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Info point & Formulaes in Economics

1) Profit = Revenue − Cost

- Business profit / Accounting
  - ↓
  - = Revenue − Explicit Cost
- Economic Profit
  - = Revenue − Implicit − Explicit

2) Equilibrium ⇒ $Q_d = Q_s$
   - Q_d → demand
   - Q_s → supply

3) Price cieling ⇒ leads to shortage
   Price floor ⇒ leads to surplus
   & Price floor > Price ceiling

4) Tax (T)

- Imposed on Seller
  - ↓
  - Supply curve shift upward by 'T'.
- Imposed on buyer
  - ↓
  - Demand Curve shift downward by 'T'

To Solve Tax Question

Tax on seller : Write 'P' in term of Q_s & add Tax on RHS
i.e. $P = f(Q_s) + T$
& then find equilibrium with demand equation.

Tax on buyer

↓

Work P in terms of Q_d & subtract Tax 'T' on RHS

$$P = f(Q_d) - T$$

& the fd equilibrium with supply equation

5) Elasticity :

$$E = \frac{\% \Delta A}{\% \Delta B}$$

Price Elasticity of demand

$$E_p = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q} \quad \text{(Point Elasticity)}$$

$$E_p = \frac{Q_2 - Q_1}{P_2 - P_1} \times \frac{P_2 + P_1}{Q_2 + Q_1}$$

6) Inelastic Demand: $-1 < E_p < 0$

Unitary elastic demand: $E_p = -1$

Elastic demand: $E < -1$

7) $TR = P \times Q$

$MR = \frac{dTR}{dQ}$

8) ~~Q~~ ~~P~~ $Q = B + a_p P$

then $MR = B + (2) a_p P$

Slope becomes Twice

9) $(TR) \Rightarrow$ Max when

$MR = 0$ & $E_p = -1$

10) ~~$MR = P\left(1 + \frac{1}{|E_p|}\right)$~~ Put E_p ~~here~~ -ve

10) $MR = P\left(1 + \frac{1}{E_p}\right)$ → Put 'E_p' -ve here

11) Elastic Demand ($E_p < -1$)

P↑ Q↓ = TR↓ P↓ Q↑ = TR↑

Inelastic Demand ($E_p < 0$)

P↑ Q↓ = TR↑ P↓ Q↑ = TR↓

* less elastic Demand
  ↓
  When few substitutes, Requires small portion of total expenditure, less time available to adjust for price

* More elastic Demand
  ↳ write opposite of above

12) Income elasticity

$$E_I = \frac{\Delta Q}{\Delta I} \times \frac{I}{Q} \quad \text{(Point)}$$

$$E_I = \frac{(Q_2 - Q_1) \times (I_2 + I_1)}{(I_2 - I_1)(Q_2 + Q_1)}$$

13) E_I (Income elasticity) = +ve

↳ Normal goods

Necessities
$0 < E_I < 1$

Luxuries $\Rightarrow E_I > 1$

E_I = -ve $\Rightarrow$ Inferior goods

14) Cross Price Elasticity → Change in quantity 'x' due to change in price of 'y'

$$E_{xy} = \frac{\Delta Q_x}{\Delta P_y} \times \frac{P_y}{Q_x}$$

$$E_{xy} = \frac{Q_{x_2} - Q_{x_1}}{P_{y_2} - P_{y_1}} \times \frac{P_{y_2} + P_{y_1}}{Q_{x_2} + Q_{x_1}}$$

$E_{xy} > 0 \Rightarrow$ Substitutes

$E_{xy} < 0 \Rightarrow$ Complement

Consumer Choice

* Individuals can rank their preferences
* Non-satiation: People prefer more to less
* Transitivity: Ranking are consistent
* Give up smaller amount of one good in order to get additional units of other good.
* Indifference curve more towards right means more satisfaction
* No intersection of curve possible due to transitivity
* Downward slopping: due to Non-satiation
* Convex to origin

15) Marginal Rate (MRS): of Substitution $-\frac{MU_x}{MU_y}$

16) Total utility = $MU_1 + MU_2 + \dots$

17) Budget line

$$P_x \times Q_x + P_y Q_y = \text{Total Income}$$

$$\text{Slope} = -\frac{P_x}{P_y}$$

18) Utility Maximization

$$-\frac{P_x}{P_y} = -\frac{MU_x}{MU_y} \Rightarrow \frac{P_x}{P_y} = \frac{MU_x}{MU_y}$$

