Ch. 20

Measuring GDP and Economic Growth.

GDP: market value of final g+s produced within a country in a given period time

- market value: at selling prices
- given period time: i.e. quarterly, annually.
- final g+s: not intermediate goods; avoid double counting (depends on its use) i.e. tires vs. tires in cars; Not second-hand goods.
- within a country: inside the borders by domestic or foreign firms.

GDP = total income = total expenditure (spending) links productivity and living standards.

Expenditures: C, I, G, NX (Net Exports)

Income: $Y = C + I + G + (X - M)$

Income: total paid to factors of production: wages, interest, rent and profit

GDP = Aggregate Expenditure = Aggregate Income

EXPENDITURE APPROACH

C: consumption expenditure on g+s. (NOT incl. new houses)

I: investment expenditure on new capital (including new houses).

(Note: any unsold final goods are added to inventory and counted as if firms purchased goods from themselves).

G: government expenditure: paid for by taxes. (not transfer payments).

(Note: financial transfers such as unemployment insurance + welfare + subsidies don't count).

RoW: Exports less Imports = Net Exports = X − M

X > M ⇒ net outflow of goods.

GDP is a "gross" measure (vs. "net") because it includes depreciation

Expenditure Approach

(I) ≡ gross investment

net investment = I − depreciation

Income Approach

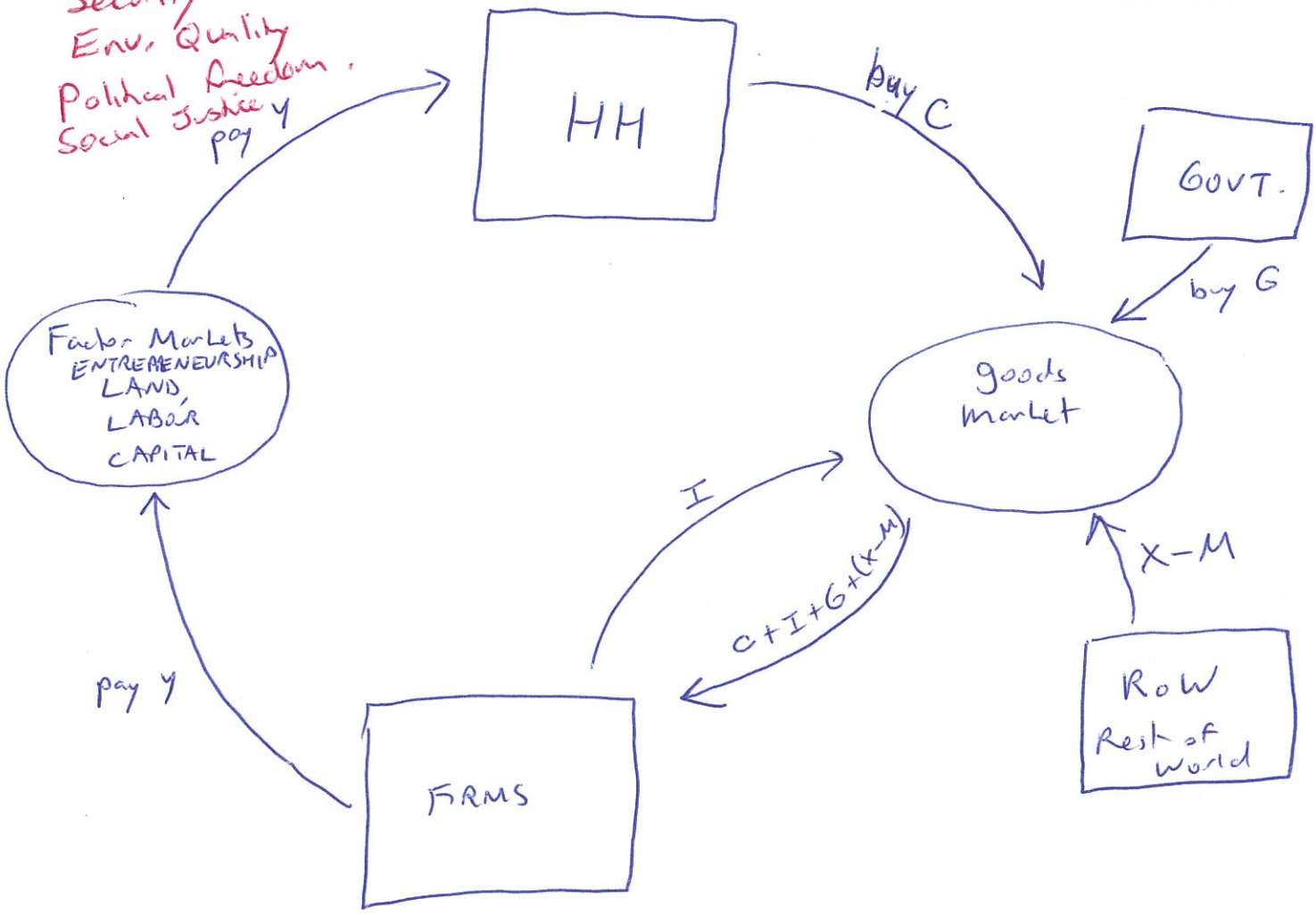
(gross profit) = revenue − operating expenses.

net profit = gross profit − depreciation

EXCLUSIONS & LIMITATIONS OF GDP measure

Household production (unclaimed). ← means GDP underestimates true total production in the economy.
Underground economic activity (MARY-JANE).
Health & LIFE expectancy.
Leisure time
Security
Env. Quality
Political freedom.
Social Justice

Circular Flow Model of Expenditure and Income



Income Approach

Sum up incomes paid to HH's for factors of production:
land(rent), labour(wages), capital (i) & entrepreneurship (profit)

Item	
Wages, Salaries and Supplementary Income	52%
+ Other Factor Incomes	24%
= Net Domestic Income(NDI) at Factor Cost	
+ Indirect Taxes less Subsidies	10%
= NDI at market prices	
+ Depreciation	(14%)
GDP or Y. (w/ a statistical Discrepancy)	

Real vs. Nominal GDP

- Real: ↑ in terms of goods; ↑ in base-year prices
- Nominal GDP: ↑ in terms of dollars; ↑ in current-year prices.

