifference Curve Map Exhibiting Inferiority

In this diagram, good z is inferior because the quantity purchased decreases as income increases. Here, y is a normal good (as it must be if there are only two goods available), and purchases of y increase as total expenditures increase.



Scanned with CamScanner

Price change:-



Price of x decreases.

Budget line becomes flatter with same y-intercept. Consumer moves to a higher indifference curve, buying more of both the goods. → Does not happen everytime. Depends on degree of substitutability.

Price of X decreases, still we end up buying more ~~Y~~ and X.

Price effect is ~~a~~ ~~two~~ composed of two effects:

1. Substitution effect } ~~The degree of substitutability of x and y will determine~~ if you buy ~~more~~ y when price of x ~~decreases~~.
2. Income effect. } The money you saved due to price decrease, ~~~~ let's you buy more goods.

Price effect is the movement of E_1 to E_2.

Price decreases, is an increase in purchasing power, ie; it feels like your income has increased.

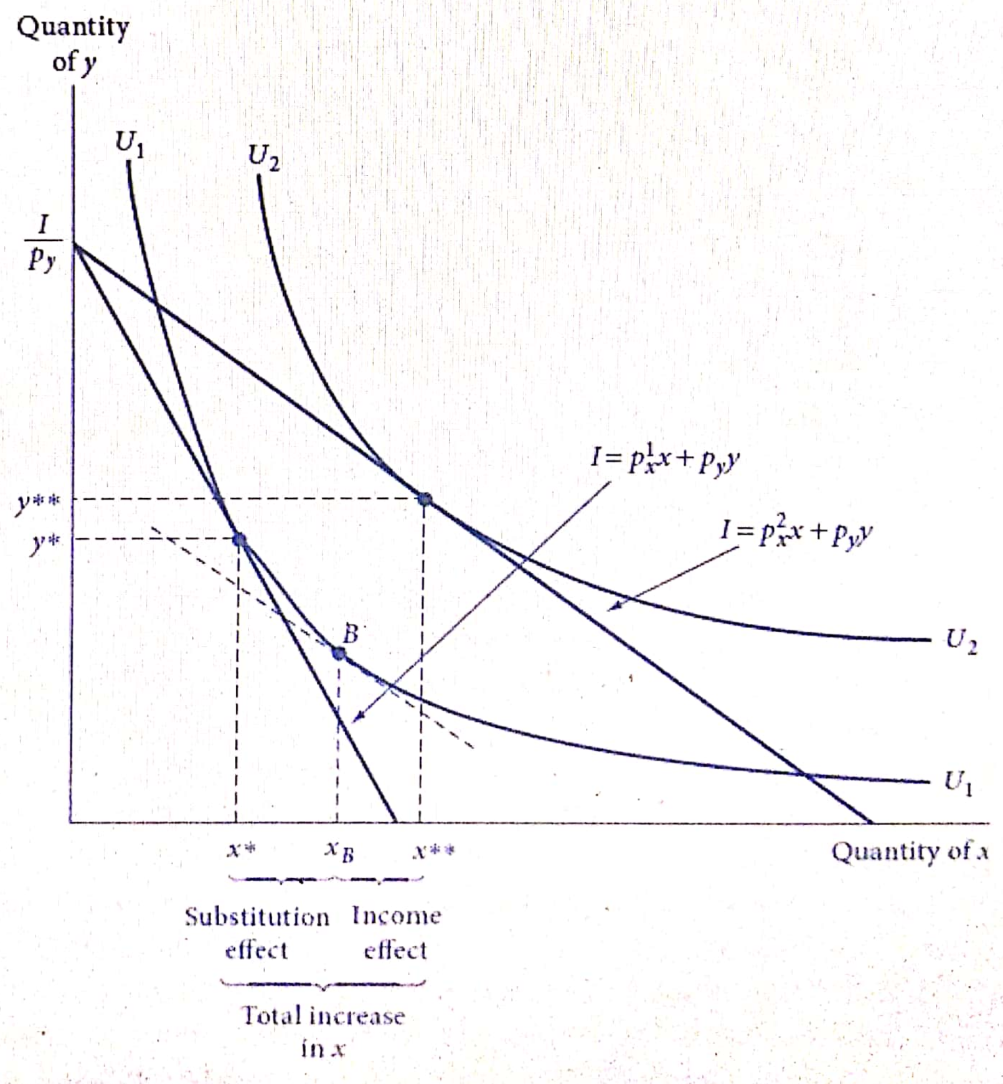
See Pg: 146, Fig 5.3 for clear idea on substitution and ~~~~ income effect.

~~~~ <u>Note:</u> In Fig 5.3, the point B is on a line parallel to the new budget line so that it is tangent to the initial IC.
~~~~

FIGURE 5.3

Demonstration of the Income and Substitution Effects of a Decrease in the Price of x

When the price of x decreases from p_x^1 to p_x^2, the utility-maximizing choice shifts from x^*, y^* to x^{**}, y^{**}. This movement can be broken down into two analytically different effects: first, the substitution effect, involving a movement along the initial indifference curve to point B, where the *MRS* is equal to the new price ratio; and second, the income effect, entailing a movement to a higher level of utility because real income has increased. In the diagram, both the substitution and income effects cause more x to be bought when its price decreases. Notice that point I/p_y is the same as before the price change; this is because p_y has not changed. Therefore, point I/p_y appears on both the old and new budget constraints.

