

Past year paper Paper 1 Eco

2008 Q5 (c).

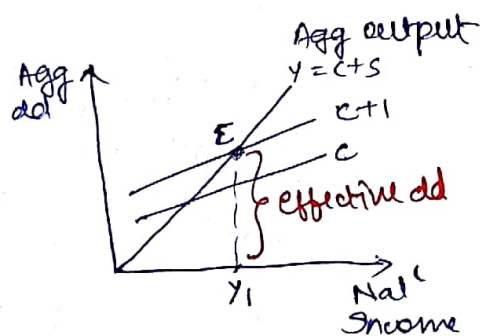
ISLM approach of determining r is improvement, why?

- Initial Keynes model had only goods market E^m , I not determined by r and Marginal efficiency of capital & independent of Y .
- r was determined by money market E^m by dd for a set of money
- But one flaw pointed by economists like Hicks :
change in $r \rightarrow$ changes $I \rightarrow$ changes of P in goods market
But no inverse influence of change in goods market on money market.
- \therefore IS LM model developed as extended Keynesian model
flaw resolved by saying that money demand influenced by income.
- So now $income$ and r jointly determined.

Q3 Principle of effective demand

Effective $dd =$ Particular $Agg\ dd$ which is equal to $Agg\ O/P$
 $= Y_1 E$

Principle of Eff $dd =$ This $Agg\ dd$ determines $Agg\ output\ eq^m$ level of income and emp^t



Imp^{ce} : 1) Unemp^t is due to deficiency in effective dd & so basic remedy is to \uparrow level of ED

- This repudiates Say's law coz $PoED$ establishes that whatever is produced is not automatically consumed nor full emp^t
- Contradicts Pigou's claim of \uparrow wages to \uparrow emp^t. Emp^t depends on Eff. dd so wage cut may or may not \uparrow emp^t
- Explains how & why depression could persist

ED consists of $consumpt^n$ & Inv^t
 As $income \uparrow$ $emp^t \uparrow$, $income$ also \uparrow leading to rise in c but
 by lesser amt than rise in income
 $\therefore c$ lags behind, \therefore to maintain ED at original level
 Inv^t equal to gap b/w c & y must be made
 \therefore ~~inv~~ emp^t cannot \uparrow unless Inv^t expands

Q1 (c) why liquidity trap causing depression?

- ie want to hold on to cash
- 1.) Gloomy economic outlook: consumers, firms, bank
pessimistic abt future so they want to increase
their precautionary savings & do not want to spend
 - 2.) Bad expectation of deflation: If prices falling then
want to keep cash.
 - 3.) Not willing to hold bonds coz think or already v low
so will rise sometime, ie price of bond will \uparrow so
want to keep cash

Paul Krugman believes: Japan has been in this for 2 decades and
post 2008 GFC, US UK Eurozone all in liquidity trap
interest rates near 0 and using QE as unconventional MP so2
can't cut rates anymore

2006 Q5(b) wicksell interest rate ?

There is a natural rate of emp interest rate assumed constant
 if or falls below this \rightarrow inflation
 or exceeds this \rightarrow deflation

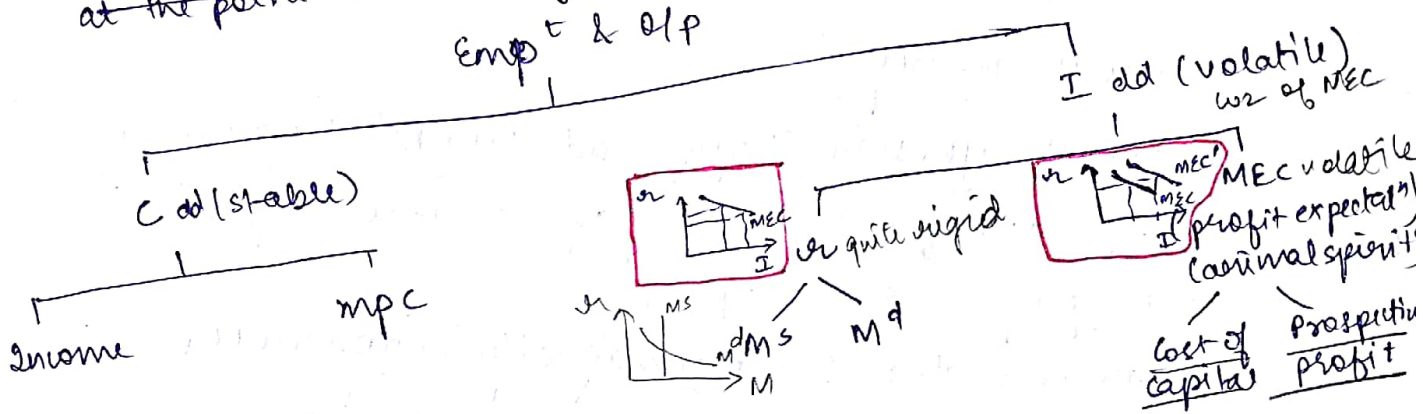
Absolute Income Hypothesis by Keynes

Consumption fn $C = C_a + cY$

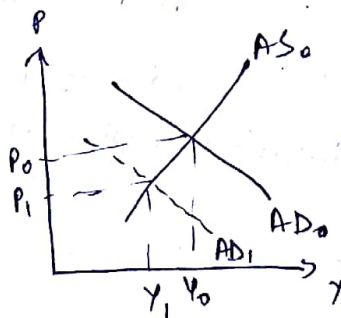
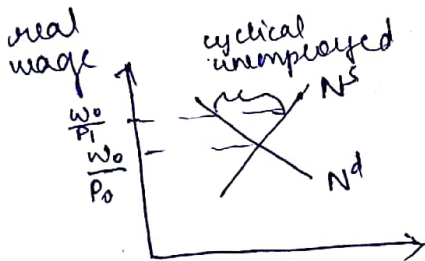
- C fn is stable fn of real disposable income
- $0 < mpc < 1$ Psychological law of consumption
- $mpc < apc$
- $apc \uparrow$ as income rises
- mpc

Theory of Employment of Keynes

1) Level of emp^t depends on Effective Demand (sum of $C + I$)
 at the point where they



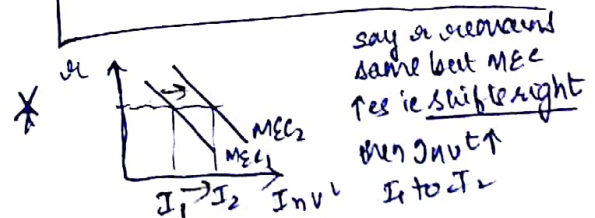
2) money wage rigid - illusion contract law for min wages efficiency wage



flexible price
 Rigid money wage w_0

"animal spirit" - waves of optimism & pessimism which guide investors
 \Rightarrow no intelligent basis for expectation of investors

* 2/6
 ① $mec \downarrow$ (pessimism)
 cause ② $prvt. Inv \downarrow$
 \downarrow
 deficiency in Agg dd
 \downarrow
 Cyclical unemp^t



Patinkin approach of integrating value theory & money theory

- Rejected principle of homogeneity - price changes in same proportion as money circulating (STM connects)
- Rejected dichotomy b/w real & nominal

when money circulating ↑, ppl realize real worth of holding money ↓ (ie value of money ↓) so alter their dd of goods, cash etc

Endogenous money

refers to post Keynesian (Keynes had said M^s exogenously fixed)
 In reality, banks fix M^s (and M^s adjusts accordingly)
 M^s actually by money multiplier,
 If we target M^s then M^s automatically endogenous

STM

Fischer - Role of money - transaction

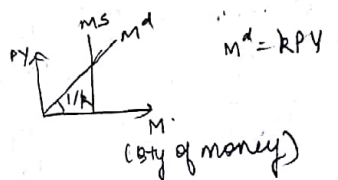
Cambridge - Role of money store of value

