Chapter 13: Income inequality

In order to compare the developmental state of different countries we used GDP or the average income per capita until now. But those numbers do not provide information about the **distribution of the income**, which is crucial, since developing countries are often characterized by a large gap between incomes.

Income inequality: the facts

The measurement of the distribution of income can be approached on two ways:
- Divide the total income into several equal sized intervals and then observe how many people are in each group
- Divide the population in equal sized groups and then compare the average income of every group.

When sketching the income distribution, several statistical keywords are important;
the *mean* is the normal average of values
the *median* the exact middle of the observations, the number of the observation which has exactly the same amount of observations below and above.
Furthermore, income data is always **skewed;** not symmetric around the means but has a long tail to one side, to the right side, where high incomes are.

The **Gini coefficient** measures the degree of income inequality in a single number, which makes it easier comparable. The Gini coefficient can take values between 0 (no inequality) and 1 (perfect inequality). To calculate the coefficient we have to introduce the **Lorenz Curve***, which relates how much (starting with the lowest income households) low income households account for the percentage of total income. If you rank the income distribution from low to high, you basically ask, How much of the total income are provided by the lowest income households? In order to calculate that curve, that question will be repeated for all percentages.

Simon Kuznet observed in his hypothesis the development of income inequality during industrialisation and urbanisation. According to Kuznet inequality will first increase because urban inequality tends to be higher than rural inequality. At later stages of economic development, equality tends to adjust. Therefore, **Kuznet's curve** is an inverted U-shaped curve when relating GDP per capita with the inequality. With the highest inequality found for medium GDP per capita, i.e. medium stage of industrialisation.

The factors causing inequality

The source of inequality within a country is based on differences among the population. The differences can relate to the field of human capital (education, health condition), the origin (rural or urban) or the ownership of physical capital, and of cause simple luck.

We will reduce the source of inequality to the simple difference in education, measurable in years of schooling (reduced to year 0-4). The return on the education years is an increased income with longer education compared to less years of schooling. Thus, the longer the education the higher the income will be.

Therefore we will use the distribution of how many people having how many years of education and the return to education, to calculate the Gini coefficient and compare that in two different countries. The model building will assist to determine the reasons for differences in income distributions and changes over time.

Model 1:

Country A and B have the same distribution of education (i.e. for both countries the same amount underwent 0, 1, .. 4 years of schooling) but they differ in the return on the education. Country A offers 10 % return whereas Country B only has 5 %. Because of the lower educational return in Country B, the income will not differ as much as in country A because of the cumulative nature of the educational returns (Gini coefficient of 0.068 for A and 0,035 for B.)

Model 2
Another source of a higher Gini coefficient is the educational distribution. In this second theoretical model, the countries do not differ in their return to education, but in the distribution of the how many people experienced different years of schooling. Country A has the normal distribution as in model 1, but Country B has a more narrow distribution this time; i.e. less students of the only 0 or 4 years of education and more students had undergone an education for the median amount of years. We come to the finding that, in this comparison, the Country B, has a smaller Gini coefficient.

That model is however constraint by its simplicity, but it demonstrates how a change in the population structure or the return to education influences the income distribution. This modelling proofs Kutznets theory; as a country develops, the return on education (capital) tend to increase, which will, as seen in model 1 increase the inequality. The higher returns will stimulate the population to take longer years of schooling, this (model 2) and the fact that the further the country develops the less will the return be, will decrease the inequality eventually.

The phenomenon of sharply rising inequality occurred in the most advanced economies after World War II. Possible underlying reasons for that paradox (because after Kuznet it should be very small) can be:

- *Technological Advances and return to labour:* Due to new arising technological progress, the return to the educated labour increased again. This was due to higher productivity, because of the complementing technologies for jobs persuaded by educated persons. Therefore as soon as the technological innovation slows down, the inequality will decrease as well.