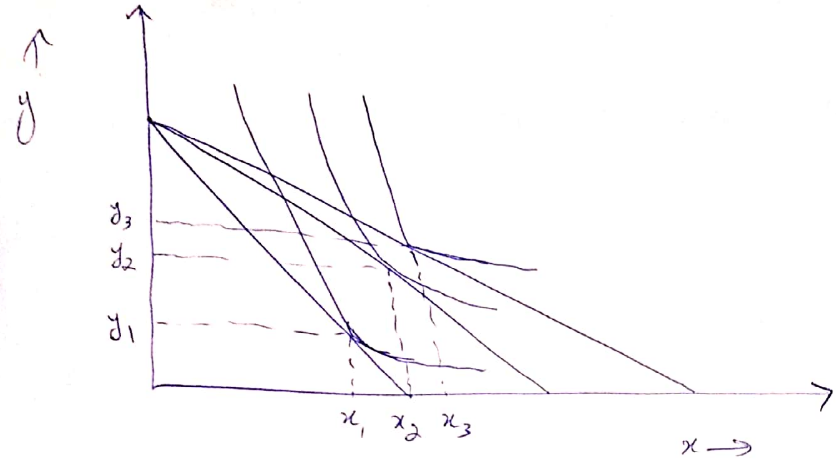


Scanned with CamScanner

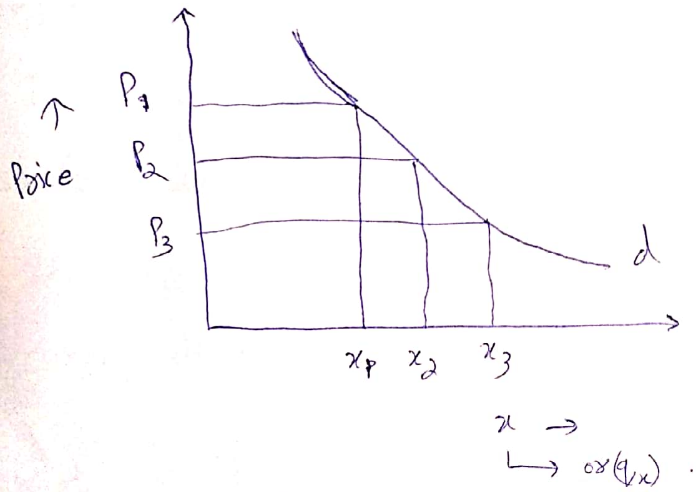
Substitution effect is how much more you prefer x because of the decrease in price of x.

Income effect is the increase in amt. of x and y that you buy due to higher purchasing power.

Now,



Now we take this x_1, x_2, x_3 and plot it with its price.



Simply put, price decreases, people buy it more. This is individual demand curve.

This is called demand curve. It shows the relation b/w price and quantity demanded, holding other things same (Ceteris Paribus).

↳ Like: Income, price of other good, preference.

Elasticity of demand :-

$$q_x = f(P_x, P_y, I) \longrightarrow \text{demand function.}$$

Rest I have explained later : $(P.T.O)^2$.

21/01/2021

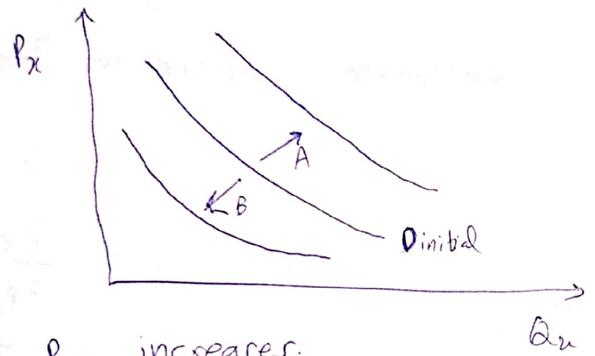
In the last class we talked about the demand curve.

We plotted Quantity demanded vs price.

We denote demand curve as:

$$Q_x = f(P_x, P_y, I)$$

↳ of course Q_x depends on more variables like preference, but we assume Ceteris Paribus for the rest.



Say P_y increases.

If X and Y are perfect substitutes, demand curve shifts upward (A).

If X and Y are perfect complements, demand curve, shifts downward (B).

What about change in income? If income increases, demand curve shifts upward.

Similarly, changes in preference also changes the demand curve.

Scanned with CamScanner

Now how do we know how much the quantity demanded (Q_x) changes with change in price.

$$Q_x = f(P_x, P_y, I)$$

$$\left.\frac{\partial Q_x}{\partial P_x} = f'(P_x, P_y, I)\right\}$$ one way is the first order derivative, but different commodities are measured in different units.

Eg: Rice - quintel, petroleum - barrels, gold - gram.

So, inter - commodity comparison becomes difficult.

A good measure is elasticity.

Elasticity is of three types:

(1) <u>Price Elasticity</u>: It measure the proportionate change in quantity demand of good x in response to a proportionate change in the price of x.

$$e_{x,P_x} = \frac{\Delta x / x}{\Delta P_x / P_x} = \frac{\Delta x}{\Delta P_x} \cdot \frac{P_x}{x} \approx \frac{\partial x}{\partial P_x} \cdot \frac{P_x}{x}$$

$$\therefore \quad e_{x,P_x} = \frac{\partial x (P_x, P_y, I)}{\partial P_x} \cdot \frac{P_x}{x}$$

$\left(\frac{\partial x}{\partial P_x}\right.$ is -ve always$\left.\right)$

(2) <u>Income elasticity</u>:-

$$e_{x,I} = \frac{\Delta x / x}{\Delta I / I} \approx \frac{\partial x}{\partial I} \cdot \frac{I}{x}$$

$x > 0$, $I > 0$ $\Rightarrow$ The sign of $e_{x,I}$ depends on $\frac{\partial x}{\partial I}$

For normal good, $\frac{\partial x}{\partial I}$ is +ve.

For inferior good, $\frac{\partial x}{\partial I}$ is -ve.

(3) Cross-price elasticity:-

$$e_{x,P_y} = \frac{\Delta x/x}{\Delta P_y/P_y} \approx \frac{\partial x}{\partial P_y} \cdot \frac{P_y}{x}$$

Again, sign of e_{x,P_y} depends on $\frac{\partial x}{\partial P_y}$.

For perfect substitutes, $\frac{\partial x}{\partial P_y}$ is +ve.

For perfect complements, $\frac{\partial x}{\partial P_y}$ is -ve.

Out of all these elasticities, price elasticity is the most important.

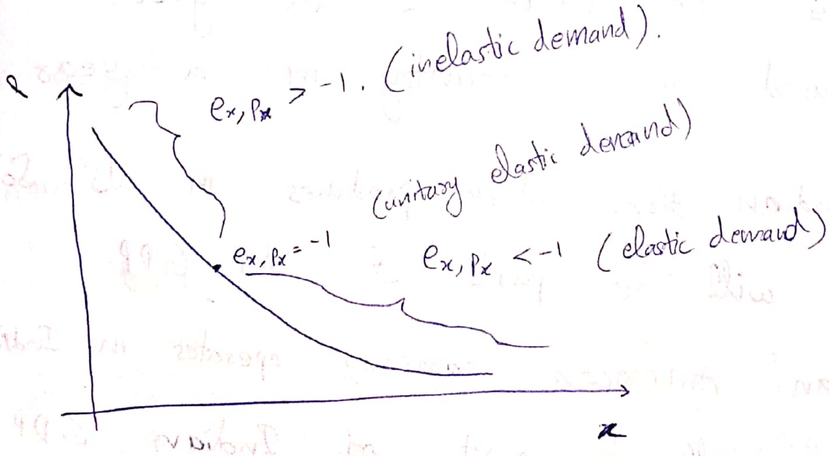
How would you interpret $e_{x,P_x} = -3$?

