

Some Review Questions with *Suggestive Answers*

1. Draw the Lorenz Curve for the following two income distributions:

Economy A: {10,20,30,140}

Economy B: {5, 25, 35, 35}

- *Order people from poorest to richest.*
- *Each person represents 25% of the population. So, the cumulative proportion of population from poorest to richest: {25%, 50%, 75%, 100% }*
- *Convert each income value to % of total income. In economy A, this becomes {5%,10%,15%,70%}. In Economy B: {5%, 25%, 35%, 35% }*
- *Calculate the cumulative % of income going from poorest to richest: Economy A: {5, 15, 30, 100}, Economy B: {5, 30, 65, 100}*
- *Plot cumulative % of income on the vertical axis against cumulative % of population on the horizontal axis.*

Just based on the Lorenz curve, is it possible to compare inequality for these two distributions? Why or why not?

Yes, it is possible. Because the Lorenz curves do not cross.

2. Is the population principle satisfied for the following measures of income inequality?

- a) Variance of Incomes
- b) Distance from maximum income to median income
- c) Coefficient of Variation of income

Population Principle is satisfied for all 3.

- a) *The formula for variance is $V = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$. When you clone the population, there are twice as many identical terms in the numerator (i.e. every term is repeated once). So, the summation in the numerator exactly doubles. But cloning creates twice as many people, so the denominator, n also doubles. Since the increases in the numerator and denominator are exactly proportional, the variance doesn't change! Intuitively, the variance measures something like "the average distance of all values from the mean" or the "dispersion from the mean". Cloning the population wouldn't change this average distance!*
- b) *When you clone the population, both the max income and the median income remain the same!*
- c) *Coef. of Variation is Standard deviation divided by mean. From (a) above, we saw that variance doesn't change, so the std. deviation (which is the square root of variance) doesn't change. The mean doesn't change when you clone the population. So Coef. of Variation stays the same.*

3. Are the Relative Income Principle and the Pigou-Dalton Transfer Principle satisfied for the above?

Relative Income Principle:

- a) *Not satisfied for Variance. When you double incomes, the distance of each value from the mean doubles, which is to say, that the terms inside the summation in the numerator ($x_i - \bar{x}$) all double. Since we're squaring each term, the numerator quadruples! The denominator (n – number of people) doesn't change, so the variance quadruples.*
- b) *No. When you double incomes, the max doubles, and the median doubles, so their distance gets larger.*
- c) *Yes, RIP satisfied for Coef. of Variation. We saw above that the variance quadruples when you double incomes. This implies that the std. deviation doubles. The mean also doubles when you double incomes. So, $CoV = \text{std dev}/\text{mean}$ stays the same.*

Transfer Principle:

- a) *When you transfer incomes from a poorer to a richer person, the average distance of incomes from the mean increases – so variance increases. Since the variance uses information on the entire income distribution, the change in the average distance from the mean due to a transfer is true of transfers between **any** two people. So, the transfer principle is satisfied.*
- b) *If you transfer income from the second richest person to the poorest person, the measure doesn't change. So, the transfer principle is not satisfied.*
- c) *As we saw above, when you transfer incomes, the variance changes in the right direction (and therefore the std. deviation does too). The mean stays the same due to a transfer. So, Coef. of Variation changes in the right direction. The principle is satisfied.*

4. Does the slope of the Lorenz curve increase or decrease as you move right? Why?

Increases as you move right, because we've ordered people from poorest to richest from left to right. The addition to cumulative % of income when you add a richer person will be larger than the addition to cumulative % of income when you add a poorer person.

5. If we run a growth regression with Initial GDP per capita as one of our explanatory variables, what does the Solow model say we should expect for the coefficient of Initial GDP per capita? What does the Harrod-Domar model say that we should expect?

We're running a regression like this:

$$\text{Growth (from 1980 to 1990)} = a + b * (\text{GDPpc in 1980}) + c * (\text{other explanatory variables})$$

The Solow model says that poorer countries grow faster. This means that if Initial GDP per capita is lower, then growth should be higher. In other words, we expect b to be negative.

The Harrod-Domar model says that the growth rate depends on the savings rate, productivity of capital and depreciation rate. If these are constant across rich and poor countries, then the growth rates across rich and poor countries should be similar. In other words, there's no relationship between initial GDP per capita and subsequent growth rates, so we expect b to be 0.

6. What does the Solow growth model predict about long-term growth rates in countries? What does the Harrod-Domar model predict? What aspect of (or assumption in) the Solow model sets it apart from the Harrod-Domar model and allows us to get these different predictions? What is the intuition behind why this difference in assumptions changes the models' predictions?

Solow: long-term growth rates are zero

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

Short answer to why we get the difference in prediction: H-D assumes a constant returns to scale production function while Solow assumes a decreasing returns to scale production function. Look in your notes to figure out what this means, and what the intuition is for why the model's predictions are so different based on the difference in assumptions.

7. What are possible responses of a country's citizens to rising income inequality? What factors determine which type of response is likely to be observed?

This is the traffic jam analogy we discussed in class. People can either get frustrated and revolt due to the rising inequality, or they see other people in the country getting richer as a sign that bodes well for their own future income prospects.

Look at your notes to figure out what factors we discussed in class leads to one response being more likely than the other. I stressed the role of ethnic fractionalization.

8. List a few important components of development and discuss why they are important in studying the economics of development. You may want to relate your discussion back to the definition of development given on the first day of class.

This is an easy question. Look at your notes from the first two days of class. We talked about inequality, stability, health, education, institutions, political freedoms etc.