Keynes & Friedman - " " " as an asset

Cambridge : $\uparrow M^s \rightarrow \uparrow PT$
 Friedman : $\uparrow M^s \rightarrow \uparrow PYT$

(V assumed constant)

Nominal GDP increases



Friedman : AD is fn of M^s alone ($AD = M^s V$)

Keynes : AD fn of $M^s, I, G, X-M$

M^s affects indirectly, i.e. $\uparrow M^s \Rightarrow r \downarrow \Rightarrow Inv \uparrow \Rightarrow AD \uparrow$
 via Inv^t

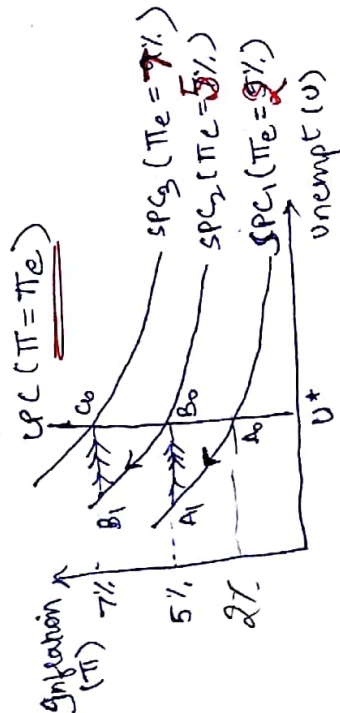
EXPECTATION AUGMENTED PC : MONETARIST VIEW

Premise

1) Natural rate of unemp^t : Current unemployed = no. of jobs available so unemployed due to structural and frictional reasons. Occurs at $P = P^e$

2) Adaptive Expectation : PE form expectation abt prices based on previous period prices and adaptive (exchange) their expectation only when actual inflation turns out to be diff. than expected.

3) Nominal wages lag behind changes in price level
 This lag results in temporary expansion or contraction in u^t in short run.



Phillips Curve

PC exist but unstable keeps shifting
 SHORT RUN: PE exist but unstable keeps shifting
 - Initially SPC_1 at A_0
 - Expansionary FP, MP \Rightarrow \uparrow Agg dd \Rightarrow inflation to 5%
 wages were set acc to 2% inflation and continue bet
 profit of firms Fed as prices \uparrow \therefore they will be
 induced to \uparrow u^t and hence emp^t $\therefore A_0 \rightarrow A_1$

- \therefore in short run tradeoffs exist
 - But now workers realize - dd higher nominal wage to restore real income - profit fall to earlier level - reduce emp^t back

$\therefore A_1 \rightarrow B_0$

- New expected inflation is 7% so we have reached SPC_3
 - Again same process $B_0 \rightarrow B_1 \rightarrow C_0$
 - LONG TERM PC: vertical line at u^*
 \Rightarrow any state of inflation will occur with u^* in long run

If policymakers want to \downarrow inflatⁿ from 7% to 5%
 unemp^t will \uparrow temporarily (wz price fall more rapid than fall in nominal wage \Rightarrow \downarrow in profits \Rightarrow cut emp^t \Rightarrow unemp^t rise beyond u^*)

Policy implication

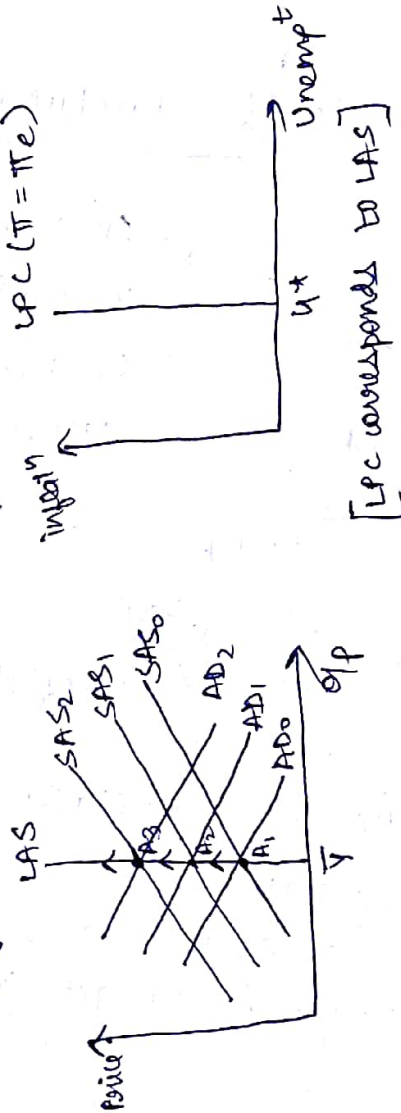
- Discretionary policy \uparrow of u^t emp^t only in short term but leads to same emp^t level and an even higher inflation in long run

RATIONAL EXPECTATION THEORY: NEW CLASSICISMS

PREMISE

1) Rational expectation: workers, producers, consumers etc use all available info to correctly understand and anticipate effect of Govt's economic policies

2) wage price flexibility: All products, factors markets are highly competitive hence wages & prices are highly flexible and can quickly change
 ⇒ no lag in change in nominal wage to change in price level or any other policy variable



Phillips Curve

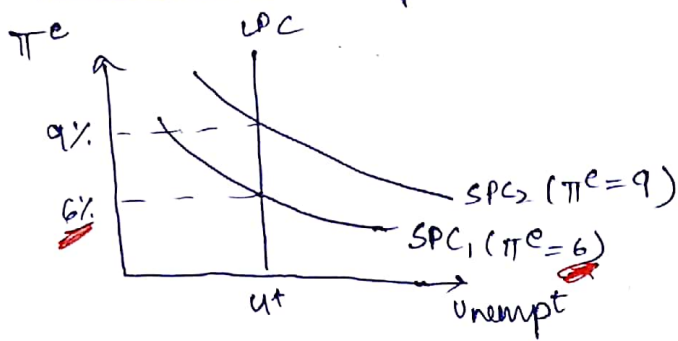
- Vertical coz no tradeoff even in short run as nominal wage quickly adjust to changes in price level
- Say AD coz of expansionary policy AD₀ → AD₁ But workers are quickly and fully able to

anticipate and take decisions (SAS → SAS, quicker) nominal wage) nullifying the effect of policy makers even in short term.
 - ∴ PC is vertical, so is Agg ss.

Policy Implication

- Discretionary policy will not help ↑ o/p, emp^t even in short term. It will only result in higher inflation.
- on the contrary it may produce unanticipated changes which cause business cycles.

Short term and long term PC relation



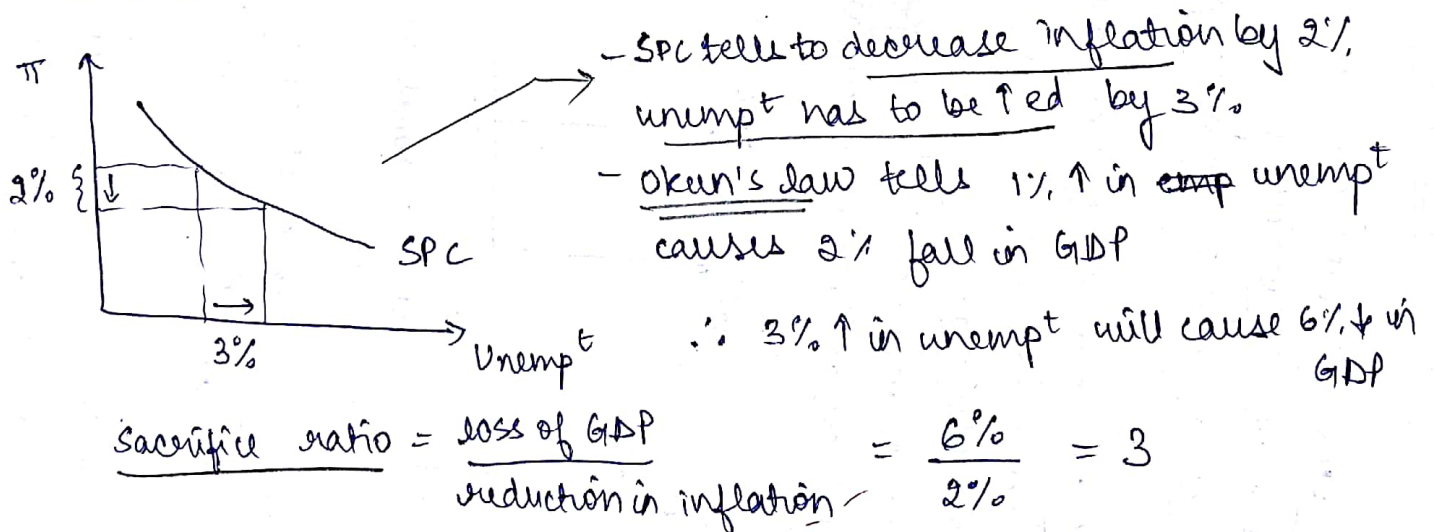
- SPC shifts as expected inflation changes
- movement along SPC is caused by changes in Agg dd

