

Macroeconomics

Multiple choice question

1: e

2: d

3: e

4: b

5: a

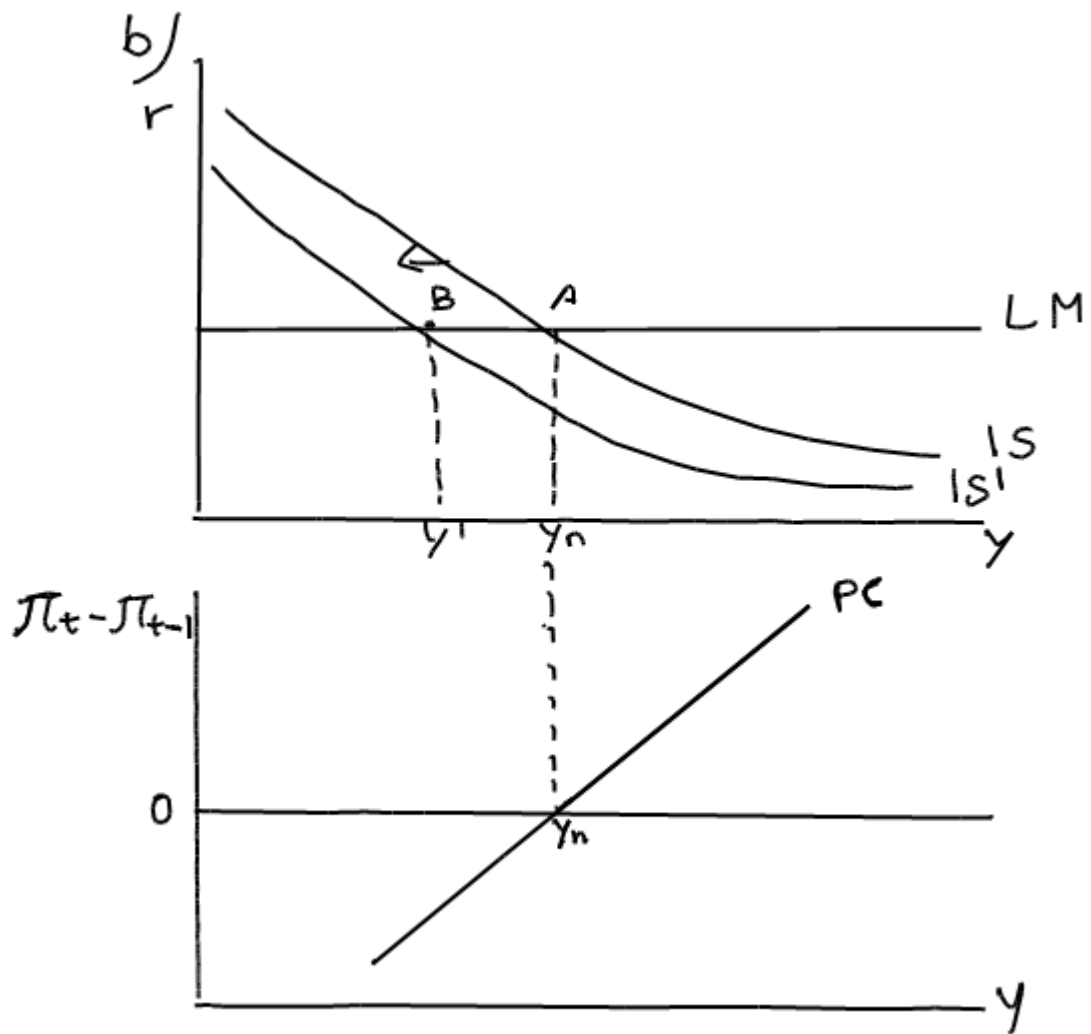
Exercise 1

$$a) \quad (1+i) = (1+i^*) \frac{E_t}{E_{t+1}^e}$$

↓

Demand for foreign bonds decrease,
People will find domestic bonds
more attractive. Demand for domestic
currency increases → the currency
will appreciate

