

UNIVERSITY OF OSLO
DEPARTMENT OF ECONOMICS

Term paper in: ECON1910

Handed out: 4 March 2011

To be delivered by: **22 March 2011, 10:00 – 12:00**

Place of delivery: Next to SV-info-center, ground floor

Further instructions:

- This term paper is **compulsory**. Candidates who have passed the compulsory term paper in a previous semester, does not have the right to hand in the term paper again. This is so, even if the candidate did not pass the exam.
- You must use a printed front page, which will be found on the course semester page.
- **Note:** The students can feel free to discuss with each other how to solve the problems, but each student is supposed to formulate her/his own answers. Only single-authored papers are accepted, and papers that for all practical purposes are identical will not be approved.
- It is of importance that the term paper is delivered by the deadline (see above). Term papers delivered after the deadline, **will not be corrected.***)
- You must hand in a declaration form with your term paper. You will find this on the course semester page. **Term papers without declaration forms will not be corrected.**
- Information about citing and referring to sources:
<http://www.uio.no/english/studies/about/regulations/sources/>
- **Information about consequences of cheating:**
<http://www.uio.no/english/studies/admin/examinations/cheating/index.html>
- All term papers must be delivered to the place given above. You must not deliver your term paper to the course teacher or send it by e-mail. If you want to hand in your term paper **before** the deadline, please contact the department office on 12th floor.
- If the term paper is not accepted, you will be given a new attempt. If you still not succeed, you will not be permitted to take the exam in this course. You will then be withdrawn from the exam, so that this will not be an attempt.

*) If a student believes that she or he has a good cause not to meet the deadline (e.g. illness) she or he should discuss the matter with the course teacher and seek a formal extension. Normally extension will only be granted when there is a good reason backed by supporting evidence (e.g. medical certificate).

The term paper consists of four exercises and you are expected to answer all four. There are no formal requirements regarding the length of the term paper, but I would think that a good answer should be somewhere between 5 and 15 pages.

Note: Your answer can be given in English or in Norwegian!

Problem 1

According to the Harrod-Domar view of the process of economic growth, the savings rate is an important determinant of the rate of growth of an economy. According to Solow's view, however, the propensity to save and the rate of growth are in the long run, unrelated. What explains this contradiction?

(You are not expected to derive the models; the important part is to understand the difference between the models)

Problem 2

One of the Millennium Development Goals is to halve the proportion of people whose income is less than one PPP dollar a day by 2015. Why do you think that the United Nations use PPP dollars?

Problem 3

Explain how the size of the urban informal sector affects the expected wage for a migrant to the city and hence works as an equilibrating factor in rural-urban migration.

Problem 4

Consider an economy of 10 people and two sectors (traditional and modern) with yearly incomes equal to \$1000 (in traditional) and \$2000 (in modern). Suppose that all growth proceeds by moving people (one by one) from the traditional to the modern sector.

a) Plot values of the Gini coefficient and the coefficient of variation as individuals (one by one) move from the traditional to the modern sector.

NOTE: There is a typo in some version of the book in the expression for the coefficient of variation. The correct expression is:

$$C = \frac{1}{\mu} \sqrt{\sum_{j=1}^m \frac{n_j}{n} (y_j - \mu)^2}$$

b) Relate your results to the inverted-U hypothesis of inequality.

c) Explain what happens to the Lorenz curves as people move into the modern sector and discuss whether or not, according to the Dalton principle, inequality is rising or falling.

Solution Key

Perm Paper ECON 1910

Problem 1

According to the Harrod-Domar view of the process of economic growth, the savings rate is an important determinant of the rate of growth of an economy. According to Solow's view, however, the propensity to save and the rate of growth are in the long run, unrelated. What explains this contradiction? (You are not expected to derive the models; the important part is to understand the difference between the models)

ANSWER: Long-term growth rates are zero in the Solow model, while long-term growth rates in the Harrod-Domar model are given by $g^* = s/\theta - \delta - n$, so it depends on the savings rate, capital productivity, depreciation and population growth and is generally positive (or at least non-zero).