Forecasting

- Qualitative Method
  - Opinion of Expert
- Quantitative Method
  - Rely on data & analytical techniques
    - Time Series
      - Trend Projection
      - Exponential Smoothing
      - Moving Average
    - Associative
      - Linear Regression

1a) Regression line

dependent ← $Y = a + bX$ → Independent

To find a & b

$$\Sigma y_i = na + b\Sigma x_i$$

$$\Sigma x_i y_i = a\Sigma x_i + b\Sigma x_i^2$$

OR

$$a = \frac{\left[\Sigma y_i \Sigma x_i^2 - \Sigma x_i \Sigma x_i y_i\right]}{n\Sigma x_i^2 - (\Sigma x)^2}$$

$$b = \frac{\left[n\Sigma x_i y_i - (\Sigma x_i)(\Sigma y_i)\right]}{n\Sigma x_i^2 - (\Sigma x)^2}$$

2a) Standard Error (S_ε):

$$\sqrt{\frac{\Sigma (Y_i - \bar{Y})^2 - \hat{b}\Sigma (X_i - \bar{X})(Y_i - \bar{Y})}{(n-k-1)}}$$

→ degree of freedom

where n = No of observation

k = No of independent variable in equation

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~~More S_e ⇒ More strong the relation~~

S_e ⇒ it is probable error in predicted values

21) Range of Y : $Y \pm t_{n-k-1} S_e$

Testing Regression Estimates

1) Coefficient of Determination (R^2)
⇓
Test the overall equation & show the strongness of the relation between dependent & independent variable

The t-stat
⇓
Test relationship between each independent variable & dependent variable individually

22) $R^2 = \frac{\sum(\hat{Y}_t - \bar{Y})^2}{\sum(Y_t - \bar{Y})^2}$

23) ~~$\sum(Y_t - \bar{Y})^2 = \sum(Y_t - \hat{Y}_t)^2$~~

23) $\sum(Y_t - \bar{Y})^2 = \sum(Y_t - \hat{Y}_t)^2 + \sum(\hat{Y}_t - \bar{Y})^2$

Total variation = Unexplained variation + Explained variation

⇒ More value of R^2 ⇒ More strong relationship

Implies independent variable explains R percent of the dependent variable

24) Coefficient of Correlation (r) $= \sqrt{R^2}$

$= R$

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The t- Static

$$t = \frac{\hat{b}}{S_b}$$

$$S_b = \sqrt{\frac{\Sigma (Y_t - \hat{Y}_t)^2}{(n-k-1)\left(\Sigma (X_t - \bar{X})^2\right)}}$$

If Calculated value > tabular value

⇓

Strong Relationship

2) Confidence Interval

$$\hat{b} \pm t_{n-k-1} \hat{S}_b$$

Goods

- Capital Goods ⇓ Required for production of other goods
- Durable Consumer goods ⇓ Used Repeatedly
- Non-durable Consumer goods used ⇓ only once like food

Trend

* Secular Trend : long run increase or decrease in data series
* Cyclical : Changes that occur over year
* Seasonal => Regular recurring fluctuations
* Irregular or Random
  Ex: due to unique events
  (Ex: Covid-19)

26) Trend projection

$$S_t = S_0 + bt$$

where S : Sales
t : time

27) Seasonal adjustment

Ratio = Actual / Trend forecast

Seasonal adjustment : Average of Ratios for each seasonal period

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28) Adjusted forecast = Trend forecast * Seasonal Adjustment

Limitation of Trend Analysis

⇒ Limited to short term
⇒ Assume historical relationship will not change
⇒ Fluctuations in economic growth

Smoothing Technique

Moving Average

Exponential Smoothing

29) $RMSE = \sqrt{\frac{\Sigma(A_t - f_t)^2}{n}}$

Production

Inputs

- Land
- Labor
- Capital
- Enterprise

$Q = f(L, K)$

Short Run

Only one variable factor i.e L or K

30) Total Product = Q

Average Product (AP_L) = $\frac{Q}{L}$

Marginal Product (MP_L) = $\frac{dQ}{dL} = \frac{\Delta Q}{\Delta L}$

Here L is the variable factor considered.