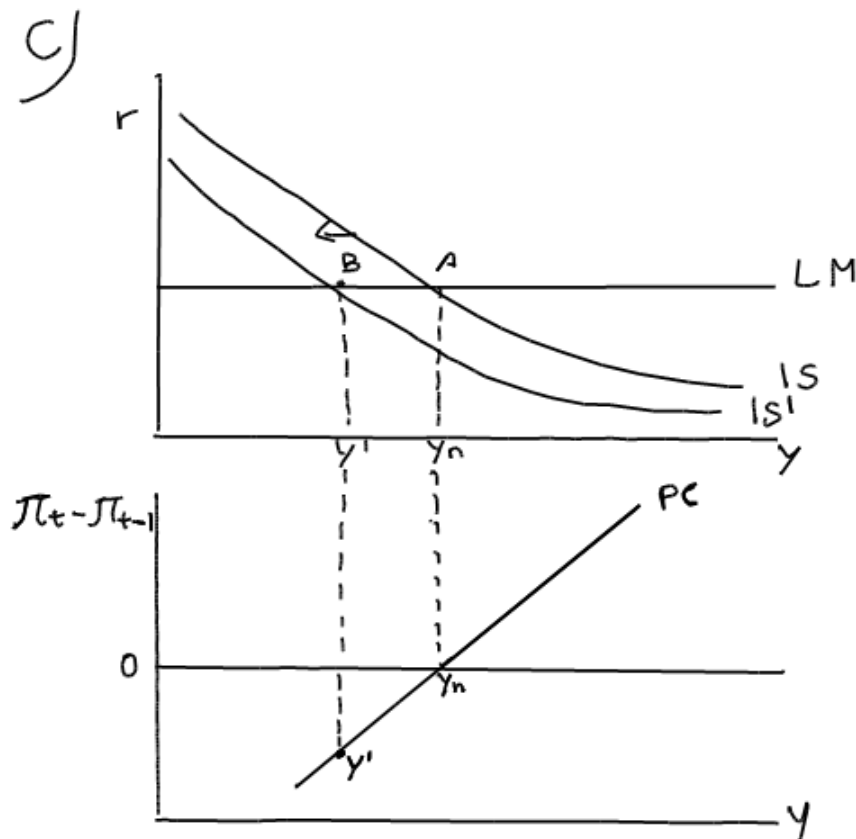
The nominal exchange rate → will increase due to the appreciation → it becomes more expensive to buy the domestic currency.



Since there was an appreciation, we know from Marshall Lerner condition that $NX \downarrow$

The domestic currency ~~de~~ appreciate, demand for domestic goods from foreign countries will go down ~~###~~ $X \downarrow$
Domestic currency is more ~~valuable~~ valuable $IM \uparrow$

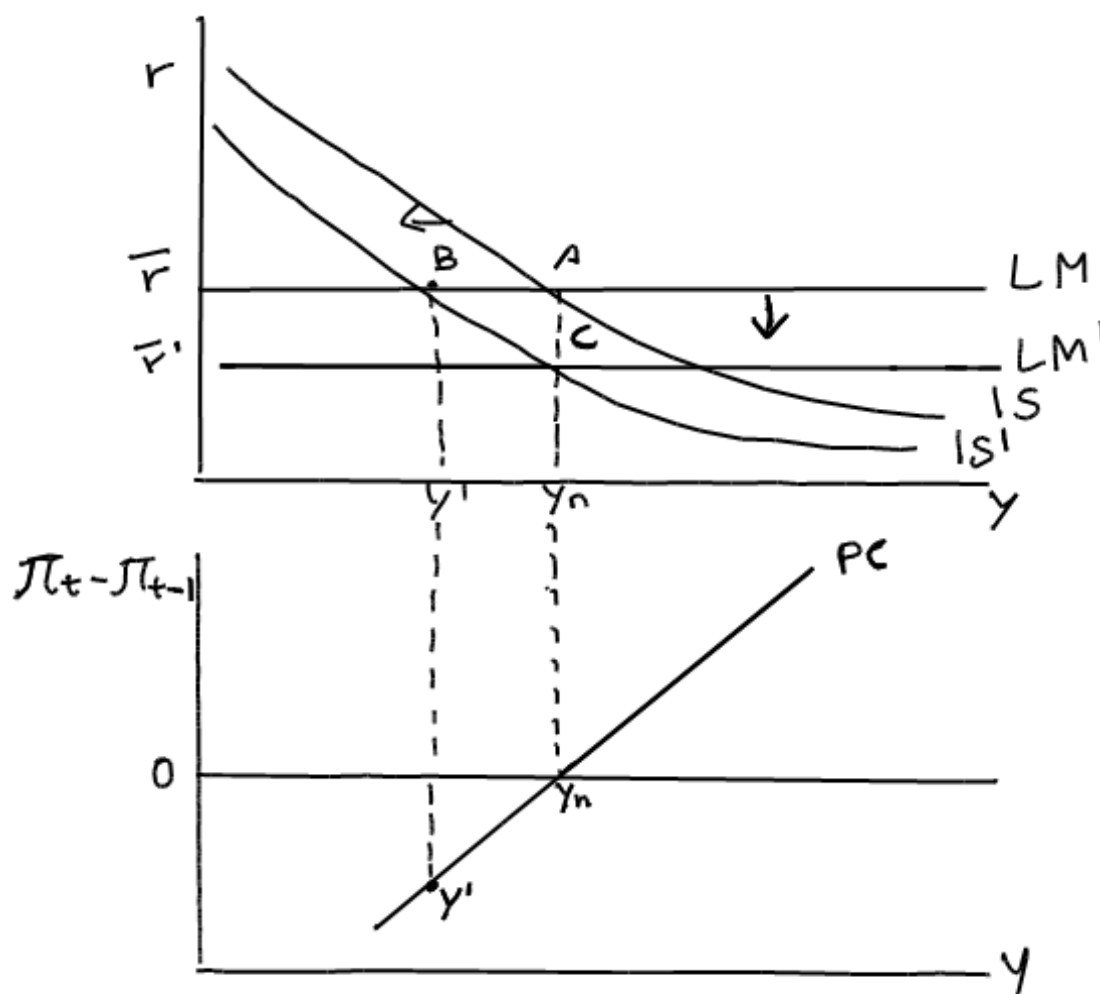
Shift of IS to the left. (also drawn)