We get the difference in prediction because the Harrod-Domar model assumes constant returns to scale production function while Solow assumes decreasing returns to scale production function.

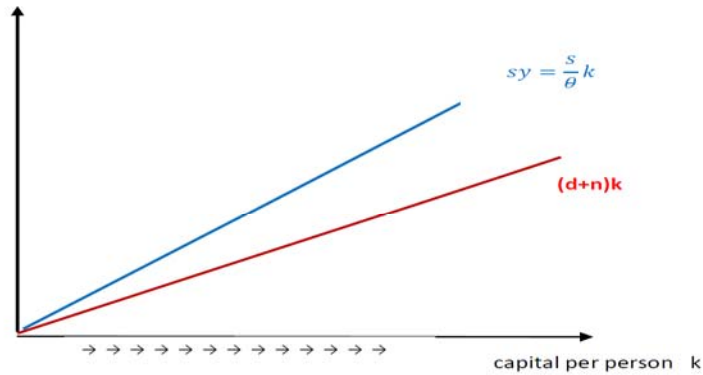
Harrod-Domar: $g^* = s/\theta - \delta - n$

We can rewrite this equation:

$$\Delta y = \frac{s}{\theta} y - (\delta + n)y$$

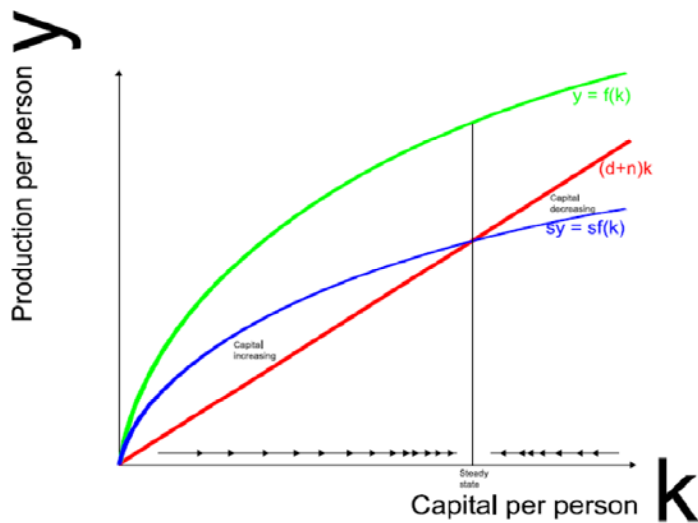
$$\Delta k = \underbrace{\frac{s}{\theta} k}_{\text{Actual Investment}} - \underbrace{(\delta + n)k}_{\text{Break Even Investment}}$$

Production per person y



Changes in the capital stock per worker, and therefore economic growth in the Solow model is given by:

$$\Delta k = sf(k) - (\delta+n)k$$



Let's compare the two equations that describe the change in capital in the two models:

$$\text{H-D:} \quad \Delta k = sk/\theta - (\delta+n)k$$

$$\text{Solow:} \quad \Delta k = sf(k) - (\delta+n)k$$

What explains the different results regarding the effect of savings is the different assumption regarding the relationship between capital and output.

In the H-D model there is a fixed relationship between capital per person and output per person:

$k \uparrow \rightarrow y \uparrow$ with a fixed amount $(1/\theta) \rightarrow$ constant returns to scale.

In the Solow model there is a positive but diminishing relationship between capital per person and output per person:

$k \uparrow \rightarrow y \uparrow$ with a smaller and smaller amount the larger k is \rightarrow decreasing returns to scale.

Problem 2

One of the Millennium Development Goals is to halve the proportion of people whose income is less than one PPP dollar a day by 2015. Why do you think that the United Nations use PPP dollars?