31) Elasticity = $\frac{\Delta Q}{\Delta L} \times \frac{L}{Q} = \frac{MP_L}{AP_L}$

* Law of Diminishing Marginal Returns

It says that as additional units of an input is used in production process while all other input are constant, then it result increment in output till some point, After that more addition leads to decline in marginal product of that variable.

3) Stages of production

Stage 1:

⇒ Marginal product reaches max & start declining

⇒ Avg product increases but slower than Marginal pro

MP_L = +ve

MP_K = -ve

Stage 2:

Marginal Product intersect Average product after which average product starts to decline continously

MP_L & MP_K = +ve

Stage 3

Marginal product become Negative

& Average product also continues decline but is positive

MP_L = -ve

MP_K = +ve

33) $MRP_L = MRP_C$

Likewise

$MRP_L = (MP_L) \times MR$

$MRP_C = \frac{\Delta TC}{\Delta L}$

34) In case of labour

$\therefore MRP_C = w$ (wage of labour)

So $MRP_L = MRP_C = w$

Long Run

35) Firms will only use combination in isoquants where they are negatively sloped.

36) MRTS (Marginal Rate of Technical Substitution) $= \frac{-MP_L}{MP_C}$

37) Isocost lines

Total Cost = $wL + rK$

where $w \Rightarrow$ wages
$r \Rightarrow$ cost of capital

Slope = $-\frac{w}{r}$

Optimal Input Combination

$$MRTS = \frac{MP_L}{MP_K} = \frac{w}{r}$$

38) Return to Scale

- Increasing
- Decreasing
- Constant

for given equal
Put K & L 2 times
if the answer is 2 times the previous ⇒ then Constant
> 2 ⇒ Increasing
< 2 ⇒ Decreasing

39) Cobb-Douglas Production Function

$$Q = AK^a L^b$$

⇓

To check Return to scale

Replace $K = 2K$

& Replace $L = 2L$

we get

$$Q' = 2^{a+b} Q$$

If $a+b=1$ ⇒ Constant Return to scale

$a+b > 1$ ⇒ Increasing

$a+b < 1$ ⇒ Decreasing

40)

Average Cost = $\frac{\text{Total Cost}}{Q}$

Marginal Cost = $\frac{\Delta TC}{\Delta Q} = \frac{W}{\frac{\Delta Q}{\Delta L}} = \frac{W}{MP_L}$

41) Average Variable Cost: $\frac{TVC}{Q} = \frac{wL}{Q} = \frac{w}{AP_L}$

Average fixed Cost = $\frac{TFC}{Q}$

42) Break Even Analysis

↳ Point where Total Cost = Total Revenue

Also known as Cost Volume Profit Analysis

Quantity at Break Even point $Q' = \frac{TFC}{P - AVC}$

Market Structure

Perfect Competition

⇒ large no. of relatively small buyers & sellers
⇒ Standardized product
⇒ Very Easy market Entry & Exit
⇒ Non-price competition not possible

⇒ Seller is price Taker

⇒ Demand Curve : Horizontal

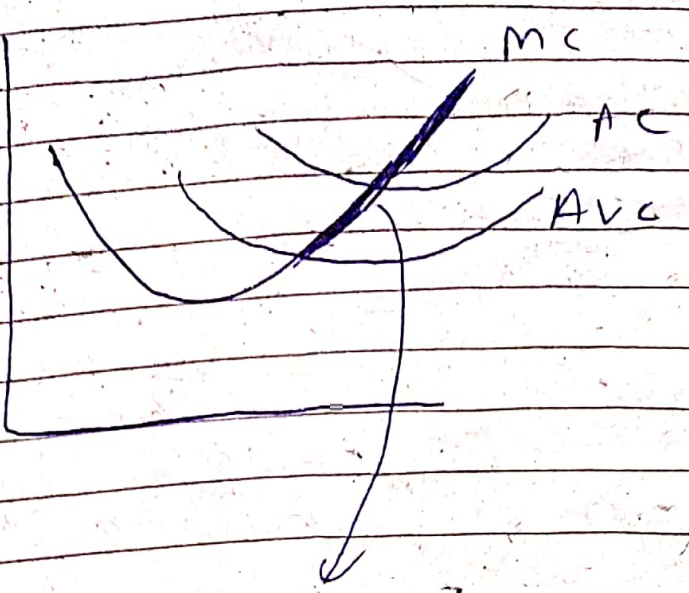
43) $P = MR = MC$ (Short Run)