It says, if P_x increases by 1%, qty. demanded of x decreases by 3%.

If $e_{x,P_x} = -1$, it is called unitary elastic demand.

$e_{x,P_x} < -1$: called elastic demand.

$e_{x,P_x} > -1$: called inelastic demand.



Remember, from the graph, it seems counter-intuitive that lesser slope is elastic demand. However, here the slope is $\frac{\partial P_x}{\partial x}$, whereas we're looking at $\frac{\partial x}{\partial P_x}$.

Eg of good with :

elastic demand : most of the non-essential commodities ~~such as~~ ~~food, travel (train, bus, plane tickets), etc.....~~

inelastic demand : addictive products such as ciggarettes, alcohol.

<u>Spending</u>:- (E = Expenditure)

$$E = x \cdot P_x$$

$$\frac{\partial E}{\partial P_x} = x + P_x \cdot \frac{\partial x}{\partial P_x} = x(1 + e_{x,P_x}).$$

* If $e_{x,P_x} = -1$, Expenditure doesn't change.
* If $e_{x,P_x} < -1$, $\frac{\partial E}{\partial P_x}$ will be negative.
* If $e_{x,P_x} > -1$, $\frac{\partial E}{\partial P_x}$ will be positive.

25/01/2021

We move on to the next topic - Production and Supply.

<u>Gross Domestic Product (GDP)</u>

Current GDP of India : 2.6 trillion US dollars.

* GDP measures the value of all goods and services produced in a country in a year.

Eg: TCS is an Indian firm which produces in US. So, their services will be part of US GDP.

Similarly, if an American company operates in India, their services will be part of Indian GDP.

<u>Note</u>: The fact that we have "in a country" and not "by the country" sums it all up.

Scanned with CamScanner

Largest Import item of India: Petroleum.

Largest Export item of India: 1) IT services.

2) Gems and Jewellery.

GDP can be measured in two ways:

1) At market price.

2) At constant price.

Say you produce 10 mangoes in first period (price = 10).

$t = 1$: $10 \times 10 = 100$ (GDP)

In the next period, you produce 10 mangoes (price = 11)

$t = 2$: $10 \times 11 = 110$ (GDP).

At constant price, we have : $t = 2$: $10 \times 10 = 100$.

So, GDP has not grown at all.

* GDP calculated at market price is called <u>Nominal GDP</u>.

In the above example, there is 10% increase in GDP at market price.

Suppose :

$t = 1$ 10 unit good $\times$ ₹10 $= 100$

$t = 2$ 11 unit good $\times$ ₹11 $= 121$

Nominal GDP increase : 21% $\left(\frac{121-100}{100} \times 100\right)$

GDP at constant price : $t = 2$ $11 \times 10 = 110$

(10% increase).

Nominal GDP $\longrightarrow$ at market price.

Real GDP $\longrightarrow$ at constant price.

Eg: India's GDP series (say):

	GDP (base is 2013)		GDP
2016	2.1	↳ ie; (price is the same as 2013).	2.8
2017	2.15		2.9
⋮	⋮		⋮
2020	2.6		3.3

Nominal GDP will be higher than Real GDP.

Price Change / Inflation :-

$$\text{Inflation} = \frac{P_{t+1} - P_t}{P_t}$$

ie; Rate of change of price.

$$I_p \cdot P_t = P_{t+1} - P_t$$

$$\Rightarrow P_{t+1} = (1 + I_p) P_t$$

Note: Here we can ~~often~~ calculate the inflation of a particular good or we can choose a consumer representative bundle.

You can take weighted average price of this.

$$P_{t+1} = (1+I_p)(\ )(\ )\dots(\ )P_0$$

↳ So P_{t+1} is an aggregate effect of all previous inflation.

For a good economy, inflation should be 3-7%.

28/01/2021

There are three broad sectors of economy:

Agriculture

Industry

Service

Each of these sectors have sub-categories.

* In India:

20% Agriculture

Industry 25%

Service 55%

Percentage denotes contribution to GDP.

60% of India's employment is under agriculture. So, productivity in agricultural sector is quite low. In fact much of that 60%, are "disguised unemployed".

Unemployment Rate :-

Unemployed is a person in his/her working age who is not working and is looking for job.

Working age : 15-60 yrs.

$$\text{Unemployment rate} = \frac{\text{No. of unemployed people}}{\text{No. of people in working age}}$$

Say if 3 brothers are working on a farm. The fourth brother is working with them, but is looking for a job.

3 bros ⟶ 100 ton produce } on same land.
4 bros ⟶ 100 ton produce }

∴ 4th brother does not provide additional productivity.

Hence, he is "disguised unemployed".

Tax

- Direct Tax
  - Eg: Income tax, Corporate tax.
- Indirect Tax
  - Eg: GST.

When the tax burden can be transferred from one person to another person ⟶ Indirect tax.

Cannot be transferred ⟶ Direct Tax.

08/02/2021

Working age population − Not working and not looking for job = Labour force.

Labour force = $\underbrace{\text{Working}}_{\text{Employed}}$ + $\underbrace{\text{Not working (but looking for job)}}_{\text{Unemployed}}$

Unemployment rate = $\frac{\text{Unemployed}}{\text{Labour force}} \times 100$.

Production:

Main activity of a firm is to make a process to convert inputs into outputs.

$$Q = f(L, K)$$

Q: output, L: Labour,

K: Capital (Latin: Kapita'l).

Marginal product of an input:

$MP_L = \frac{\partial Q}{\partial L}$ = Additional output that can be produced by employing an additional unit of labour, holding K constant.

Similarly,

$MP_K = \frac{\partial Q}{\partial K}$ = " (with similar changes in words).

$MP_L > 0$, $MP_K > 0$.

Returns to scale:-

$$Q = f(L, K)$$

* If labour and capital are increased by t-fold and output increases by t fold, then the production function exhibits constant returns to scale.

* If output increases less than t fold, then production function exhibits decreasing returns to scale.

* If " " more than t-fold, " "
" " increasing " " " .

* $Q = A L^{\alpha} K^{\beta}$

$$Q' = A (tL)^{\alpha} (tK)^{\beta}$$

$$= t^{\alpha+\beta} A L^{\alpha} K^{\beta}$$

$$= t^{\alpha+\beta} Q.$$

If $\alpha+\beta = 1 \Rightarrow$ CRS

$\alpha+\beta > 1 \Rightarrow$ IRS

$\alpha+\beta < 1 \Rightarrow$ DRS.