Initially $\pi^e = 6\%$, then $M^s \uparrow$ so actual inflation rises to 9%. But ~~it~~ initially this is unanticipated so there is movement along SPC₁ to the left, \uparrow ing u^t .

How SPC changes

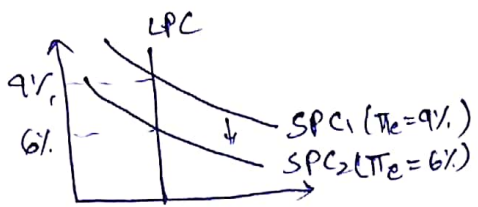
When inflation rate remains steady at 9%, it becomes anticipated so π^e become 9% and we reach SPC₂

GDP-inflation Tradeoff : Painful disinflation



Painless disinflation by New classicals

- No need of sacrifice ratio
- Only "credibility" of policy makers ensure, ~~it should announce~~ (e.g. setting inflation target) as we did



ppl will believe when policy makers announce that they will ↓ inflation ⇒ ppl quickly respond by lowering their expectation of inflation

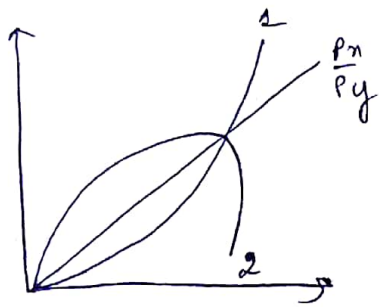
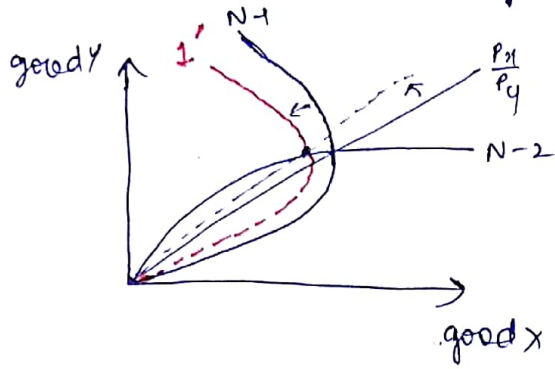
⇒ SPC shifts down w/o any ↑ in unemp^t

⇒ credibility of policy makers to ↓ inflation will decide how costly the policy is

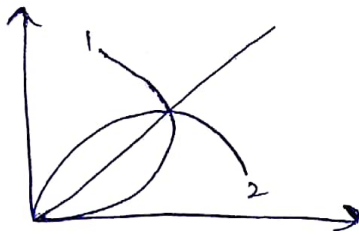
2013
Q1(b)

Offer Curve Shapes

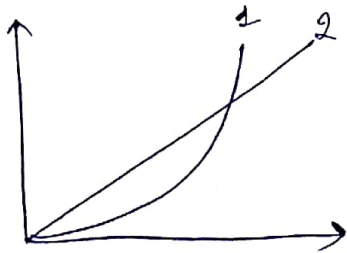
→ Inelastic import dd by N-1 : backward bending OC with tariff $\rightarrow 1'$



if N-2 has inelastic dd



if both have inelastic import dd



if N-2 is pure elastic dd then coincides with price line

2016 Q6(b)

very confusing!
Rec

Technical progress in Y $\Rightarrow w \downarrow, r \uparrow$
Tech. progress in X $\Rightarrow w \uparrow, r \downarrow$

Trade and growth

Assumptions

Nation 1: Exports X, Imports Y

Nation 2: Exports Y, Imports X

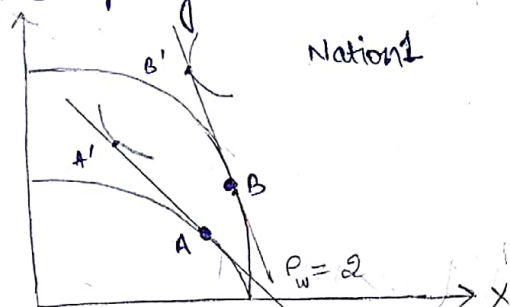
Good X: labour intensive

Good Y: Capital intensive

Perfect competition

Case 1: Tech. progress in Y

is this needed?

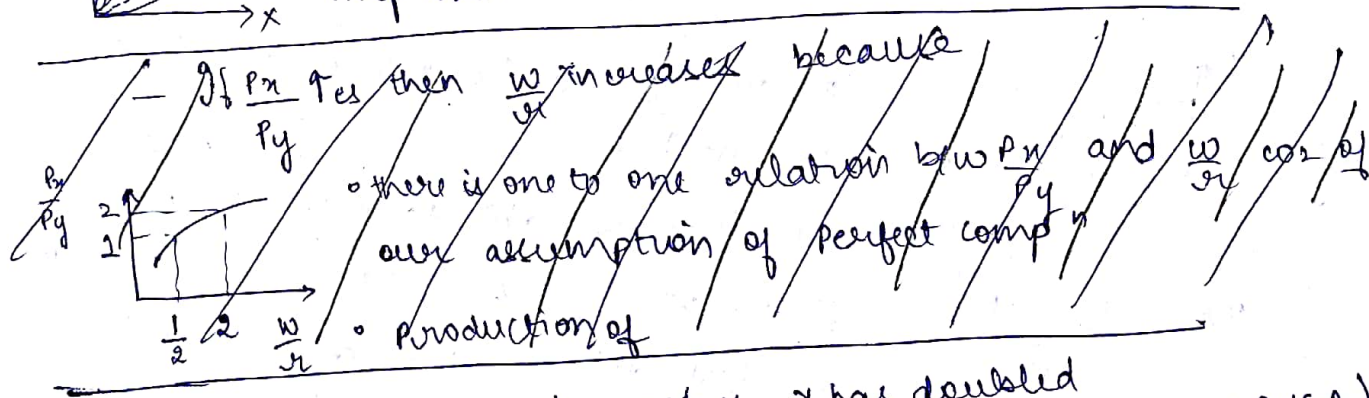
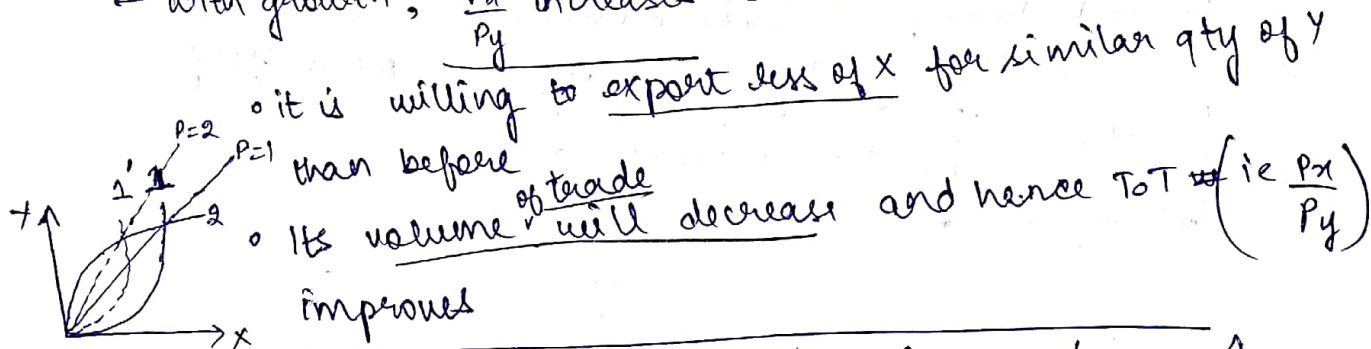


