

# **Measuring of inequality and segregation**

# Inequality, segregation, diversity

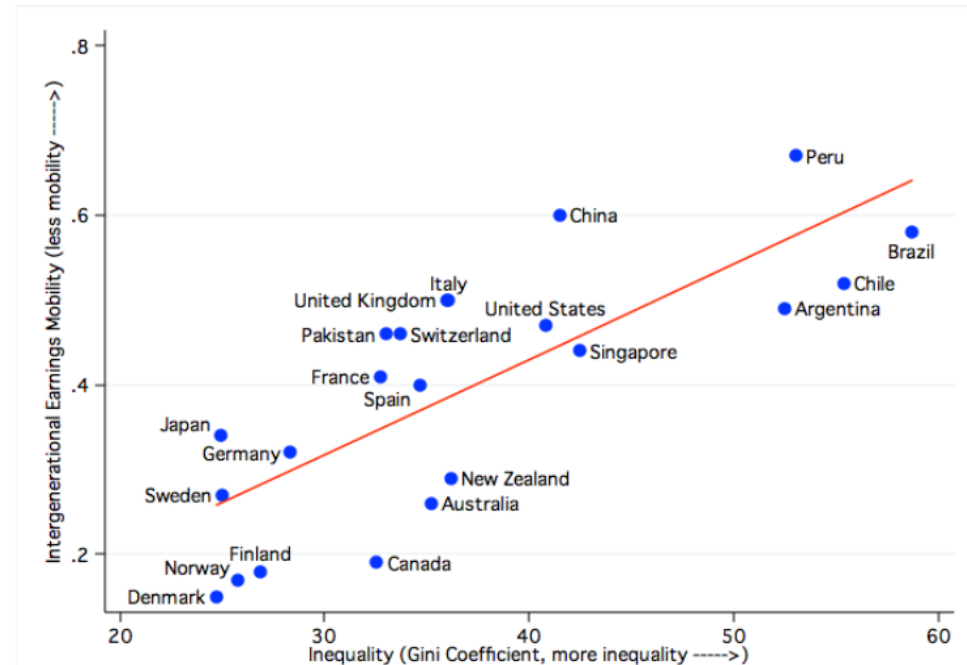
- *Inequality, segregation, diversity* are tightly coupled concepts
  - diversity indicates mostly variety or quantity of groups in population
  - inequality and segregation indicate precise differences among groups
- *Inequality* refers to the *uneven distribution of resources, opportunities, outcomes* across groups
  - distribution of a variables in population
  - differences in one population from one criterion
  - vertical differences
- *Segregation* refers to the *uneven distribution of groups* across separate places, occupations or institutions
  - differences between two and more groups
  - differences between populations in specific areas (educational system, labor market)
  - horizontal differences
- Inequality and segregation implies the idea of equality or evenness

# Two concepts of inequality

- *Inequality of (economic) conditions*
  - unequal distribution of income to people
  - vertical differences in wealth and material conditions
  - different incomes means different chances to get different goods
  - indicated by Lorenz curve or GINI (*economic theme*)
  - useful as explanatory variable for sociology
- *Inequality of opportunity*
  - unequal start positions
  - vertical differences in start positions means different chances to get different levels of education, jobs and incomes
  - indicated by levels of social mobility (*sociological theme*)
  - levels of societal openness

# Inequality of conditions vs. inequality of opportunity

- *Inequality of conditions* and *inequality of opportunity* are connected in empirical reality
- Analytically they are two concepts that describe differences among people
- *Inequality of conditions* result from social classes in empirical reality
- *Inequality of opportunity* result from social movements/social mobility
- *GGC: Great Gatsby Curve*
  - inequality generates less opportunities
  - low social mobility