44) Firm should continue till

$P > AVC$

45) Contribution Margin = $TR - TVC$

TVC → Total variable Cost

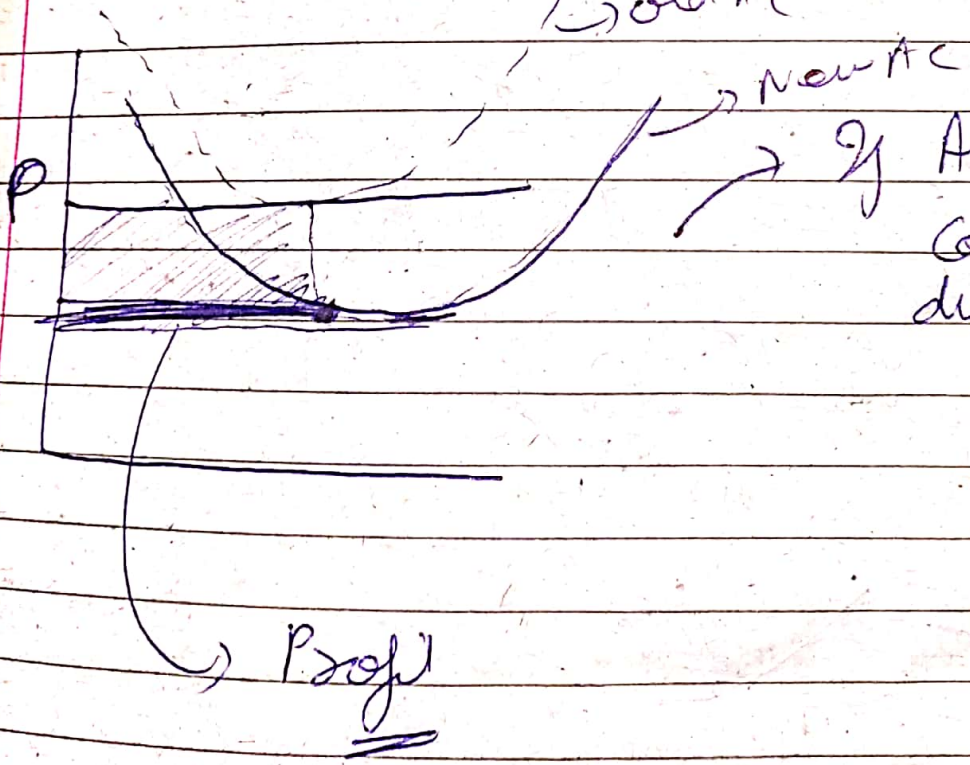


Supply equation of perfect Compet.