NOMINAL GDP

2002	Q	P	Spending Total
C	10	5	50
I	3	10	30
G	1	20	20
NOMINAL Y			100

2012	Q	P	Spending Total
C	4	5	20
I	2	20	40
G	6	40	240
NOMINAL Y			300

Real GDP ← current production at base-year prices

$$\text{Real GDP}: Q^{2012} \times P^{2002} = \underbrace{(4 \times 5^{\$})}_{C} + \underbrace{(2 \times 10^{\$})}_{I} + \underbrace{(6 \times 20^{\$})}_{G} = 160^{\$}$$

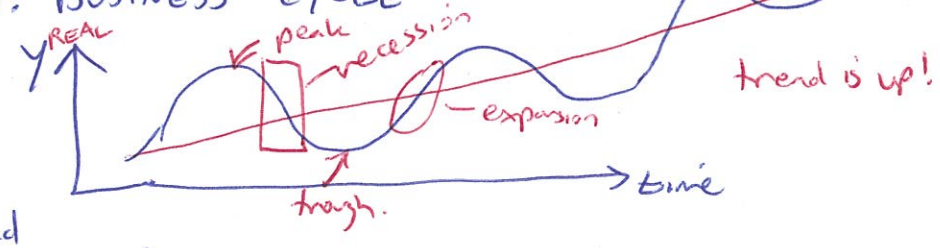
So if prices had not changed, Y^{Real} would be $\frac{160}{100} = 1.6$ times higher in 2012 than in 2002 (NOT 3 times higher).

(NOMINAL GDP can't be used to tell us if we produce + earn more, or if just the prices went up!!)

Real GDP is useful to compare Standard of Living (S.o.L), but should use

$$\text{real GDP per person} = \frac{\text{real GDP}}{\#\text{ of people}}$$

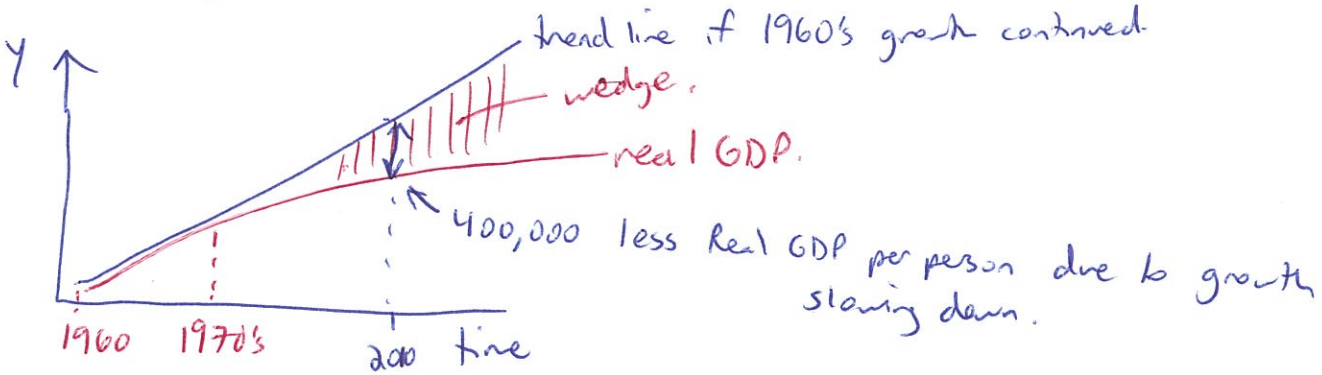
- CAN compare SoL over time and across countries.
- CAN study fluctuations: BUSINESS CYCLE



POTENTIAL GDP

max level of real GDP w/o factor shortages which would lead to inflationary pressures (prices ↑↑↑).

Productivity Slowdown + LUCAS wedge.



Comparing countries' standards of Living

1st convert foreign currency into comparison currency.

China: $y^{Real}_{per\ person} = 23{,}400$ yuan, exchange rate is $\frac{8.2\,Y}{1\,\$}$

$$\frac{23{,}400\,Y}{X^{\$}} = \frac{8.2\,Y}{1^{\$}} \Rightarrow X^{\$} = \frac{23{,}400\,Y}{8.2\,Y} \times 1^{\$}$$

(cross multiply + divide)

$$X^{\$} = 2853^{\$}$$

but $2853 can buy much more in China than in U.S.

so if $y^{U.S.} = 42{,}800$ then U.S. is $\frac{42800}{2853} = 15$ times higher.

but if goods in China are cheaper then $y^{U.S.}$ is not 15 times higher after all.

PPP: purchasing price parity ⇒ same prices for both countries.

ie. Big MAC in U.S. = $3.75 so American income (per person) is $\frac{\$42800}{3.75} = 11413$ big MAC's.

In China Big MAC is $1.62 so Chinese income (per person) is $\frac{\$2853}{1.62} = 1761$ big MAC's

so $\frac{y^{US}}{y^{CHINA}}$ using PPP is $\frac{11413 \text{ big MACs}}{1761 \text{ big MACs}} = 6.5$ times higher in U.S. than China

Ch. 20 MATH NOTE

Chained Dollar Real GDP : to avoid the problem associated with not knowing which price level to use, old or new.

2011	Q^0	p^0	Q^0p^0
C	3	5	15
I	3	10	30
G	5	20	100
Totals			145

2012	Q^N	p^N	Q^Np^N
C	4	5	20
I	2	20	40
G	6	40	240
Totals			300

old basket new prices $Q^0p^N = (3\times 5^{\$}) + (3\times 20^{\$}) + (5\times 40^{\$}) = 275^{\$}$

new basket old prices $Q^Np^0 = (4\times 5^{\$}) + (2\times 10^{\$}) + (6\times 20^{\$}) = 160^{\$}$

using $p^0 \Rightarrow \frac{Q^Np^0 - Q^0p^0}{Q^0p^0}\times 100\% = \left(\frac{Q^Np^0}{Q^0p^0} - 1\right)\times 100\% = \left(\frac{160}{145} - 1\right)\times 100\%$

$= 10.3\%$

- NOTICE you can just look at $\frac{Q^Np^0}{Q^0p^0} = 1.103$

using $p^N \Rightarrow \frac{Q^Np^N}{Q^0p^N} = \frac{300}{275} = 1.091 \Rightarrow 9.1\%$

Average of the two % increases $= \frac{9.1\% + 10.3\%}{2} = 9.7\%$

or directly: $\frac{\frac{Q^Np^0}{Q^0p^0} + \frac{Q^Np^N}{Q^0p^N}}{2} = \frac{1.103 + 1.091}{2} = 1.097$

so 9.7% is the growth rate of GDP^{Real} from 2011 to 2012

so if CPI^{20} is 179 then CPI^{2012} is 9.7% higher:

$$CPI^{2012} = \overset{CPI^{2011}}{179}(1.097) = 196$$

so: growth rates are decided by adjacent years (while CPI level and choice of base year are connected but don't affect growth rates)

Ch. 21 EMPLOYMENT and Inflation

Great Depression: 20% unemployment $\left(\frac{U}{E+U} = \frac{U}{LF}\right.$ as a % means $\times 100\%$; $\left.LF$ ↖ labour force$\right)$

$U \rightarrow$ lost income & production
lost human capital

- Labour force survey: questionnaire about age & jobmarket status.
- working age pop^n: 15 years and older.
  - Labour Force = Unemployed + Employed (+ Full-time, voluntary Part-time, + involuntary P-T.)
  - not in Labour Force: not looking for work (disgruntled or otherwise)

Unemployed: looked for work in last 4 weeks.
OR laid off and waiting to be called back
OR waiting to start new job in next 4 weeks.