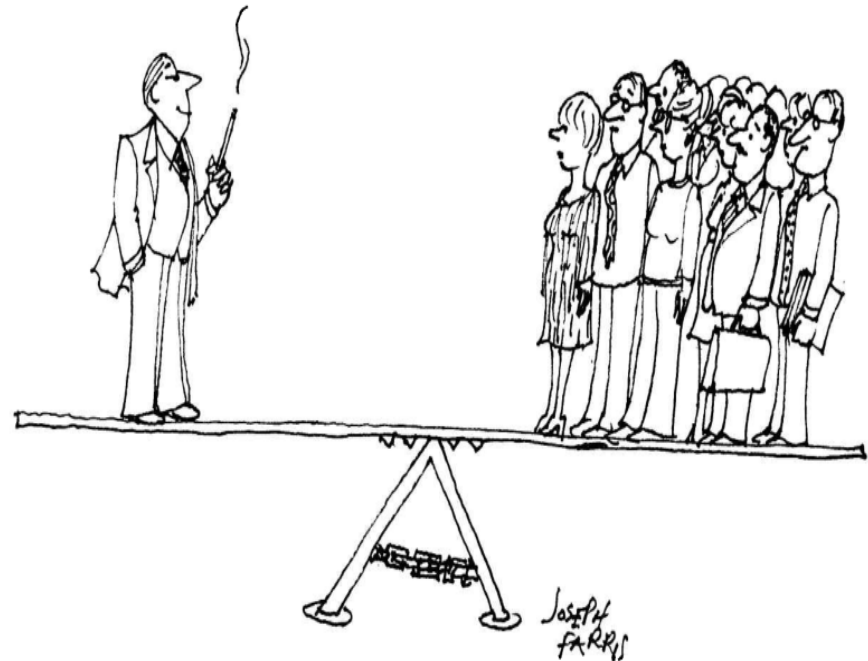
# Inequality of economic conditions

- Economic inequality is a huge social and political challenges of our time
- President Obama calls inequality the *defining issue of our time*
- World Economic Forum 2014 meeting at Davos pointed to inequality as the most pressing problem of the coming decade
- In April 2014 Pope Francis tweeted: *Inequality is the root of social evil*
- *Statistics:*
  - In Germany top 1% earns more than 150,000 EUR per year
  - In UK top 1% earns more than £150,000, top 5% earns more than £70,000 per year
  - In USA top 1% earns the annual income of \$422,000
- These data are not comparable from inequality point of view

# Inequality of economic conditions

- indicated by **Lorenz curve** in empirical reality
  - curve not number, it shows the shape of material inequality not the size
- the size of material inequality is indicated by **GINI coefficient**
  - it is number, it shows the size of material inequality

- **CURVE vs. NUMBER**

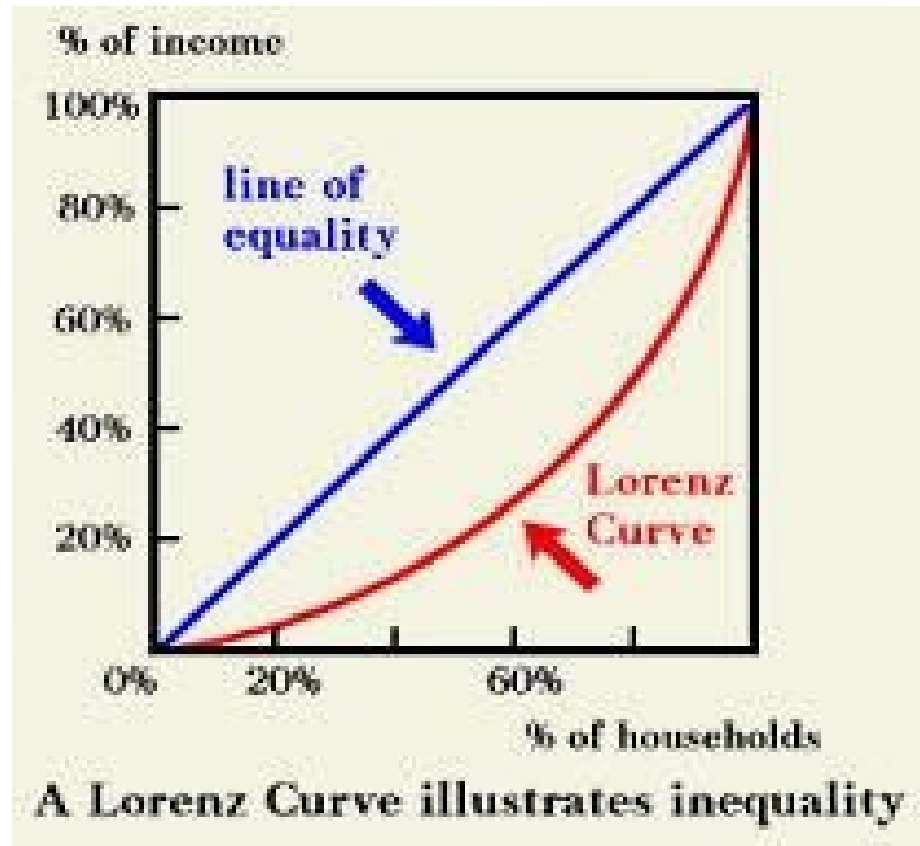


# Lorenz curve I

- Max O. Lorenz (1876-1959), American economist
- description of concentration of incomes/wealth in societies
- graphical presentation of inequality of conditions
  - it is cumulative distribution function
- Lorenz curve is utilized in social sciences as:
  - economy
  - sociology
  - demography
  - statistics

