

Institutt for samfunnsøkonomi

## **Eksamensoppgave i SØK2007 – Utviklingsøkonomi / Development Economics**

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**Eksamensdato:** 27. mai 2014

**Eksamenstid:** 4 timer (09.00-13.00)

**Sensurdato:** 19. juni 2014

**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 Casio fx-82ES PLUS, Citizen SR-270x, SR-270X College eller HP 30S

**Målform/språk:** Bokmål, nynorsk og engelsk

**Antall sider:** 3 inkl forside

**Antall sider vedlegg:** 0

## **Bokmål**

Eksamensoppgaven består av tre oppgaver, og alle skal besvares. Poengvekting er gitt i parentes.

### Spørsmål 1 (25%)

- a) Hva er Gini-koeffisienten?
- b) Forklar det skjulte momentum i befolkningsvekst.
- c) Hva er agglomerasjons-gevinster?

### Spørsmål 2 (50%)

Bruk Lewis modellen og Harris-Todaro modellen til å drøfte mulige effekter av rural-urban migrasjon.

### Spørsmål 3 (25%)

Forklar hvordan bistand og FDI (Foreign Direct Investment) kan fremme økonomisk vekst ved å fylle forskjellige gap.

## **Nynorsk**

Eksamensoppgåva inneheld tre oppgåver, og alle skal svarast på. Poengvektar er gitt i parentes.

### Oppgåve 1 (25%)

- a) Kva er Gini-koeffisienten?
- b) Forklar det skjulte momentum i vekst i befolkning.
- c) Kva er agglomerasjons-gevinstar?

### Oppgåve 2 (50%)

Bruk Lewis modellen og Harris-Todaro modellen til å drøfte moglege effektar av rural-urban migrasjon.

### Oppgåve 3 (25%)

Forklar korleis bistand og FDI (Foreign Direct Investment) kan fremja økonomisk vekst ved å fylle ulike gap.

**English**

The exam consists of three questions, and all of them should be answered. Score weights are given in parenthesis.

Question 1 (25%)

- a) What is the Gini-coefficient?
- b) Explain the hidden momentum of population growth.
- c) What are agglomeration economies?

Question 2 (50%)

Use the Lewis model and the Harris-Todaro model to discuss possible effects of rural-urban migration.

Question 3 (25%)

Explain how foreign aid and FDI (Foreign Direct Investment) can promote economic growth by filling different gaps.

Kommentarer til SØK2007 besvarelse 10037, V14:

Oppgave 1 a)

Kandidaten viser hvordan GINI-koeffisienten er konstruert ved hjelp av Lorenz-kurven. Forklaringen er god og kandidaten viser en illustrasjon. Han snakker om styrker og svakheter til dette målet. Besvarelsen ville vært enda bedre hvis de fire styrkene til GINI-koeffisienten nevnt i forelesning ble ramset opp; 1)

Anonymitet, personer skiller bare med én variabel, ofte inntekt (i noen tilfeller brukes landeiendom og utdanningsfordeling) og ingen andre karakteristikk. 2) Skala-uavhengighet, valuta eller størrelse på økonomien teller ikke. 3) Målet er uavhengig av befolkningsstørrelse. 4) Overføringsprinsippet, hvis vi overfører inntekt fra en rik til fattig person vil den nye inntektsfordelingen være mindre ulik.

Oppgave 1 b)

Fylldig beskrivelse av befolkningsutvikling i u-land ved hjelp av den demografiske overgangen. Både sosiale, økonomiske og institusjonelle forklaringer på høy befolkningsvekst nevnes.

Oppgave 1 c)

Grundig beskrivelse av agglomerasjonseffekter. Kandidaten nevner mange potensielle kanaler til agglomerasjonsgevinster. Savner derimot en mer overordnet inndeling av agglomerasjonsmekanismene, som nevnt i forelesning; matching, sharing, learning. Dette ville ha gitt en mer ryddig disposisjon.