Now output is below potential output. So unemployment increased because output went down. When unemployment is higher the bargaining power for workers went down. Therefore we do not have the following mechanism where real wages demanded is higher and higher and therefore prices will be higher and higher – which is inflation. So now where unemployment is higher – the change in inflation is negative.

d)

The central bank will react to this change in inflation by using an expansionary monetary policy. If the central bank (CB) did not react and this could continue the economy is in fear of recession. CB will therefore intervene. CB will buy bonds – increase money supply and thereby decrease the interest rate to get output back to potential. The decrease in the interest rate will make investment more attractive and therefore increase investment. Through the multiplier the full effect will be bigger than just the increase in investment.



We will have new medium run equilibrium at point C.

The final level of investment is greater than before the foreign change in the interest rate – since CB followed and decreased the domestic interest rate. When the foreign interest rate decreased the change in NX was negative since X decreased and IM increased. After CB intervened the domestic

currency will depreciate and through Marshall Lerner condition NX will go up. Therefore the effect on NX is uncertain. Consumption must have decreased at its final level due to the decrease in output/income → which affect consumption directly.

Inflation is lower due to the period the negative change in inflation rate.

e)

Yes, the economy would have moved back to its medium run equilibrium without any monetary or fiscal policy.

The economy could have self-corrected itself through changes in price-levels. Since the domestic country had a negative change in the rate of inflation – and foreign prices would have increased more this would eventually create a real depreciation → NX will go up. This will go on until the economy hits its potential output.

The policy implemented will find the medium-run equilibrium in the short run.

Exercise 2

a)

$$Y = C + I + G$$

$$* Y = C_0 + c_1(Y - T) + d_0 + d_1Y - d_2(r + x) + G$$

$$y = 50 + 0,7(Y - 100) + 50 + 0,1Y - 1000(2\% + 0) + 190$$

$$Y = 50 + 0,7Y - 70 + 50 + 0,1Y - 20 + 190$$

$$Y - 0,7Y - 0,1Y = 200$$

$$0,2Y = 200$$

$$\underline{\underline{Y = 1000}}$$

* Will now use this to find the multiplier

$$Y = C_0 + c_1Y - c_1T + d_0 + d_1Y - d_2r - d_2x + G$$

$$Y - c_1Y - d_1Y = C_0 - c_1T + d_0 - d_2r - d_2x + G$$

$$Y(1 - c_1 - d_1) = C_0 - c_1T + d_0 - d_2r - d_2x + G$$

$$Y = \frac{1}{(1 - c_1 - d_1)} (C_0 - c_1T + d_0 - d_2r - d_2x + G)$$

we know $x = 0$

$$Y = \frac{1}{1 - c_1 - d_1} (C_0 - c_1T + d_0 - d_2r + G)$$

$\frac{1}{1 - c_1 - d_1}$ is the multiplier

$$\frac{1}{1-c_1-d_1} \quad c_1 = 0.7$$

$$d_1 = 0.1$$

$$\frac{1}{1-0.7-0.1} \rightarrow 5$$

5 is the value of the multiplier

b) $x = 1\%$ $i = 2\%$ $\pi^e = 0\%$
real borrowing rate $r = i - \pi^e + x$

$$r = 2\% + 1\% = \underline{\underline{3\%}}$$

The real borrowing rate is now increased.
It became more expensive to borrow money.

