Question 1:

a) Firstly, GNI pc is defined as the GDP (total domestic production) plus returns on investments abroad, divided on the whole population (pc).

If we were looking at the traditional way of measuring and comparing living standards, GNI pc would be a sufficient measure, as it measures the populations income and what they can buy for it.

However, GNI pc is a pure monetary measurement, and is not a sufficient method of comparing living standards across countries. A person's living standard is not just determined by its income, but levels of education and health is also important factors.

Additionally, it does not take into account the income distribution in the country, meaning that it can exist a large share of poor people and a small elite of rich people pulling the numbers up.

Furthermore, it does not adjust for purchasing power (and thus real exchange rate). When using nominal, official exchange rates, the poor developing countries seem to get a lower purchasing power, and thus this exaggerates the differences between rich and poor nations.

Hence, I would not say that GNI pc is a good or preferable measure of living standards across countries.

By using tex the Human development index, which includes all three factors of education, health and income, you would get a better picture of the living standards.

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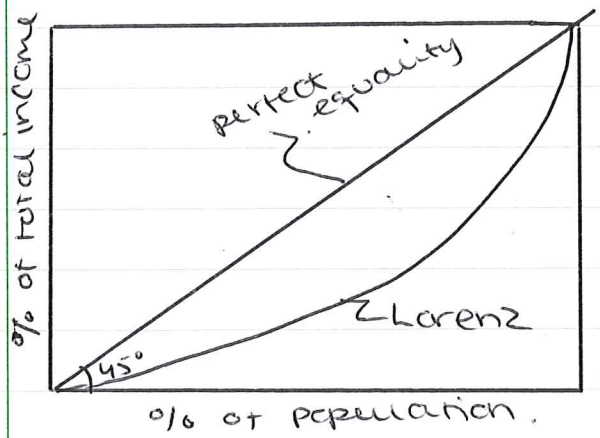
1b) The Lorenz curve is a graphically measurement of the income distribution in a country.



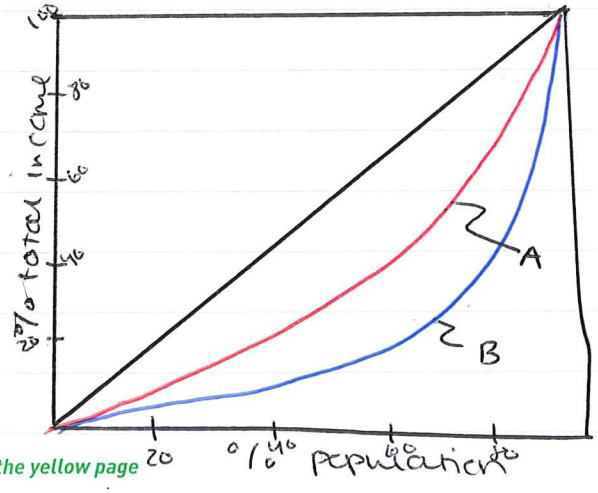
The 45° degree curve in the graph illustrates perfect equality. Here 20% of the country's "poorest" people, gets 20% of the total income. In this case we have no inequality.

The Lorenz curve provides a value between 0 and 1, where 0 is perfect equality, and 1 is as unequal as you get. Where 1 person receives the entire total income.

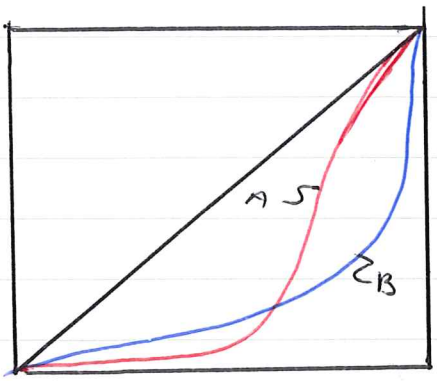
Both the percentage of total income and the percentage of population, is cummulatively aggregated, and is illustrated as ginies or deciles.

Lorenz curves are often used to compare income distributions between countries. The country with a Lorenz curve closest to the "line of equality" has Lorenz dominance, and the most equal distribution of income.

Here we can see that country A has the most equal income distribution.



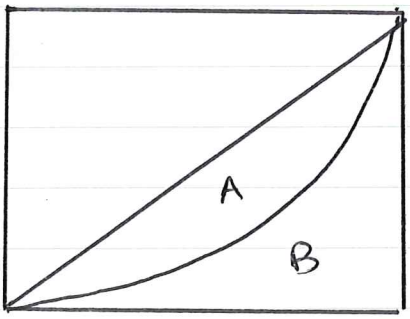
However, if the two country's Lorenz curves are intersecting, or crossing, it will be "impossible" to compare the income distribution, and can thus not be used.



We can then use the Gini coefficient instead.
Gini coefficient is a measure which is anonymous, independant of scale and population size, and emphasizes the transfer principle saying that a rich person could give some of his income to a poor person, and thus make the income distribution more equal.