Oppgave 2

Meget bra besvarelse. Modellene er godt forklart. Det er inkludert kritikk av antakelsene i Lewis modellen, samt er Harris-Todaro modellen utledet både grafisk og analytisk med kalibrering.

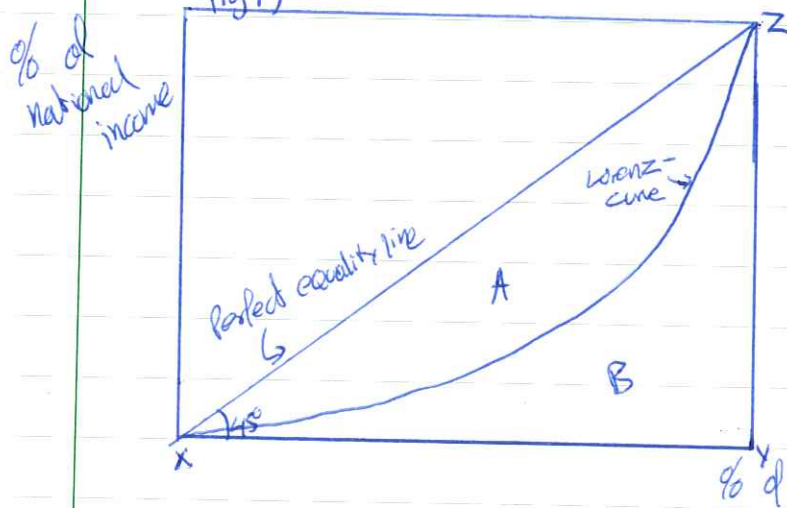
Oppgave 3

Meget god og strukturert gjennomgang. FDI og bistand er definert. Alle gapene er nevnt og forklart. I tillegg brukes Harrod-Domar modellen til å illustrere problemet med sparegapet. Kritikk av FDI og bistand er også gjengitt.

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## ~~Oppg~~ Questions

a) The Gini-coefficient is a measure of the equality of income distribution derived from the Lorenz-curve. It takes a value between zero and 1 where 1 is an unequal distribution and zero is as equal as it gets. The line with a Gini-coefficient of zero is a line where the bottom 10% receives 10% of national income, adding an other 10%, the bottom 20% receives 20% of national income and so forth, this is perfect equality:



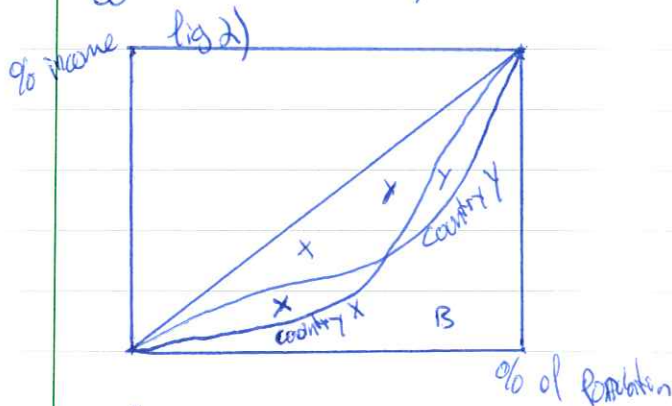
This means that any deviations from this line ~~indica~~ implies a lesser than perfectly equal distribution and great deviations implies more unequal distributions.

As the Lorenz-curve is drawn in fig 1) we see a fairly unequal distribution where the bottom 10% receives less than 10% and so forth.

