NTNU
Det skapende universitet

Institutt for samfunnsøkonomi

Eksamensoppgave i SØK2002 – Sysselsetting og konjunkturanalyse

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Eksamensdato:	6. juni 2013
Eksamenstid:	5 timer
Sensurdato:	27. juni 2013
Tillatte hjelpemidler:	Flg formelsamling: Knut Sydsæter, Arne Strøm og Peter Berck (2006): Matematisk formelsamling for økonomer, 4utg. Gyldendal akademiske. Knut Sydsæter, Arne Strøm, og Peter Berck (2005): Economists' mathematical manual, Berlin. Enkel kalkulator Citizen SR-270x, HP 30S eller SR-270X College
Annen informasjon:	Eksamensoppgaven består av 2 oppgaver med delspørsmål som alle skal besvares. Vekting gitt i parentes.

Målform/språk:	Bokmål
Antall sider:	2 (inkl. forside)
Antall sider vedlegg:	0

Oppgave 1 (30%)

a) Betrakt et arbeidsmarked med fagforeninger og vis hvordan sysselsetting, arbeidsledighet og lønn blir bestemt.

b) Diskuter tiltak for å redusere likevektsledigheten.

Oppgave 2 (70%)

Anta at markedet forventer at norske kroner skal depresiere. Diskuter optimal pengepolitikk i dette tilfellet.

Comments on exam of candidate 10022 SØK2007 spring 2013

This is a very good exam, and the candidate demonstrates good understanding of the relevant topics. The answer of question 2 is clearly the weakest part, and in total the exam is given the grade B.

Question 1

The candidate provides thorough answers, and shows good understanding. It's positive that the case of crossing Lorenz curves is mentioned in question 1a, since this demonstrates the advantage of the Gini coefficient. It is important that the difference between absolute and relative poverty is explained in question 1b. In addition, the candidate gives precise explanations of the main measures of poverty. The graphical illustrations in question 1c are well explained, and in addition the candidate discusses the importance of the organization of the agricultural sector for productivity. In question 1d the candidate mentions many relevant factors, but in particular the explanation of the micro-macro paradox is inadequate. The answer to question 1e is very brief. The explanations of the concepts are ok, but the discussion could be extended to include how social/private costs/returns vary with the level of education (preferably by the use of figure 8.6 in the textbook).

Question 2

This is the weakest part of the exam. The analytical presentation of the Harris-Todaro model is incomplete and partly wrong, and the effect of the suggested policy change is not illustrated. However, the candidate discusses the relevant mechanisms and gives a graphical illustration of the model.

Question 3

Both the graphical and the analytical discussion of the productivity specification are solid. The dynamics of the model are well explained, and the expression for relative productivity in the long run equilibrium is derived. The graphical illustration of increased human capital shows the long-run effects, but not the transition path. The candidate claims that the effect of increased human capital through innovation affects the slope of the curve, while the effect through technology adoption generates the outward shift. This is not correct. The effect through adoption affects the slope of the curve, while both channels contribute to the outward shift.

Trondheim, 07.09.13

Hildegunn E. Stokke

Question 1

a) The Gini (coefficient) → properties is a aggregate numerical measure to compare two economic factors like income and income receivers or land and proportion of land owners. Before I explain the coefficient in more detail, I will explain and illustrate the Lorenz Curve which forms the basis of the Gini coefficient.

The Lorenz Curve is generally used to illustrate the size distribution of income in an economy. The typical example is to show cummulative income on the vertical axis while displaying the cummulative proportion of income on the horizontal axis. In other words, it shows what proportion of a county's total income (usually measured in GDP) is owned by what proportion of the population. To draw the actual curve, we begin by looking at a situation in which those ~~is~~ perfect income is equally distributed between a county's residents, 50% of the population will receive 50% of the total income in cummulative terms. This situation will be depicted as a ~~diagonal~~ diagonal line with a 45° degree slope:

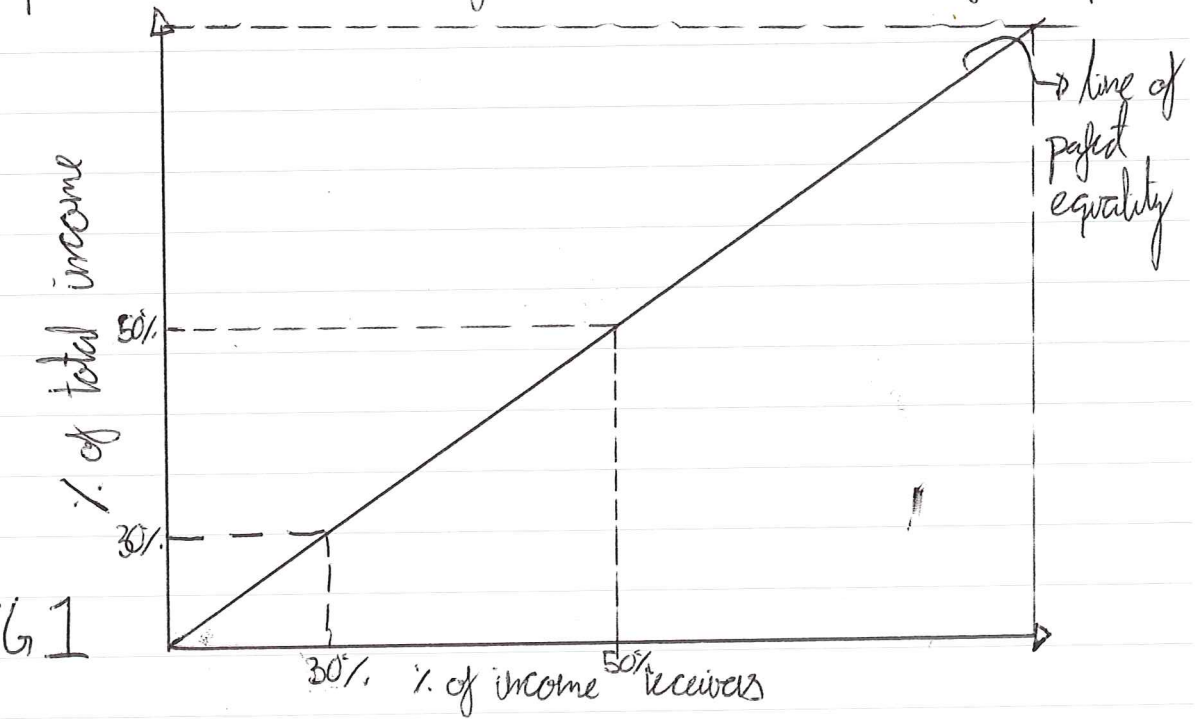

FIG 1

FIG 1 illustrates perfect equality in income distribution within a country. This will not be the case for any real world country where income distribution will vary greatly between countries. Economies with a relatively equal size distribution of income will have Lorenz curves which lie close to the line of perfect equality. More equal countries will lie further away. In the graph I have drawn hypothetical Lorenz Curves for a country with equal distribution of income (like Norway) and for one with less equal distribution (South Africa for example).

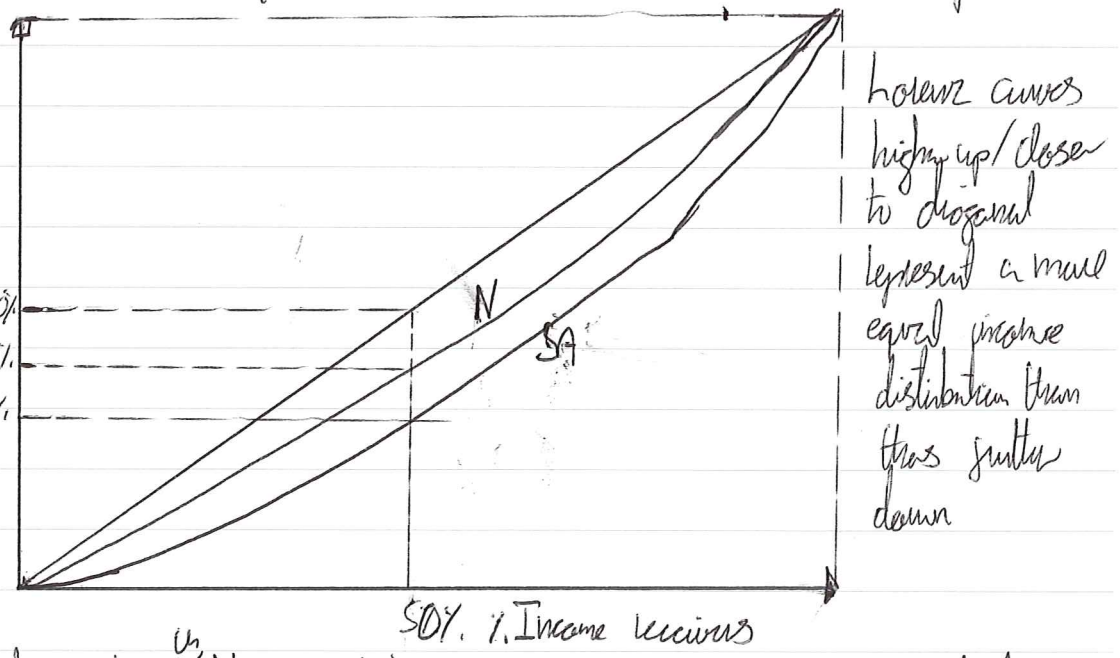

FIG 2

Fig. 2 shows how in Norway (N), 50% of the income receipients receive 40% of the total national income - a fairly equal size distribution. Much more unequal in South Africa where 50% only receive 30% of the income. When the Lorenz curves are depicted like this, it is easy to make an objective, and absolute in terms of money, statement about which country is more equal. If, however the curves are crossing between each other, it becomes more difficult to assess which one has the more equal distribution. Subjective opinions like that a richer middle class is better than richer poor but also richer high income receipients does not help us make critical statements.