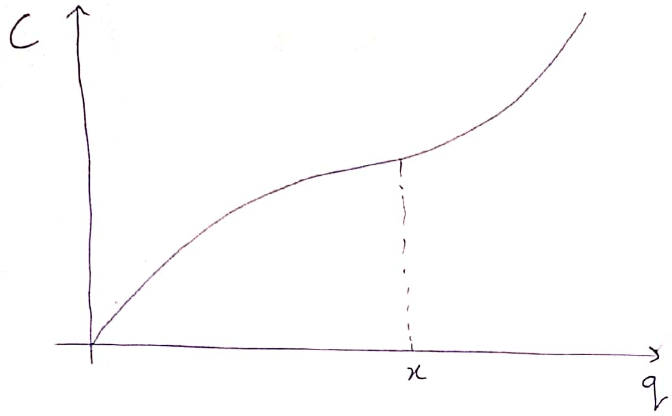
Scanned with CamScanner

Cost of Production :-

$$C = f(q)$$

→ Fixed Cost (Eg: maintenance charges, basic labour charges, etc...

→ Variable Cost (To increase production than the basic amt, you need to spend more. This comes under Variable Cost).



x is the optimal point of your production.

Marginal Cost $= \frac{\partial C}{\partial q}$. (MC)

Average Cost $= \frac{C}{q}$. (AC)

→ Additional cost incurred by a producer to produce an additional unit of good.

Note that MC decreases till x and increases after.

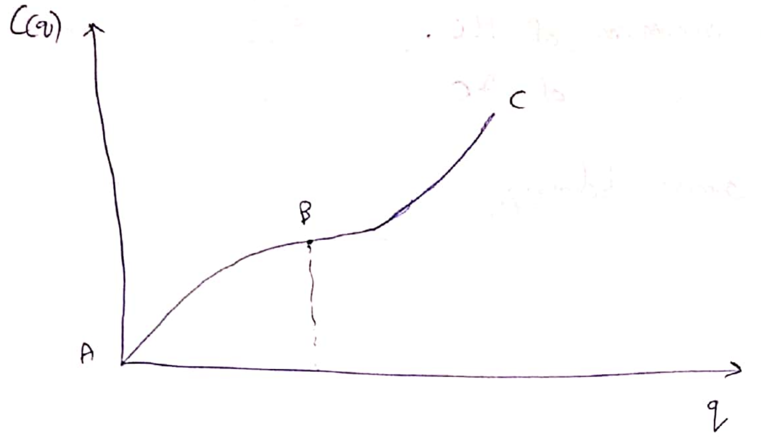
This is because, with the initial machinery, labour etc..., we don't have to spend a lot more to produce more. Later, the maximal point for this is reached, and we need to ~~start~~ spend more (eg: get new machines, more labour force, etc...) for more production.

02/02/2021

Cost

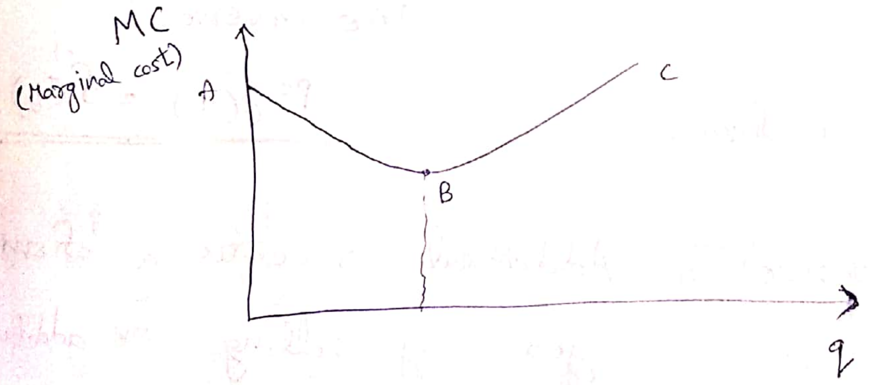
$C = c(q)$

$q = q(L, K)$.



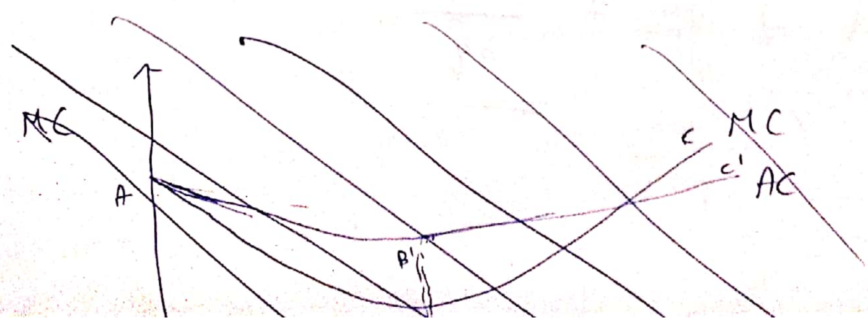
AB: Cost increases at ~~an~~ a decreasing rate, Marginal cost ↓s.

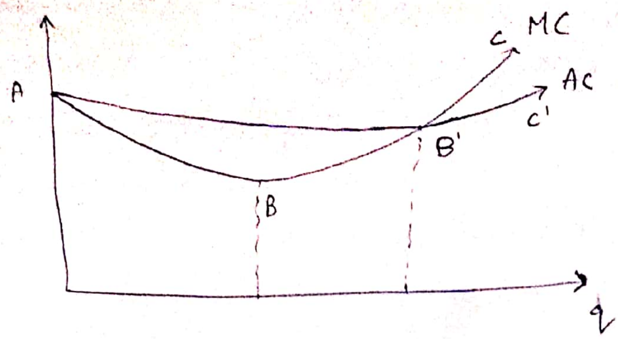
BC: Cost increases at an increasing rate, Marginal cost ↑s.



$$MC = \frac{\partial c(q)}{\partial q}$$

Average cost (AC) : $\frac{c(q)}{q}$.





B – Point of local minimum of MC.

B' – " " " " of AC.

MC intersect AC from below.

Revenue: (R)

$R = P.q$ P – price

q – qty. demanded

$= g(q) \cdot q$

$= h(q)$

We already know:

$q = f(P)$ } demand curve.

Take inverse:

$P = g(q) = f^{-1}(q)$.

Revenue of a firm.