Now, by taking the area A which is the countrys deviation from perfect equality and dividing it on the total area, B(xyz), you get the Gini-coefficient. It is now clear like I said earlier that a Gini-coefficient of 1 indicates a very unequal distribution, because that means that the deviations from perfect equality is as big as it gets. Note that equality tells us nothing about each share of populations contribution to the national income and in that sense

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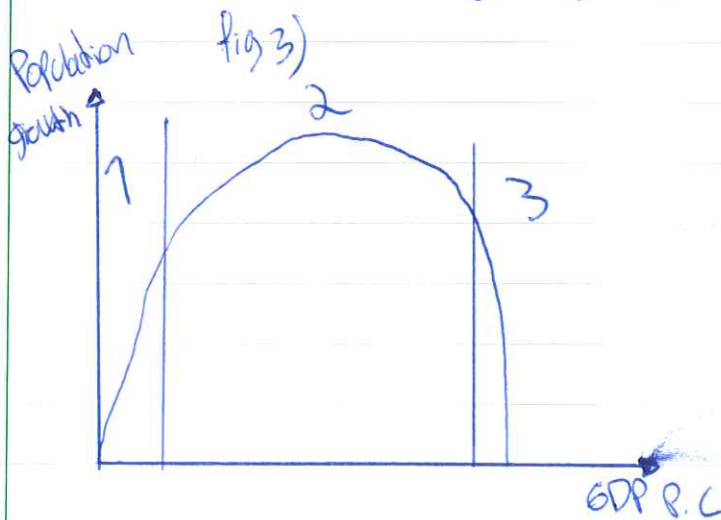
Should not be confused with how "fair" the distribution is. The Gini-coefficient is a convenient measure when two countries Lorenz-curves cross each other, because it is then difficult to see which country has the biggest area A, deviation from perfect equality:



$$Gini^X = \frac{X}{B} \quad Gini^Y = \frac{Y}{B}$$

Note that we also separate between Global income distribution which is the income distribution between the countries in the world and national, which is the distribution within a country.

b) I will describe the hidden momentum of population growth as part of the demographic transition theory with the following figure:



1, 2 and 3 are stages of the population growth over GDP - gross domestic product - per capita.



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At stage 1 the country is underdeveloped and poor with a low GDP.P.C. At this stage woman are usually at home taking care of the kids or working on the farm. Education level is low, food is scarce, clean drinking water is scarce, there is a lack of medicine, doctors, and treatment facilities and the general knowledge about good hygiene and health is low. All this leads to high death rates in underdeveloping countries adding also maybe the impact of political unrest and wars.

At the same time birth-rates are high as well, this due to the idea of having many children as insurance for when you get old that someone will take care of you, also because the people know that the chance of losing a child before its fifth birthday is high so they have many children to "compensate", and the lack of family planning and knowledge about contraceptives drives the birth rate up. With high death- and birthrate the country has a low population growth.

At stage 2 the country is developing and GDP P.C. is increasing. As peoples income increases they get more food, better food, better equipment, better medicine, more treatment facilities so the death rate is reduced, but the birthrate is still high mainly because of two reasons, and it is here the hidden momentum of population growth comes in. Firstly birthrates take time to reduce. Peoples traditions and the way to do things can take years to alter, like the tradition to have many children to provide for you when you get old. An other reason is that even if birthrates were reduced to, say 2 children per family, these children would come from a big population from a time with high birth rates and would still

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add a big number of people to the population.  
Therefore at stage 2 the population growth is high.  
At stage 3 the country is developed. The country has a high GDP per level, medications, contraceptives, bed, water etc so both birth rates and death rates are low and the population growth is low.

C) Agglomeration economies is the cost-reducing effect of increased population in a sector/city has on production. We separate between the agglomeration effect on the industry as a whole (Global agglomeration effect) and the agglomeration effect for each sector/company.  
Say that production is a function of each input and city population:

$$y = f(K, L, N)$$

Cobb-douglas function:

$$y = K^\alpha L^\beta N^\gamma$$

$$\frac{\partial y}{\partial L} = K^\alpha \beta L^{\beta-1} N^\gamma$$

K = capital  
L = Labor  
N = Population  
y = production

With perfect competition the change in production with hiring one more worker is equal to the wage.