ANSWER: Key Points:

- Define PPP: This can be with an example, i.e. a U.S. dollar spent in India will buy more haircuts than a dollar spent in the United States, PPP takes into account this lower cost of living and adjusts for it as though all income was spent locally, or by a textbook definition, mentioning traded versus non-traded goods and the exchange rate.
- The definition of PPP might already answer why the United Nations use this measure, but anything that resembles the following idea is correct: Using market exchange rates to compare countries' standard of living or per capita Gross Domestic Product can give a very misleading picture. The exchange rate only reflects traded goods in contrast to non-traded ones.

Problem 3

Explain how the size of the urban informal sector affects the expected wage for a migrant to the city and hence works as an equilibrating factor in rural-urban migration.

- **Answer:** In the urban sector, employers must pay at least the mandated minimum wage, which introduces the possibility of an informal urban sector.
- Worker choose between remaining in the rural/agricultural sector and a sure wage and moving to the urban area with a positive probability of landing a job in the formal sector, but also with a positive probability of ending up unemployed or working in the informal sector.
- Because the fate of a potential migrant is not known, we must consider the expected income from migration and compare it with the actual income received in agriculture.
- Expected income from migration:

$$\frac{\bar{L}_F}{\bar{L}_F + L_I} \bar{w} + \frac{L_I}{\bar{L}_F + L_I} w_I$$

$\bar{w} > w_I$ - formal wage is higher than the informal wage

\bar{L}_F - Number of formal jobs (determined by the minimum wage)

L_I - Informal employment

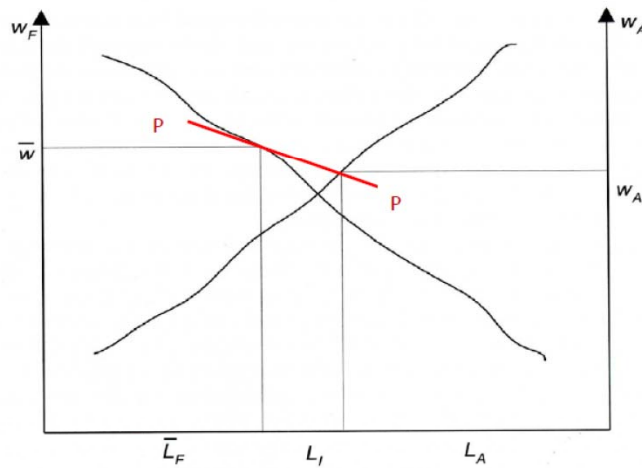
$\bar{L}_F + L_I$ - Number of potential job seekers

- We see directly from the expected wage equation that the size of the urban informal sector reduces the expected wage for a migrant to the city.
- Migration to the city will take place until the expected income from migration is the same as income in agriculture (rural wage)

$$\frac{\bar{L}_F}{\bar{L}_F + L_I} \bar{w} + \frac{L_I}{\bar{L}_F + L_I} w_I = w_A$$

The size of the urban informal sector therefore works as an equilibrium factor in rural-urban migration. As long as there is an positive size of the informal sector, we will have equilibrium even if the formal wage is higher than the wage in agriculture.

- Graphical illustration:



Problem 4

Consider an economy of 10 people and two sectors (traditional and modern) with yearly incomes equal to \$1000 and \$2000. Suppose that all growth proceeds by moving people from the traditional to the modern sector.

A) Plot values of the Gini coefficient and the coefficient of variation as individuals move from the traditional to the modern sector.