The Gini coefficient is calculated like this:

$$\frac{A}{A+B} = \text{Gini} \in [0,1].$$



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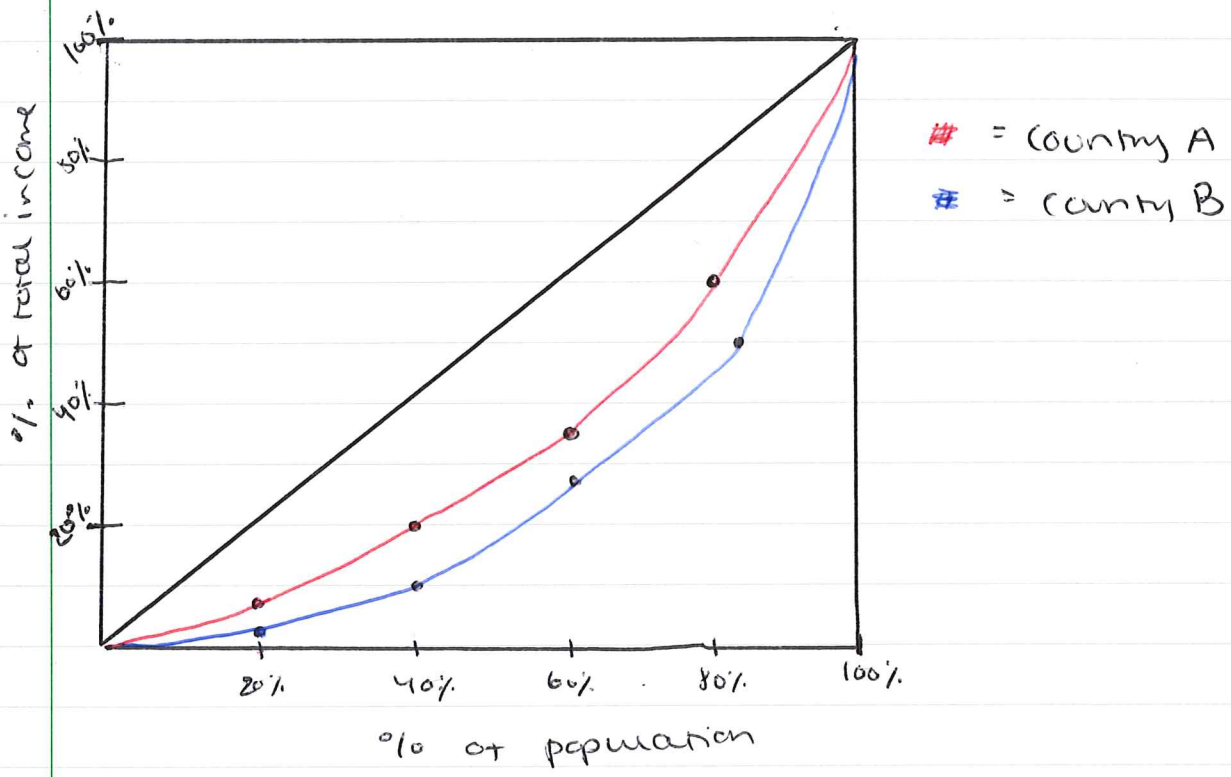
1c)

	A	Cummulative	B	Cummulative
0 %	0	0	0	0
poorest 20 %	8	8	3	3
second 20 %	12	20	7	10
third 20 %	15	35	18	28
fourth 20 %	25	60	22	50
richest 20 %	40	100	50	100



Yes, it is hence possible to decide which county is more equal, since the two Lorenz curves are not crossing each other. We can thus conclude that county A is the most equal regarding income distribution. Line "red" and county A has Lorenz dominance over county B.

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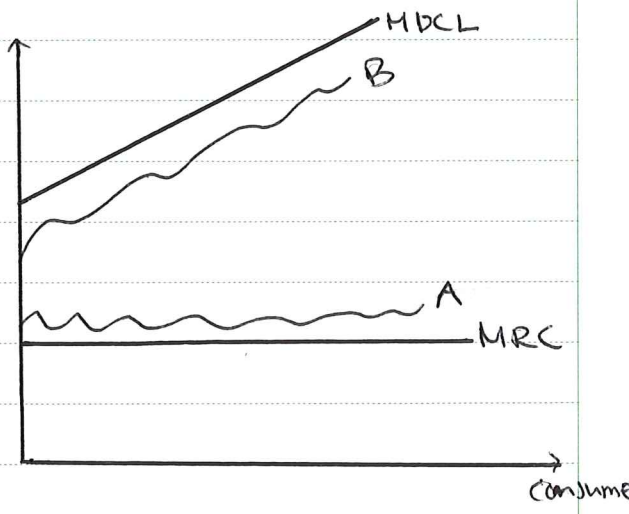
1a) First of all, small farmers in poor countries are often self-sufficient farmers, meaning that they produce just above necessary consumption level for surviving. There are thus not much room for risk taking, as this in the worst case would lead to death.

We can illustrate the case with two farmers, where the farmer ascribed above would be farmer A. Farmer B on the other hand is producing more, just below the level of "minimum desired consumption". We assume that both farmers initially use traditional methods and tools in their production process.

We can illustrate the current situation: →



where MRC = minimum required consumption level for survival, and MDCL = minimum desired consumption level.

Hence, we see from the graph that farmer B produces "way" above the critical level for survival and will not risk dying if they took some chances in the production process.