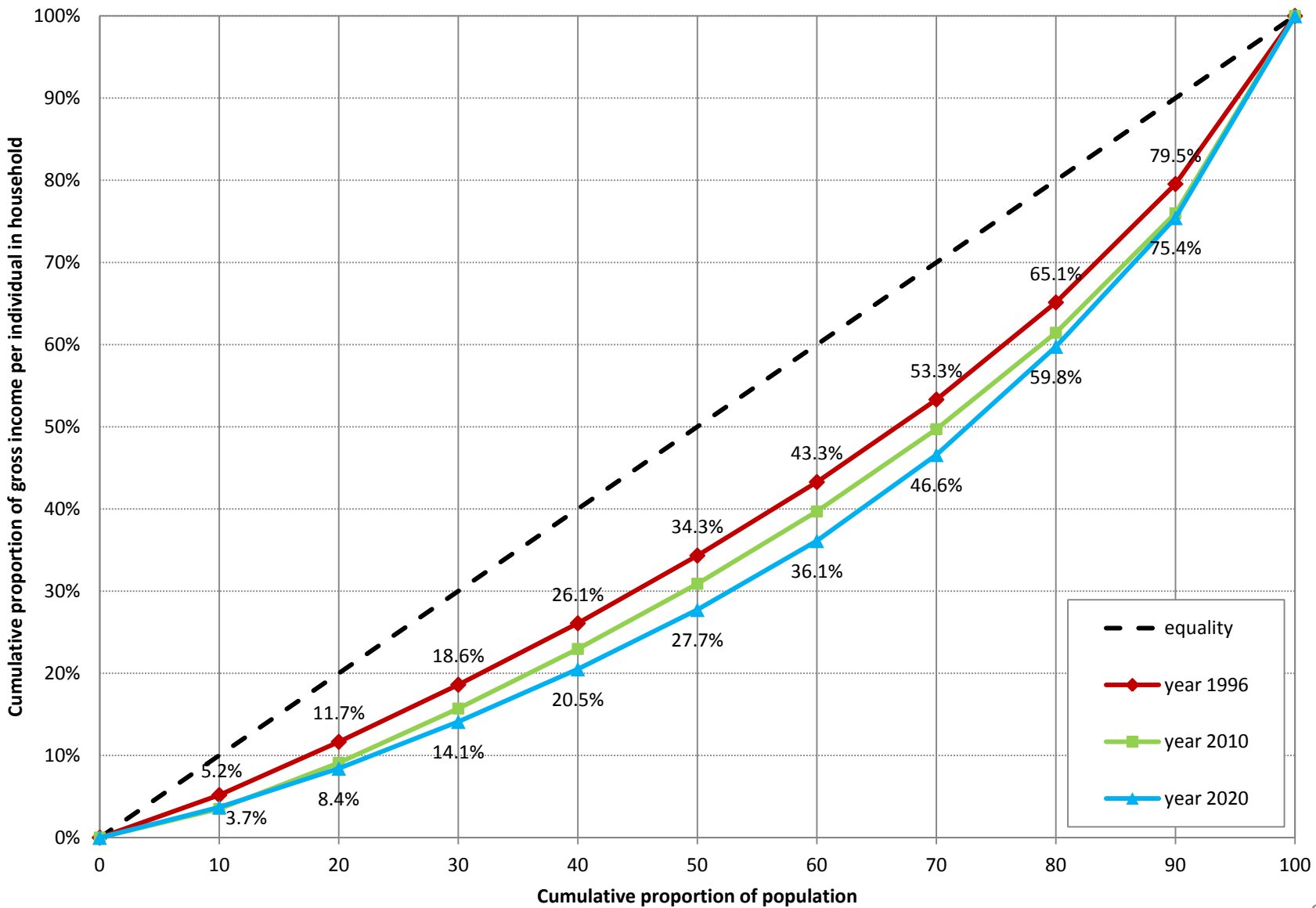
## Lorenz curve II

- it is based on the comparison of cumulative distribution of incomes to cumulative distribution of population
- higher distance between hypothetical and real Lorenz curve means higher inequality in incomes in society