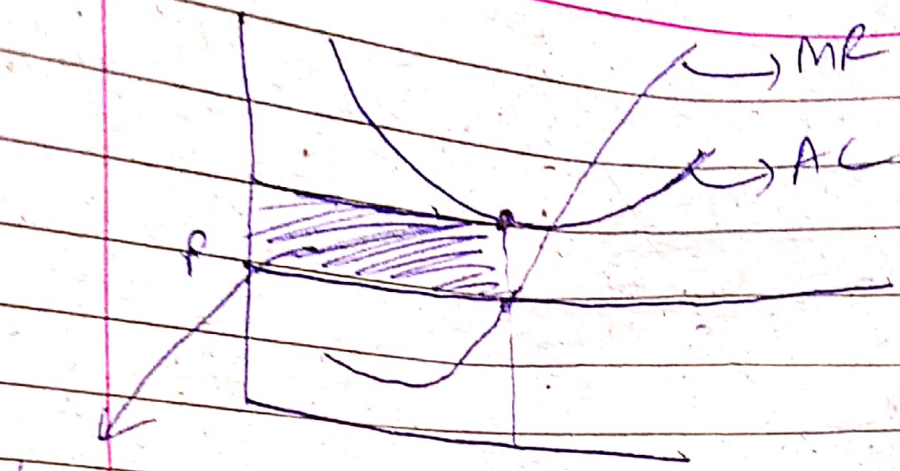
↓

Curve of MC above AVC

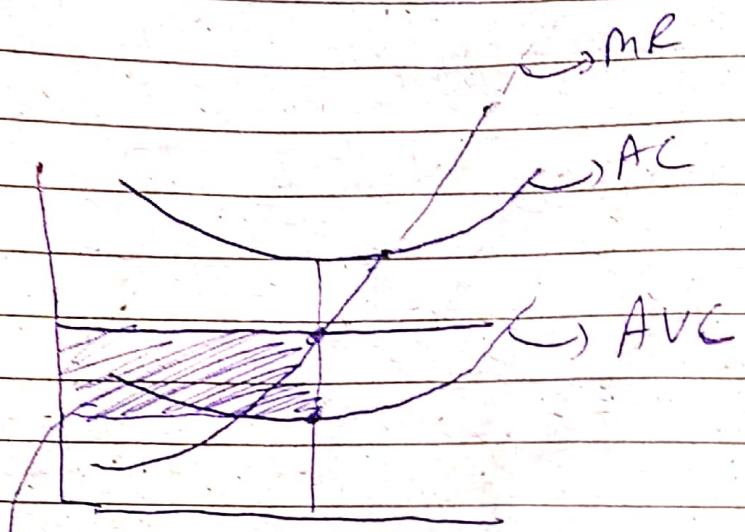
Different Components in Perfect Compet.



↳ If Average Cost decrease due to save rear



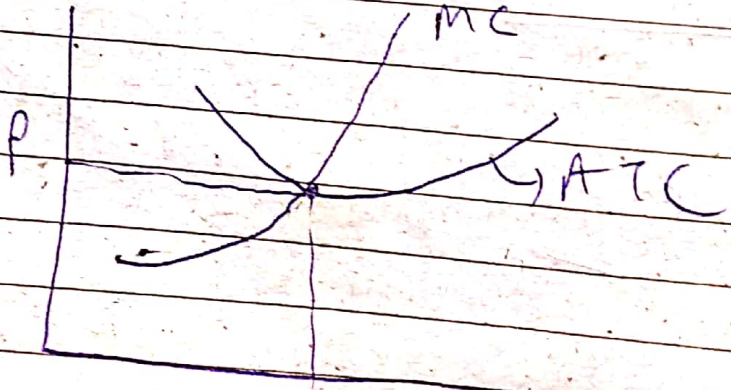
Loss



Contribution Margin

In long run ⇒ Economic Profit = 0

Accounting Profit = Revenue − wL − rK



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16) In long RUN

$P = AR = MC$

In long Run

Not $MR = MC$

Imp point:
In perfect competition we cannot calculate TR using demand equation as one firm more or are less

Monopoly

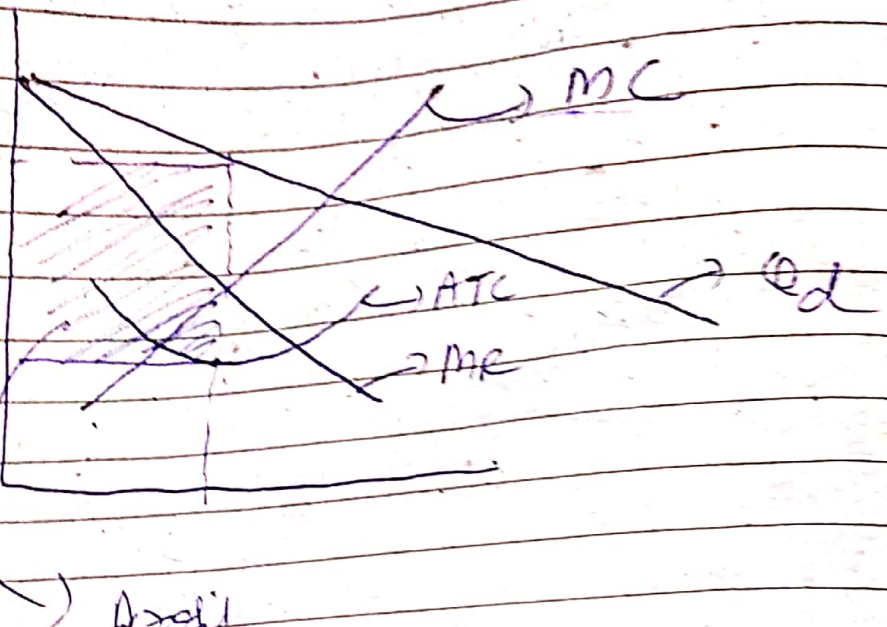
⇒ One firm
⇒ Unique product
⇒ No, entry, exit possible
⇒ Non-price competition not necessary