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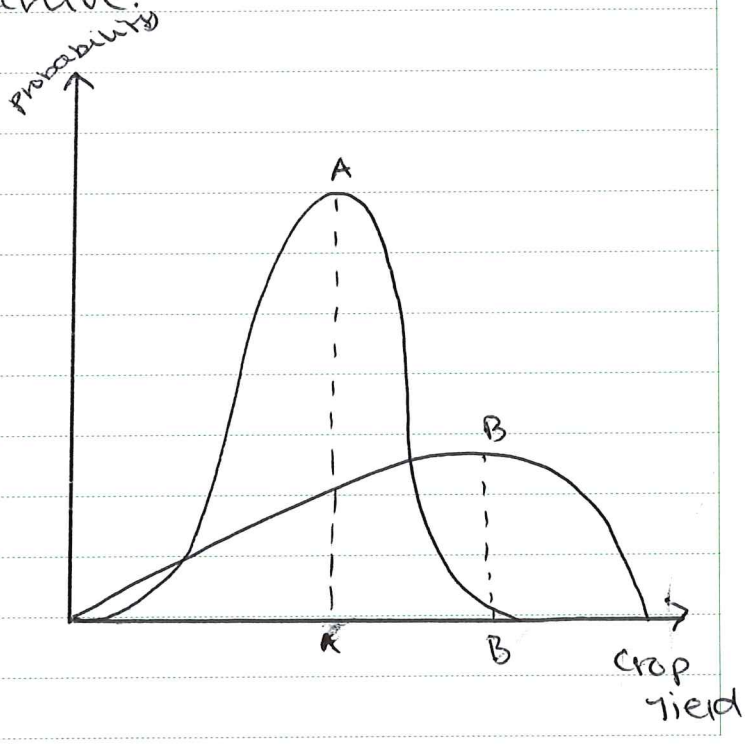
Hence, when the two farmers are introduced to a new innovation that can raise farm productivity, farmer A show scepticism, while farmer B is interested.

The new innovation is said to increase the crop yield a lot, but has a lower variation and a slightly lower certainty than the traditional method.

Firm A cant afford to risk the lower certainty in the new innovation, and stick to the old one with high certainty / probability of crop. Firm A is thus risk averse.

Firm B on the other hand can afford the possibility of a bad crop for a period, as it is way above the critical level. Even with bad results one year it will still survive.

Graphically it will look like this:



We see that firm A obtains a smaller crop yield than B.

To conclude, the reasons why small farmers in poor countries resist new

→ next page

innovations, can be due to the lack of information and communication around the innovation (how it works etc), it can also be due to the fact that it is hard for poor people in small countries getting credit enough to actually being able to attend the good, making the poor farmers stuck with consumption just above critical level and with old/traditional rural methods of agricultural work.

1e) First, aid is outlined as either

1) favorable loans (with ie low interest)
2) Gifts

Foreign aid can be given as either

1) Bilateral aid
2) Multilateral aid

where bilateral aid is when a donor country directly sends aid/money/funds to a receiving country, and multilateral aid is when donor countries gives money to humanitarian organizations, like WHO, red cross etc, and these organisations distribute the money to whoever needs it.

When we are looking at the issue regarding "aid not generating growth", we will focus on the bilateral aid, the direct transfer of aid

between countries. To mention some reasons:

Wrong motives:

Donor countries often have the wrong motives when donating aid to receiving countries. The decision is often based on either political, historical and strategic factors. Empirical evidence from eastern is mentioned to support this statement:
France give foreign aid to former colony countries, Japan give aid to countries supporting them against China, while the US gives aid to Israel and Egypt to strengthen their influence in the middle east. Thus, countries who are on poor but thats not a former colony or that lacks strategic or political advantages will not receive foreign aid and remain poor.

Emergency aid

Emergency aid is given in the presence of (tex) natural disasters like landslides, tsunamis etc, and has the aim to help the country now rather than generate growth.

Corruption:

Many poor developing countries suffer under poor functioning political rules. In many cases, giving aid to a county led by corrupt leaders will lead to the money (aid) ending up not spent on what it was supposed to be spent on. Burnside & Dollar claims in their article, that the countries who

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benefit most from foreign aid is countries who have a low GDP pc and a well functioning political rule (ie democracy).

Samaritans dilemma

This is the case where the receiver country ends up wasting up the aid, because if the foreign aid resulted in growth and improvements - the country might not qualify for aid in the next period. Thus, by wasting the aid, they will still be getting aid later.

Micro macro paradox

Aid spent on individual projects might be successful on micro level, but will, in most cases, not influence the macro level which is necessary to generate growth.

Short run vs long run

Often too little aid is spent on ie health and education, which on long term would generate growth.

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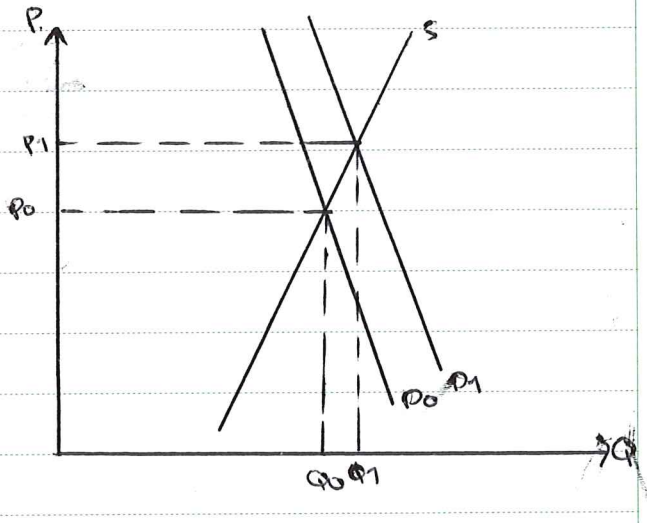
1f) Price elasticity tells us how sensitive supply / demand for a good is to changes in the price.