# Trends in Lorenz curve in the CR

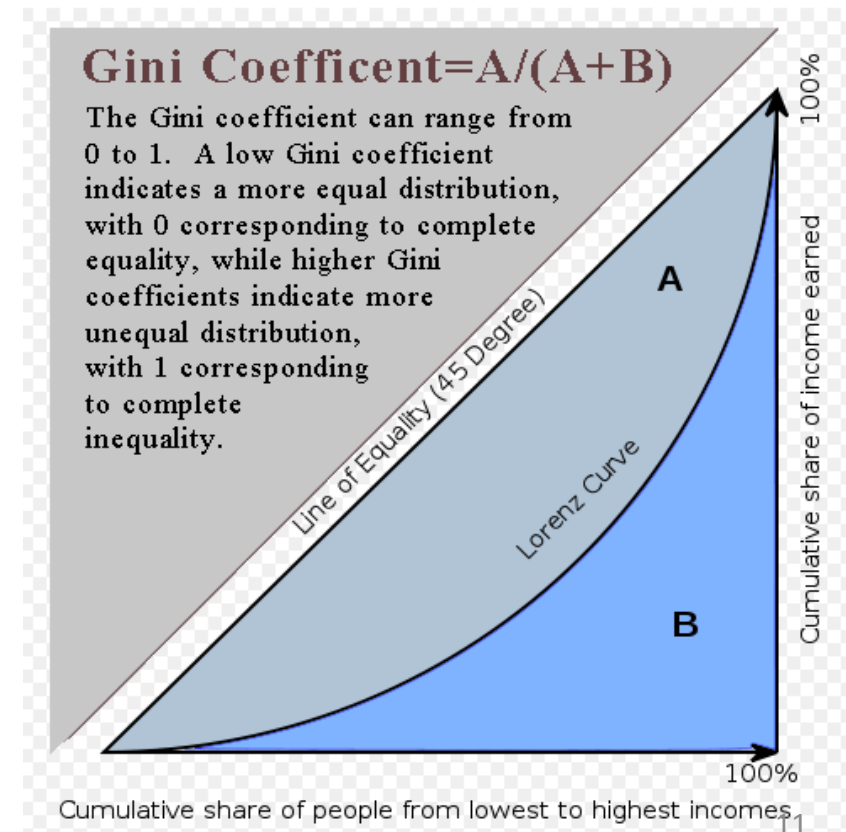
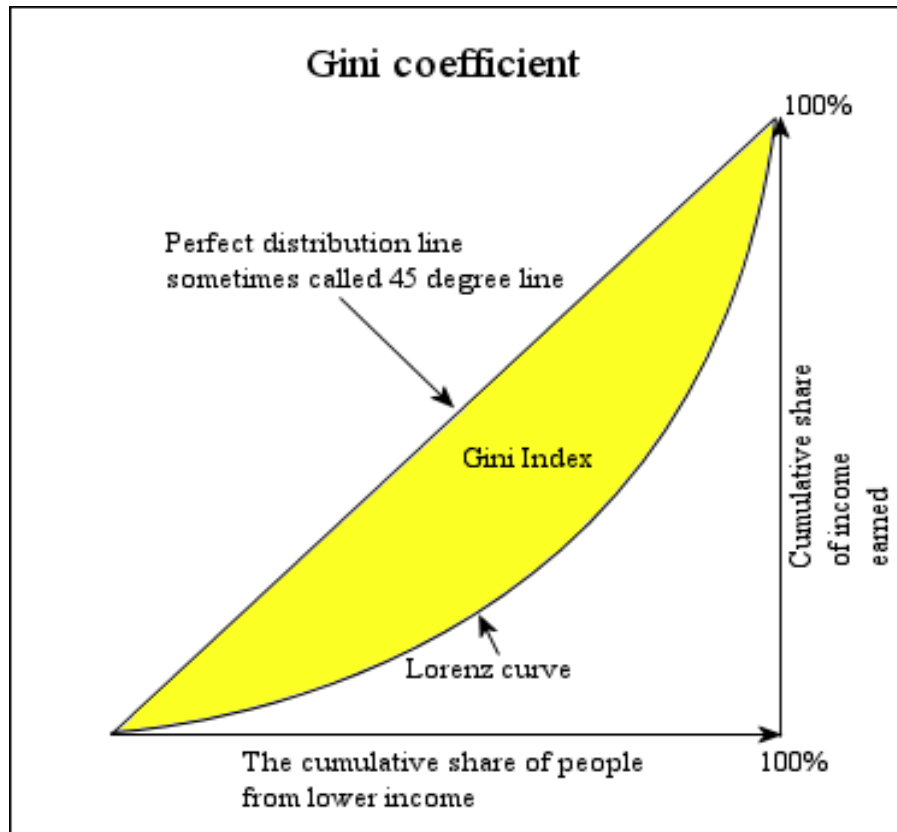


# Gini index I

- Corrado Gini (1884-1965), Italian sociologist, statistician and demograph
- the Gini coefficient is also known as the Gini index or Gini ratio
- a measure of the income inequality
- it is one number that represents the income distribution in society
- the coefficient varies between 0, which reflects complete equality and 1, which indicates complete inequality (one person has all the income or consumption, all others have none).