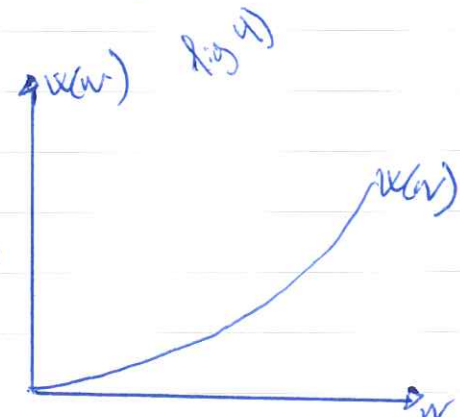
$$\frac{\partial y}{\partial L} = w$$

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

$\gamma > 1$  = Agglomeration economies

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

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



The higher population, lower cost, the higher the wage; Agglomeration economies.



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These agglomeration economies can come as a consequence of several factors;

- As  $N$  increases the population density increases, distances becomes shorter and shipping costs decreases.
- As  $N$  increases companies can produce larger quantities having production of scale benefits and decreasing average cost.
- As  $N$  increases companies can share storage and infrastructure costs.
- As  $N$  increases people learn from each other at bars/meetings/restaurants etc. known as the spillover of knowledge effect.
- As  $N$  increases people can produce specialized products for the sectors now that the demand for this specialization is increasing.
- As  $N$  increases companies can share the labor market especially if labor is demanded intensively by one company during winter season and demanded more of another company during summer season.

Some examples of this from the world today is Silicon valley in California producing semiconductors, Hollywood in Los Angeles producing movies, Wall-street in New York on financial services.

Also; when  $N$  increases it gets easier to hire temporary and companies ~~can~~ does not have to turn down big contracts.

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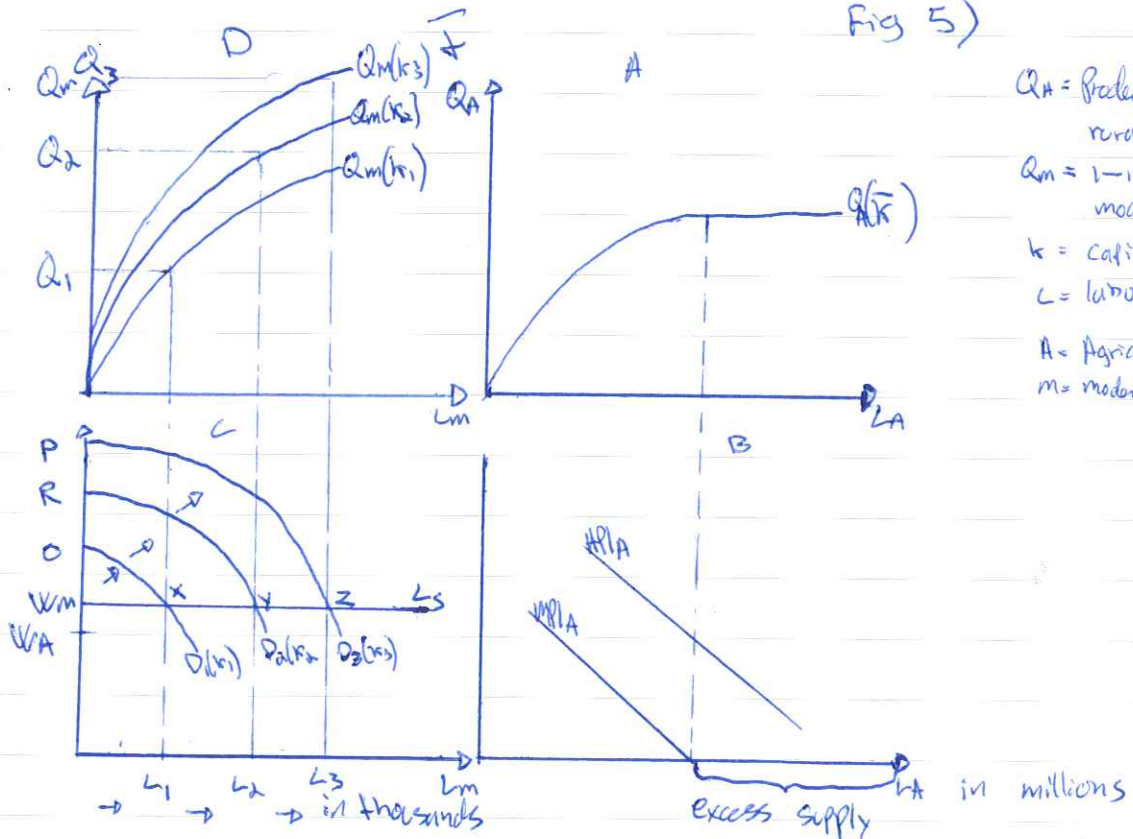
## Question # 2