Low price elasticity means that the supply or demand for the good, here primary goods is inelastic.

Inelastic demand for primary goods is due to the fact that for instance food, which is a primary good, is a necessity good. Hence, as I will show graphically later, a big change in prices of food will <u>not</u> lead to a big change in demand. Food is something the consumer needs to survive, hence a price increase will not influence the consumption level proportionally.



Thus, if we experience a price increase in food, the price will increase from $P_0 \rightarrow P_1$, and the quantity will change from $Q_0 \rightarrow Q_1$, where the change in price is bigger than the change in quantity.

Looking at the inelastic supply; a small change in crop one year will lead to a bigger change in price, than quantity. The farmers are not able to

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against the crop or quantity produced straight away. Additionally, small agricultural farmers have limited possibilities of storage etc, thus if they one day produced a big 'surplus' quantity of food, they might have to decrease the prices with a bigger proportion to be able to sell it all out, before the food goes bad.

Therefore, for developing countries, where the export of primary goods are their main source of trade, having low price elasticity of supply/demand can cause big volatility / fluctuations in the export prices.

A country's terms of trade is a measure of a countrys value of exports relative to its value of imports.

$$TOT = \frac{\text{price export}}{\text{price imports}}$$

When the exportprice is experiencing heavy fluctuations, this will lead to earnings instability as the terms of trade will vary and thus the country's welfare. Primary goods are the most important factor of trade (export) for developing countries, and thus fluctuations in this price will affect their earnings a lot and make the earnings unpredictable / unstable.

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Question 2

a) Agglomeration economies is the cost reducing effect a big population growth in a city has on the production.

Agglomeration economies occur when a large, significant share of a population migrate to a city. This can often be because initially, the transportation to the city from periphere areas is lower, than it is between peripheral areas itself. Thus many firms and companies choose to establish, attracting workers, costumers and other firms → and thus keeps growing. In agglomeration economies, the inhabitans of the city can gain from matching, sharing and learning; ie firms can share customer base, suppliers, storages etc. they can find employees easily, short transportation distances, Knowledge spillover etc. These are factors that attract more people and the city grows bigger.

It can be worth mentioning "first city bias" where the biggest city grows significantly bigger than the second biggest city. People are drawn to the biggest city because it is close to the firms, political rule, shorter distances and they are often treated with "bread and circuses" → a way of distracting the population from being dissatisfied with the politics or power in the country.

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As mentioned, agglomeration economies has a cost reducing effect on the production, but however has a cost increasing effect on the costs of living. Because of "congestion" / big clusters of people, the housing prices for example are pushed up because of the market mechanism of demand.

The workers wages, on the other hand, is increasing with the population.

~~Production function:~~

$$\cancel{Y = f(N, K, L)}$$

As I am deriving the wage curve in task 2b I will in this task save some time, and is thus just refering to the next task where both the wage curve and the cost of living curve will be explained and drawn graphically.

2b)

To explain and illustrate the equilibrium population of a city I will use the Duranton model. It includes 4 curves and together it gives us the equilibrium population size of a city.

We still assume agglomeration economies and free migration, or in other words, no migration barriers.

We will start by looking at the four curves:

Curve 1: The wage curve

As we said earlier, the wage per worker will be increasing with the population size. To prove this we can look at the production function:

$$Y = f(N, K, L) \quad \text{f} \quad Y = N^{\alpha} K^{\beta} L^{\gamma}$$

where

N = workers / labor

K = Kapital

L = Land

Y = Total production.

A profit maximating firm will set the wage equal the value each worker produce, in other words: wage = marginal product.

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This gives us:

$$\frac{dY}{dN} = W$$

$$\frac{dY}{dN} = \alpha N^{\alpha-1} K^{\beta} L^{\gamma} > 0$$

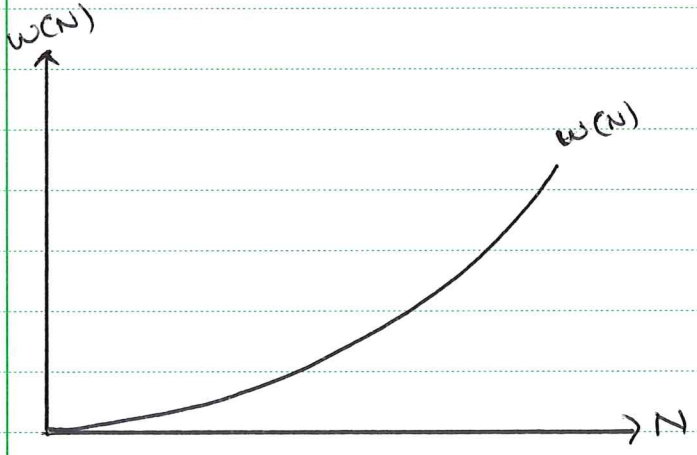
since we assume that $\alpha > 1$ when we have agglomeration economies.

$$W = \alpha N^{\alpha-1} K^{\beta} L^{\gamma}$$

To see how the wage is affected by increases in labor, we take the derivative of the wage-function with respect to N:

$$\frac{dW}{dN} = \alpha(\alpha-1) N^{\alpha-2} K^{\beta} L^{\gamma} > 0$$

which tells us that the wage curve is increasing and convex.