Production frontier moves outward in favour of Y
~~before tech progress with price trade~~

	Before growth	After growth
Product ⁿ	A	B
Consumpt ⁿ	A'	B'

$P_w = \frac{P_x}{P_y} = 1$

with growth, $\frac{P_x}{P_y}$ increases because



Techⁿ progress in Y \Rightarrow for each X, Y has doubled

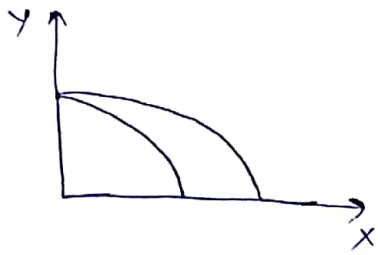
Productⁿ of Y has \uparrow ed more than X after growth (point B vs A)

\Rightarrow productⁿ is antitrade

\therefore as Y \uparrow ed more \Rightarrow returns to Y \uparrow more

This is like trade with tariff - Stolper-Samuelson of imported good \uparrow use returns to that factor rises

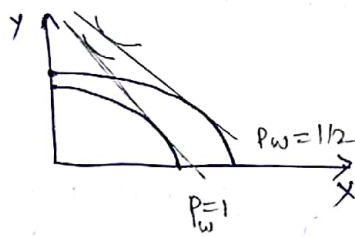
Case 2 Tech progress in x



For every Y, productⁿ of X doubled
 Productⁿ is pro trade
 X ↑ more after growth than ↑ in Y
 ∴ w ↑ more

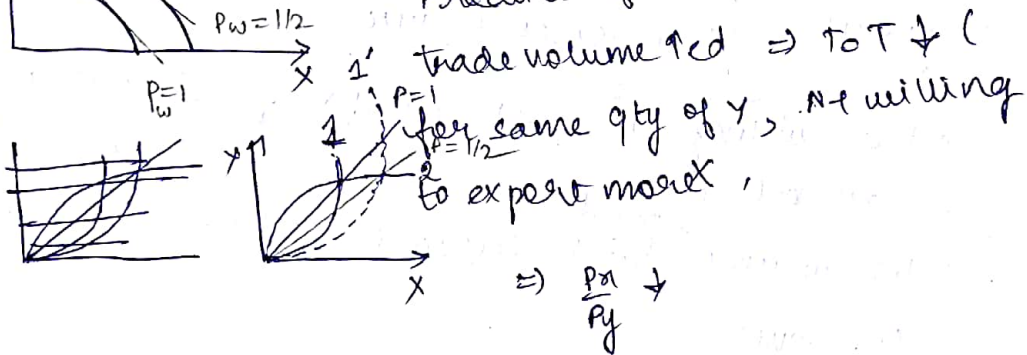
Q7(a) Export biased growth : say L ↑ for Nation 1

Case 1:
 N1 is
 large

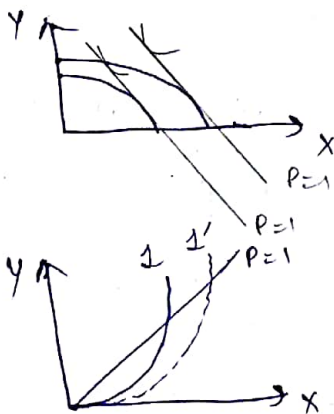


$$\frac{P_x}{P_y} \uparrow \Rightarrow T \uparrow$$

Productⁿ of X has increased ⇒



Case 2:
 Small
 country



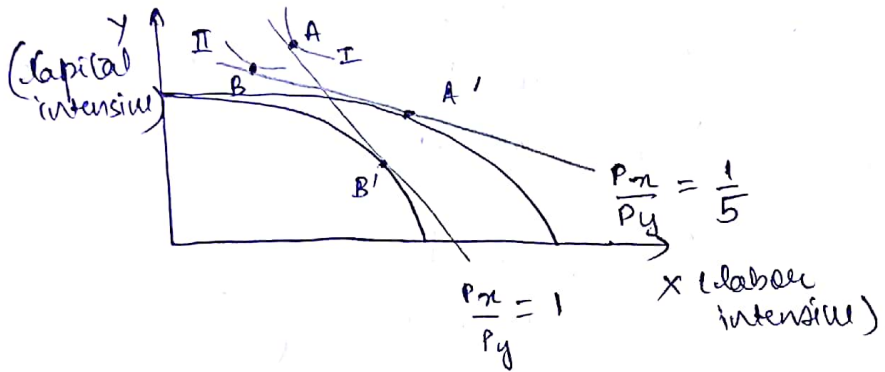
productⁿ of X has ↑ ed but and trade of volume ↑ ed

But it is not able to influence world prices coz it is small so T ↑ same i.e. don't deteriorate despite ↑ in Volume

OC of 2 can be considered as price line

B. Immiserizing growth by Jagdish Bhagwati

Growth is strongly export biased, it may lead to drastic fall in ToT of exporting country such that there is net decline in welfare.



The nation exports X and imports Y. PPF curve moves outward as a result of neutral technical progress in good X, not ↑ in factor L

Terms of trade $\frac{P_x}{P_y}$ fall so much that after growth, the country consumes at a low Indiff^e curve at point B.

⇒ country worse off after growth!

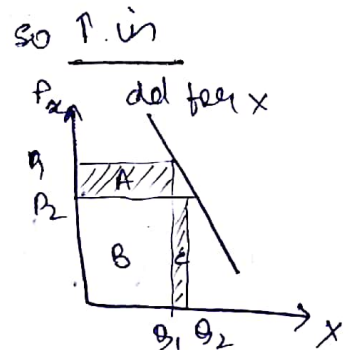
→ This happens when demand of X is price inelastic

val. of exports, there is a net + in export earnings

Initial earnings = A + B (area)

After growth earnings as price falls = C + B (area)

As $C < A \Rightarrow$ overall earnings fall



(fall in prices greater than increase in vol)

unc Policy implication ??

- Grow in capital intensive tex
- Grow in ad elastic goods

Q4 2006, Q3(b) 2015 · Relax assumptions of Keynes to get classical results.

Q5(b) 2010 → speculation and responsibility for unemp?