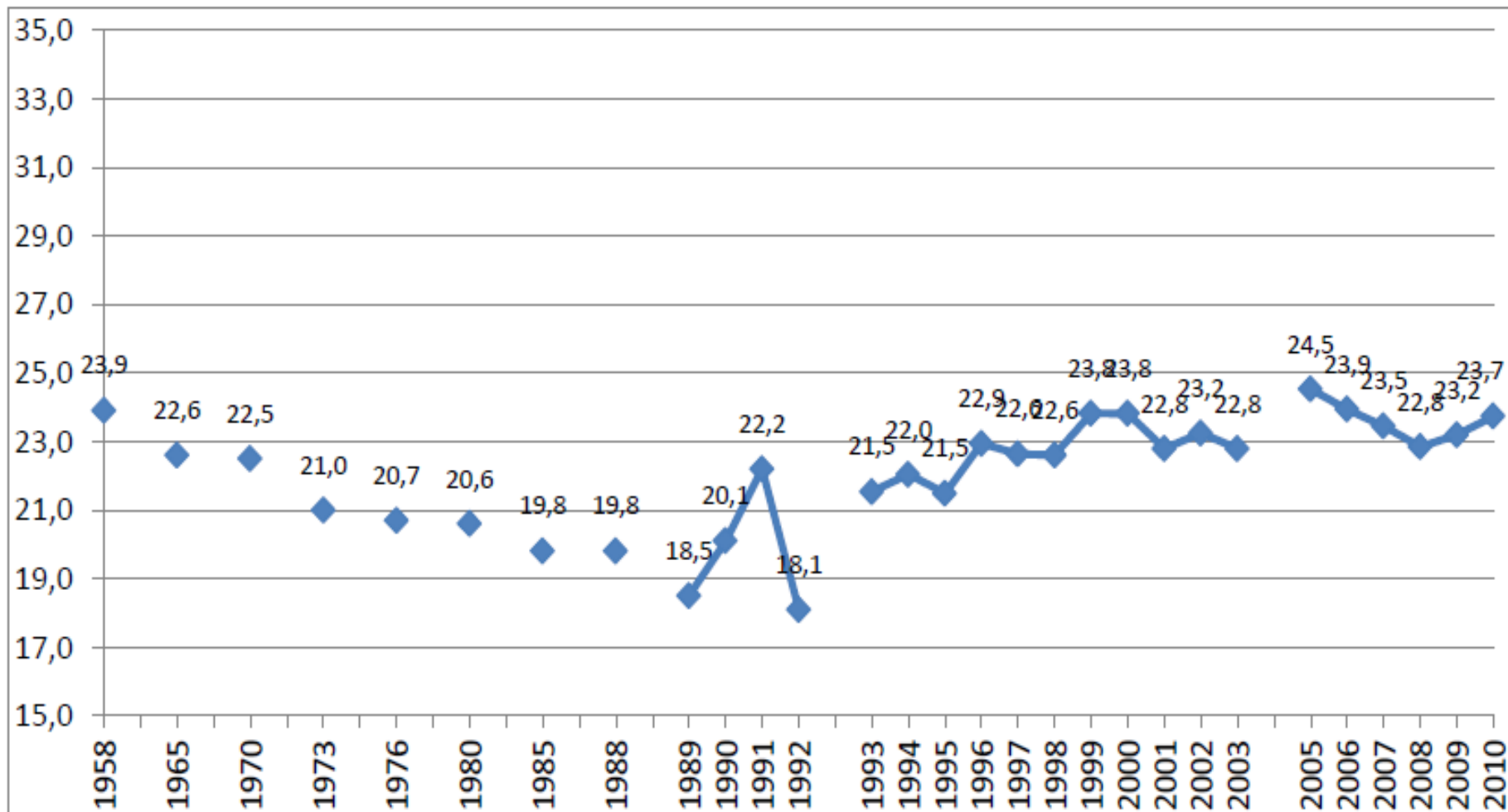
# Gini index II

- GI is derived from Lorenz curve
  - it shows the relationship between the Lorenz curve area and the total area under ideal Lorenz curve area



# Trend in GINI in the Czech Republic

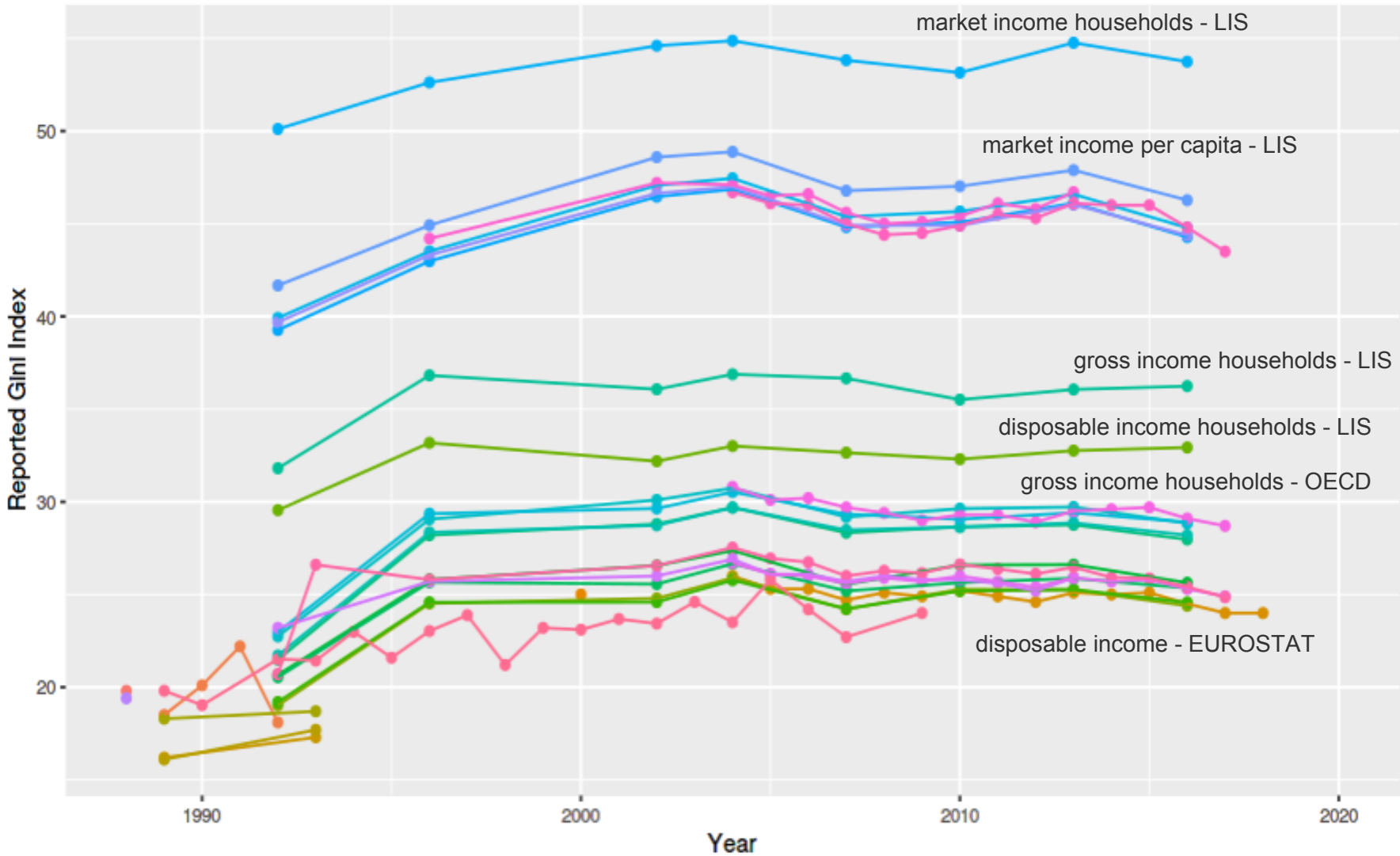
Figure 2.2 Gini coefficient, Czech Republic