4 indicators: a) Unemployment rate $= \frac{U}{LF} \times 100\%$ (% in the labour force who are searching but can't find work)

b) Involuntary P-T rate $= \frac{\#\text{ involuntary P-T}}{LF} \times 100\%$
(under-employed).

c) LF participation rate $= \frac{LF}{\text{working-age pop}^n} \times 100\%$

d) Employment to pop^n ratio. $= \frac{E}{\text{working-age pop}^n} \times 100\%$

↑ if this ↑ then it means economy is creating jobs faster than working age pop^n growth.

Under-Utilized labour

Marginally-attached worker ⇐ still part of U and LF: not working, not looking, but has looked recently.
- when they finally give up looking ⇒ "discouraged worker" ↖ no longer part of U or LF

Note: when a discouraged worker drops out of LF the unemployment rate falls!!

$\frac{U}{LF} = \frac{2}{10} \Rightarrow \frac{1}{9}$ (looks as if things have improved but actualy they are worse than before).

Unemployment vs. Full Employment

part of FULL EMPLOYMENT "NATURAL UNEMPLOYMENT"

Frictional Unemployment: natural flow of workers in/out of LF
"SEARCH" for best worker / best job to fit skills ⇒ "MATCHING"
- normal turnover due to job creation/destruction.
- permanent, healthy feature of job market.

Structral Unemployment: industry becomes obsolete ⇒ workers laid off & require new skills + training.
factory closes down & moves elsewhere
- long-lasting → retraining, relocation

Cyclical Unemployment: due to recessions / expansion of business cycle.

FULL EMPLOYMENT ⇒ $U = U^{NATURAL, FULL}$ = FRICTIONAL + STRUCTURAL

determined by: age distribution of popn
scale of structural change (techn. ie revolution)
real wage rate (wage in terms of goods it buys) ⟷ "efficiency wage" – pay above minimum or market wage to attract and keep best workers (most productive)
unemployment benefits (benefits ↑ ⇒ U^{NAT} ↑)

When $U = U^{NATURAL} \Rightarrow Y = Y^{POTENTIAL}$, $Y - Y^{POT}$ = output gap.

The difference between Y and Y^{POT} is "output gap"

$U > U^{NAT} \Rightarrow$ cyclical unemployment > 0, $Y < Y^{POT}$, output gap is negative. (bad!)

$U < U^{NAT} \Rightarrow$ cycl. $u < 0$, $Y > Y^{POT}$, output gap is positive.

price level, inflation and Deflation

Inflation : persistant $P\uparrow$
deflation : persistant $P\downarrow$

potential problems w/ unexpected bursts of inflation & deflation

- redistribution of both income & wealth.
- $\downarrow y_{Real}$ and $\uparrow u$
- reallocation of resources away from production

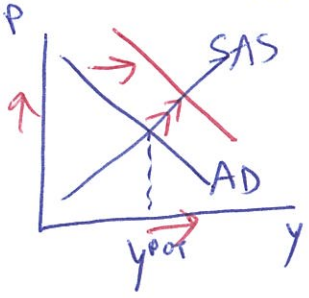
if $P\uparrow\uparrow \Rightarrow$ until wages $\uparrow$ the real wage is lower
$\Rightarrow$ workers worse off and firms better off with higher real profits.

- opposite for deflation.

if $P\uparrow\uparrow \Rightarrow$ repayment of loan is in $ that are worth less than orginal loan so lender is worse off and borrower is better off.

$$\bar{i} = r\downarrow + \pi\uparrow$$

$\bar{i}$: nominal interest rate. r: real interest rate. π: inflation



$\Rightarrow$ the boom caused by rising profits and hiring is temporary. and when wages start to rise, eventaly economy will return to $y^{POTENTIAL}$

Deflation $\Rightarrow$ cuts in spending by borrowers ($\pi\downarrow \Rightarrow i\uparrow$)
leads to recession and $u\uparrow$

inflation/deflation distract economic fores from where they would otherwise put their resources into speculative behaviour.

hyper-inflation ($\pi > 50\%$ per month) $\Rightarrow$ economic & social collapse.

Measuring Inflation using CPI (CONSUMER PRICE INDEX) (4)

(Δ change in prices, not the prices themselves!!!)

CPI: measure of average prices paid by urban consumers for a fixed basket of Consumer g+s → creates

reference base period: CPI = 100.

if 2011 is base with $CPI^{2012} = 120$ $\Rightarrow \pi = \frac{CPI^N - CPI^0}{CPI^0} = \frac{120-100}{100}$

$\pi = 0.2 \times 100\%$

$= 20\%$

Construction

- select the old basket
- find the updated, new prices of those goods. (uses monthly price survey).
- calculate CPI.: $\frac{Q^0 p^N}{Q^0 p^0} \times 100. = \frac{70}{50} \times 100 = 1.40$

old, fixed basket

Item	Q^{old}	p^{old}	$Cost^{old}$ $Q^0 p^0$	Q^{old}	p^{New}	$Q^0 p^N$ (New cost)
Oranges	10	1	10 $	10	2 $	20
Apples	5	8	40 $	5	10 $	50
			50 $			70 $

So $\pi = \frac{140-100}{100} \times 100\% = 40\%$

Suppose $CPI^{2012} = 120$, $CPI^{2013} = 125$ $\Rightarrow \pi = \frac{125-120}{120} \times 100\% = 4.1\bar{6}\%$

Suppose $Q^0 p^0 = 12{,}000$ ← old cost, $Q^0 p^N = 12{,}500$ ← new cost $\Rightarrow \pi = \frac{Q^0 p^N - Q^0 p^0}{Q^0 p^0} \times 100\% = 4.1\bar{6}\%$

BIASES: "COMMODITY SUBSTITUTION" → we don't buy the same goods as in past
"New goods" aren't same as old (computer vs. typewriter)
"Quality change" (iphone 6 vs. iphone 3); "OUTLET SUBSTITUTION" discount shopping

Alternative measures

GDP deflator : based on goods in GDP, not just consumer goods.
- Uses new basket not old

$$\text{GDP deflator} = \frac{y^{Nom}}{y^{Real}} \times 100 \Rightarrow y^{Real} = \frac{y^{Nom}}{\text{GDP deflator}} \times 100$$

(GDP deflator acts as a price level)

uses chained-dollar method (Appendix Ch. 20).
⇒ uses both current and older quantities
⇒ overcomes biases associated with CPI.

CPIC : Chained Price Index for Consumption.

$$CPIC = \frac{C^{Nom}}{C^{Real}} \times 100$$ (uses both current & older quantities)

lower than traditional CPI approach.

Core Inflation Rate : excludes volatile elements like oil/gas and food.

if food & gas ↑ in price, then core inflation will underestimate actual inflation.