⇒ Price is excess of MC
⇒ Possibility of price discrimination

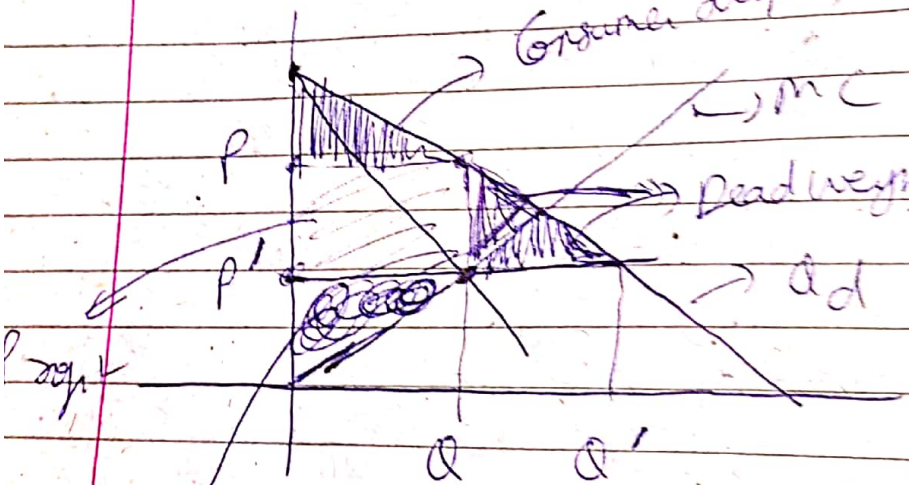
NOTE: Here TR can be calculated using demand equation as whole demand is only one firm unlike in perfect Compete

Profit Maximisation at 'Q' ⇒ where $MC = MR$

Different graphs



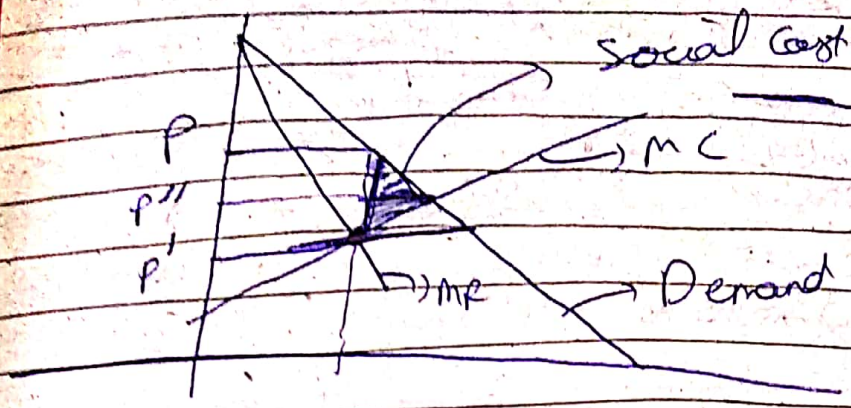
Profit



Producer surplus

P → Price at which monopoly is set

$P' = MC = MR$ (Perfect Competition price)



P'' ⇒ Price where MC intersect with demand line

Monopolistic Competition

⇒ Seller has some control on price
⇒ large no of small firms acting independent
⇒ differentiated product
⇒ Entry & Exit easy
⇒ Non price competition is important
⇒ Each seller target it's own small market segment
⇒ Collusion is difficult
⇒ No firm pays attention to other except they are sensitive to average market price

Note

Demand curve is less elastic than perfect competition but more than monopoly

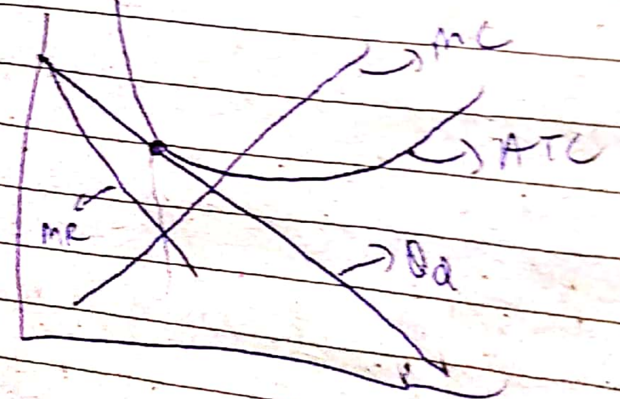
(47) ① MC

Short Run

Quantity that supplied MC = MR
⇓
Then Price for this quantity is set using demand curve