MR (Marginal revenue) = Additional revenue a firm gets by selling an additional unit of output.

$$= \frac{\partial R}{\partial q}.$$

Profit Maximization :-

Profit is denoted by π.

$$\pi = R - C \quad (R - \text{Revenue},\ C - \text{cost}).$$

$$= R(q) - C(q)$$

$$\frac{\partial \pi}{\partial q} \Rightarrow \frac{\partial R(q)}{\partial q} = \frac{\partial C(q)}{\partial q}.$$

$$\Rightarrow \underline{\underline{MR = MC.}}$$

Relationship between price and MR :-

$$R = P \cdot q.$$

$$MR = \frac{\partial R}{\partial q} = P + q \cdot \frac{dP}{dq}$$

$$= P \left(1 + \frac{dP}{dq}\frac{q}{P}\right)$$

$$= P \left(1 + \frac{1}{\frac{dq}{dP} \cdot \frac{P}{q}}\right)$$

$$= P \left(1 + \frac{1}{e_{q,P}}\right)$$

$\rightarrow$ Price elasticity.

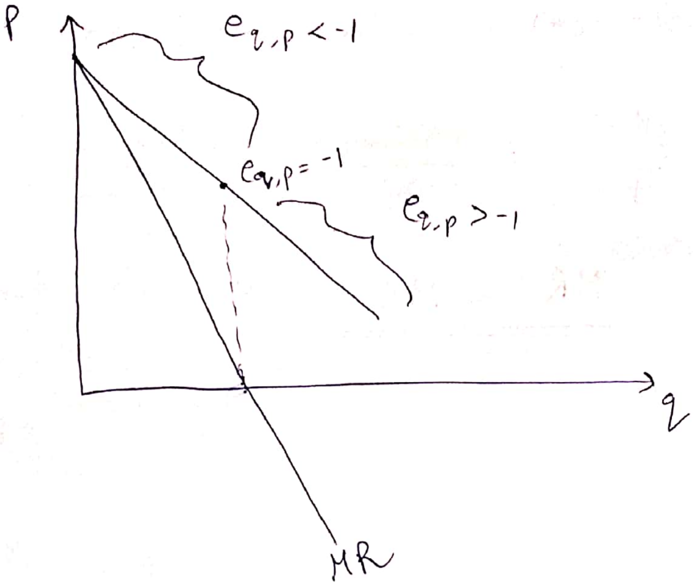
~~When e_P~~

When $e_p = -1$, $MR = 0$

$e_p > -1$, $MR > 0$

$e_p < -1$, $MR < 0$.

ie;



04/02/2021

Market Structure

* Number of players/firms.

One-firm market:

- This type of market is called Monopoly.
- The firm is called monopolist.
- Eg: Electricity.

Two firm market:

- This type of market is called Duopoly.

→ More than two firms ~~Oligopoly and~~

Few firms — A large no. of firms.

Few firms : Market structure called Oligopoly.

Eg: Sports, garments.

Large # of firms : Market structure called Perfect Competition.

Eg: Most of the goods nowadays.

* Market Power decreases with increase in # of firms.

The power of deciding the price, etc... (power over the market).

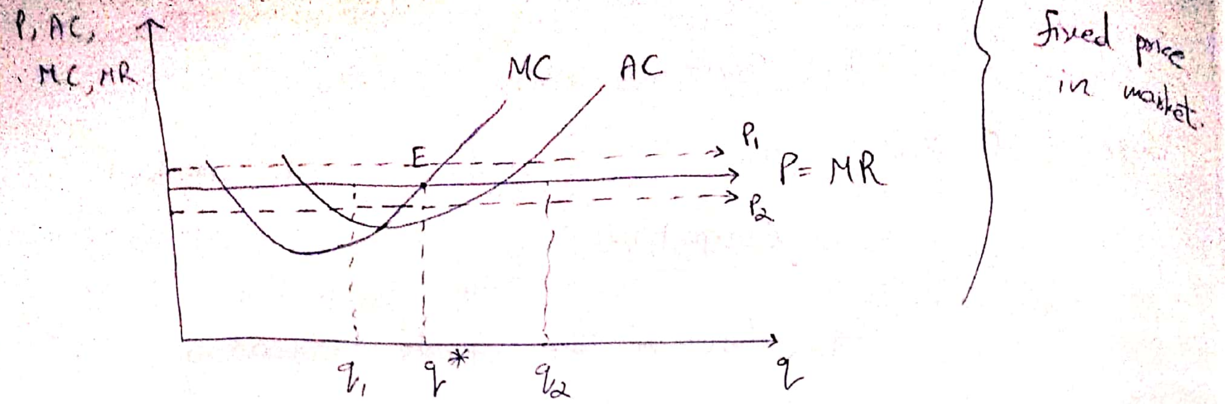
(If you increase price too much, you may lose customers).

Perfect competition:-

1. A large number of sellers.
2. A large number of buyers.
3. Free entry / exit of sellers.
4. All sellers sell homogenous product.
   ↳ ie; product of each seller is a perfect substitute for each other.

↳ These are the characteristics of perfect competition (actually, these are the axioms through which one defines perfect competition).

1, 2, 3, 4 ⇒ A firm is a price taker, ie; firm has to accept the market price. Only thing firm can change is the # of products to sell.



Profit Maximisation happens when $MR = MC$, ie, at E.

E is the point of equilibrium (maximum profit).

Firm's profit maximising output is q^*.

Equilibrium means, firm reaches this point at the end starting from any nearby point.

Say at q_1: We have more revenue than cost

$\Rightarrow$ Firm increase production and moves towards q^*.

At q_2: Revenue < Cost $\Rightarrow$ Firm decreases production

$\Rightarrow$ Firm move towards q^*.

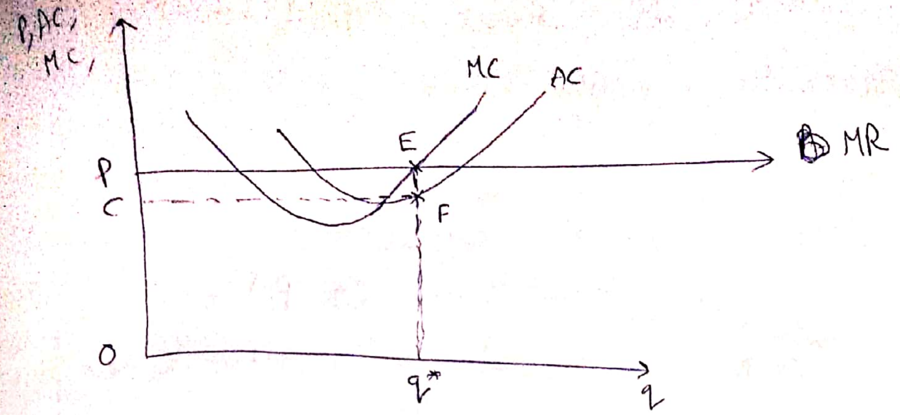
$\therefore$ q^* is the point of equilibrium.