Notes: Gini coefficient in the Czech Republic. Income sharing unit is household, units of analysis is household (after 1993) or person (up to 1992), income defined as disposable income (monetary disposable income before 1989). Data for 1965-1985 valid for Czechoslovakia. Household income equalized since 2005.

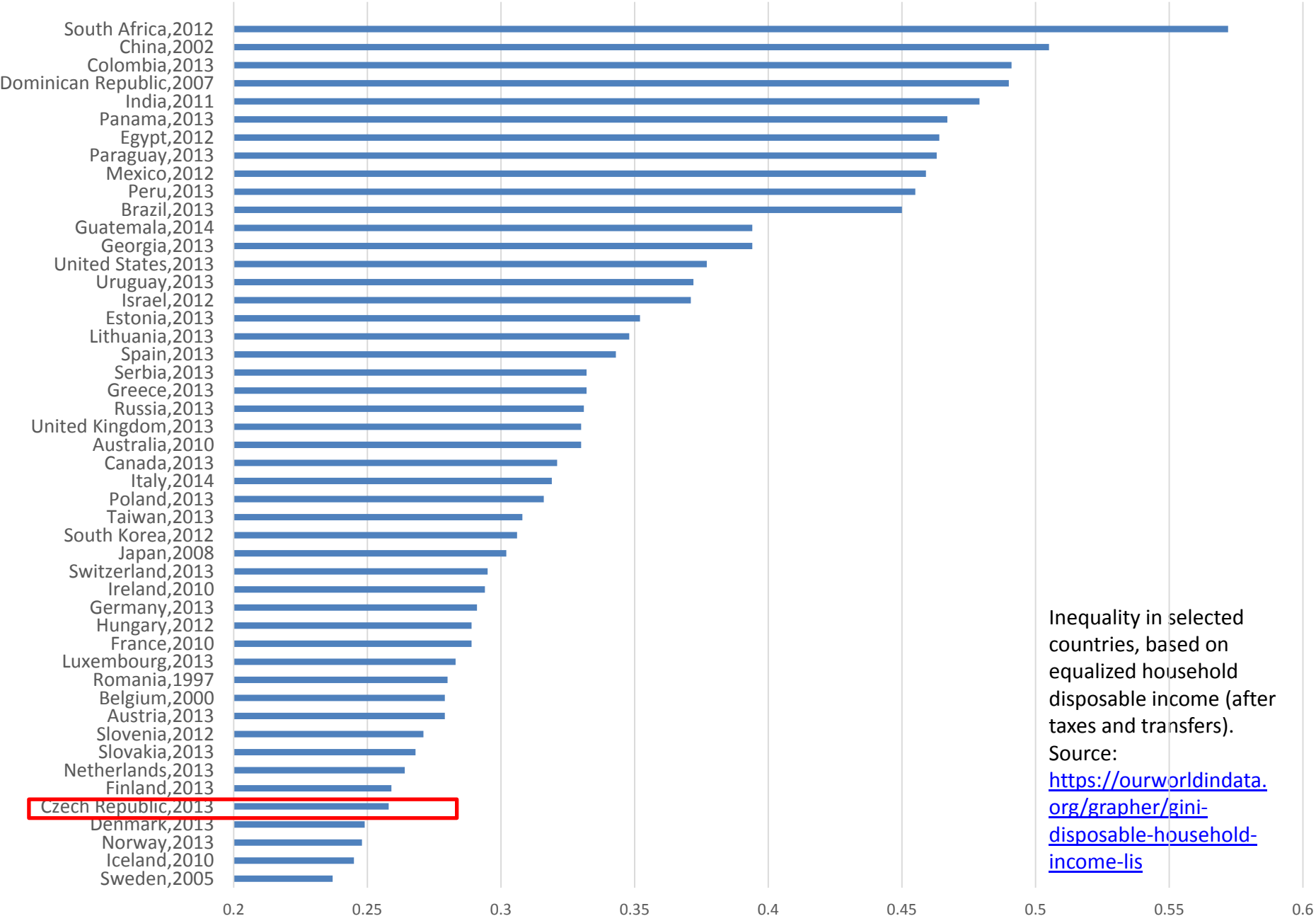
# Trend in GINI in the Czech Republic

Differences in: 1) *type of income*; 2) *unit of analysis*; 3) *type of database*