Hence, we have proved that the wage is increasing with population

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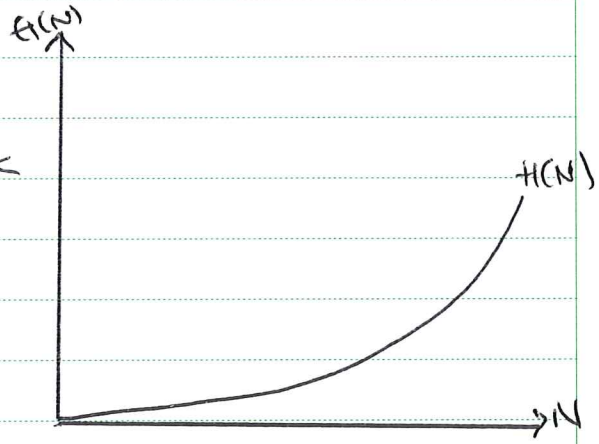
• Curve 2: Cost of living

As mentioned in task 2a), with agglomeration economies the cost of living will increase with population. Demand mechanics in a "congested" city leads to higher prices of ie housing and transportation. We will thus also have a convex shaped cost of living curve. However, it will not be as steep to start with as the wage curve, but will initially reach a threshold before its slope becomes steeper.

Graphically, it will look like this:



• Curve 3: Net wage curve:

The net wage curve shows the difference between the wage and the costs of living: $NW(N) = W(N) - H(N)$. It will have the shape of an inverted U:

(1) $\frac{\partial W(H)}{\partial N} > \frac{\partial H(N)}{\partial N} \Rightarrow \frac{\partial NW(N)}{\partial N} > 0$: increasing curve

(2) $\frac{\partial W(H)}{\partial N} < \frac{\partial H(N)}{\partial N} \Rightarrow \frac{\partial NW(N)}{\partial N} < 0$: decreasing curve

(3) $\frac{\partial W(H)}{\partial N} = \frac{\partial H(N)}{\partial N} = \frac{\partial NW(N)}{\partial N} = 0$: Top point.

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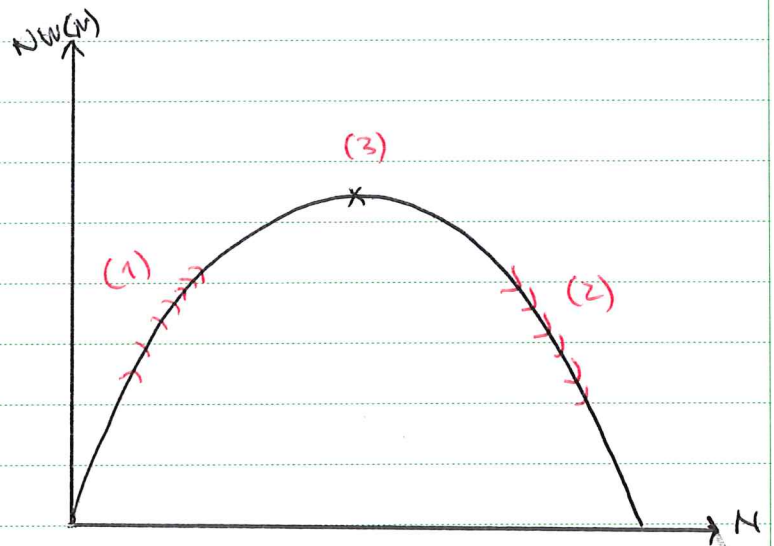
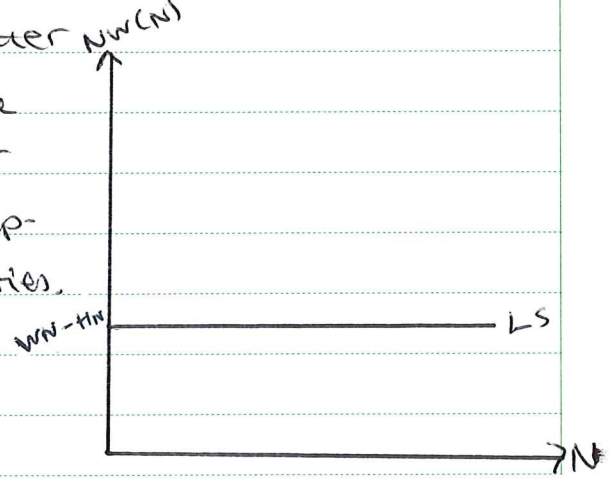
Graphically it will look like this:

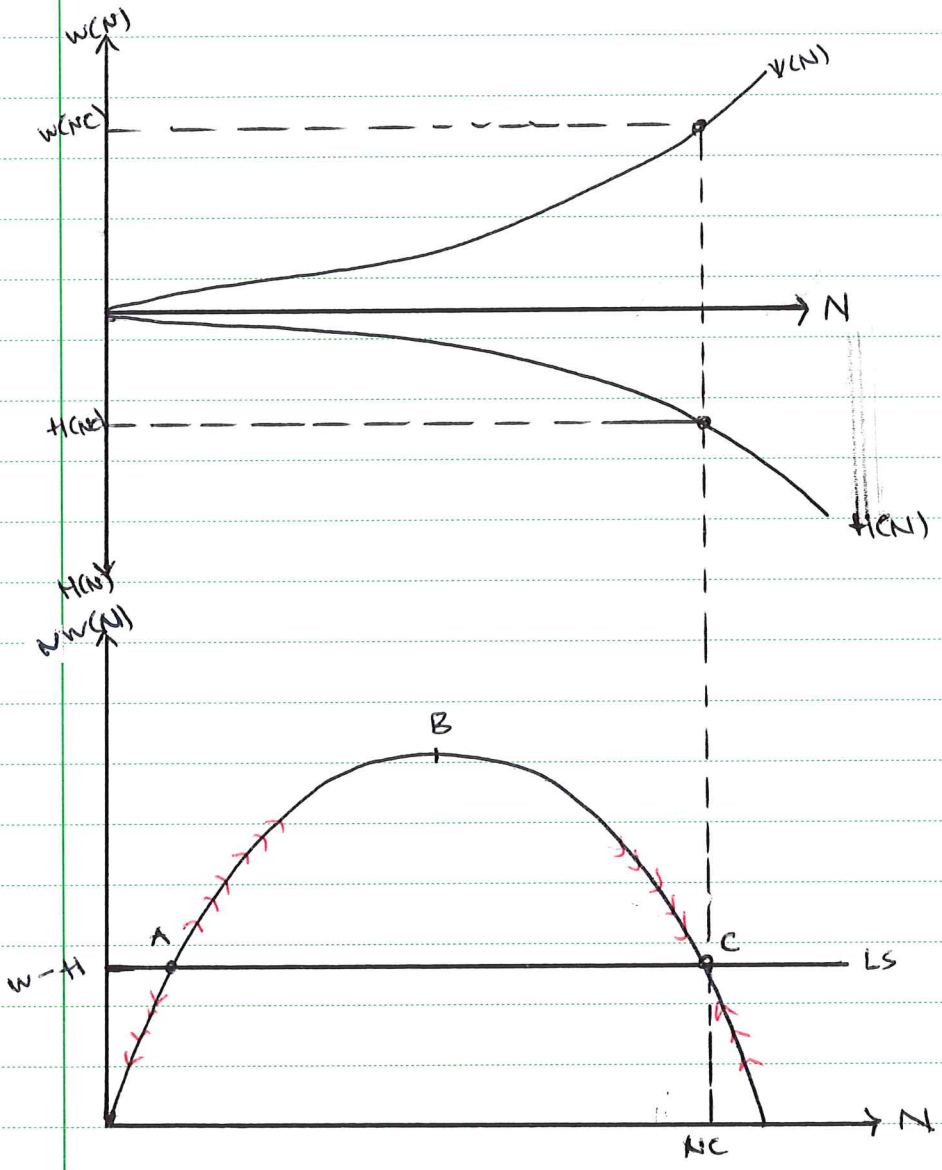


• Curve 4: Labor supply curve

The labor supply curve will in this case be perfectly elastic / a straight line, as we assume that there are no barriers of migration. (If we however had barriers or migration, the curve would be steeper). The labor supply curve reflects the wage the workers are demanding, or the wage they require to work. This demand can adjust, ie with better ammenities in the city the workers will demand a lower net wage, as they feel compensated with better ammenities.



By putting all of these 4 curves together, we get the Dixit-Norman model:



Hence we have several equilibria; A is an unstable, B is the pseudo optimal - and C is a stable equilibrium.

In A, an arbitrary shock to the left will lead to a net wage below the demanded wage rate level. This will lead to less people migrating, pushing the wages down more than the costs of living and thus

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end up even further to the left.

A small shock to the right of A, will lead to higher net wages than demanded → leading to even more migration → pushing the wages up more than the cost of living → and we get a further movement to the right.
→ Therefore A is unstable.

Point C: A small shock either way will lead us back to the stable equilibrium.
A shock to the left of C provides a higher net wage than demanded. Wage > cost of living, attracting more migrants, giving us a movement to the right and back to point C.

A movement to the right from point C, the opposite happens. Here the net wage is lower than demanded, reducing the difference between W(N) and H(N). Thus less migration because of less attractive salary. This gives us a movement to the left and back to inital point C.

Therefore we find the population equilibrium size in point C, with a population equal NC, net wage equal W(NC) − H(NC).

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Question 3:

We are here looking at the Benhabib Spiegl model, in other words the Nelson Phelps model with the an extention regarding domestic innovation ($g(H)$).

$\hat{A}$ = domestic productivity level (^growth)

$\hat{T}$ = frontier productivity level (world leading country with reipect to technology) (^ growth)

$g(H)$ = domestic innovation

$c(H)\left(\frac{T_t}{A_t} - 1\right)$ = Technology adaption ability

Assumptions

→ Frontier productivity level grows at a constrant rate, equal to λ

→ Innovation at home gross with less than it does abroad ($g(H) < \lambda$)

→ Human capital is given exogenously

To start, we can say that productivity growth is synonymous to growth in technology (according to many economists). Growth in technology can come from either R&D (research and development) also called inventions, here noted as $g(H)$, or through technology adaption where products are copied for example, here noted as $c(H)\left(\frac{T(H)}{A(H)} - 1\right)$.