For higher price P_2, higher q_2 is the point of equilibrium.

For lower price P_1, lower q_1 is the point of equilibrium (However, price shouldn't be too)

↳ See next page.

Scanned with CamScanner



R = Area of rectangle Oq^*EP.

C = Area of rectangle CFq^*O.

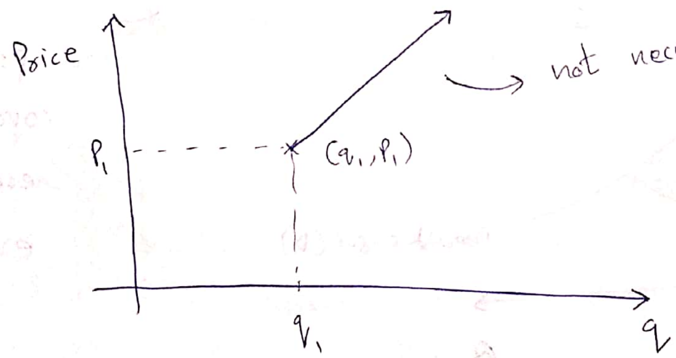
⇒ Profit = Area of PCFE.

* If price falls and reaches the minimum point of AC, then there is zero profit.
* If price falls below that, then firm is at loss ~~and~~ (ie; negative profit).

~~∴ The point where min. point of AC is~~

∴ The minimum point of the AC curve is called the Breakeven point.

So, now we get a supply curve:



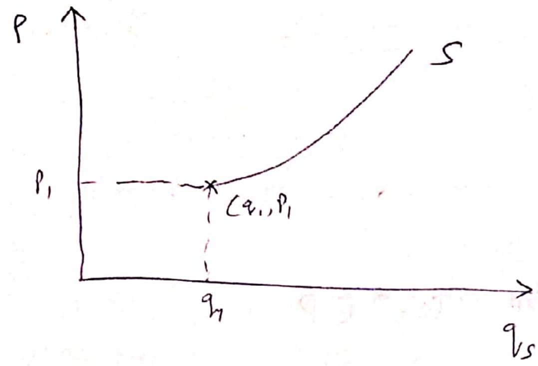
→ not necessarily a stright line.

(q_1, P_1) is the breakeven point.

↳ This is the individual supply curve.

↳ Point of this is to show that there is no supply below breakeven point.

So, once we collect all firm's supply curves, we can get the aggregate supply curve.



(q_1, P_1) is the breakeven point.

<u>Note:</u> Supply curve is +vely sloped (otherwise there would be problem because:

Higher Production should be accompanied with a higher price, otherwise firm will be at loss).

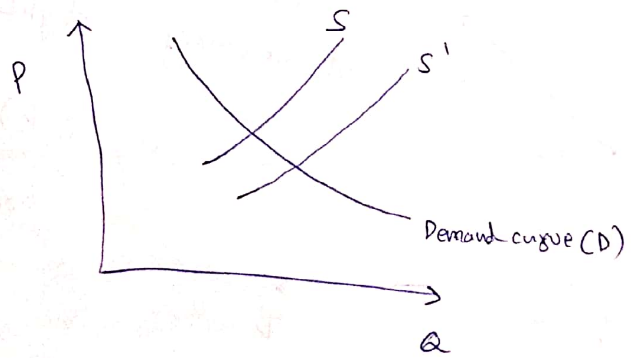
<u>08/02/2024</u>

<u>Dynamics in Perfect Competition:</u>

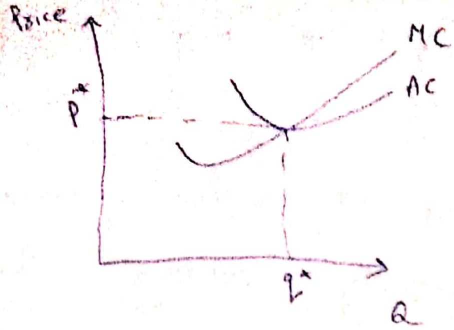
Excess profit $\Rightarrow$ entry of new firms. → ($\because$ there is free entry of firms)

($\because$ we r lookin at aggregate supply curve) $\Rightarrow$ supply curve shifts rightward ($S \to S'$)
$\Rightarrow$ decrease in price $\Rightarrow$ profit reduces

This process will continue till there is no excess profit.



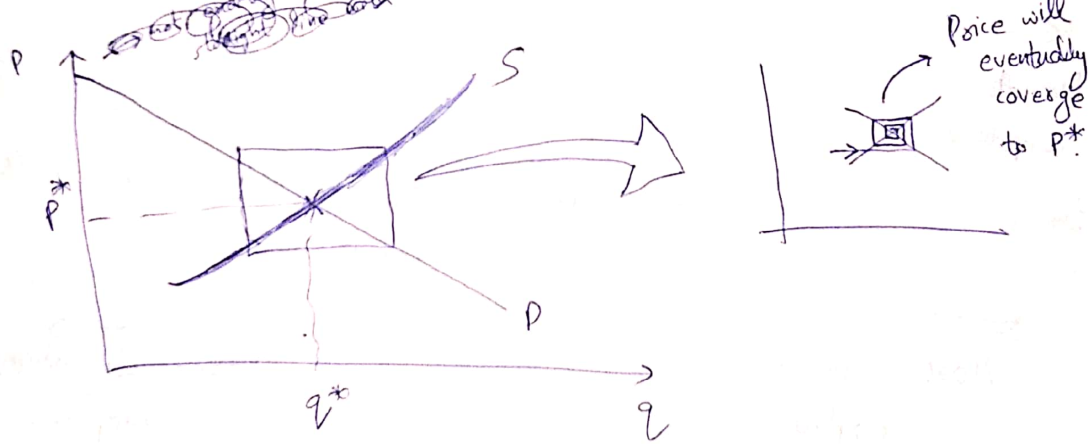
So in the long run equilibrium, there wouldn't be any excess profit.