Ch. 22 Economic Growth

Growth rates in general : $\frac{New - Old}{Old} \times 100\%$

$y^{(Real)}_{2012}$ growth rate : $\frac{y^N_{2012} - y^O_{2011}}{y^O_{2011}} \times 100\%$

↑ growth rate ⇒ ↑ standard of living.

real GDP per person : $\frac{Y}{pop^n}$

$$\text{growth rate} = \frac{\frac{Y^N}{pop^n_N} - \frac{Y^{OLD}}{pop^n_{OLD}}}{\frac{Y^{OLD}}{pop^n_{OLD}}} \times 100\%$$

Note: approximation : growth rate of real GDP − growth rate of popⁿ

COMPOUND GROWTH

RULE of 70: # of years to double = $\frac{70}{\text{annual \% growth rate.}}$

(Approximation also)

so $\frac{70}{5\%} = 14$ years or $1^{\$}(1.05)^{14} = 1.98^{\$}$.

$\frac{70}{7\%} = 10$ yers. or $1^{\$}(1.07)^{10} = 1.97^{\$}$

- This suggests that higher economic growth could allow poor countries to catch up to wealthy, developed countries.

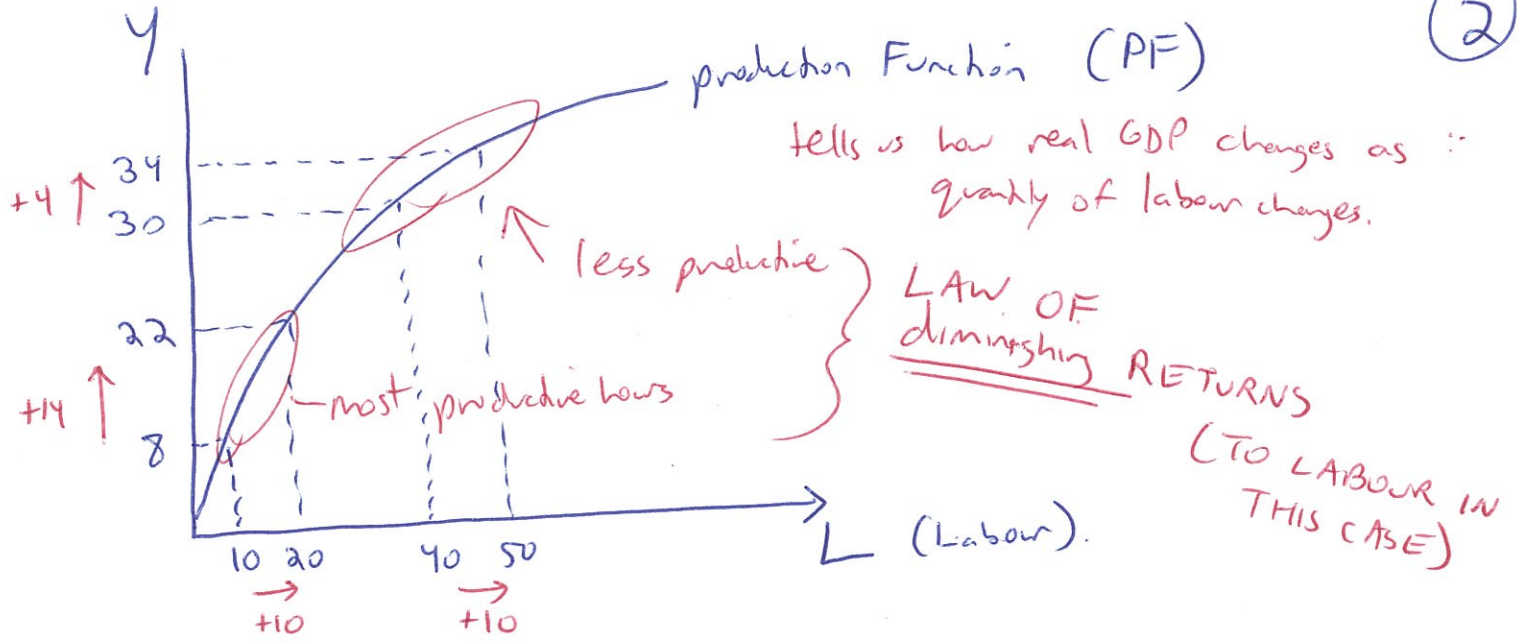
- In recession, growth rates ↓ ; NEGATIVE during great depression (1920s–30s)
- Avg. growth rate is 2% over century., currently around 1.5%

POTENTIAL GDP and how it grows

labour is the only variable factor in the short-run (SR).

So labour market must be studied.

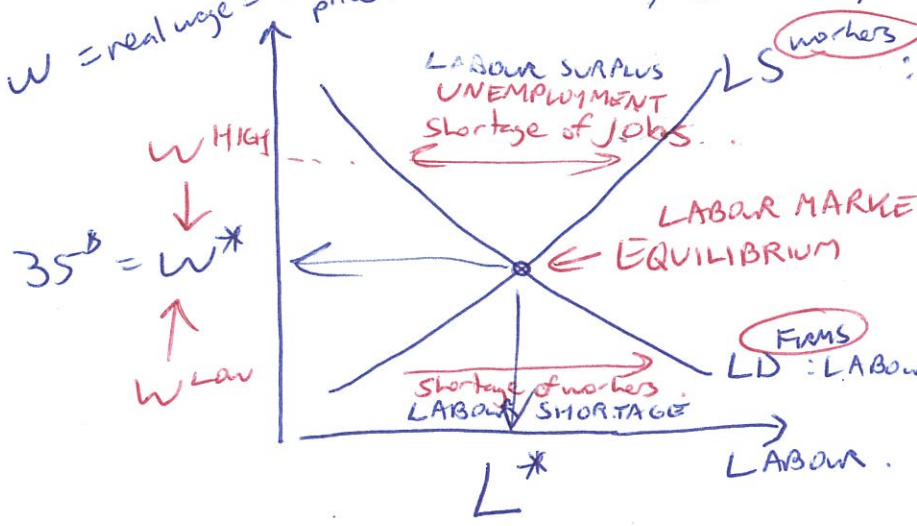
- Aggregate Production function (holding land, capital + entrepreneurship fixed).



tells us how real GDP changes as quantity of labour changes.