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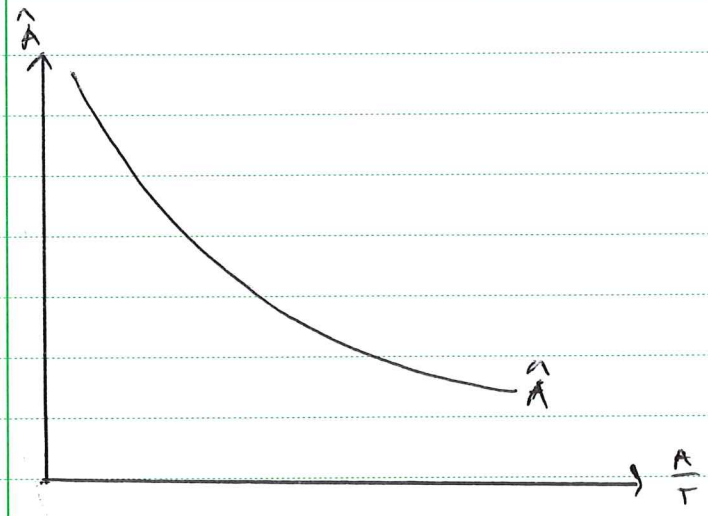
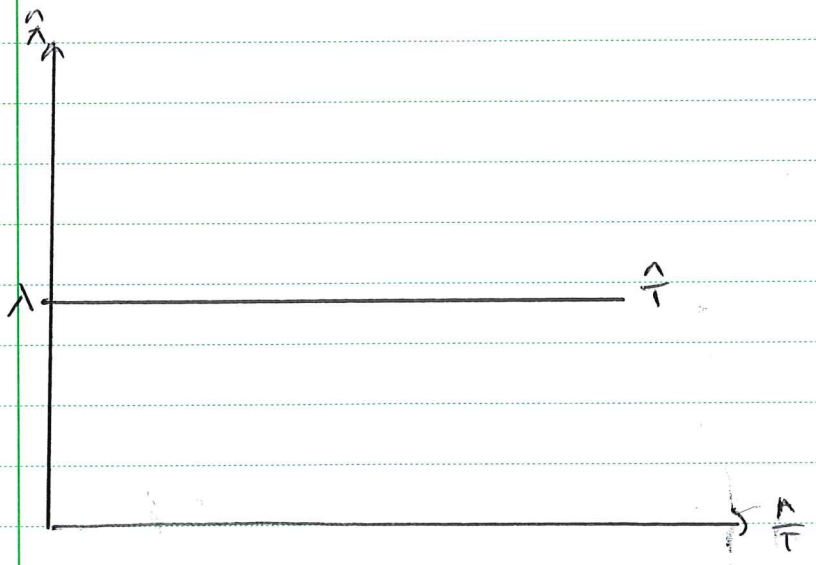
First we will find the slope of the curves:

$\frac{d\hat{A}}{d\frac{A}{T}} = -\frac{C(+1)}{(\frac{A}{T})^2} < 0$ decreasing curve

$\frac{d^2\hat{A}}{d(\frac{A}{T})^2} = 2\frac{C(+1)}{(\frac{A}{T})^3} > 0$ convex shape



The frontiers productivity growth is constant, and thus looks like:



We will now solve the model and see how an increase in human capital will affect the productivity level.

$$\hat{A} = g(H) + c(H)\left(\frac{I(t)}{A(t)} - 1\right)$$

We rewrite it a bit:

$$\hat{A} = g(H) + c(H)\left(\frac{1}{A/T} - 1\right) \qquad (1)$$

In equilibrium growth in the two countries will be equal, $\hat{A} = \hat{T}$, and $\hat{T} = \lambda$. This gives:

$$\lambda = g(H) + c(H)\left(\frac{1}{A/T} - 1\right) \qquad (2)$$

We solve the equation with respect to the relative productivity level:

$$\lambda = g(H) + \frac{c(H)}{A/T} - c(H)$$

$$c(H) + \lambda - g(H) = \frac{c(H)}{A/T}$$

$$\frac{c(H) + \lambda - g(H)}{c(H)} = \frac{1}{A/T}$$

$$\Rightarrow \quad \left(\frac{A}{T}\right)^* = \frac{c(H)}{c(H) + \lambda - g(H)} = \Omega$$

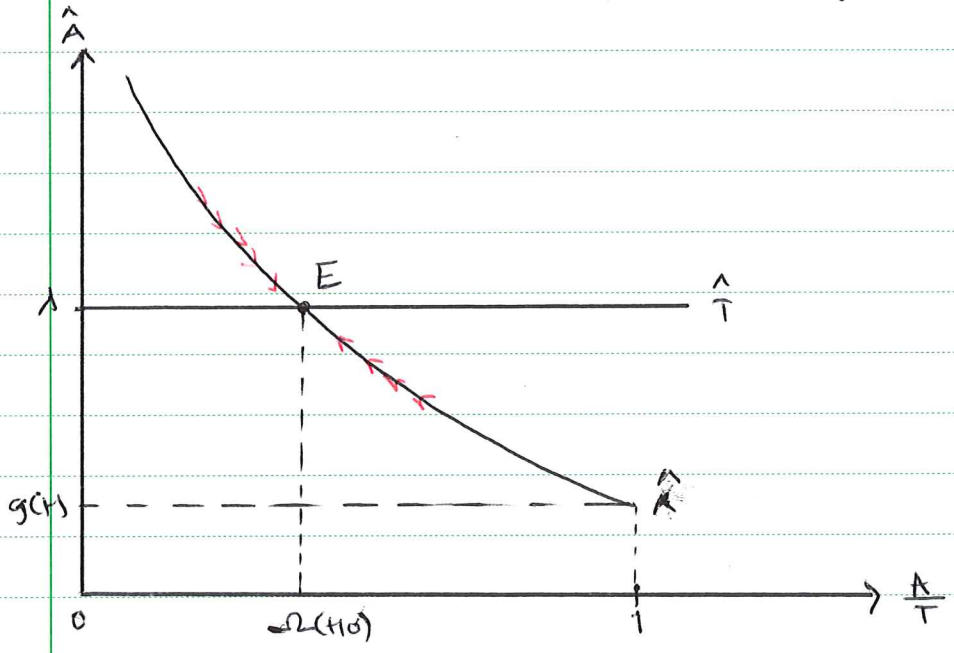
Ω gives equilibrium value when $\hat{T} = \hat{A}$