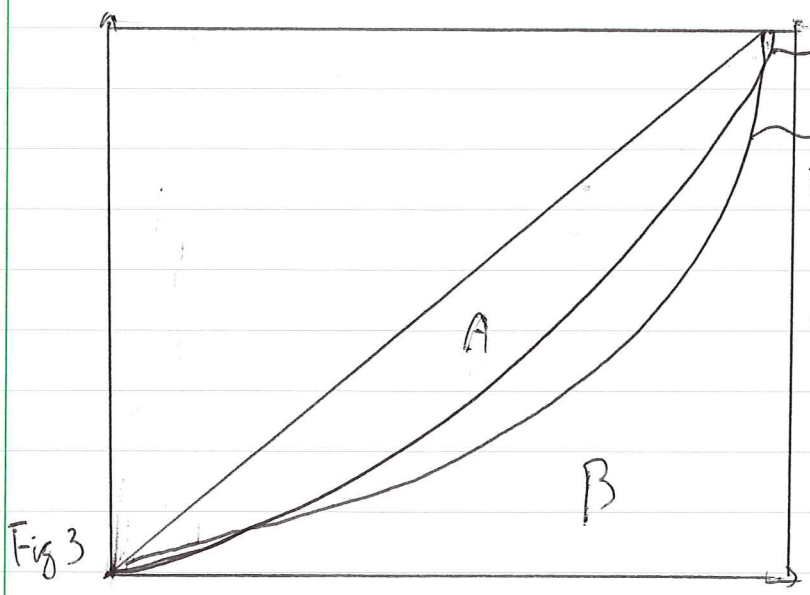

Fig 3

When the curves are crossing, it is impossible to make an objective, absolute statement about which country has a more equal distribution.

To determine which of the curves show a more equal distribution of income, we it is possible to use the Gini coefficient

The Gini coefficient measures the ratio of the area between the curve and the diagonal line and the total area under the income equality line. Mathematically from fig 3:

$$\text{Gini} = \frac{A}{A+B}$$

This will give a number between 0 and 1 in every case. Numbers closer to 1 represent more inequality while a number closer to 0 illustrates almost perfect equality. Gini coefficient is considered a useful measure of poverty because it satisfies 4 important axioms: The anonymity principle, the scale independence principle, the population independence principle and the transfer principle

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(b) Measuring poverty.

Usually we can define poverty as being either absolute or relative:

- Absolute poverty – more common in developing countries; includes all people living beneath a certain, minimum point usually regarding income. Generally this point will be the international set poverty line, where people living for under $1,25 a day (or $2 PPP- adjusted) are considered living in absolute poverty.

- Relative Poverty – Concerns people who have a low income level compared to other people in their country/society/village. A person living in a developed country might be considered poor even tho, but the same income level would label him as rich in a developing nation. Used to more define poverty mostly in the developed nations.

When we want to measure poverty, we usually want to obtain information about those living in absolute poverty. Using the head-count index, we start by defining the number of people living below the international poverty line in a country as H. Dividing this number by the amount of residents in that country, we obtain the proportion of the population living below in absolute poverty – the headcount index. Mathematically: H/N

The headcount index is considered an inferior measure of poverty because it does not separate the people below the line. The severity of the situation is ~~much worse for a person living well below the line than for one living right below it~~ much worse for a person living well below the line than for one living right below it.

Den gule kopien beholder du/*Please keep the yellow page*

So we need a way to distinguish between the absolute poor - the Total Poverty gap (TPG) is a means to do so. TPG measures the amount of money it would take to raise all those living below the absolute poverty line, just up to it. Mathematically:

$$\sum_{i=1}^{H} (Y_p - Y_i)$$

Y_i → income of a person living below the poverty line

Y_p → income at poverty line

The equation sums the difference between income at the poverty line an the income of a person two all the persons living below it. Another measure of poverty would be the average income shortfall (AIS) - it measures by how much, on average, a ~~person~~ poor persons income falls below the poverty line.

The Human development index (HDI) is often used to measure the poverty in a country ~~and~~ ~~positions~~ in terms of the standard of living. It uses 3 indexes to provide a weighted sum of a country's standard of living:

$$1/3(\text{income level per capita}) + 1/3(\text{~~life~~ Health}) + 1/3(\text{education})$$

=> education category consists of 2/3 adult literacy rate and 1/3 school enrollment ratio.

The HDI scale will be between one and 0 where a higher score is a sign of high standards of living.

In later years, the New HDI has been developed. The main change in it is that it calculates the geometric average rather than the arithmetic.

$$(\text{income} + \text{health} + \text{education})^{1/3}$$

It also changes what the education index consists of, in addition to lowering the minimum values and increasing the maximum values of the 3 different indexes.

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The multidimensional poverty index (MPI) is another tool used in assessing poverty. It measures several different aspects of being poor like access to water and the ownership of transportations vehicles. A person is deemed multidimensional poor if it obtains a score higher than 0,33.

Another measure of poverty would be the Gross national product of a country divided by the total number of citizens. GDP measures the total output of a country regardless of wether that production has foreign or domestic claims. Dividing this value by the number of citizens gives us the average income of each citizen. The problem with GDP p.c as a ~~monetary~~ measure of income is that is is purely a monetary measure and says nothing about the standard of living of the population. Also, it does not consider equality. Income per capita might be high for a country but if the most of the wealth is in the hands of a small proportion of the population, poverty will still be a problem.

c) Agricultural productivity in developing countries:

For Latin America, the problem is generally that the size of the farms is too big to be efficient. The trend is that there are a few rich landowners who own large areas of land (multifundios) and employ a large amount of workers to work at their farms, or they rent it out for sharecropping. Empirical studies have shown that this is not an efficient way of producing agricultural goods, mainly due to the lack of incentives for workers leasing the land or just working for a rich owner.