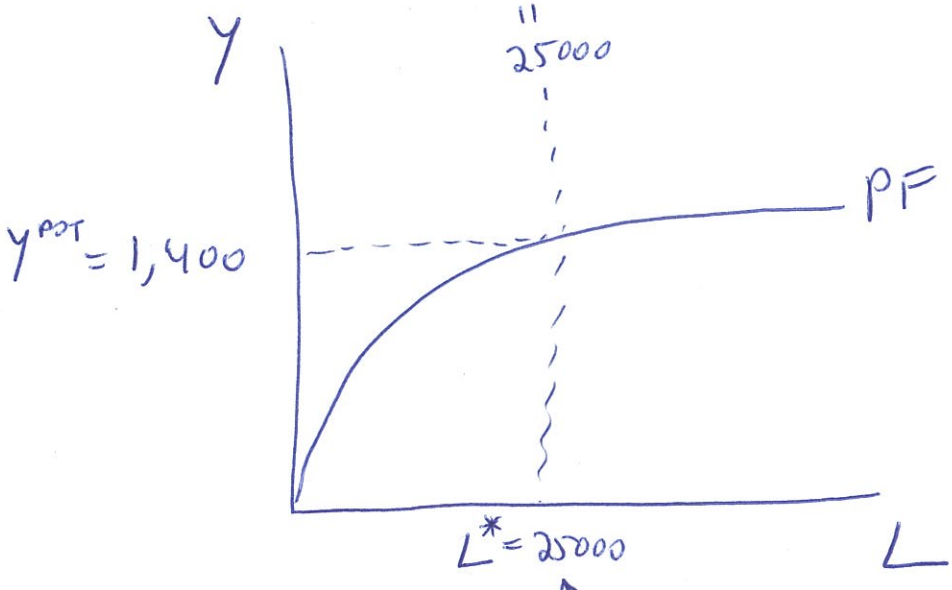
LABOUR MARKET.

W = real wage = $\frac{\text{nominal wage}}{\text{price level}}$ = how many g+s money can buy, ie. $\left(\frac{100\$}{2\$ \text{ per good}} = 50 \text{ goods.}\right)$



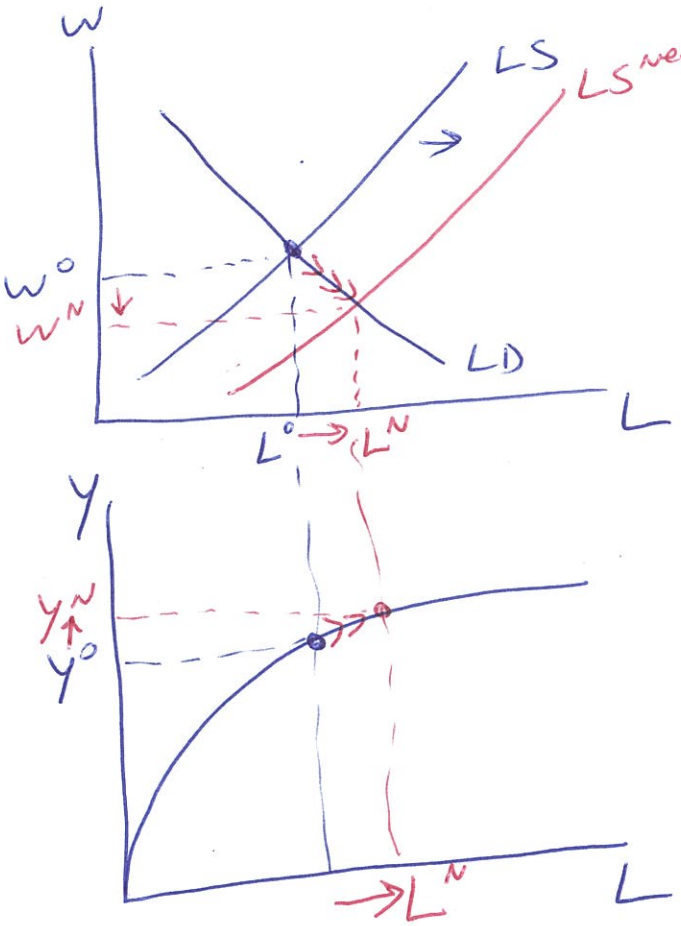
higher real wage ⇒ more people willing to work, and for longer hours.

LD : LABOUR DEMAND : as labour increases, it becomes less productive so firms are willing to pay less! (LAW OF diminishing Returns).



How does Y^{RDT} grow?

LS grows (shifts right)



L = # of workers × Avg. hours per worker.

$L \uparrow$ if # of workers ↑ (ie. immigration) pop^{n} ↑, employment rate ↑

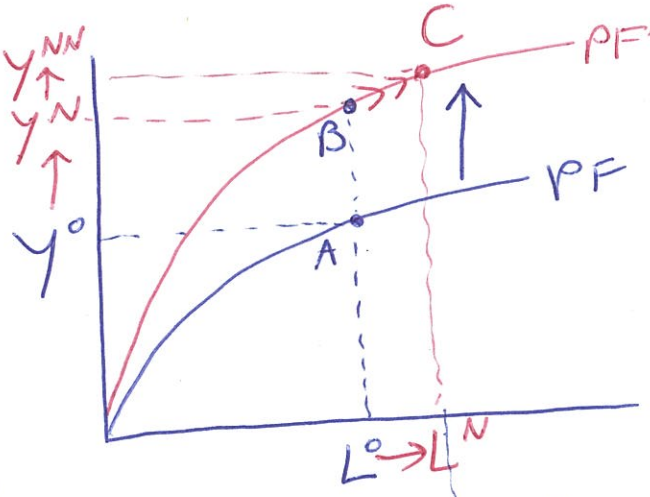
Avg. hours per worker ↑

LD grows (shifts right)

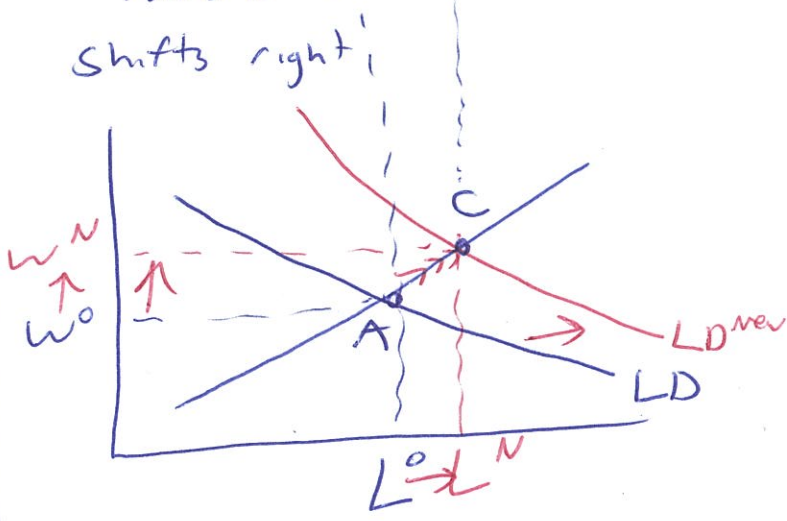
Why would firms want to hire more workers? could be due to an ↑ in productivity

Labour productivity = $\frac{Y}{\#\text{ of workers.hours.}}$

if Labour productivity ↑ ⇒ Prod. F^{n} ↑



also, firms will pay more to get more hours of labour so demand shifts right



⇒ LABOUR is more productive & more is employed.