I will first apply the Lewis - 2 sector - model to discuss rural-urban migration, because this model assumes full employment in the modern sector, and then apply the Harris-Todaro model opening for unemployment:

Assumptions:

- 2 sectors: rural & modern
- Production is a function of capital and labor in both sectors
- Capital is fixed in rural sector
- Technology is fixed overall
- Diminishing marginal product of labor
- Excess supply of labor in rural in millions
- Profits are reinvested in modern sector
- Wages in rural is equal shares of production  $w_A = \frac{Q_A}{L_A}$
- Higher wages in modern sector
- Free migration

Fig 5)



$Q_A$  = Production in rural sector  
 $Q_M$  = " " " " in modern sector  
 $k$  = capital  
 $L$  = labor  
 $A$  = Agricultural/rural  
 $M$  = modern/urban



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Fig. 5) panel A shows the production in rural sector with fixed capital and diminishing marginal product of labor

$$\frac{\partial QA}{\partial LA} > 0 \quad \frac{\partial^2 QA}{\partial LA^2} < 0.$$

There is an excess supply of labor

in this sector in the millions, which means that the sector is ~~fully~~ in need of no more labor, the added production by adding more labor is zero and hence the marginal product of labor is zero. In panel B we see that  $MPL=0$  and the APL, the average product of labor which gives us the wage in the rural sector. Not that since  $MPL=0$  adding one more labor increases the labor more than production and the APL is therefore decreasing.

In panel ~~A~~ we see that the wage in the modern sector is higher than in the rural sector. Since we have an excess supply of labor in millions willing to migrate to the higher wage the labor supply curve is completely elastic and a straight line, LS.  $D_1(k_1)$  is the modern sector demand for labor with capital level  $k_1$ . This gives production equal ~~to~~  $Q_1$  (panel D) and the cost is wages times workers,  $w_m \times L_1$ . This means that  $OXW_m$  is profits.

The profits are completely reinvested and this increases the capital level to  $k_2$ . Demand for labor is now  $D_2(k_2)$  and an extra  $L_2 - L_1$  are migrating to the modern sector. Production increases to  $Q_2$  and new profits are  $R_1YW_m$  which again are reinvested. The exact same thing happens again

$$Q_2 \rightarrow Q_3 \quad k_2 \rightarrow k_3 \quad D_2(k_2) \rightarrow D_3(k_3) \quad L_2 \rightarrow L_3$$

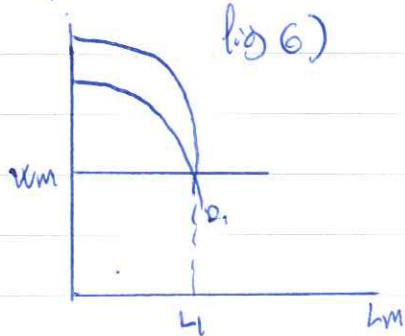
We see that the rural-urban migration has led to increased production in the modern sector, the country has modernized, and the investments and capital stock has increased. Excess supply from the rural sector migrated and was

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employed in the modern sector to the higher wage  $w_m$ . This dynamizes would continue until all were employed in the modern sector and the economy is fully modernized or wages in rural sector increased as the excess supply vanishes. Note that the ~~ex~~ labor in rural is measured in millions while in the modern sector in thousands.