Q3(b) 2015: Relax liquidity preference case

not understood

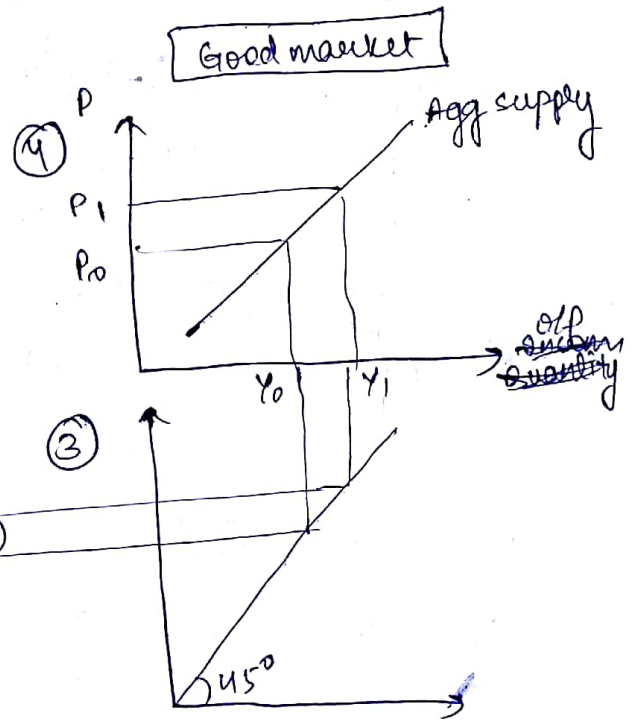
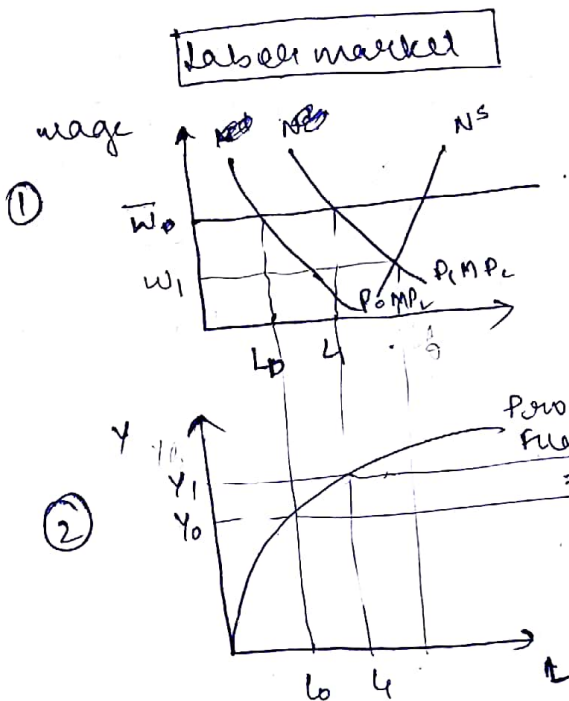
LP is M^d which is inverse relation b/w r and money dd
 If remove then M^d will be independent of r
 ⇒ constant velocity of money as assumed in GTM: $M^d = kPY$
 ⇒ Vertical LM which is classical case



- Keynesian result of ^{involuntary} unemp^t is coz of wage rigidity (b money illusion) ~~assumptions~~ Assumptions:

◦ wage rigidity / contractual wage
 $w = \bar{w}$

◦ excess ds of labour (coz he wrote at time of recession)



Since L_0, L_1 labour employed at price P_0, P_1 of good respectively, the remaining $(N^s - N^d)$ are unemployed.
 If wages were flexible downwards say to w_1 then

$N^s = N^d$ and there would be no unemp^t voluntarily. This would be the Classicals' case where labor market clears and we get full emp^t level of labour & income (Y_f). This makes AS vertical and economy becomes supply driven. In such a case any change in AD, due to relaxing assumption of M^d (as money market influences AD), does not matter

∴ Assumption of rigid wage, excess labor supply or of recession need to be relaxed, to give result of classical.

~~relaxing~~ Relaxing M^d assumption (as asked in 2015 ques.) does not matter & it remains Keynesian

2014

Q3(c)

~~$f(L, K) = \lambda f(\lambda L, K)$~~ homogeneous of degree 1 $f(\lambda L, K) = \lambda f(L, K)$

⇒ Profit = $Pf - wL - rK$

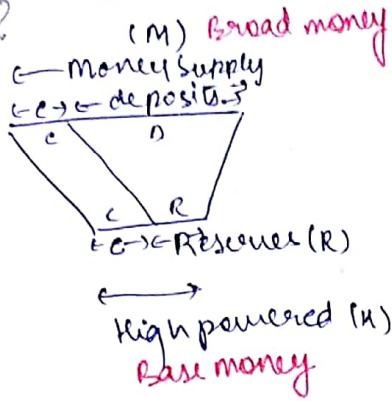
* Profit = $Pf(\lambda L, K) - w\lambda L - r\lambda K$

If price Δ & t +ve profit ⇒ then he goes on "ing product" ⇒ no finite solⁿ

If price Δ & t loss ⇒ no production
Scale of production in long run indeterminate

2015 Q3(c): Money Multiplier

ask? dual case??



$M = C + D$
 exogenous → endogenous asked

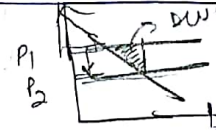
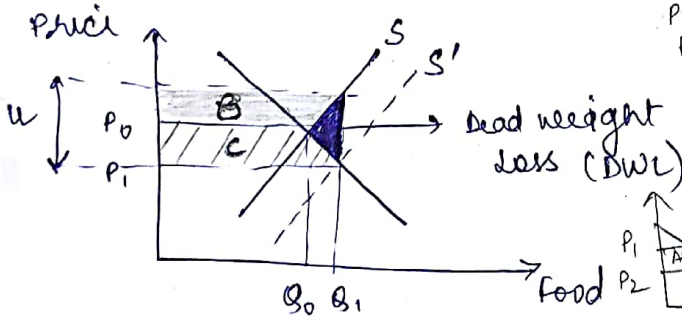
$D = \frac{C}{r}$ where $r = \text{cash reserve ratio}$
 $R = \frac{C}{k}$ where $k = \text{currency deposit ratio}$
 $H = C + R$

money multiplier, $m = \frac{M}{H} = \frac{C + \frac{C}{r}}{C + \frac{C}{k}} = \frac{C + \frac{C}{r}}{C + \frac{C}{k}} = \frac{r+1}{r+k}$

2015 Q4(b) Subsidies +ve & -ve

tax reduces beneficial trade
 subsidies increase wasteful trade

Case 1. Perfect competition, dd & ss, no externalities



without price control
 would not invest efficiency
 apply cost implementation

- 1) Efficiency loss, not Pareto optimal
- 2) Govt. expenditure ↑, Fiscal deficit.
- 3) opportunity cost:

Subsidy u per unit being given by govt to producer - Cd hv been used for
 ss shifts out
 Qty ↑ but DWL
 If govt. had
 hv paid lump
 sum cash instead
 of subsidy
 then only
 investment
 which hv created
 multiplier effect

- Total cost to govt. is $u * Q_1$
 - Total benefit to producer = area B
 - " " " Consumer = area A
 ∴ DWL Δ is efficiency loss
 ⇒ outcome is not Pareto optimal

Now govt. spends $A+B$ of which only A is consumer surplus & B is govt. surplus
 inclusion extension covers

- Infra needs - physical & social
 - compromised
 - Not targeted well so
 suggestive in India's case, eg LPG subsidy
 poorest 50% get only 25% (Economic Survey '16)

- 5) leakages in administering \uparrow wasteful expenditure, corruption
Eg PDS 45% of grains leaked (Shantaram comm.)
- 6) overuse eg fertilizer subsidy - envt impact
- 7) Distorted market prices Eg ration from PDS sold in black market CO_2 dual prices existing

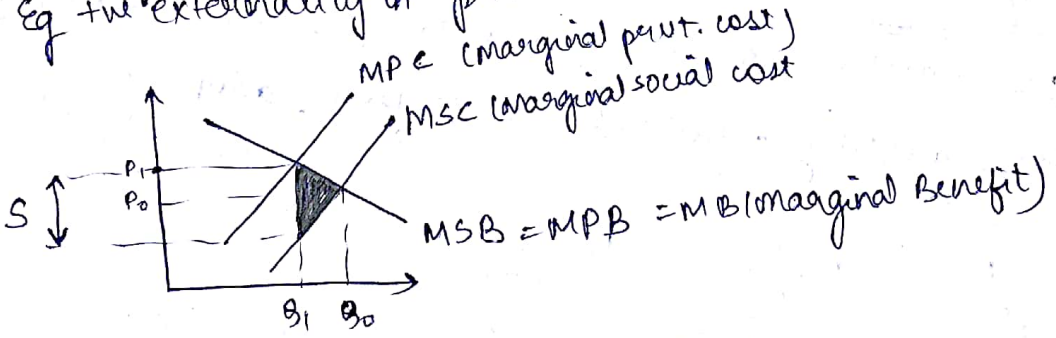
Positive

- 1.) Welfare objective of \uparrow consumption of the good
Eg food subsidy: Eg 75% food receive under NFSA
IPG - cleaner, so envt benefits also + health benefits for women
fertilizers - \uparrow productivity in agri