Why does Labour Productivity grow?

preconditions : incentive system by firms, markets, property rights + money.

if
- physical capital (machines, factories)
- * Human capital (accumulation of skills + knowledge). ← Fundamental
- Technological advances (microchips, processors, techniques)

} ↑ ⇒ productivity ↑

Growth Theories (policies to ↑ growth: ↑ savings, R+D, Education, aid to developing nations; ↑ Intl. trade)

A) Classical (MALTHUS): real GDP per person can't grow over LR because as soon as we make some money, we make more babies + are right back where we started.
" poor → rich → sex → baby → poor."

B) Neo-Classical: real GDP per-person can grow because of technological innovations. ⇒ investments in capital ↑

⇒ $\left(\frac{K}{L}\right)$ ↑ until its constant again (due to diminishing returns)

→ growth will stop w/o technological advances.
→ DOESN'T explain WHAT CAUSES TECHN. ADVANCES!!
predicts, if all economies can access same technology + interest rates then all economies will eventaly converge $\left(\frac{Y}{popn}\right)$.

C) New Growth Theory: people make choices to innovate (not accidental) and will
NO GROWTH STOPPING MECHANISM. { ↑ as profits and income ↑, ⇒ (Y → R+D → Y → R+D → ...)
• INVENTIONS ARE PUBLIC GOODS ⇒ SHARED!!

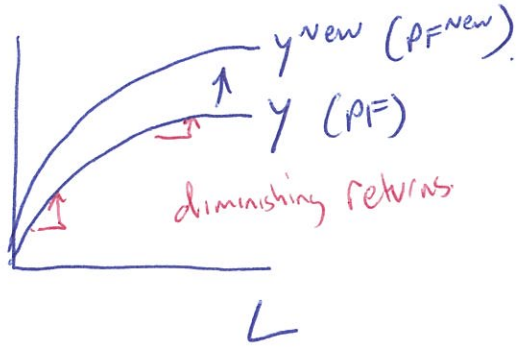
Ch. 23 (NOT ON BRUCE HAMMOND'S outline) ← BUT IN LATER CHAPTERS

FINANCE, SAVINGS & INVESTMENT

FINANCE: ACTIVITY OF PROVIDING FUNDS THAT finance expenditure on capital. (different from money).

FINANCIAL CAPITAL: the funds that firms use to buy physical capital.

capital ↓
↑K ⇒



Capital (K) changes due to investment (↑K) and depreciation (↓K).

net investment = gross investment (I) less depreciation.

↖ GDP, G is for "Gross", so it includes depreciation!!

Initial capital = 40k
depreciation = 25% = .25(40k) = 10k.
gross investment = 20k
New capital = 40k − 10k + 20k = 50k.
(Depreciation, I)
net investment = 10k.

Wealth: Stock variable. (accumulation of Savings income).

Savings: income not paid to taxes or spent on C. ⇒ used to finance investment.

↑ savings ⇒ ↑ wealth.

($\underbrace{Y - T}_{\text{after-tax income}} - C = \text{Savings}$).

Capital gains (when market value of assets ↑).
Capital losses (" " " " ↓).

To make Y grow, Savings and wealth need to be transformed into investment & capital.

3 types of Financial Capital Markets

1) LOAN MARKETS (credit): loan to buy car or couch
mortgage to buy house.
business wants to buy inventory.
typically ST. but mortgages can be LT.

2) BOND MARKET: A bond is a promise to make specific payments on specific dates.
- bonds can be resold. (so you can buy all sorts)
- govt. & businesses issue bonds. (ie. GOVT: "treasury bills")
- LT or ST.

"mortgage-backed securities"

3) STOCK MARKETS: certificate of ownership in a company.

Financial Institutions play on both sides of the market: (borrower + lender).
and act as intermediaries between other borrowers & lenders.

(ie. commercial banks, pension funds, trust companies, insurance companies)
↑ risk-sharing services

RISKS FACED BY FINANCIAL INSTITUTIONS

Insolvency: if assets < liability } ⇒ networth < 0
or lending < borrowing } ⇒ "insolvent", must go out of business.

Liquidity (to avoid this, they are regulated).
↳ When loans are high but LT so they can't be collected in order to pay ST borrowings (that need to be repaid).
Usually this doesn't happen since they can borrow more but if every institution is cash-strapped, then could arise.

- BOTH played a part in 2007-8 financial meltdown.

Interest & asset prices

a 100$ bond pays 10$ a year.

$\frac{\$10}{\$100} \times 100\% = 10\%$

if bond price falls to $50: $\frac{\$10}{\$50} \times 100\% = 20\%$

so $P^{BOND} \downarrow \Rightarrow i \uparrow$ (they move in opposite directions)

REMEMBER, it's the payment that's fixed, not the interest rate

(LF) LOANABLE FUNDS MARKET: All the financial markets together.

FUNDS COME from 3 sources: HH savings $(Y-T-C)$ (net taxes (after transfers))

Govt savings (govt. budget surplus): $T-G$

RoW: $M > X \Rightarrow$ we are borrowing (borrowings). RoW = Rest of World. other's savings. to pay for those extra imports.

$$\underbrace{(Y-T-C)}_{\text{after-tax income}} = \underbrace{S}_{\text{PRIVATE HH}} + \underbrace{(T-G)}_{\text{GOVT}} + \underbrace{(M-X)}_{\text{RoW}}$$

$$I = S + (T-G) + (M-X)$$

Investment is financed by these 3 sources.

Derivation: $Y = C + I + G + X - M$.

rearranging. $Y - C - G + M - X = I$

$$Y - T - C + T - G + M - X = I$$

$$S + (T-G) + (M-X) = I$$

Note if $T < G$ then govt. budget deficit and govt. competes with firms for investment funds.

if $X > M \Rightarrow$ then our goods act as loans to other countries and so our funds are being invested elsewhere.

NATIONAL SAVINGS = $S + (T-G)$. (HH + GOVT.)

$\Rightarrow$ NATIONAL SAVINGS and foreign borrowing finance investment.

Real Interest Rate: opportunity cost of loanable Funds (LF).