Investment will decrease since it depends negatively on the borrowing rate through d_2

So output decreased because investment decreased.

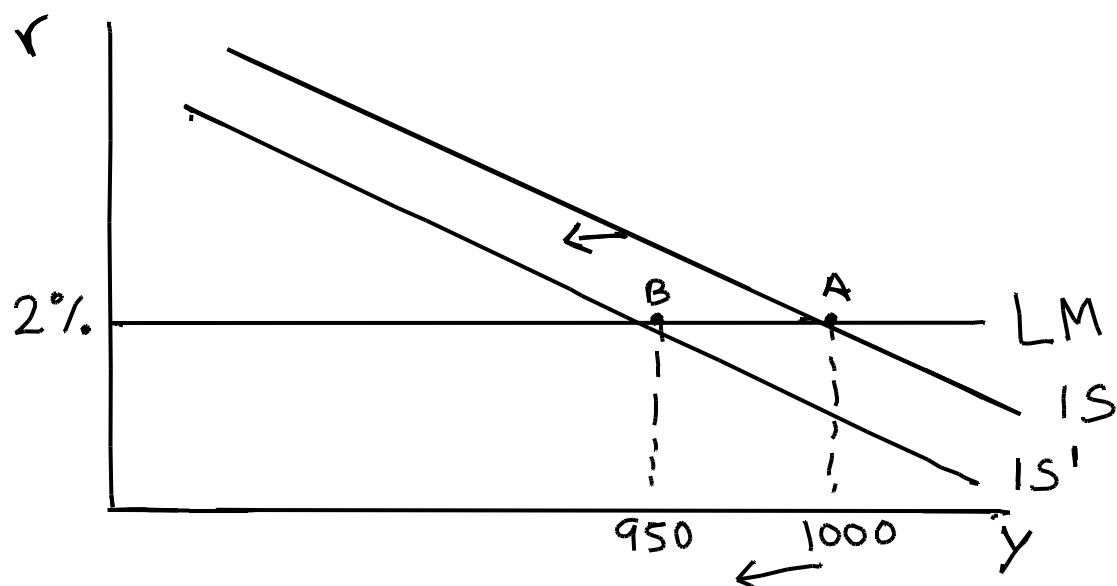
Consumption will also decrease since consumption depend positively on output and output decreased.

$$Y = 50 + 0.7(Y - 100) + 50 + 0.1Y - 1000(2\% + 1\%) + 190$$

$$Y - 0.7Y - 0.1Y = 50 - 70 + 50 - 30 + 190$$

$$0.2Y = 190$$

$$Y = \underline{\underline{950}}$$



Shift of IS to the left since
X is not part of the real interest
rate $r = i - \pi^e$

c)

if the sensitivity of investment to changes in the borrowing rate would increase to 1200 the effect would have been bigger. Since investment now changes more to changes in the real borrowing rate. So any small changes would make firms more uncertain to whether or not they should invest → decreasing investment even more.

$$d_2 = 1200$$

$$Y = 50 + 0.7(Y - 100) + 50 + 0.1Y - 1200(2\% + 1\%) + 190$$

$$Y - 0.7Y - 0.1Y = 50 - 70 + 50 - 36 + 190$$

$$0.2Y = 184$$

$$Y = 920$$

$$\Delta Y = 80$$

d)

if the central bank wanted to bring equilibrium back to its initial level they could use expansionary monetary policy (expansionary open market operation). The central bank would buy bonds – to increase money supply and demand for bonds → to decrease the interest rate.