The **Standardized World Income Inequality Database**: [The SWIID's income inequality estimates are based on thousands of reported Gini indices from hundreds of published sources.](#)

# Cross-country comparision of GINI

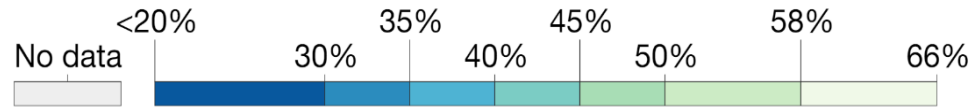
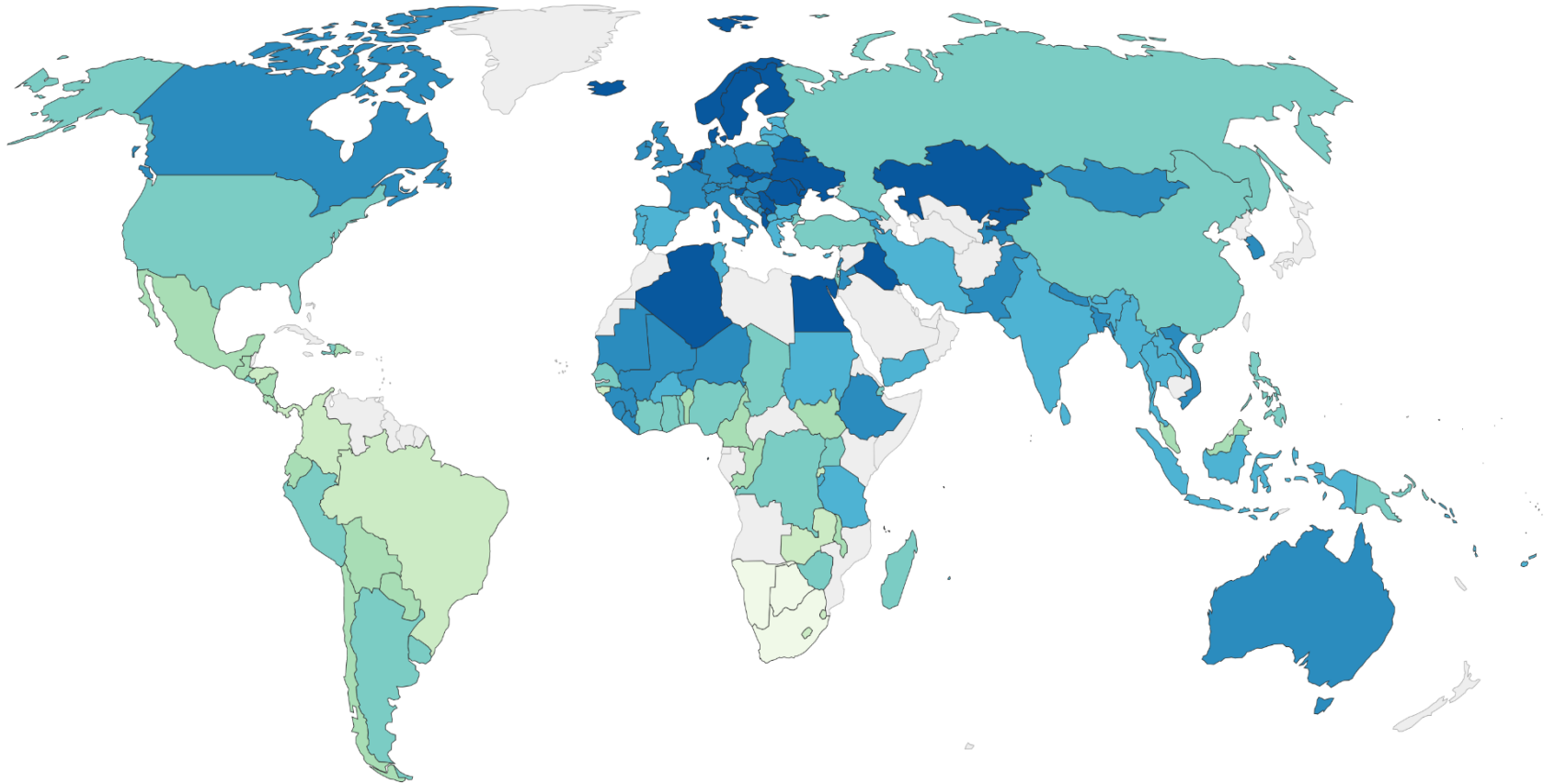


Inequality in selected countries, based on equalized household disposable income (after taxes and transfers).