Suppose that there are 10 people and that x of them are in the modern sector. In that case, the average income is given by

$$\mu = \frac{2000x + 1000(10 - x)}{10} = 1000 + 100x$$

So applying the formula for the Gini (see page 188), we see that

$$G = \frac{1}{200(1000 + 100x)} x(10 - x)|2000 - 1000| + (10 - x)x|1000 - 2000| = \frac{2 * x(10 - x)}{200 + 20x}$$

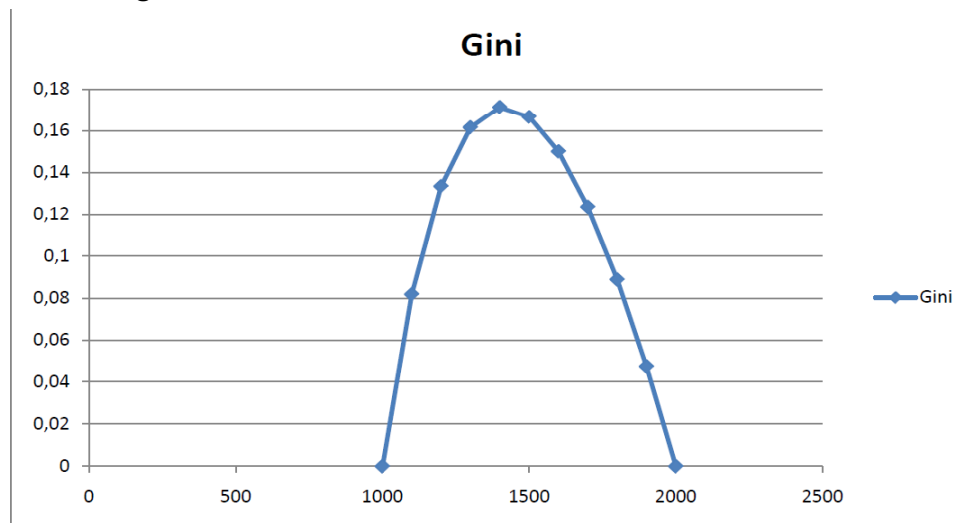
Similarly, we can apply the definition of the coefficient of variation.

$$C = \frac{1}{1000 + 100x} \sqrt{\frac{(10 - x)}{10} (100x)^2 + \frac{x}{10} (1000 - 100x)^2}$$

Number of people in modern sector X	G	C
0	0	0
1	0.081818	0.272727
2	0.133333	0.333333
3	0.161538	0.352506
4	0.171429	0.349927
5	0.166667	0.333333
6	0.15	0.306186
7	0.123529	0.269563
8	0.088889	0.222222
9	0.047368	0.157895
10	0	0

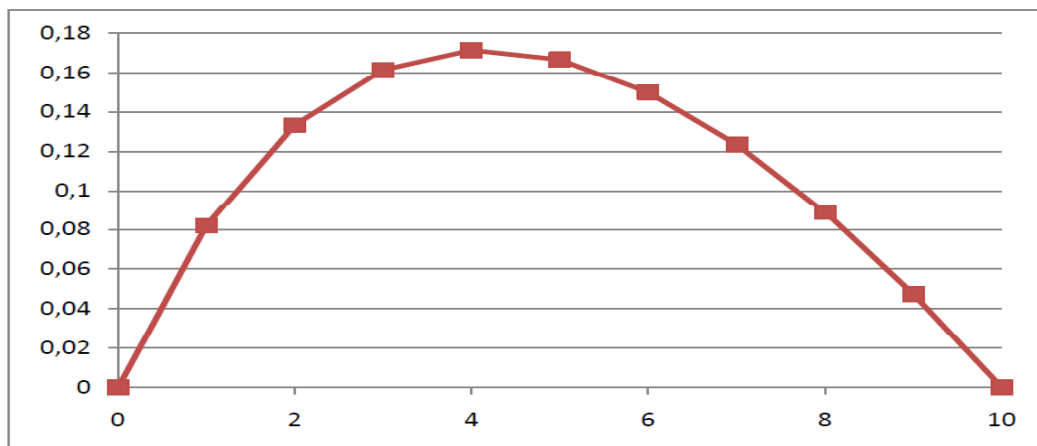
- By plotting this for various values of x, we will see that in this scenario, the Gini must look inverted-U shaped as the value of x goes from 0 to 10

Gini and average income:



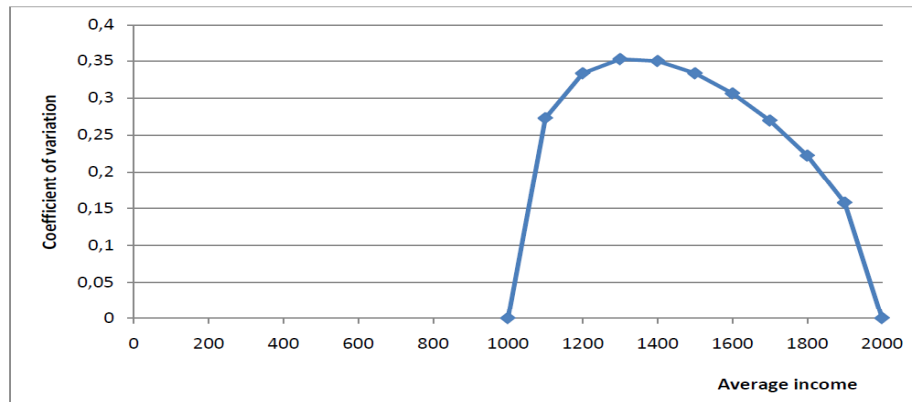
- By plotting this for various values of x, we will see that in this scenario, the Gini must look inverted-U shaped as the value of x goes from 0 to 10

Gini and number of people in modern sector:



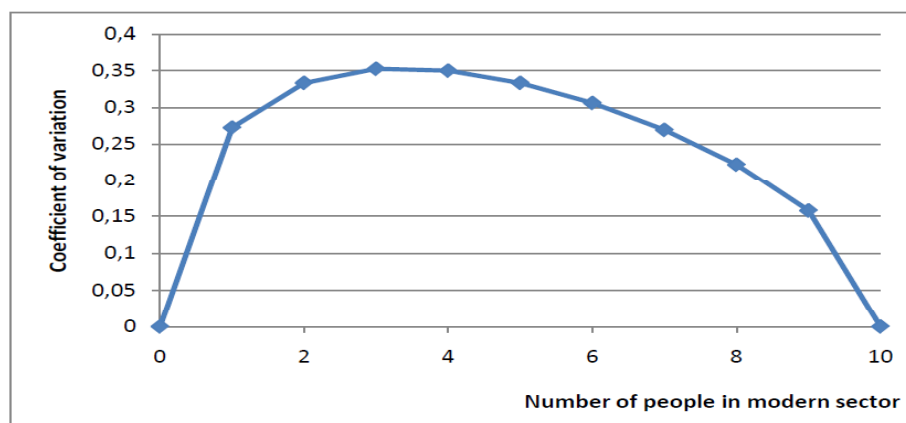
- By plotting this for various values of x , we will see that in this scenario, the Coefficient of variation must look inverted-U shaped as the value of x goes from 0 to 10

Coefficient of variation and average income:



- By plotting this for various values of x , we will see that in this scenario, the Coefficient of variation must look inverted-U shaped as the value of x goes from 0 to 10

Coefficient of variation and number of people in modern sector:



B) Relate your results to the inverted-U hypothesis of inequality

- Both the Gini and Coefficient of variation is in accordance with the inverted-U hypothesis.
- Hence, if development occurs through a process of migration from traditional to modern sector, then there may be a tendency for well-known inequality indicators to first rise and then fall.

C) Explain what happens to the Lorenz curves as people move into the modern sector and discuss whether or not, according to the Dalton principle, inequality is rising or falling.

The Lorenz curves cross throughout, so the Dalton principle cannot be applied to evaluate changes in inequality at any of the stages (except at the very beginning when x goes from zero to 1 and at the very end when x goes from 9 to 10).

The inverted U may be (to some extent) a statistical artifact.

According to the table the two inequality measures does not agree in the ranking of the different distributions, hence the Lorenz curves must cross.