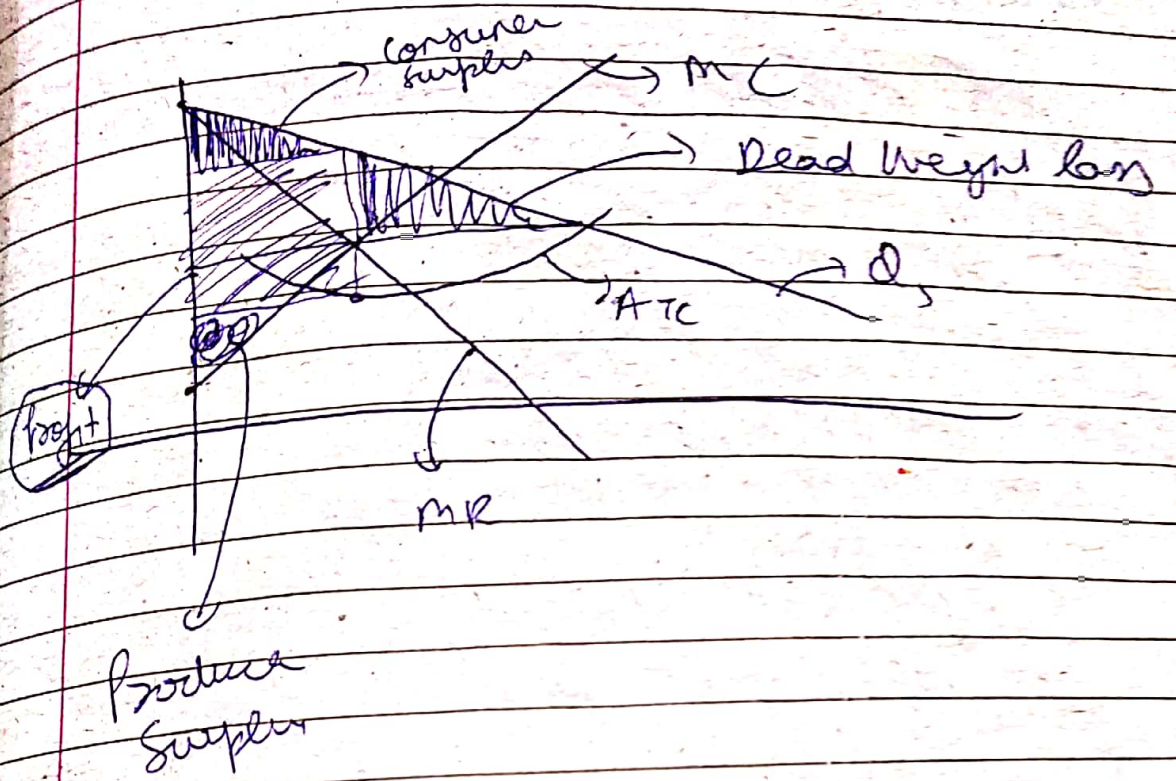
Long Run

⇒ ATC curve ~~bec to~~ rises & has tangent at the Demand curve at Price (p)



Scanned with CamScanner

At this point ATC is not minimum



Oligopoly

⇒ Differentiated or standardised product
⇒ Entry Exit difficult
⇒ Non-price competition
⇒ Few seller to product
⇒ Collusion can occur
⇒ Abnormal Profit