- adjusted to remove the effects of inflation

$r_{at} = i(1-t) - \pi$ (after-tax)

$$r = i - \pi \quad \text{from} \quad i = r + \pi$$

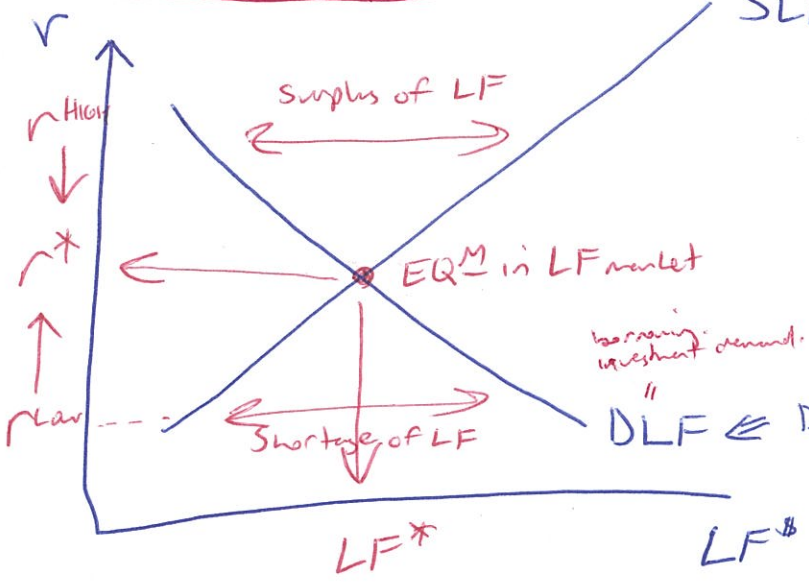
(r: real, i: nominal, π: inflation)

I lan you $1000 at 5% (i)
In one year you give me $1050.
but $\pi = 2\%$ so $1000 in goods cost $1020, So I only really made $30 ($r = 3\%$).

if you want to earn 5% in "real" purchasing power you need 5% interest plus. you need to cover inflation

So $i = r + \pi$
$5\% = 3\% + 2\%$

START w/ CLOSED ECONOMY



SLF ⇒ ↑r ⇒ ↑ Savings.

shifts due to: $(Y-T)\uparrow \Rightarrow LF\uparrow$
y Dire $\uparrow \Rightarrow LF\downarrow$
wealth $\uparrow \Rightarrow LF\downarrow$
default risk $\uparrow \Rightarrow LF\downarrow$.

↑ means right
↓ means left.

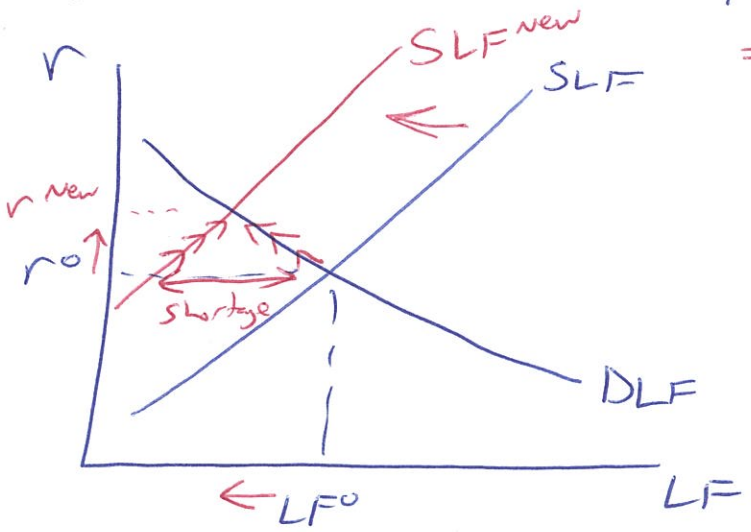
borrowing/investment demand

DLF ⇐ Demand is downward sloping because fewer investments are profitable at high REAL interest rates. (PROFIT ↓ r).

If expected profits soar (ie recession)

DLF shifts left.

Suppose $y^f \uparrow \Rightarrow$ save less (y'all have more money later).



$\Rightarrow$ creates a shortage of LF at r^0

$\Rightarrow$ borrowers offer higher r so they can get savings

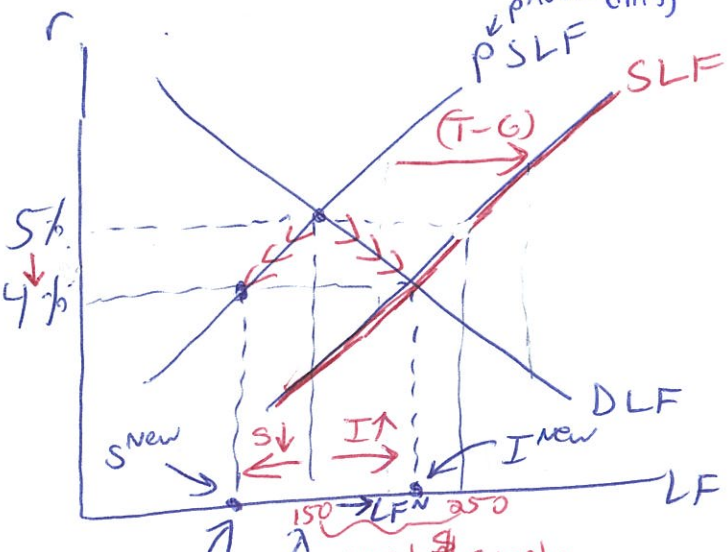
$\Rightarrow r \uparrow$, LF $\downarrow$.

GOVT in the LF market

SLF : Supply comes from S (HH's), T-G (gov't savings), and M-X (RoW borrowings)

GOVT BUDGET SURPLUS (T>G)

(T-G)>0 then more supply of LF

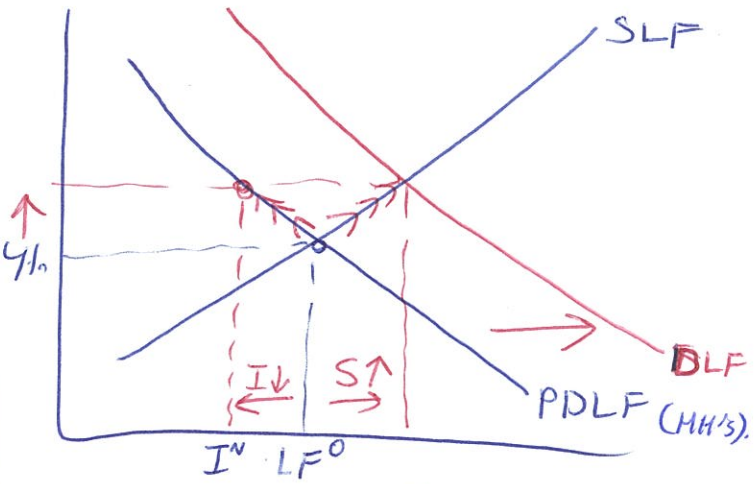


notice that private savings fell since r↓

Also note that total savings did NOT go up by 100b$, but less!