Some critique of the model:

- It is not given that as the company reinvest its profits that the labor demand would increase proportionally. If the modern sector invested in more capital intensive production the demand would shift like this (fig 6) not increased labor demand;  $L_1$ .



- Assumption of big excess supply in rural sector could be invalid. As the CNR has calculated that more people live in the urban areas than in the rural areas.



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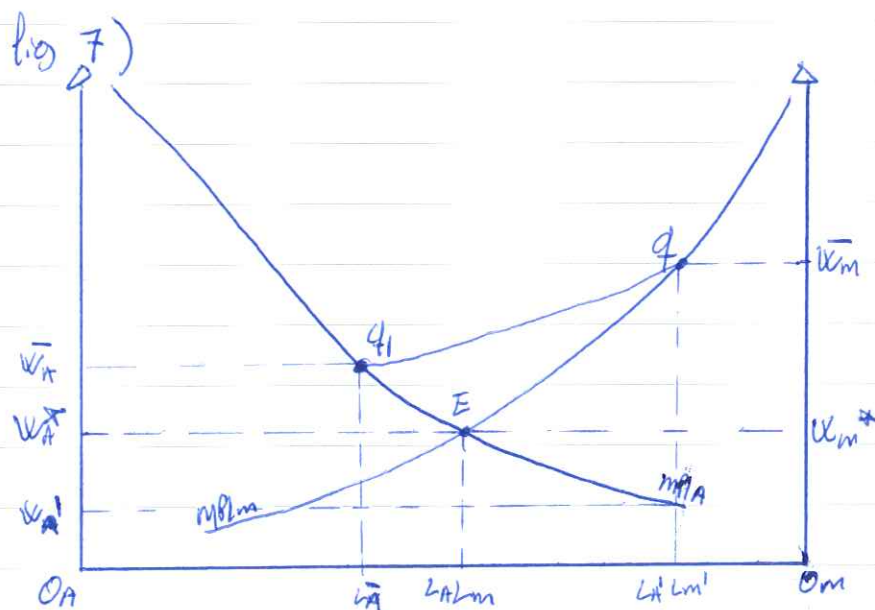
## The Harris-Todaro model:

### Assumptions

- Migrating decision based on expected future income.
- Unemployment in the modern sector.
- Decreasing MPL in both sectors
- Institutionally higher wage level in modern sector
- Free migration
- Full information

$W_m$  = wage level in modern sector

$W_A$  = wage level rural sector



The equilibrium  $E$  is the equilibrium if the two expected incomes were equal and no unemployment, meaning the two wage levels would be equal  $W_A^* = W_m^*$  this is due to the fact that as people migrate to the sector with the highest wage supply/demand of labor would adjust the wages until they are equal. Now, according to the assumptions above people would migrate to the modern

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Sector based on the expected future income in that sector. This means that they calculate the risk of being unemployed or just getting informal, temporary, low wage jobs, and the higher potential wage and migrate if that expected income exceeds rural wage level.