Kinked Demand Curve Model

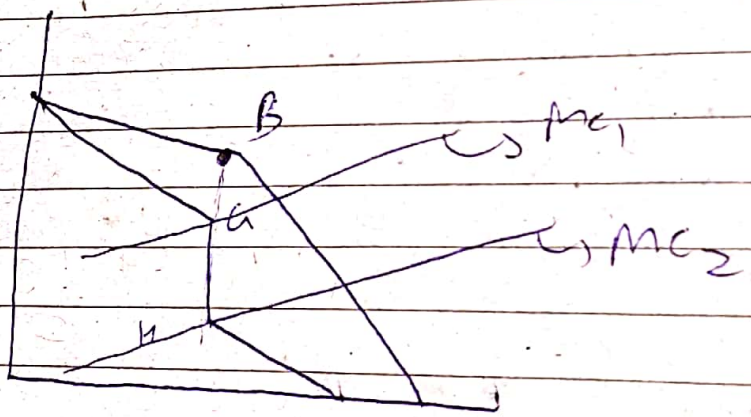
↳ If Oligopolist raise price other seller will not increase price leading to decline in sale of Oligopolist that increased the price

here demand is elastic

But if oligopolist decrease price, other seller will also decrease price leading to very short term profit

here demand is inelastic

So MR will discontinue at this price for given Range



Price will not change if MC_1 & MC_2 lies between G & H i.e. range of MR when it is discontinued

National Income Accounting

National Income : Value of income from sales of good & service in a country

National Accounts :

↳ Records monetary value of goods & services purchased & sold domestically and exported over a period of single year

National Income Accounting

↳ Records all incomes & expenditure that contribute to a country's income & output

NDP

⇒ All goods should be counted only once

⇒ Economic products : Meant for sale, have market value

Non economic products → Not meant to be sold, & no market price

GDP (Gross Domestic Product)

In country boundary

Sum of market values / factor payments of all officially recognized final goods & services

GDP_{MP} (Market value)

GDP_{FC} (Factor cost)

GNP

↳ GDP + All final goods & services outside by the country but owned by country resident

48) $GNP = GDP + NFIA$

49) NFIA = fact payment from abroad — factor payment to abroad

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50) Gross = Net + Depreciation

Net = Gross − Depreciation

51) NDP = GDP − Depreciation

↳ National Domestic product

52) Market Price = Factor price + Net Indirect Tax

53) Net Indirect Tax = Indirect Tax − Subsidies

54) GDP_{mp} = GDP_{fc} + Net Indirect Tax

54) $NGDP_{mp}$ = GDP_{mp} − Depreciation

$NGDP_{mp}$ = GDP_{fc} + Net Indirect Tax − Depreciation

$NGDP_{mp}$ = $NGDP_{fc}$ + NIT

~~55) NNP~~

55) NNP_{mp} = NNP_{fc} + NIT

NNP_{mp} = GDP_{mp} − Depreciation + NFIA

N to G ⇒ Add depressor

D to N ⇒ Add NF, A

FC to mP ⇒ Add N, A

Trick

NNP to GDP Conversion

Start from ~~Right~~ left most letter in Convers

Step 1: ((N)NP)$_{MP}$ to ((G)DP)$_{FC}$

N to G ⇒ add depreciation

Step 2: (N(NP)$_{MP}$ to G(D)P)$_{FC}$

N to D ⇒ Subtract NFIA

Step 3

(NNP)(MP) to G(DP)(FC)

MP to FC ⇒ Subtract NIT

So,

Ans ⇒ GDP = NNP + Depreciation − NFIA − NIT

To Measure National Income

- **Expenditure Method** = Sum of Expenditure of final goods & services
- **Income Method** = Sum of income of factor of production (Rent, profit, Interest, etc)
- **Production Method** = Add sum of value added in each stage

Expenditure Method

$$GDP_{mp} = C + I + G + (X - m)$$

- C → Private final Consumption Expenditure
- I → Investment
- G → Government purchases
- (X − m) → Export − Import

OR

$$C + G = \text{Final Consumption Expenditure}$$

$$I = GDCF\ (\text{Gross Domestic Capital Formation}) + \text{Change in Stock}$$

* Depreciation is also called as Consumption of fixed capital

Income Approach

$$NDP_{fc} = (R) + (I) + (P) + COE + MI$$

R → Rent
P → Profit
I → Interest

COE → Compensation to Employees
↳ Include all wages & benefits given by company or government to employee

MI → Mixed Income
↳ self & Employed people earnings

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Production Based (Value Added Approach)

GDP

GVA_M

GDP_{MP} = GVA at Primary Sector
+
GVA at Secondary Sector
+
GVA at Tertiary Sector

= Sales + Change in Stock
− Intermediate Consumption

$$GVA_{MP} = GDP_{MP}$$ ⇒ Remember