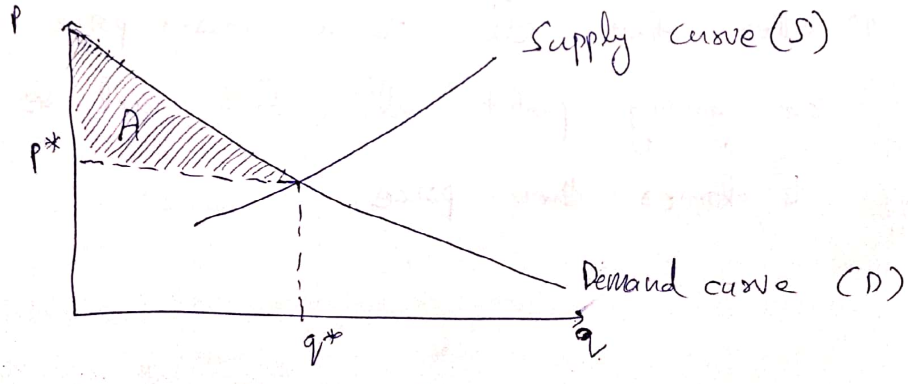
$\therefore$ p* will be the ~~low~~ price in the long run.

Similarly, if there is loss, some firms exit and supply curve shifts leftward $\Rightarrow$ price rises
$\Rightarrow$ profit increases (or loss decreases)
till it reaches eqlbm point p* (price).

Consumer's surplus :-



So, now lets look at the curves.



Shaded area A is called the consumer surplus.

Some consumers are willing to buy the product despite the high prices, but since the price is lesser and everyone buys at that lesser price, these consumers are actually "saving" their money.

This is called consumer surplus } amt. how much they save.

* In a perfectly competitive market, consumer surplus remains completely with the consumer.

So, if we choose consumer surplus as a measure of welfare → it is maximum in a perfectly competitive market.

Perfect Competition ⟷ Monopoly

Two ends of the market structure

← More consumer surplus

Lesser consumer surplus. →

because the firm cannot decide the price.

If other firms sell at a lower price and are gaining profit, all firms will be forced to lower their price.

Monopoly:

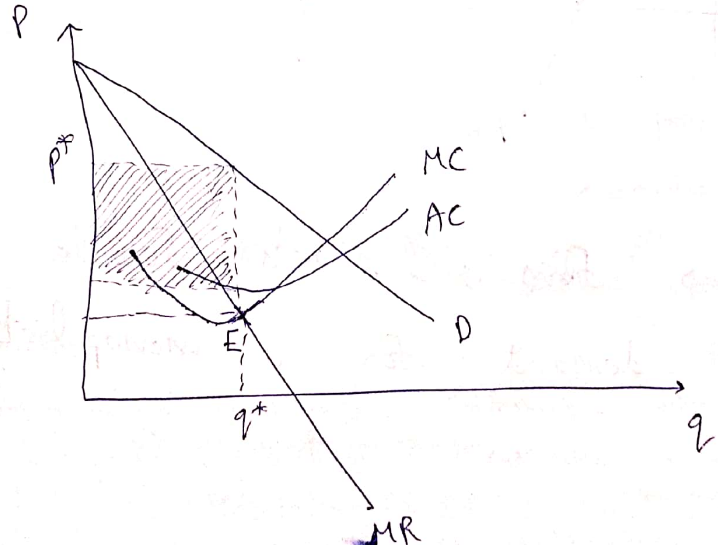
* One firm.
* Many consumers.
* Sells product that does not have close substitutes.

Reasons for monopoly: (ie; why monopoly emerges)

* Technology (possesion of exclusive technology).
* Market. (The market is such that, if you allow a lot of firms, many ~~none~~ will gain significant profits and they'll drop out).
* Investment.
* Societal concern.
  ↳ Eg: We can't leave defense production to lot of firms. We have to give it to government firms, or private firms whom we can trust.

11/02/2021

In monopoly, the market demand curve is the firm's demand curve.



Shaded region is profit.

E is the eqlbm point.
(ie; where MR = MC).

Profit Maximisation:

$$MR = MC \Rightarrow P\left(1+\frac{1}{e_p}\right) = MC$$

$$\Rightarrow P + \frac{P}{e_p} = MC$$

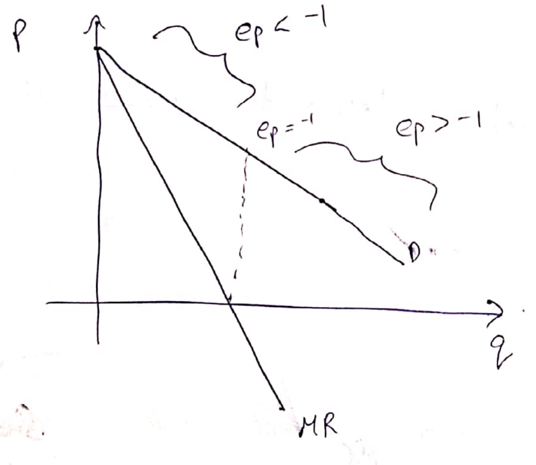
$$\Rightarrow P - MC = \frac{-P}{e_p}$$

$$\Rightarrow \frac{P-MC}{P} = \frac{-1}{e_p}.$$

$\left(\frac{P-MC}{P}\right)$ is called mark-up.

Mark-up is inversely related to price elasticity.

If $e_p > -1$ then MR is $-ve$. Hence firm will not operate in the region of the demand curve where MR is $-ve$.



$e_p < -1 \Rightarrow$ feasible part of demand for a monopolist.

Monopoly price is higher than the competitive price.
Therefore consumer surplus is reduced for monopoly.

Reference for monopoly: Same book. In chapter called monopoly, we covered first two sections so far. We'll be covering two more sections (not 3 and 4).

Price discrimination :-

* Charging different price to different buyers.

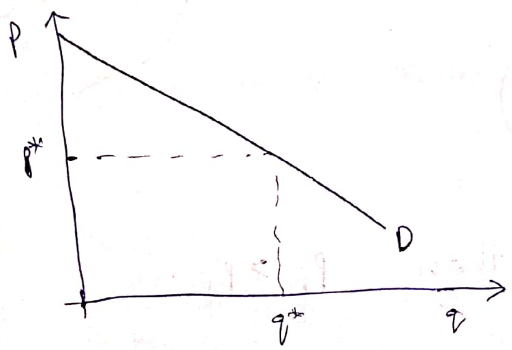
Eg: Electricity → for commercial use and domestic use, prices are different.

Airplane ticket → if you buy at the last moment, price is higher.

A firm can discriminate based on two ~~of~~ conditions:

1) Market can be divided (Eg: Market in rural, urban).
2) No reselling is possible.