The interest rate have to decrease to 1% to bring equilibrium back to its initial level. See calculations underneath.

$$Y = 50 + 0.7(Y - 100) + 50 + 0.1Y - 1000(i + 1\%) + 190$$

$$Y - 0.7Y - 0.1Y = 50 - 70 + 50 - 1000i - 10 + 190$$

$$0.2Y = 210 - 1000i$$

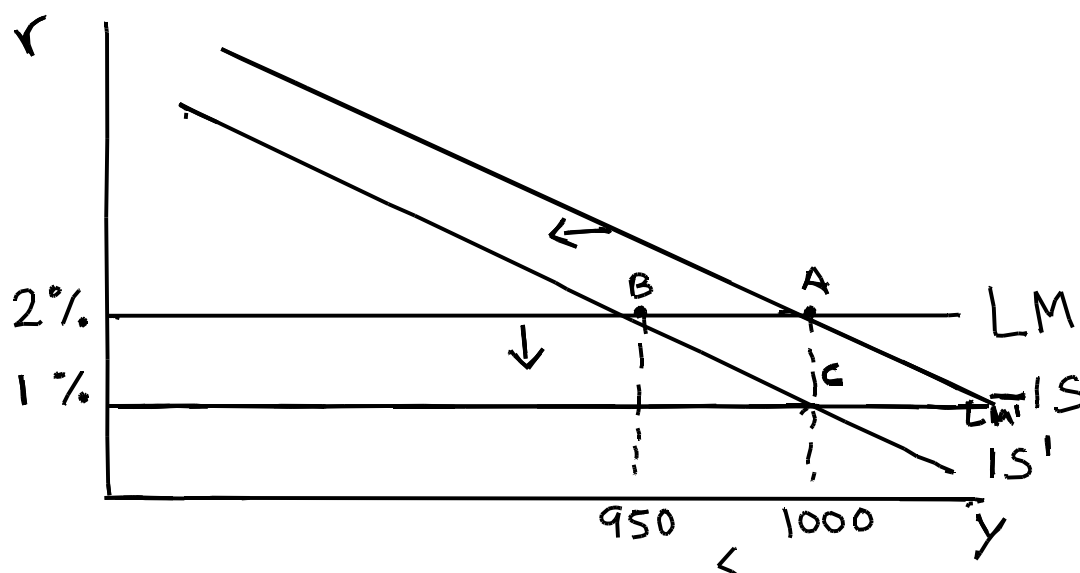
$$Y = 1050 - 5000i$$

We know $Y = 1000$

$$1000 = 1050 - 5000i$$

$$5000i = 50$$

$$i = 0.01 \text{ or } 1\%$$



New equilibrium at point c.

e)

if the risk premium increases to 3% \rightarrow and inflation stays at 0% then the interest would have to decrease below 0. It is not possible to have an interest below 0. (zero lower bound). Due to that argument it is not possible to maintain the same level of output.

Exercise 3

a)

$$\frac{Y}{N} = 5 \sqrt{\frac{K}{N}}$$

Steady state implies $\Delta \frac{K}{N} = 0$

$$S f \frac{K}{N} = \delta \frac{K}{N}$$

Country A $\delta = 0.06$ $S = 0.1$

$$5 S \sqrt{\frac{K}{N}} = \delta \frac{K}{N}$$

$$5^2 S^2 \frac{K}{N} = \delta^2 \left(\frac{K}{N}\right)^2$$

$$5^2 S^2 = \delta^2 \frac{K}{N}$$

$$25 \left(\frac{S}{\delta}\right)^2 = \frac{K}{N} \rightarrow 25 \left(\frac{0.1}{0.06}\right)^2 \rightarrow 69.4 = \frac{K}{N}$$

$$\frac{Y}{N} = 5 \sqrt{25 \left(\frac{S}{\delta}\right)^2} \rightarrow 5 \cdot 5 \frac{S}{\delta} \rightarrow 25 \frac{0.1}{0.06} \rightarrow 41.6 = \frac{Y}{N}$$

$$\frac{C}{N} = (1-s) \frac{Y}{N} \rightarrow (1-0.1) \cdot 41.6 = 37.44$$

Country B $\delta = 0.06$ $s = 0.2$

$$\frac{k}{N} = 2s \left(\frac{s}{\delta} \right)^2 \rightarrow 2s \left(\frac{0.2}{0.06} \right)^2 \rightarrow 277.77$$

$$\frac{Y}{N} = 2s \frac{s}{\delta} \rightarrow 2s \frac{0.2}{0.06} \rightarrow 83.33$$

$$\frac{C}{N} = (1-s) \frac{Y}{N} \rightarrow 0.8 \cdot 83.33 = 66.66$$

b)