2.) vast majority poor (22%) and dependent on agri (agr.) which is not high income generating, so essential for India

3.) Pigou subsidy in case of positive externalities leads to efficiency gains and pareto optimal of P

Eg +ve ^{envt} externality in production



Optimal is $MSC = MSB$ ie Q_0, P_0
 if left alone then Q_1, P_1 ie underproduction
 \therefore Govt gives subsidy to producer of S per unit
 \therefore shaded area is net benefit

PC assumes all hv complete info but not true in real life & leads to market failure

Info asymmetry
eg.

market for old used cars: sellers know true quality, buyers don't

labour market: workers know their ability but potential employers don't

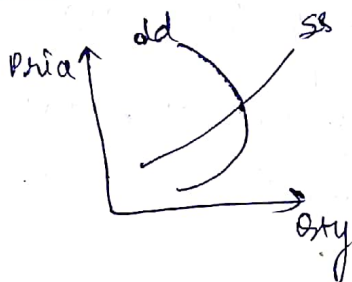
insurance market: customer better informed abt getting ill

market for lemons: by Joseph Stiglitz

lemon = defective items

eg in market for old cars: Price in market will be of avg quality of car coz buyers uninformed so won't be willing to pay more
owners of good car will withdraw from market coz price low for them & bad ones remain. ∴ lemon market

This is adverse selection. very few buyers & sellers remain



backward dd coz ~~price~~ depends not only on price but quality of cars offered

To solve Info Asymmetry:

- Used cars: good dealers provide guarantee, service centres to check quality & give info to buyers, adopting brand names

- Insurance:
$$\bar{P} = P_H \frac{H}{H+L} + P_L \frac{L}{H+L}$$

total avg probability of illness

H = group of high sick ppl
L = " low "

P_H = probability of their illness
P_L = " "

∴ $P_H > \bar{P} > P_L$

c = cost of insurance

I = insurance premium fixed

$I \geq c\bar{P}$

* Examples of screening: Agent with less info taking steps signalling is agent with more info taking step

~~High~~ L ppl will not be willing to buy \Rightarrow Adverse selection *
 H " " eager to buy

* \therefore coinsurance: individuals share a portion of loss

o compulsory insurance schemes for groups. Eg employees of a factory, teachers. Employers offer them at fringe benefits. This way risk distributed.

* + problem of moral hazard

Those who bought insurance won't take care. Insurance companies cannot observe this hence problem of MH.

* They can specify precautions

* Mandate annual check up to continue using health insurance

labor market/education by Spence

Signalling: Sellers of high quality can send signals to tell abt their superior quality

Eg Edⁿ acts as a signalling device in job market

Spence model:

wtd avg productivity of workers $\leftarrow \bar{P} = P_H \frac{H}{H+L} + P_L \frac{L}{H+L}$

H = no. of high quality workers, P_H = their productivity
 L = low quality " , P_L = " "

$\therefore P_L < \bar{P} < P_H$

If paid acc to \bar{P} , high quality will not come,

Assume - Edⁿ does not ~~not~~ increase productivity

2 - $C_H < C_L$ C_H = cost of Edⁿ for high productivity workers
 C_L " " low

3 - $C_H < (P_H - P_L) < C_L$
 differential in productivity \therefore diff^{ce} in wages

(wage will be paid acc to productivity)

$$\therefore W_L = P_L, W_H = P_H$$

$C_H < P_H - P_L \Rightarrow H$ ppl find it ~~profit~~ worthwhile to invest in Edⁿ as a signal

$C_L > P_H - P_L \Rightarrow L$ do not

$\therefore \boxed{C_H < (P_H - P_L) < C_L}$ is a separating Eqⁿ

H & L separate themselves for acquiring Edⁿ as signal to get job

Principal Agent Problem

Eg corporates - shareholders are owners - Principals - want profits
- Managers control working - Agents - want high income
cash flows

PAP is when managers pursue their goals like high salaries, prestige etc at the cost of owners

Shareholders large in no., have lack of info, difficult to obtain this; managers hv info, discretion

To solve:

- 1) - Can get them dismissed by Board of Directors who monitor managers
- 2) - Takeover by other owners: threat of this induces performance
- 3) - long term contracts, profit sharing, pay linked to profit (bonus)
- 4) - Part ownership, stock purchase plans for managers

5) Efficiency wage theory

productivity of workers depends on wage paid to him. firms pay them wage higher than competitive wage to provide them incentive to not shirk.

If they are fired ^{for showing} they will be employed elsewhere at competitive wage \therefore won't show
This wage rate is called "efficiency wage"

Eg Henry Ford in 1914 raised min. daily wage, + benefits -
productivity \uparrow , profits \uparrow

2016

theory of limit pricing / Entry preventing pricing Ch 48

uptill now oligopolist mkt are closed (Cournot best...)
but decisions of existing firms will be affected not only
by actual entry but potential entry of firms

\therefore long term view to max profits

if short term excessive profits, will induce new firms
to come which will \downarrow profits in long term

\therefore collusive oligopoly don't charge monopoly price

Bain pioneer in this: case of collusive oligopoly

- limit price / entry preventing price is the highest price that
oligopolist can charge w/o attracting entry of new firms

- LP affected by
cost of potential entrants
price elasticity of dd
size of market
no. of existing firms
shape of long run avg cost

- ~~monopoly price~~ This is like barriers to entry

Barriers to entry:

1. Absolute cost Advantage
2. Product differentiation
3. Tech, machines, managerial, specialised labor
4. large initial Capital requirement
5. Economies of scale
bulk buying & transport cost
6. Advertising
7. predatory pricing

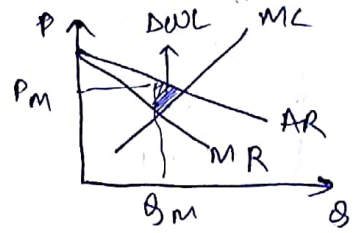
Critique

- Bhagwati: non price competition like advertisement more
warp
- Real life established large firms diversify instead of ^{small} new
firms entering
Eg Tata, Reliance can enter new industries & succeed.

Govt. policies towards monopoly Ch 49

Monopoly drawbacks

- 1.) Restrict of p, \uparrow price \Rightarrow DWL so inefficient
welfare loss \Rightarrow \downarrow consumer surplus
- 2.) 'managerial slack'
lack incentives to \downarrow cost coz absence of pressure of competition
- 3.) don't do R&D
- 4.) Rent Seeking : Spend money to maintain or acquire monopoly positions.
- 5.) entry barriers by predatory pricing



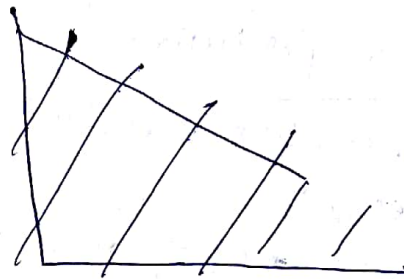
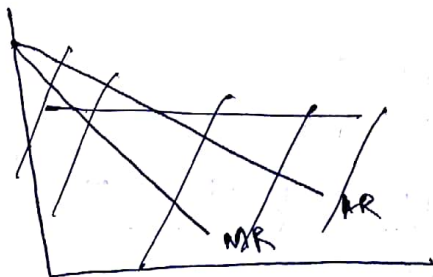
Govt. response