In fig 7) the modern wage is institutionally higher,  $w_m$ , if they only migrated based on wage levels  $O_m L_m$  would work in modern sector and  $O_A L_A$  would work in the rural sector, getting only  $w_A < w_m$ . But since they base their decision on expected future income they would migrate to urban sector even if employment is as low as  $O_m L_m$ . In fact, for different sets of urban wages ~~and~~ and unemployment we get different sets of rural wages to which the rural population would be indifferent between migrating or not:

$$w_A = \frac{L_m}{L_A} w_m$$

$L_m = \text{employment}$      $L_A = \text{Modern labor pool}$   
Say that  $w_m = 100$   
 $w_A = 50$

then unemployment could be as high as 50% before rural ~~pop~~ population becomes indifferent

$50 = (0,5)(100)$  if  $w_m \downarrow$  unemployment  
that is "accepted" by the rural population also goes down.  
This gives us the indifference curve  $qq'$  in which the rural population is indifferent between migrating or not



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This means that with migration based on expected future income and higher wages in modern sector  $OAL_A$  would be employed in the rural sector getting  $\bar{w}_A$ ,  $Oml_m$  would be employed in the urban sector getting  $\bar{w}_m$  and the rest? Well, they would migrate to the urban sector taking their ~~chances~~ chances on getting  $\bar{w}_m$  and be unemployed;  $LA'LA$ .

This shows that with the higher wage level in the urban sector, the rural-urban migration could lead to unemployment in the modern sector or put another way rural-urban migration could still persist even if there is unemployment in the modern sector. This could lead to the creation of slums and shanty towns as we observe outside cities like Cape Town.

A quick discussion of policy possibilities to reduce modern unemployment should follow after the graphical Harris-Todaro model because it might be tempting to suggest a policy of creating more jobs in the modern sector, but this could actually worsen the problem if the supply of labor increases more than the jobs created:

$$\pi = \frac{\lambda N}{S - N} \quad (1)$$

$$d = w\pi - r \quad (2)$$

$$\lambda = f(w, \alpha)$$

$$S = f(d)$$

$\pi$  = Probability of getting a job

$\lambda$  = Job creation parameter

$N$  = Modern employment

$S$  = Modern labor force

~~$w$~~   $w$  = modern wage

$\alpha$  = Policy parameter to create jobs,  $f'(\alpha) > 0$

$S$  = Supply of labor

$d$  = wage differential

$r$  = rural wage

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① into ②

$$d = w \frac{\Delta N}{S-N} - r$$

$$\frac{\partial S}{\partial \alpha} = \frac{\partial S}{\partial d} \frac{\partial d}{\partial \pi} \frac{\partial \pi}{\partial \alpha}$$

→ The change in labor supply with a change in the policy parameter.

As I said: if the supply increases more than the jobs created (demand) with a change in  $\alpha$  unemployment increases.

Supply Demand

$$\frac{\partial S}{\partial \alpha} > \frac{\partial \Delta N}{\partial \alpha}$$

← increased unemployment

$$\Rightarrow \frac{\partial S}{\partial d} \frac{\partial d}{\partial \pi} \frac{\partial \pi}{\partial \alpha} > \frac{\Delta N}{\Delta \alpha}$$

$$\Rightarrow \frac{\partial S}{\partial d} w \frac{\Delta N}{S-N} \frac{\Delta \pi}{\Delta \alpha} > \frac{\Delta \pi}{\Delta \alpha}$$

$$\Rightarrow \frac{\partial S}{\partial d} \frac{w}{S-N} > 1$$

multiply w/  $\frac{d}{w} \frac{S}{S-N} \frac{S-N}{S}$

$$\boxed{\frac{\partial S}{\partial d} \frac{d}{S} > \frac{w\pi - r}{w} \cdot \frac{S-N}{S}}$$

If the elasticity of labor supply with respect to the wage differential is greater than

the wages differential relative to urban wage times unemployment ( $S = \text{labor pool}$ ,  $N = \text{employed}$ ,  $\frac{S-N}{S} = \text{unemployment rate}$ ) the unemployment in modern sector will increase when the government increases the policy parameter  $\alpha$  to create more jobs. This elasticity has proven not to have to be very high:

$$w = 100$$

$$\pi = 0,177 = 17,7\%$$

$$r = 60$$

$$\frac{S-N}{S} = 0,37 = 37\%$$

$$\frac{\partial S}{\partial d} \frac{d}{S} > 0,03 = 3\% \text{ only, with } 30\% \text{ unemployment.}$$



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## First; Definitions:

Foreign Aid is a transfer of money from a donor to a recipient either as a loan with very favorable interests or as a gift. Donor can be one country (bilateral) or several maybe via organisations like WHO, world bank, NATO (multilateral)

Foreign Direct Investments is companies usually multinational corporations (MNC) invests in a developing country either by "setting up shop" like buildings, factories, offices or via acquisitions of stocks, lesions.