At time t $\frac{k}{N} = 60$

Law of capital motion

$$\frac{k_{t+1}}{N} - \frac{k_t}{N} = sf \frac{k}{N} - \delta \frac{k}{N}$$

Country A $\delta = 0.06$ $s = 0.1$

$$s \cdot sf \sqrt{\frac{k}{N}} - \delta \frac{k}{N} + 60 = \frac{k_{t+1}}{N}$$

$$0.1 \cdot 5 \sqrt{60} - 0.06 \cdot 60 + 60 = \frac{k_{t+1}}{N}$$

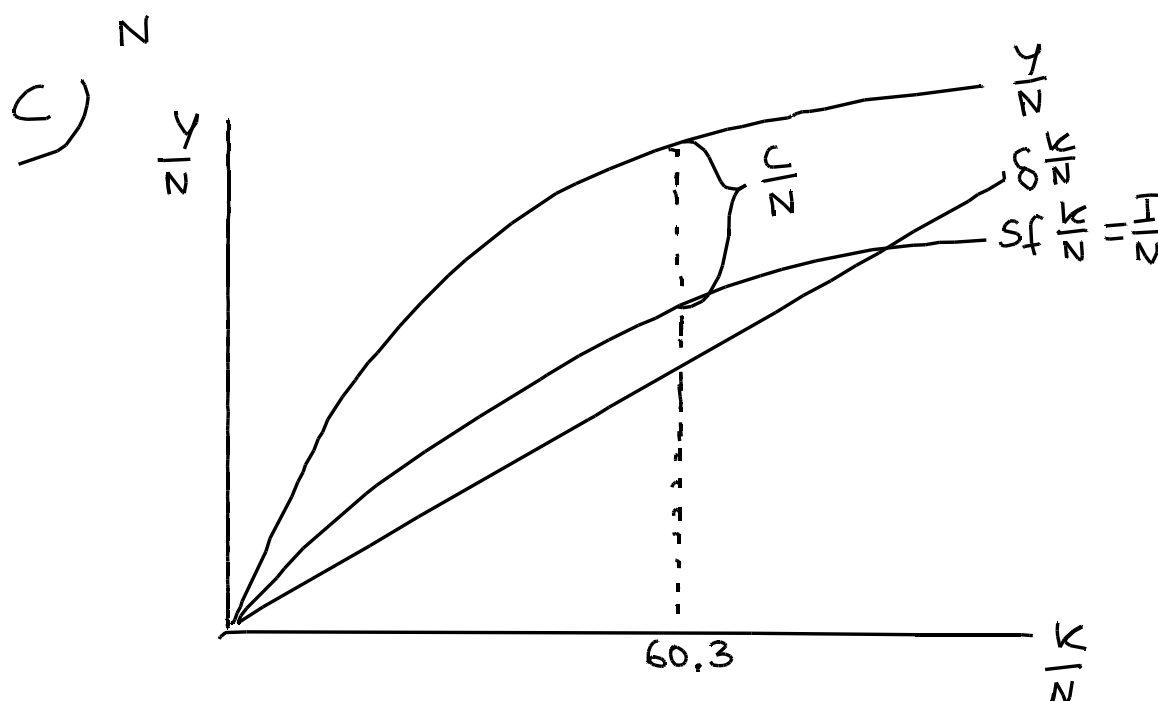
$$\frac{k_{t+1}}{N} = 60.3$$

Country B $\delta = 0.06$ $S = 0.2$

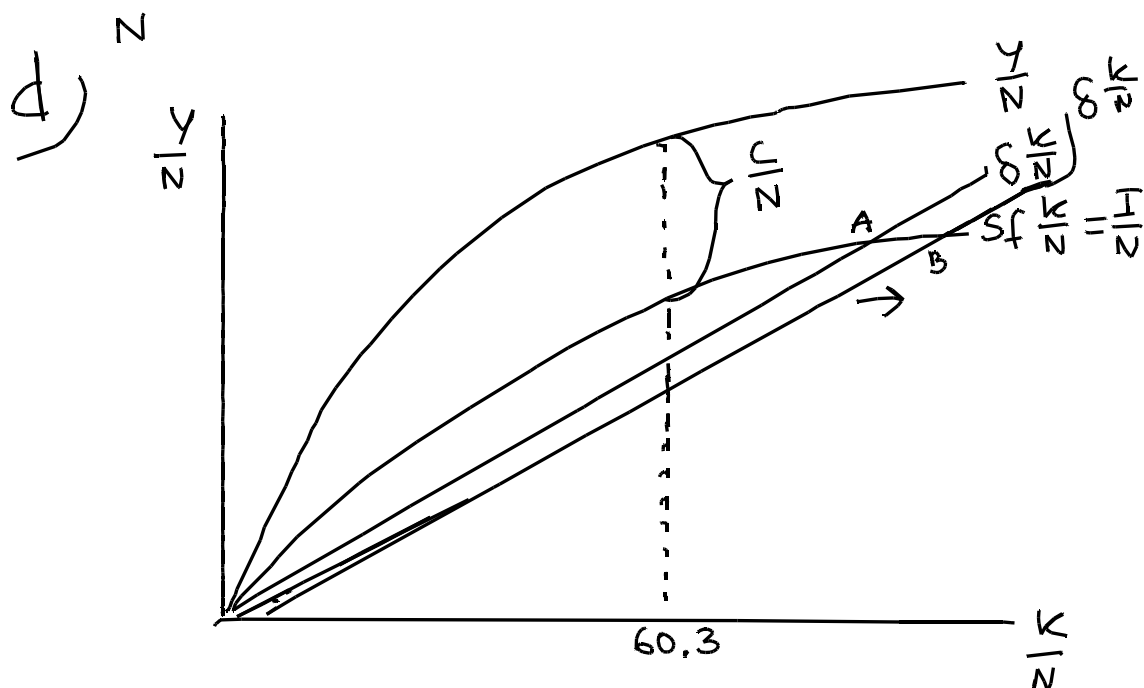
$$0.2 \cdot 5 \sqrt{60} - 0.06 \cdot 60 + 60 = \frac{k_{t+1}}{N}$$

$$\frac{k_{t+1}}{N} = 64.145$$

Country A had only an increase of 0.3 in capital / worker while country B had an increase of 4.145. The difference comes from the fact that country B has a higher savings rate \rightarrow invests more \rightarrow capital per worker is increasing more. Due to the numbers I can conclude that country B is further away from its steady state than country A and therefore the growth rate of output is bigger at country B.



The slope of investment per worker is concave. Investment is a function of savings. Savings is the part of your income Y which you do not consume. As savings increase it will reach a level where consumers is unwilling to save anymore or it is simply not possible to save more than 1. Therefore the function is concave or showing decreasing returns to scale.



The new steady state will increase to point B.

The decrease in the depreciation rate will cause a positive effect on the growth rate of capital per worker and in turn growth rate of output per worker which is a function of capital per worker. So the growth rates in $t+2$ is bigger than in $t+1$ now that capital depreciates at a slower rate \rightarrow bigger part of investment is used to buy new equipment instead of replacing old and since we are below our steady state \rightarrow this has a positive effect on growth.

e)