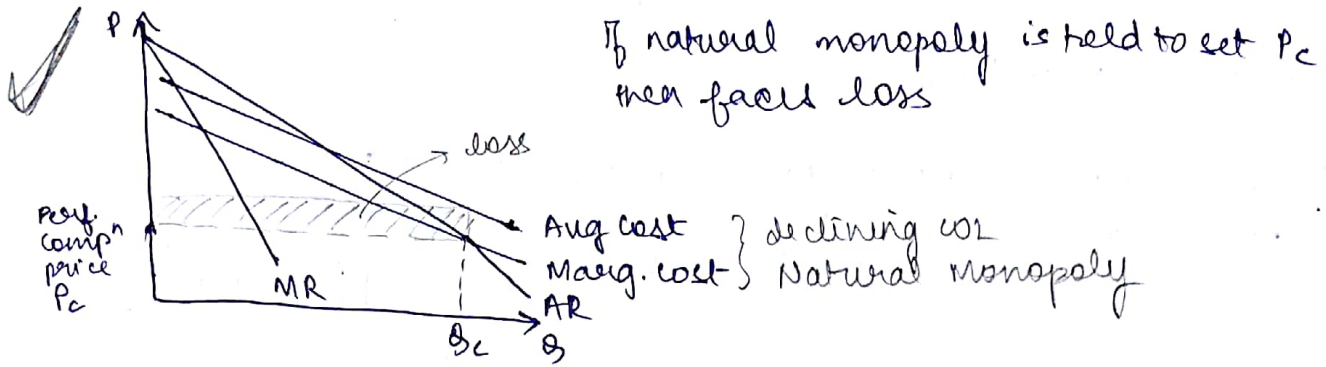
1.) Nationalization / Public ownership

- Done for Natural monopolies

\hookrightarrow There is economies of scale so Avg cost steadily decline + market s.t can support only 1 optimum size firm

eg electricity, rail etc





If natural monopoly is held to set P_c then faced loss

If give subsidy then they can inflate cost better to take over

2.) Regulation of natural monopolies

A.) Marginal cost pricing: Public interest theory

Set P_c to max. public welfare but losses

+ if cost ↓ then price will hv to ↓ cost of regulator so no incentive

B.) Avg cost pricing

Allow normal profits, fair return on capital

Set price where Avg cost is tangent to dd.

But DWL will be there

+ no incentive to cut cost, innovate

+ 'Regulatory Capture': regulators promote interest of monopoly than ppl - bribes - Avg cost allowed to inflate - DWL ↑

3.) Encourage competition

- Eg telecom, new firms entered so services ↑

- Allow imports

- Allow mergers only if done to ↑ efficiency etc & not being done to ↓ competition. Eg cc 1 made

Non Price Competition Ch 42

Product variation Advertising

- Quality change
- design "
- Add on services
- selling cost = Add expenditure + salaries to salesmen + sales dept^t expens
+ demonstratⁿ + window display + add agency " " "
= Incurred to change or create ad for a good
- Imp^e in oligopoly & monopolistic
(In PC, monopoly - adds can be to promote not for competition)
- optimal level of add.
 ↳ $MCP = MCA - m$ cost of advertisement
 Marginal contribⁿ to profit
- AC shifts up coz we add Avg selling cost.

Cost plus pricing / mark up pricing / full cost pricing / Avg cost Pricing Ch 43

Kall & Hitch: MC, MR data absent in real life

$$P = MC \frac{e}{e-1} = MC + \underbrace{MC \frac{1}{1-e}}_{\text{markup}} \quad \text{Reconciliation //}$$

firms don't decide based on π maximizalⁿ or marginal analysis

Behavioural theory of Firm : Satisficing model Ch 47

- Firms don't aim to maximize profits / sales / utility

- Info regarding this absent

- Seek to satisfy performance (satisfice)

- In conventional theories single goal = profitmaxⁿ

In Behavioural = conflicting multiple goals

- production goal (eg for workers)
- inventory goal
- Sales goal (eg for salesment)
- market share goal (eg for top level managers)
- profit goal (eg for shareholders, managers to show performance...)

∴ some sort of implicit priority

2015 Q2(b) Nash Eq^m for oligopolistic market

Game theory in oligopoly: firm behaves strategically.
 Decision regarding price, o/p, advertisement etc takes into
 account how rivals will react (interdependence) to its
 decisions assuming them to be rational.

Eg say to decide whether to advertise or not
 Firm B

Payoff matrix

		Firm B	
		Add	No Add
Firm A	Add	5, 5	10, 1
	no Add	1, 10	6, 6

So for both add is dominant strategy

(Add, Add) is NE

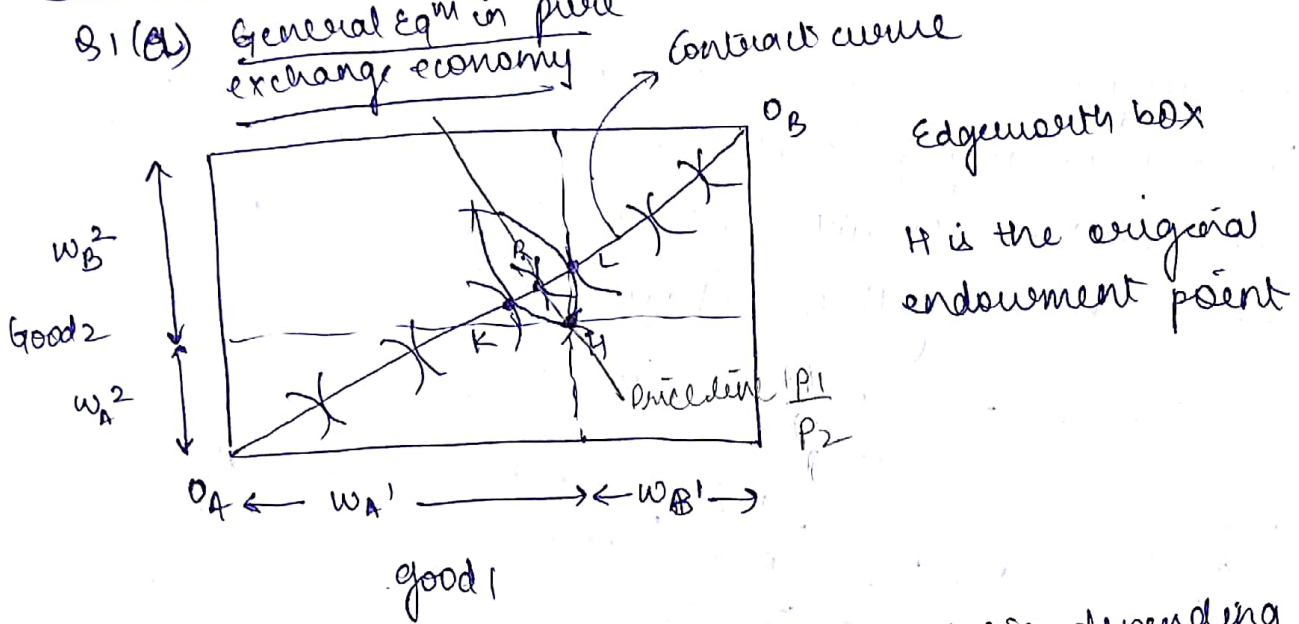
- Nash Eq^m: ~~condition~~ ^{set of strategies} where every player has optimized its outcome base on other players' expected decision. None will have any incentive to deviate from this.
- Ify cartels can be analysed. Both will cheat so cartel collapse

	cheat	don't
cheat	5, 5	10, 1
don't	1, 10	6, 6

- Ify entry deterrence (set price low or high)
 Qty (set qty low or high) etc.