1st degree price discrimination :- (Aka Perfect price discrimination).



Seperate price for each consumer

⇒ All Consumer surplus is lost.

Information requirement (about consumer) is huge on the part of the firm.

Eg: Lawyer's Fee, ~~people~~ people who know your vulnerability or willingness / ability to pay.

Scanned with CamScanner

3rd degree price discrimination:-

* Markets are properly segregated.
  → Eg: Rural / Urban, domestic \ international (foreign).

  Eg: Electricity.

  Two rates for the same product

  (Eg: Tourism - rate maybe different for you and your foreign friend.

* Reselling is not possible.
  ↳ Eg: (1) You cannot buy electricity at rural place and sell it to urban area.
  (2) You cannot buy same rate ticket for your foreign friend.

→ MC of production is same.

Equilibrium condition:

$$MR_i = MR_j = MC$$

} Think about this.

$$P_i\left(1+\frac{1}{e_{p_i}}\right) = P_j\left(1+\frac{1}{e_{p_j}}\right)$$

i,j are markets

Eg: Market i = Rural,

Market j = Urban.

$$\Rightarrow \frac{P_i}{P_j} = \frac{\left(1+\frac{1}{e_{p_j}}\right)}{\left(1+\frac{1}{e_{p_i}}\right)}$$

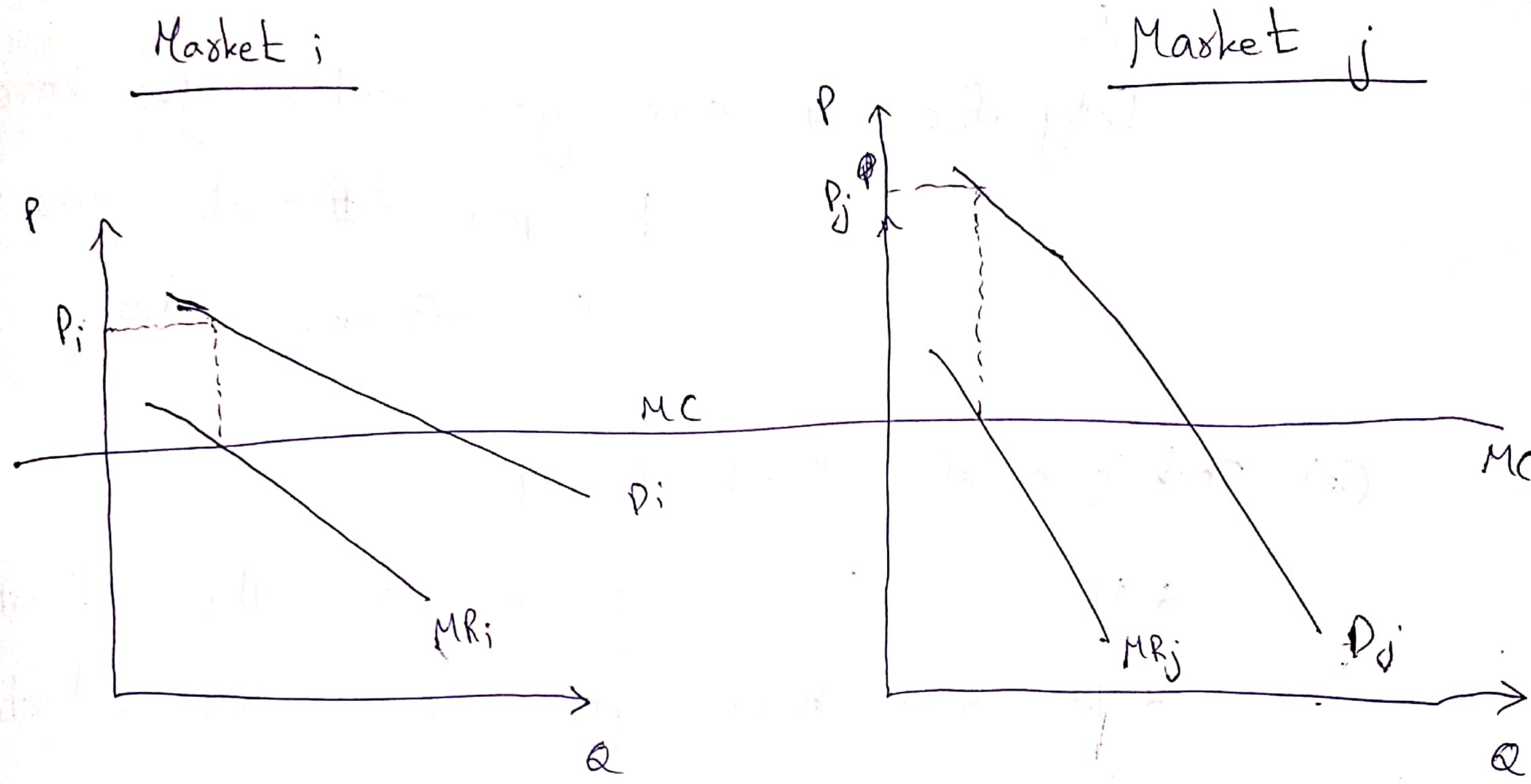
$\Rightarrow$ If $e_{p_i} < e_{p_j}$, then $P_i > P_j$.

Eg: elasticity in Urban area is less

$\Rightarrow$ Higher price compared to Rural.

Graphically speaking,

MC is constant



Price elasticity for demand is higher in market i than market j

$\therefore \quad P_i < P_j$

A detailed picture is attached.

2nd Degree of Price Discrimination:-

So far, we saw that monopolists seperated demanders into identifyable categories and select profit-maximising price for each category.

An alternative approach is ~~to~~ for the monopolists to choose a price schedule that provides incentives for demanders to separate themselves depending on how much they want to pay.

Eg: (1) Amusement Park.

↓

Entry fee + once you enter, you have to pay different prices for different rides.

(2) Technique of Block pricing:

* If you buy qty. 0-a, then 1st rate.
* If you buy qty. a-b, then 2nd rate.

(3) As a producer, I don't know how much you'll pay for flight ticket.

∴ I categorize price based on urgency/need.

Last minute tickets are much costlier than buying earlier.

So, in short:

Perfect Competition ———————————— Monopoly

(Two ends of a rope)

Perfect Competition	Monopoly
→ Price low.	→ High Price.
→ Firms can't decide price.	→ Firm decides price.
→ Consumer surplus remains with consumer.	→ Consumer surplus is captured by firm.

* —— End of Microeconomics —— *

Macroeconomics:-