We can note that when:

$\frac{A}{T} \to 0 : \hat{A} \to \infty$

$\frac{A}{T} \to 1 : \hat{A} \to g(H)$

We can show this graphically:



Equilibrium E is equilibrium because:

$\hat{A} > \hat{T}$: Productivity at home will be growing faster than the productivity at the front, hence we will move to the right as the relative productivity will become smaller.

$\hat{A} < \hat{T}$: Productivity at home is less than at the front, hence the gap between the technologies will increase and thus we'll get a movement toward the left.

=> End up where $\hat{A} = \hat{T}$ in point E.

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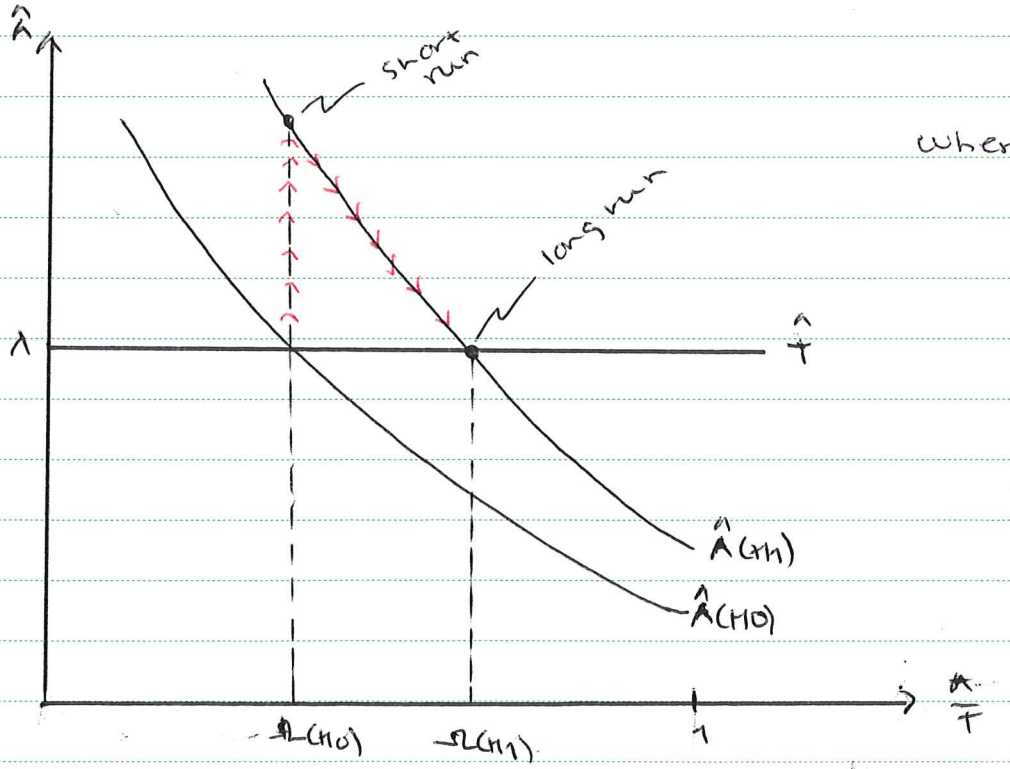
From the graph we can see that if the domestic country reaches the leading country's technology level, $\frac{A}{T} = 1$ and thus g(H) innovation is the only thing that can further increase "homes" Productivity growth.

We can now look at what an increase in human capital will do the productivity level.

We know that human capital occur two places in the equation, in c(H) and g(H). H↑ will thus lead to c(H↑) and g(H↑). We will therefore get a shift to the right (through the innovation channel) and a steeper curve (through the adaptive channel):



where $H_1 > H_0$.

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we can look at this analytically as well:

$$\left(\frac{A}{T}\right)^* = \frac{C(H)}{C(H)+\lambda-g(H)}$$

$$\Rightarrow \frac{1}{(A/T)^*} = \frac{C(H)+\lambda-g(H)}{C(H)}$$

$$\Rightarrow \frac{1}{(A/T)^*} = 1 + \frac{\lambda-g(H)}{C(H)}$$

$$\Rightarrow 1 + \frac{\lambda-g(H\uparrow)}{C(H\uparrow)} \Rightarrow \frac{1}{\left(\frac{A}{T}\right)^*\downarrow} \Rightarrow \left(\frac{A}{T}\right)^*\uparrow$$

We can therefore see that by increasing the human capital level, we will in the short run get an increase in the productivity growth, before it stabilizes at a constant rate $\hat{A}(H) = \hat{T}$.

We thus have a movement to the right and the relative productivity growth levels are reduced, (closer to 1 where they grow at the same rate).

To clearify, an increase in human capital level can be that the government decides to fund education, improve educational systems etc → make the population in the country highly educated.

We can see that the domestic country has taken advantage of the human capital increase and because of the catching up hypothesis and the advantage of backwardness they now increased

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their productivity level by a lot → probably more than a developed country could have done with the same amount of increase in human capital.