In Asia, the problem is reversed. Here there is too many subsistence farmers on too little land. According to the law of diminishing returns to factors of production, many farmers working small plots of land will not produce a significant output. Sharecropping is also, normal in Asia. Moneylenders have also became a problem, mainly because they take advantage of poor farmers in dire need of capital. Agricultural productivity has been greatly improved in the past years in Asia, mainly because of the Green Revolution in which a gene modified type of rice helped boost production.

For Africa, the problem is mainly the lack of fertile land and the overcultivation of land. Land is usually cropped so often that it is not allowed to regain its fertility. The problem of subsistence farming and lack use of mainly labour is also apparent in Africa. Farmers do not invest in capital or other techniques to boost production because they are too poor.

Poor farmers will be reluctant to invest in new equipment because they cannot afford the potential loss such an investment could mean. Farmers also tend to lack the necessary information or knowledge or they might find it difficult to obtain credit or loans from banks

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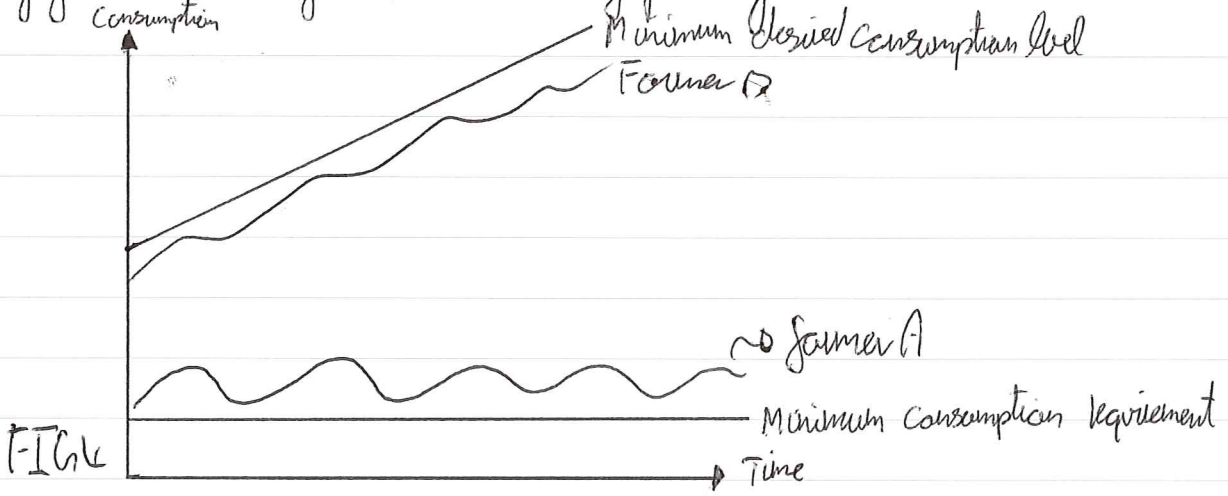
which could have been used to invest in productivity boosting capital equipment.

Another problem characterizing developing countries is that they often emphasize the development of the urban sector, all labour and investment are channeled into the urban sector and this stagnates agricultural productivity.

Solish aversion is a key concept in explaining why agricultural productivity is held back in the developing countries. Subsistence farmers, which is the most normal type in ~~these~~ developing countries, have little incentive to invest. Modern techniques will typically yield a higher input but with a greater risk of failure. Two ways to illustrate this graphically:



FIGURE

Farmer A is barely meeting his minimum survival amount of consumption, falling below this line as a result of a failed investment would be fatal. Farmer B on the other hand is well above this line. He is striving to reach his minimum desired level of consumption. He is in a much better position to take a chance and invest in modern production techniques.

Another way of illustrating the yield - risk trade - off between a modern technique and a traditional one:

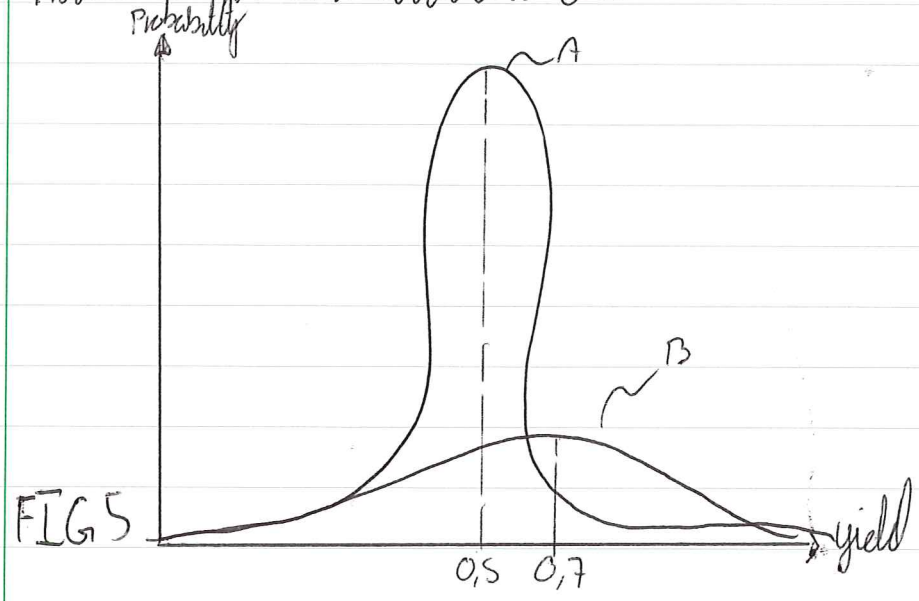


FIG 5

The graph shows how technique A gives a lower mean yield than B, but has a higher probability of achieving this yield than technique B. Farmers who are risk averse will always choose technique A because it is safer.

d) Why foreign aid might not generate economic growth:

1 • Motivation of donor country: if the country giving aid has some underlying political or strategical motivation for giving the aid, it is not likely to generate economic growth. This was usually the case during the Cold War when the U.S gave aid to Russian neighbouring countries.

• Emergency aid: Aid given to countries during a natural or social catastrophe is not intended to generate growth but rather to save human lives or save the country from utter chaos. Example of this would be Haiti after the flood/earthquake.

• Long run vs short run projects: aid foreign aid is often too focused on completing a project that will yield short term effects, but will not be of much significance in the long run. Typical examples of this would be education and health investments which usually take many years before they yield any significant result.

• Micro - macro paradox: page projects which are considered successful on the micro level might not have the same effect on the macro level. Foreign aid is often critized for focusing too much on consumption rather than investment.

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- Samaritans dilemma: A country (B) receiving aid from country (A). A sets certain development goal for B to reach in order for it to keep receiving aid. B knows that it will not receive any more aid if it is successful entirely in its projects. It chooses to just achieve the bare minimum and wastes the rest of the money so that it continues to receive aid. The problem here is that aid is dynamically inconsistent.

- Difficult to earmark funds: Aid given to a project already planned will usually be ~~s~~reallocated away.

e) Private returns to education will usually be less than social returns, and hence there is a market failure. It is in societys best interest to educate people; but the social benefit of education as a result of externalities will usually be larger than the private ones. This means that government is needed to intervene to correct this market failure. The ~~lower Social returns~~

Private costs of education will come in the form of school fees and other costs associated with schooling. In addition, a person considering an education will consider the loss of potential income from working instead as a cost. This cost will be the discounted value of all future income. Getting a job will also mean (generally) a higher income level. For a person considering education, the discounted future level of income after education

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will be his private benefits. If the discounted income flow from future educated jobs is larger than the total cost of education, a person will choose to get educated

The social cost of education will come in the form of subsidies given to students and the loss of taxpayers money. Society and current taxpayers will have to pay to keep students in school.

Question 3 (question 2 will be answered at the end) -> from page 19 and on

Productivity growth ($\hat{A}$) given as %

$$\hat{A} = g(h) + c(h)\left[\frac{T(t)}{A(t)} - 1\right] \quad (1)$$

I will use the article by Barbukis and Spiegel as a starting point as a guide to when explaining the productivity growth specifications and when discussing the effects of increased human capital.

Firstly, I modify equation (1), so that $\hat{A}$ becomes a function of the relative domestic productivity level (A/T)*

$$\hat{A} = g(h) + c(h)\left[\frac{1}{A/T} - 1\right]$$

*The time indexes has been dropped.

Some definitions: $g(h)$ - is the rate of innovation in the country; how much research and development it is doing on its own.

$c(h)$ - the rate of technology adaptation in the country. This will depend on the technology level at the frontier and the domestic technology level

Defining a new variable: $\hat{T}$ which is constant and equal to $\bar{T}$ -> the productivity growth at the frontier.

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Before Continuing, I have to make some assumptions in order to develop ~~top~~ the model:

- $\bar{\Pi} = \hat{\Gamma}$ & constant
- Technology progress is neutral
- Human Capital is exogenously given
- $\hat{A}$ is an exponential function of the rate of innovation ($g(h)$) and the adoption rate ($c(h)$).
- $g(h) < \bar{\Pi}$ -> domestic innovation will be less than that on the frontier.

I can now state that technology progress will come about either from technology adoption or innovation, which in turn are dependent on the level of human capital

Wanting to graph this, I will have to get a sense of what the curve for the $\hat{A}$ function looks like. For this I will differentiate the function with respect to $\frac{A}{\Gamma}$ (want $\frac{A}{\Gamma}$ on the x-axis) &

$$\frac{d\hat{A}}{d\left(\frac{A}{\Gamma}\right)} = -\frac{c(h)}{\left(\frac{A}{\Gamma}\right)^2} < 0$$ -> this means that the curve will be decreasing (negative slope) -> ~~with~~ "catching-up" hypothesis

Differentiating one more time to determine ~~its shape~~ whether its concave or convex

$$\frac{d\hat{A}}{d^2\left(\frac{A}{\Gamma}\right)} = 2\frac{c(h)}{\left(\frac{A}{\Gamma}\right)^3} > 0$$ -> positive, which means it will be diminishing (convex shape).