- *International Trade and increase of rate of return:* When engaging in international trade, the good which one country is abundant in but the other not, will experience an increase in the rate of return to that good (e.g. labour), which will rise the inequality as well.

- *"Superstar" dynamic:* A recent phenomenon, which holds that the top-educated people of an occupation earn significantly more than slightly less educated persons. Take for example Top managers or Top athletes, which earn enormous amount more than insignificant lower qualified managers/athletes. Superstar Payments tend to increase inequality because the return on very high qualification rose.

Those three examples are channels through which the income inequality can arise even in high developed countries.

How income inequality effects growth

Domestic income inequality is able to effect economic growth on three different levels:
  1. *Income inequality and Accumulation of Physical capital*
Income inequality has a positive effect on economic growth through the instrument of physical capital, the savings rate. As the income increases, the savings rate will raise simultaneously, e.g. a person who earns more tends to save more.

Therefore, more people have a higher income, i.e. the higher the income gap; the more will be saved in total. We examined the effect of a risen savings rate before: the economy will be able to reach a higher steady-state and therefore have a higher level of output. For the savings rate it might not be favourable to redistribute income, because only if capital is accumulated it will have a high savings rate. Some income is distributed from the rich to the poor; the savings rate will suffer, because people with a lower income tend to save less.

2. Income inequality and the Accumulation of Human capital

Unlike the positive influence on Physical capita, income inequality tends to have a negative impact on Human capital. The contrast is due to the differences between Human and Physical capital; Human capital investment is limited, whereas investment in Physical capital is rather unlimited. That is because it is possible to own Physical capital, e.g. tools or factories, but it is not possible to transfer the ownership of Human capital, e.g. being the owner of the education of somebody else.

The inequality assumption can be expressed with the example of two persons and their investment options. Let's consider the case that one is rich and the other poor and how their investment decisions differ. We assume that Human capital has diminishing marginal product; the more we invest the less we get as extra return, whereas the marginal product of physical capital stays constant, no matter how much a person already invested. That is because the personal investment in physical capital is diminutive compared to total investment the overall rate is also diminishing.

Taking the two persons again in consideration, we find that a person with less income will first invest in Human capital, whereas as income rises, the second person will tend to invest in human capital up to the intersection point and then in physical capital.

If now redistribution from the rich to poor person would take place, and we assume that the poorer person has not reached the intersection point yet, the poor person would invest the extra income in more Human capital. That leads to a reduced investment by the rich person in physical income, and the higher investment in human capital by the poor person with the higher return than the physical capital before will increase the total return (i.e. output). Therefore the more equal the income, the more beneficial for the Human capital.

The opposite effect of inequality (positive for Physical, negative for Human Capital) has a different implication for different economic situations. Consider the economic stage at the end of the 19th century. Since the driving force of the economic development was physical accumulation, e.g. technological change, a strong income inequality could have been beneficial for economic growth, because the inequality is positive for physical capital accumulation. On the other hand, growth in developing countries today is more Human Capital based therefore income inequality has a highly negative impact on economic growth.

3. Productivity and Income Redistributions (Taxation)

Income redistribution occurs when the government, for the reason of income inequality takes a share of the income of the high-income population and transfer it to people with low income. This redistribution has two effects on every person;
- First the obvious fact, that the disposable income will either increase or decrease. The disposable income is the **pre-tax income** (purely what a worker earns before taxes are collected) minus the taxes paid and plus the transfer income received.
- The second, more subtle effect is that because of the taxation, productivity will tend to decrease the more the tax rate increases which will lower the pre-tax income.

Inequality and efficiency are conflictive implications; whereas inequality implies a higher taxation, efficiency calls for no taxation.