2013 Paper 1

Q1 (a) General eq^m in pure exchange economy



KL shows range within which solⁿ will lie depending on the relative bargaining power of the two people

walrasian eq^m

$$MRS^A = MRS^B = \frac{P_1}{P_2}$$

only relative prices can be found not absolute

eg if both increased n times

$$MRS^A = MRS^B = \frac{n P_1}{n P_2} = \frac{P_1}{P_2} \quad \text{eq^m same}$$

SOLOW Neo classical

Neo classical Productⁿ fn: Eg Cobb Douglas fn \rightarrow

1.) CRS

$$F(\lambda K, \lambda L, T) = \lambda F(K, L, T) \text{ for all } \lambda > 0$$

homogeneity of order 1

K, L are rival inputs, Tech non rival

$$\left. \begin{aligned} y &= AK^\alpha L^{1-\alpha} \\ \frac{y}{L} &= A \left(\frac{K}{L} \right)^\alpha \\ y &= AK^\alpha \\ A &> 0 \\ 0 < \alpha < 1 \end{aligned} \right\}$$

2.) Diminishing returns to K and L individually

$$\frac{\partial F}{\partial K} \text{ MPK } \downarrow \text{ing}$$

$$\frac{\partial F}{\partial L} \text{ MPL } \downarrow \text{ing}$$

Steady state

$$\dot{k} = \dot{y} = \dot{c} = 0$$

$$\frac{\dot{k}}{k} = \frac{\dot{y}}{y} = \frac{\dot{c}}{c} = \frac{\dot{L}}{L} = n$$

\Rightarrow "Balanced growth path"
each variable growing
at const rate regardless
of starting point

Endogenous Growth

1) Increasing Returns to scale

2) Constant returns to single factors

capital - human + knowledge R&D also
 \therefore no more diminishing returns

4) Perfect competition

3) Tech endogenous

AK Model

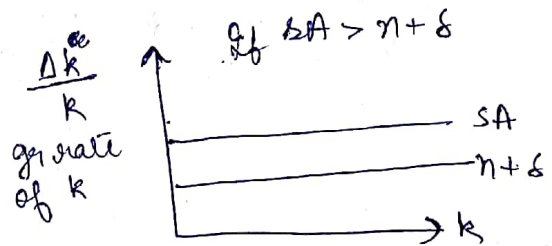
$Y = AK$ $\left\{ \begin{array}{l} \text{Includes human capital} \\ \text{satisfies abv conditions} \end{array} \right.$
 \downarrow
 tech level

$$Y = AK$$

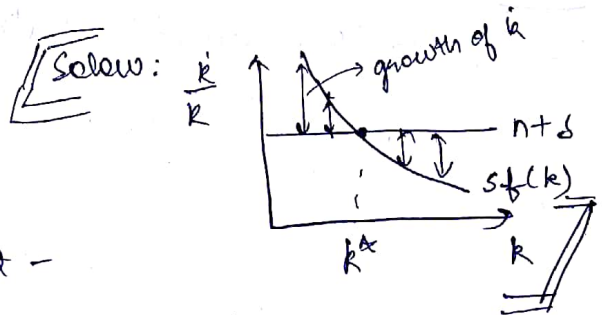
$$\text{Solow: } \Delta k^* = sf(k) - (n+\delta)k$$

$$= SAk - (n+\delta)k$$

$$\frac{\Delta k}{k} = SA - (n+\delta)$$



\Rightarrow perpetual growth in k even w/o tech



Problem:

- If this happens then firms will hire all L and all L in market - become monopoly - Assumptⁿ of PC breaks down
- All firms can undertake tech - then profits again 0
- Predicts all economies grow at same rate if hv same parameters s, A, n, δ . So no convergence

→ Learning by doing & knowledge spillovers

- knowledge created as side product of invt → ^{household} ~~exp~~ ^{endogenous}
- with experience, it learns how to ~~use~~ ↑ productivity of physical capital while simultaneously investing in it → "learning by doing" (learning by investing)

- Eg labour augmenting tech say

$$Y_i = F(K_i, A_i L_i) \quad \text{for firm } i$$

↳ knowledge with firm

- As $K_i \uparrow$, A_i also \uparrow es
 - Knowledge is public good, once discovered it spills over
- ⇒ $A_i = K$
↳ agg capital

$$Y_i = F(K_i, A_i L_i) \quad \Rightarrow \text{CRS so endogenous growth}$$

If firm expands, $K_i \uparrow$, K rises accordingly - spillovers

→ R&D

"A" variable produced by R&D as knowledge

↳ non-rival
↳ excludable (by patents, trade secrets etc)

Romer's Model : R&D model

- Production fn: $Y = \delta(K, AL)$
 $Y = K^\alpha (AL)^{1-\alpha}$
 ↳ endogenous technology

- Capital accumulation as in Solow

$$\dot{K} = sY - dK$$

- labour input grows at constant rate n $\left(\frac{\dot{L}}{L} = n\right)$

- Constant returns to individual inputs: K and L

Increasing returns to scale (ie to all inputs including tech Y)
 diminishing return to physical capital more than compensated by increasing return to

- 2 sectors
 → goods producing (physical op) ⇒ Production labour L_Y human capital
 → innovation/R&D sector ⇒ uses R&D labour L_A
 (innovation is like any good)

Total labour force = $L_A + L_Y$

- $A =$ knowledge base

Ideas production function: $\dot{A} = \bar{B} L_A^\lambda$ $0 < \lambda < 1$

$\bar{B} =$ productivity parameter

(shows rate at which knowledge will improve with improvement in ^{R&D} labour force)

$\lambda =$ determines returns to scale

"stepping on toes effect" ie there can be more than one worker developing the same idea

- productivity will depend on how much has already been discovered

$$\boxed{B = BA^\phi}$$

$$0 < \phi < 1$$

A = knowledge base

ϕ tells how much impact existing knowledge base will have on future knowledge base
"standing on shoulders effect"

$$\Rightarrow \begin{cases} \dot{A} = B L_A^\lambda = B A^\phi L_A^\lambda \\ g_A = \frac{\dot{A}}{A} = \frac{B L_A^\lambda}{A^{1-\phi}} \end{cases}$$

γ & K don't matter in how A evolves
growth rate of ideas

Taking log $\log A - \log A = \log B + \lambda \log L_A - (1-\phi) \log A$

differentiating w.r.t t :

$$\frac{1}{A} \frac{dA}{dt} - \frac{1}{A} \frac{dA}{dt} = 0 + \frac{\lambda}{L_A} \frac{dL_A}{dt} - \frac{(1-\phi)}{A} \frac{dA}{dt}$$

$$\boxed{g_A = \frac{\dot{A}}{A} = \frac{\lambda \eta}{1-\phi}}$$

Romer equation

$g_Y = g_K = g_A$ All g_A is due to innovation

$$\frac{\Delta Y}{Y} = 1$$

$$\frac{\Delta K}{K} = \frac{\Delta Y - dK}{K} = \frac{\Delta Y}{K} - d$$

$\frac{\Delta A}{A} = \frac{B L_A^\lambda}{A^{1-\phi}} = \text{constant on balanced } g_A \text{ path}$

$\Rightarrow L_A^\lambda A^{\phi-1} = \text{const}$
differentiate both sides

$$\frac{\lambda L_A^{\lambda-1} A^{\phi-1} \Delta L_A + L_A^\lambda (\phi-1) A^{\phi-2} \Delta A}{L_A^\lambda A^{\phi-1}} = 0$$

$$\lambda \frac{\Delta L_A}{L_A} + (\phi-1) \frac{\Delta A}{A} = 0 \Rightarrow \lambda \eta - (1-\phi) \frac{\Delta A}{A} = 0$$

$$\boxed{\frac{\Delta A}{A} = \frac{\lambda \eta}{1-\phi}}$$

conclusions of Romer

1) $g_A = \frac{\lambda n}{1-\phi}$

- \uparrow in $n \Rightarrow \uparrow$ in g_A (and not \downarrow per capita income)
larger labor ss \rightarrow more contribution to R&D
 \rightarrow higher dd fee commodities to absorb growth

- \uparrow in $\lambda \Rightarrow \uparrow$ in g_A
higher productivity of R&D

- ϕ policy determined

Better structure can be created to use & analyze past knowledge

2) No convergence suggested \Rightarrow IRs
Economy keeps growing

3) Innovation, R&D drive long term growth

Criticism

- If IRs in capital then why outflow of capital from one country to another
- Assumes R&D facilities absorb workforce but some economies poor to spend on R&D. Then populatⁿ growth won't fuel economic gr but \downarrow per capita income.