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Illustrating my results graphically:

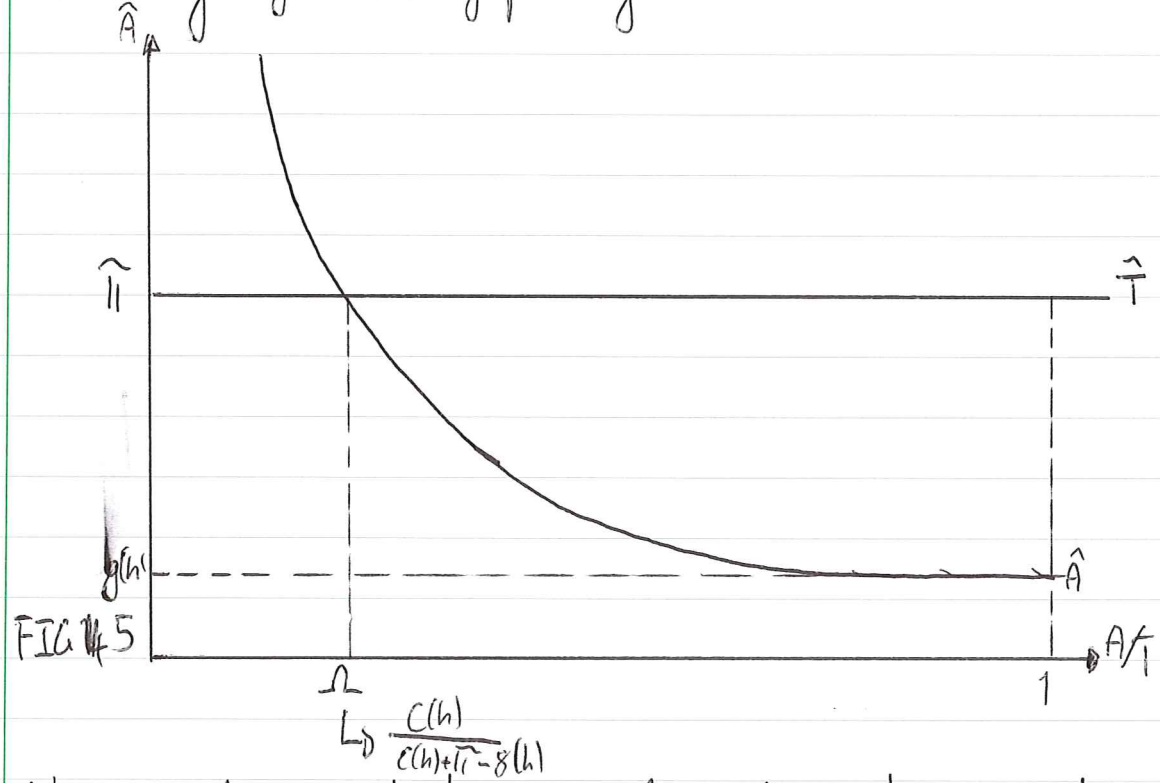

FIG 5

$$L_D \frac{C(h)}{C(h)+\hat{\pi}-g(h)}$$

Now I want to analytically ~~explain~~ define the equilibrium points and from that explain the dynamics of the model. At Ω, $\hat{A}$ will be equal to $\hat{\pi}$:

$$\left(\frac{A}{T}\right)^* = \hat{\pi} \Rightarrow \hat{A} = \hat{T} \Rightarrow g(h) + C(h)\left[\frac{1}{A/T} - L\right] = \hat{\pi}$$

$$\frac{C(h)}{A/T} - C(h) = \hat{\pi} - g(h)$$

$$C(h) - C(h)\left(\frac{A}{T}\right) = \hat{\pi} - g(h)$$

$$\hat{\pi}\left(\frac{A}{T}\right) - g(h)\left(\frac{A}{T}\right)$$

$$C(h) = \left(\frac{A}{T}\right)\left(\hat{\pi} - g(h) + C(h)\right)$$

$$\left(\frac{A}{T}\right)^* = \frac{C(h)}{C(h)+\hat{\pi}-g(h)}$$

This will be the equilibrium relative level of productivity in the model, and this point, the productivity growth will be in a stable equilibrium.

Looking at the dynamics of the model to determine why it is stable

$\hat{A} \uparrow > \tilde{\Pi} \Rightarrow \frac{A}{T} \uparrow \Rightarrow \hat{A} \downarrow$

$\hat{A} < \tilde{\Pi} \Rightarrow A/T \downarrow \Rightarrow \hat{A} \uparrow$

Looking at some extreme cases for the level of $\frac{A}{T}$

$\frac{A}{T} \to 0$, then $\hat{A} \to \infty \Rightarrow$ advantages of backwardness, the pulling behind a country is the technological frontier, the higher its productivity growth will be

$\frac{A}{T} \to 1$, then $\hat{A} \to g(h)$; it will only achieve growth through innovation of its own. The country at the frontier will have $\hat{A} = g(h) = \tilde{\Pi} = \hat{T}$