For the aid or FDI to promote ~~the~~ economic growth theory focuses on low gaps that can be filled in the developing country:

1: Savings gap: the developing countries often has too low savings rates which means that investment is too low and they are not accumulating enough capital to have economic growth. This gap can be filled with investment-earmarked-aid or FDIs.

Using the Senrod-Domar model we get the savings gap as:

$$\frac{Y_{t+1} - Y_t}{Y_t} = \frac{S}{C} - \delta - n$$

$\delta$  = depreciation rate

$n$  = population growth

$S$  = Savings rate

$C$  = Capital-Production

rate. How much

capital needed to

produce 1 Y.

if desired growth from  $t$  to  $t+1$  is 6%

$$\delta = 5\%$$

$$n = 4\%$$

$$C = 3\%$$

$$S = 18 - 15 - 12$$

$$| S = 9\% | \text{ this can}$$

be made possible with aid, or

foreign direct investments.

$$\frac{Y_{t+1} - Y_t}{Y_t} = \text{GDP growth rate.}$$

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20 Budgetary gap; developing countries often have ~~be~~ budget deficits, but still have to allocate government spendings on public goods like hospitals/roads/defense due to the market failure that each individual does not value public goods enough so that their willingness to pay for these goods are too low and the government has to do it. This gap can be filled by foreign aid and FDI's through tax-revenues

30 Foreign exchange gap; if the developing country does not have enough exports to pay for their imports, say export of primary goods to pay for imports of capital, the gap can be filled by foreign aid or FDI's, as the FDI could increase production in that country and then increase exports.

40 ~~40~~ Management gap; developing countries might lack competence and knowledge to induce economic growth which can be filled by aid or FDI as technical assistance to the developing country, maybe as a spillover effect from the FDI.



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Although the theory is clear, it is not always the case that foreign aid or FDI's induce economic growth. This can be due to several reasons, some mentioned below:

1. Wrong motives
2. Good samaritan dilemma
3. Micro-micro paradox
4. Long vs short run
5. Corruption
6. Spillover effect is insignificant
7. Liberal tax systems to attract FDI's
8. Emergency aid

7: Most common with bilateral aid where the aid is given on other motives than growth like political influence/moral obligation etc.

- The US gives a lot of aid to Israel & Egypt to empower their influence in the middle-east.
  - Japan gives to countries supporting their economic and political interest against China
  - France gives to former colonies as a moral motive.
- These aid ~~transfers~~ are then not necessarily spent on investments and ~~does~~ not lead to growth.

2: Recipient wastes aid to get aid in the future

3: Aid works on micro-level but insignificantly on macro-level

4: Aid spent on health/human capital could give growth generating ahead.

5: Corruption could lead to aid spent on consumption/parliaments/jets or salaries and not investments.

6: Empirical work has shown that the spillover -

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Effect from FDI is insignificant, that they often hire their own high skilled labor and that the knowledge transfer from these to the population is small.

7: ~~By~~ Developing countries might be tempted to lower taxes on MNCs ~~also~~ to increase their incentives to establish here. These MNCs are often very profitable and tax-revenues could then be very small from their establishment.

8: Sometimes aid is given during emergencies like in the Philippines after the earthquake and in the South-East Asia after the tsunami in 2004. This aid is then given as food/clothes etc. and not investments and does not nor are supposed to lead to growth.

Note; Empirical evidence has shown positive effects of FDI on economic growth and development.