The new steady state is at a higher level of output/worker but the growth rate at the steady state is still zero. This higher level of output comes from the fact that capital depreciates at a slower rate and therefore does not require the same level of investment to replace.

f) Discuss the following statement: "the higher the savings rate, the more can be consumed in the steady state."

The higher the saving rate the higher level of the steady state in terms of output. But however since consumption is the part of your income which you do not save – then higher saving = lower consumption. On the other hand – it is true that a higher level of savings \rightarrow higher level of the steady state \rightarrow bigger production \rightarrow therefore more can be consumed not saying that it will.

Open question

Options for central bank

- Economy self-correct through changes in price levels \rightarrow real revaluation in the medium run
- One time – revaluation

The central bank can not use monetary policy because the country is operating under a fixed exchange rate regime. In a fixed exchange rate regime the domestic interest rate must equal the foreign one. If the central bank were to use monetary policy they would use contractionary monetary policy \rightarrow increasing the interest rate. This cannot be done because it would create a

reevaluation of the currency due to the increased demand for domestic bonds → increased demand for domestic currency → reevaluation.

Options for the government:

- Contractionary fiscal policy
 - Increase T
 - Decrease G

If the government decreased G it would have a direct effect on output which would decrease → and through the multiplier effect the decrease would be even greater than the decrease in G. So consumption and investment would decrease.

The government could also increase taxes and thereby lowering consumption which also would decrease output. The decrease in output would lead to lowering of investment which depends positively on output.