Now it is possible to analyze the effects of an increase in the human capital level. First, the equation $\tilde{A}$ shows us that increased h will have an effect both through the innovation channel, resulting in a steeper slope of the curve, and the technology adoption channel, shifting the curve to the right. Our former expression concerning the equilibrium point of $\frac{A}{T}$ is quite ambiguous about the total effect of the increase in human capital. It is necessary to reformulate this expression so that we can get a more definitive answer to whether what effect it has and where the new equilibrium will be.

$$\frac{1}{(A/T)^*} = \frac{C(h) + \tilde{\Pi} - g(h)}{C(h)} = 1 + \frac{\tilde{\Pi} - g(h)}{C(h)}$$

Now it is easier to see the effect of increased h:

$$h\uparrow \Rightarrow g(h)\uparrow,\ C(h)\uparrow \Rightarrow \frac{\bar{\Pi}-g(h)}{C(h)}\downarrow \Rightarrow \frac{1}{(A/T)^*}\downarrow \Rightarrow \left(\frac{A}{T}\right)^*\uparrow$$

Safe to conclude that the increase in human capital raises the relative productivity level. ~~Reduced~~ Increased

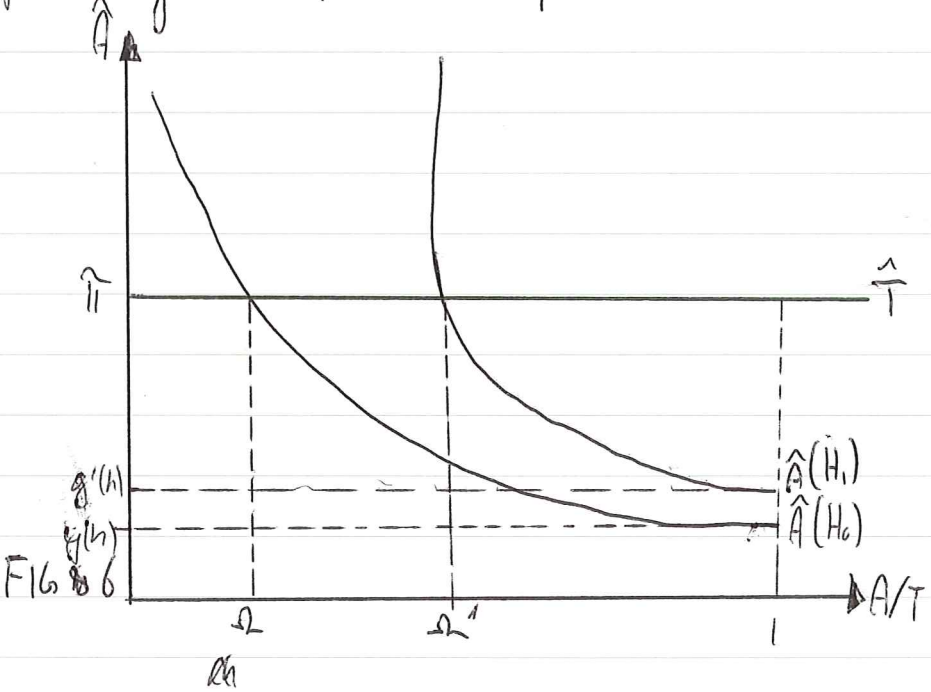

FIG 6

Important to note that the productivity growth only increases in the short run in accordance with the dynamics of the model. This short-lived increase raises the relative productivity level before it returns to $\hat{A}=\hat{T}$. I have now shown how increasing the total supply of human capital raises the $\left(\frac{A}{T}\right)$.

$$\frac{d\hat{A}}{dh} = g'(h) + C(h)\left[\frac{1}{(A/T)} - 1\right]$$

Empirical research have supported that the three channels through which human capital enter this equation and affects productivity growth are statistically relevant.

So for Developing Countries to increase their productivity level, human capital is of vital importance.

Defining human Capital: educated and experienced part of the labour force. Examples are teachers, professors and other academics

The problem in developing countries is that it is difficult to increase human capital, partly because of the reasons concerning education costs and benefits being different for privat and social agents.

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Question 2

The Harris-Todaro model explains how the emmigration from rural areas to cities in the search of jobs may be an economically rational decision even though urban unemployment is high, it does this with the use of the expected ~~urban~~ rural income adjusted for the probability of getting a job in the urban sector.

The model assumes that the income level is higher in the city and that labour supply is determined by the expected urban wage (d). It also assumes that individuals make their decisions purely on the basis of their expected wage.

Supply of labour is determined by ~~on~~ the ~~expected urban wage~~ gain of moving to the city (d) and the ~~bargain~~ probability of getting a job ($\tilde{\pi}$):

$$S(L) = f_L(d, \tilde{\pi})$$

~~The expected urban wage is again determined by~~
The gain of moving to the city is determined by the urban wage ~~and, the unemployment rate and the rural wage~~.

probability of getting a job:

$$d = \frac{w_U}{\pi} - w_r$$

The ~~unemployment rate~~ probability of getting a job is determined by the rate of job creation in the urban sector (π) and the total unemployment rate ($N-U$)

$$\tilde{\pi} = \frac{\pi N}{N-U}$$

The main idea of the model is that increasing the job creation rate will help stimulate people expectations of getting a job, increasing it more than the actual increase in job creation, leading to more ~~unemployment~~

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unemployment. This is due to the fact that the expected urban-rural wage difference often is very elastic in responses to the probability of getting a job.