GOVT BUDGET DEFICIT : T<G

T-G<0 then gov't. is a borrower and DLF shifts right.



the gov't. competes for LF causing I↓ (since r↑)

This is known as "CROWDING OUT EFFECT"

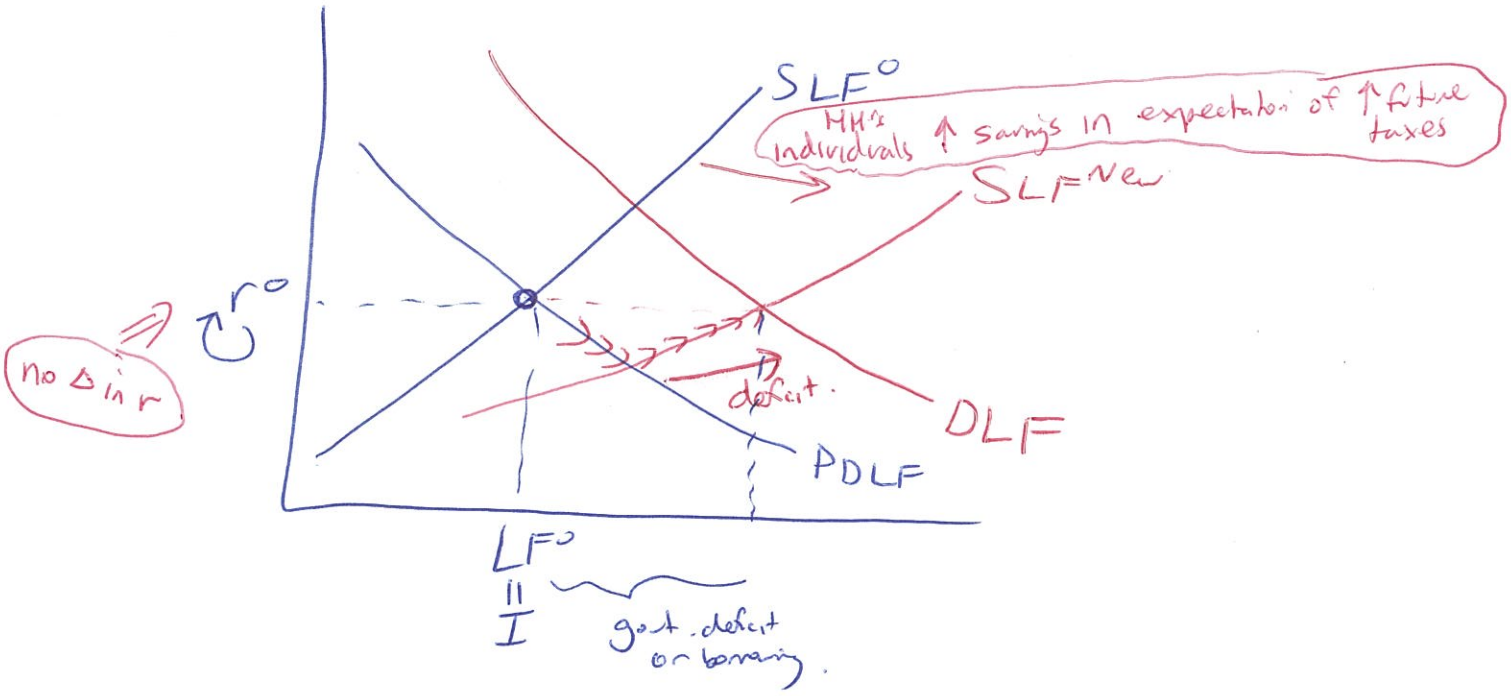
(gov't budget deficit $\Rightarrow r \uparrow = I \downarrow$)

Ricardo – Barro Effect

Claimed govt. budget deficit has no effect on r or I

Since rational taxpayers.

If taxpayers observe a deficit ⇒ They decide to ↑ Savings in expectation of future higher taxes that will make disposable income lower in future.



GLOBAL LF MARKET

FINANCIAL CAPITAL is GLOBAL : Int. capital mobility

- lenders will go where r is highest
- borrowers will go where r is lowest.

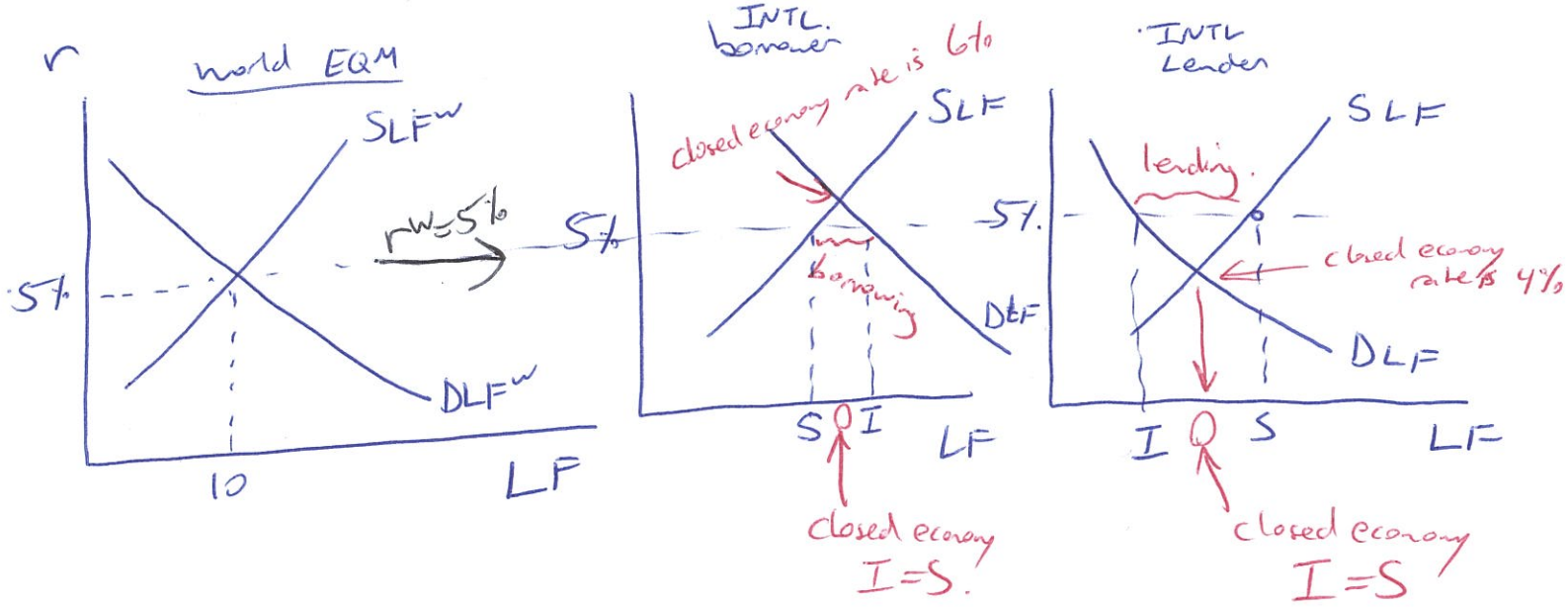
if $X < M$, $NX < 0$ ⇒ they are a borrower,

and Q^{LF} > National savings $S + (T-G)$

(Q^{LF} includes ROW borrowing)

if $X > M$, $NX > 0$ ⇒ they are a lender.

and Q^{LF} (we are a lender.) < National savings $S + (T-G)$.



If a small county experiences a shift in SLF or DLF, there won't be a significant Δ in $r^W = 5\%$, but if a large county like U.S. or China experiences a significant shift, then SLF^W or DLF^W will shift and r^W would Δ as well.