Source: <https://ourworldindata.org/grapher/gini-disposable-household-income-lis>

# Economic inequality – Gini Index, 2013

Shown is the World Bank (PovcalNet) inequality data. This data includes both income and consumption measures and comparability across countries is therefore limited. A higher Gini index indicates higher inequality.



# Advantages and disadvantages of Lorenz curve and GINI coefficient

- **advantages of GINI**
  - it is a number suitable for comparison of many historical periods or countries
- **disadvantages of GINI**
  - it does not show the shape of inequality, different shapes but one GINI coefficient
- **advantages of Lorenz curve**
  - it shows the shape of inequality, it means that it makes differences among various types of inequalities
- **disadvantages of Lorenz curve**
  - but Lorenz curve is not very suitable for huge comparisons, many curves means chaos



# Some other measures of inequality

- **Share of income** (top 10%, 1%, .1%, .01%)
- **20:20 Ratio** (or decile ratio can be used)
  - Compares how much richer the top 20% of populations are to the bottom 20% (SE=4,UK=7,US=8)
- **the Robin Hood index, the Atkinson index and Theil's entropy measure.**
- **Palma ratio** (the ratio of the income share of the top 10% to that of the bottom 40%).

# Income inequality – How Much Inequality Is Too Much?

- *Video YT:* Richard Freeman | Stanford Center on Poverty and Inequality
- <https://youtu.be/y-zzkTpfzTg>



# Measures of inequality of opportunity

- social mobility
  - SM is the movement of people up or down the stratification system
- retrospective vs. prospective measurement
- structural social mobility vs. net social mobility
- absolute vs. relative social mobility
- percent/proportions vs. odds ratios
  
- opportunity structure for specific behaviour vs. effort, motivation, real behaviour

# Measures of segregation

- Entropy, Theil Index, Information Theory Index, Dissimilarity Index, Divergence Index
  - Most measures are „entropy-based“
  - Dissimilarity index is not „entropy-based“
- Entropy a Theil Index indicate the level of diversity between groups
  - if all are members of one group, there is no diversity in population
- Entropy measure is offered for discrete variables (proportion)
- Theil Index is offered for continuous variables (distribution)

# Dissimilarity index I

- DI, D, or  $\Delta$ , the most popular empirical measure of segregation
- DI indicates the absolute difference between relative distributions two groups according to categories of next variable
- example: what is gender segregation in tertiary education?
  - 1) compute proportion of students by gender in selected study fields (social science, natural science, law, medicine, pedagogy)
  - 2) subtract these proportions (negative results multiply by -1)
  - 3) sum up all differences and divide the results by 2
- DI is computed as sum of positive differences between two percent distributions divided by number 2:

$$\Delta = \frac{1}{2} \sum |T_i - R_i|$$

# Dissimilarity index II

- advantages
  - intuitive and easy interpretation
  - identification of categories where the differences are high
  - multiply by 100 indicates what proportion is needed for equality between groups
- disadvantages
  - numbers of categories influence the size of DI
  - more categories means higher probability in differences between groups
  - two DI can be compared only for groups with the same number of categories

# Entropy (E)

- Theil (1967, 1971, 1972) introduced the concept of *entropy* to SS as a measure of population diversity
  - E is commonly used in physics to measure the randomness of a system
- E is the amount of information needed to describe a probability distribution
- High E, high uncertainty = two outcomes are equally likely
  - high probability of one outcome, less uncertainty about it and low E
- E measures the probability of an outcome (m) occurring (e.g. race group), weighted by its probability occurrence ( $\pi$ ) (proportion of race group in population)
- overall E (interpreted as a measure of diversity) is:

$$E = \sum_m \pi_m \ln \frac{1}{\pi_m}$$

- if all are in the same group = no diversity in population, E=0
- If all are evenly distributed in two or more groups =, max diversity in population, E=1

# Theil index ( $TI$ )

- Theil (1971, 1972) derived several indexes using the logic of entropy
- Theil index ( $TI$ ) can be calculated for continuous distribution (income)
  - It measures the difference between the observed distribution and the mean

$$I = \frac{1}{n} \sum_{i=1}^n \frac{y_i}{\bar{y}} \ln \frac{y_i}{\bar{y}}$$

- if all incomes are equal = no inequality,  $TI=0$
- if all are evenly distributed in two or more groups =, max diversity in population,  $TI=1$



# Segregation – why it happens?

- *Video YT:* Segregation in US | Stanford Center on Poverty and Inequality
- <https://youtu.be/zxICQqDPD4g>



Segregation in the U.S.: Douglas Massey