In order to find the desired tax rate, regarding the relationship between inequality and efficiency, we will build a model in which the government only redistributes income. First the government collects the same fraction of income from everybody. That means that people with a high income will pay more. The redistribution follows the principle of a **lump-sum transfer**; everybody receives the same amount from the taxes collected. (e.g. if the country has 4 inhabitants, which pay, according to their different income, 2 $, 8$ 10 $ and 12 $, everybody would receive a lump sum transfer of 8 $). In addition, the equality of income is easier reached with a high tax rate even though it will decrease the productivity.

The effect on workers:

1. Workers who have pre-tax income above the mean (in our example 8 $)
A worker, who's pre-tax income is above the mean, will have to pay more (e.g. 10$) than he gets redistributed again from the government (8 $). Furthermore, the effect of reduced productivity due to the taxes will reduce his pre-tax income further. Hence, as soon as a worker earns more than the average he will be against redistribution.

2. Worker has a pre-tax income exactly the mean
The lump-sum fee the worker will get redistributed is exactly the same amount he had to pay as taxes (=8 $), therefore in that manner he does not mind the redistribution. But the underlying effect of the reduced efficiency due to tax imposition will decrease his pre-tax income and therefore people earning the mean lump sum fee will also be in favour of no taxation.

3. Pre-tax Income below the mean
Workers with a pre-tax income below the mean will be the sole beneficial from the redistribution, since they will receive more than they had to pay (take for example the inhabitant who paid 2 $ and received 8 $.) In addition, his pre-tax income will be reduced due to the decreased efficiency. The worker will prefer a higher tax rate the greater the gap is between his income and the mean income.

The analysis above showed that people earning more than the mean income will be against imposing a tax rate (or for a lower rate), whereas people which an income below will favour one (or higher rate). The tax rate is primary a political decision, because when giving everybody a vote the majority preferring another rate will alter the tax rate due to elections.

Therefore when lining up the income in ascending order, (i.e. the related desired tax rate in descending order, remember, the higher the income the less desired tax rate), the median income will set the tax rate. Then the same amount will have a higher pre-tax income, and desire a lower tax rate, and on the other hand, the same amount of voters has a lower income and therefore desires a higher tax rate. The median pre-tax income person is called the **median voter**. The median of the distribution will always be below the mean for income distribution, therefore, the median voter will vote for a positive tax rate.

If the income inequality increases, that is the distribution of income becomes more skewed, the median will move further away below the mean; and thus the tax rate favoured by the new median voter will be higher (because further below mean). Therefore, higher inequality leads to higher redistribution and to increased inefficiency.

Unequal distribution may provoke pressure for distribution, if nondemocratic systems fail to adjust the median vote rate. Rising pressure might be expressed through increased political instability, as different groups aim for power, or crime, which is also a form of redistribution from the rich to the poor.

Economic Mobility

Up to now, we only considered the distribution of income for inequality, but the ease of diffusion from one income class the another should also be examined.

Economic mobility refers to the ease of moving between the income distributions. Furthermore, intergenerational mobility measures the ease of enhancing the family status from one generation to the next. The correlation of the Childs education depending on the family's education can be used as a measurement for **intergenerational mobility**.

 A correlation coefficient of "1" points out a strong dependency on the parents' educational level and hints at a low intergenerational mobility. Thus, the intergenerational mobility is easier if the coefficient approaches zero. Another way of measurement is a so called **transition matrix**. It is a table showing the probabilities that individuals will move from one income group to another.

Effects of mobility on economic growth
1. A high economic mobility implies that the economy is able to make full use of all talents available, regardless their born income class; and that will enhance economic growth
2. A high degree of mobility can reduces inequality, and therefore decrease the pressure on political systems

Determinants of mobility

1. Mobility is more likely with an efficient and broad available education system.
2. Efficient institutions and governments can enhance the effect of mobility and hinder the sole pressure of interest groups.
3. The development for mobility is often dependent on family forming nature; if marriage is limited to the same income and social class, which is referred to as **assortative mating**, mobility and mixture is hindered.
4. If racial of ethnic discrimination takes place, children from that minority might not be able to move with ease to other income classes.