Empirical evidence has also shown that the elasticity of the response of urban immigration to a change in job creation need not be large for unemployment to increase.

Graphically

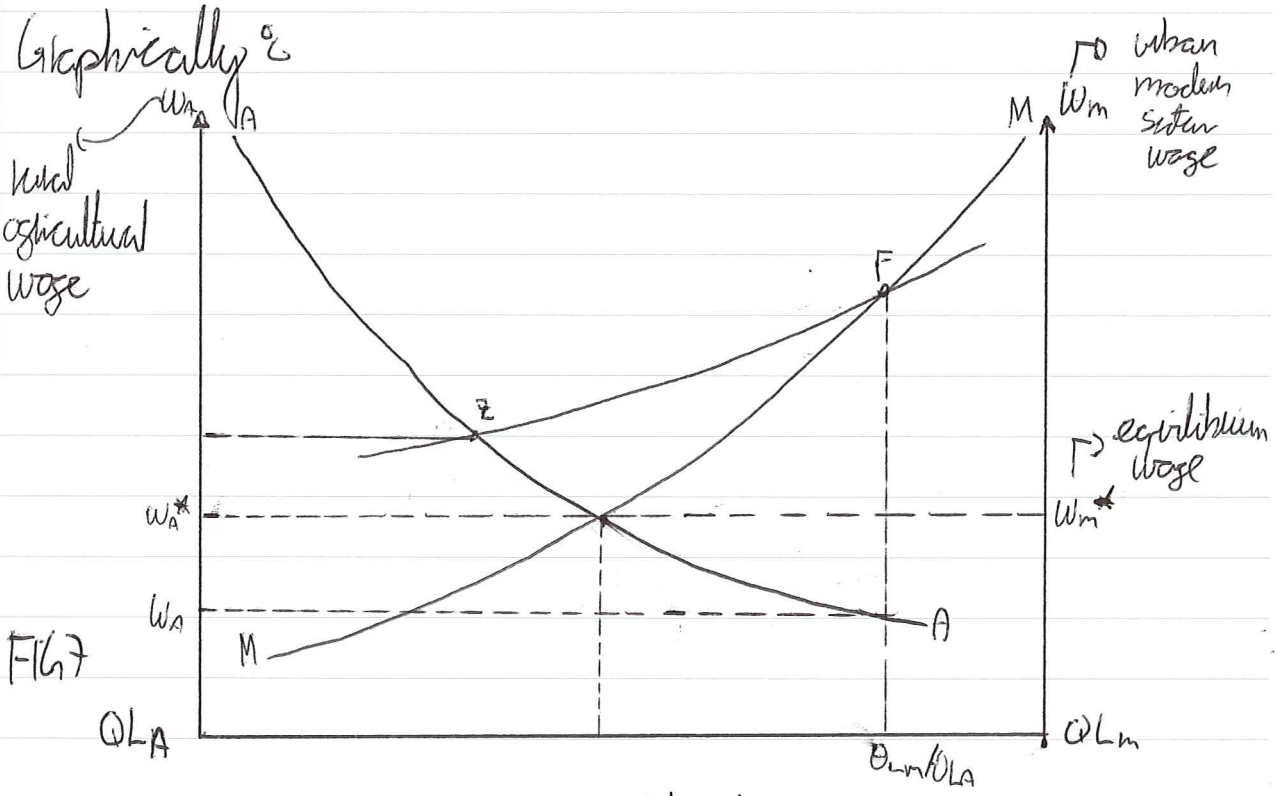

FIG 7

At point Z & F, workers will be indifferent between working in the rural and the modern sector

The model suggests that through the mechanisms of increased urban wage, increased probability of getting a job and increased job creation rate, unemployment will increase as a result of policy change.

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The mechanisms of the effects can be explained as follows:

The immigration of labour will be a function of the probability of getting a job and the urban-rural wage difference.

$$\frac{\partial d}{\partial \pi} > 0 \qquad \frac{\partial d}{\partial W_U - W_R} > 0$$

The probability of getting a job, will in turn be determined by the urban job creation rate (λ) and the unemployment rate.

$$\frac{\partial \pi}{\partial \lambda} > 0 \qquad \frac{\partial \pi}{\partial u} < 0$$

↳ λ will increase with a, and hence have a positive effect on labour immigration

If now the unemployment rate can first be said to be equal to the ratio of labour immigration and job creation rate, it is possible to see the effects of an increase in a. The policy change increases the job creation rate λ, which counts negatively on unemployment. However, it also increases the probability of getting a job, which in turn increases immigration and finally leads to an increase in unemployment

The dominating effect will decide wether the ~~employment~~ unemployment increases or not.

As mentioned earlier, calculations show that the increase in urban immigration often is the dominating effect, resulting in higher unemployment when λ increases. This will be the case even when the Sargely response is highly inelastic.

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