

Inequality
Positiveness analysis: Indicators and determinants

1. Describing and measuring inequality

1.1. Describing inequality: Graphic representation of inequality with the Lorenz curve (Figure 1)
Objective: Represent inequality in income, consumption, wealth, and/or land holdings

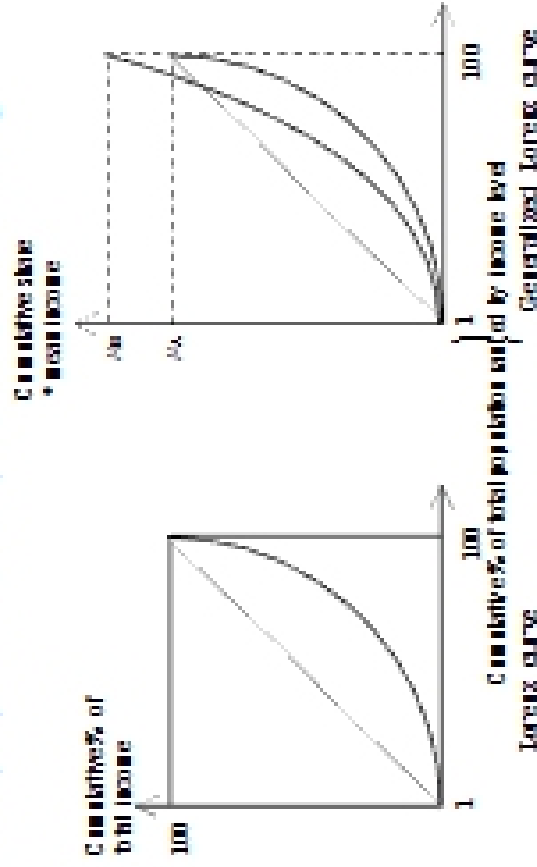


Figure 1. Lorenz curves

Note 1: If two Lorenz curves cross, inequality comparisons require additional criteria.
Note 2: Generalized Lorenz curve shows the role of both inequality and average income level on the fraction of mean income held by any percentile of the population.

1.2. Measuring inequality: alternative indicators

- Desirable properties of inequality indicators (Datt):
 - Anonymity principle: Permutations of people should not affect the inequality measure
 - Dalton transfer principle: A transfer from a richer to a poorer person should reduce inequality
 - Population principle: The inequality index should be unaffected by changes in population size
 - Relative income principle: Index should be unaffected by changes in absolute income levels, only by relative incomes

A an inequality index is said to be Lorenz-consistent if it satisfies these four properties

- Define: x = number of persons in the population
 r_i = income rank of household i , $1 \leq r_i \leq x$
 y_i = income of household i
 μ = average income
 σ = standard deviation of income
 Y = total income of the population
 For group data:
 $k = 1, \dots, w$ groups
 n_k = number of households in group k .
 μ_k = average income in group k .

- Coefficient of variation: $CV = \frac{\sigma}{\mu}$
CV index is Lorenz-consistent

- Gini coefficient: $G = \frac{A}{A+B} = \frac{2}{x\mu} \text{cov}(y, r)$
Gini index is Lorenz-consistent

- Theil entropy index: $T = \sum_{i=1}^n \frac{y_i}{Y} \ln \left(\frac{y_i / Y}{1/n} \right)$
Limits: equality = 0 $\leq T \leq \ln x$ = maximum inequality
Does not satisfy the population principle

- Income shares and Kuznets ratios
Income share: Share of income of the poorest 20% (say) in total income
Kuznets ratios: Ratio of income of richest 20% (say) to poorest 40% (say)
Does not satisfy the transfer principle

Two useful properties of indicators are

- Decomposable in between and within sub-populations inequality (regions, socio-economic groups)
- Gini is not decomposable, Theil and CV are decomposable
- Possibility to compute the index, even with some negative income y . Possible with Gini, and CV, not with Theil

2. Decomposition of inequality indices

2.1. Decomposition of the coefficient of variation by sources of income

$$\sum_{i=1}^n \frac{A_i}{\mu} \frac{CV_i}{CV} \rho = \sum_{i=1}^n w_i q_i = 1$$

A_i = mean income from source i
 CV_i = CV of income source i
 w_i = weight of income source i or share of source i in average income = A_i / μ
 q_i = relative concentration coefficient
 ρ = $\text{cov}(y, r) / Y$

2.2. Decomposition of the Gini coefficient by sources of income

$$G = \frac{2}{x\mu} \text{cov}(y, r) = \sum_{i=1}^n \frac{A_i}{\mu} \left[\frac{2}{x w_i} \frac{\text{cov}(y_i, r_i)}{\text{cov}(y, r)} \right] = \sum_{i=1}^n w_i G_i R_i$$

$$\sum_{i=1}^n w_i G_i R_i = \sum_{i=1}^n w_i A_i = 1$$

w_i = share of source i in average income,
 G_i = Gini coefficient of income source i ,
 R_i = correlation of income source to overall inequality relative to correlation of income source to within source inequality.
 R_i = relative concentration coefficient
 If $R_i > 1$, i -th source increases inequality;
 If $R_i < 1$, i -th source decreases inequality
 $w_i A_i$ = share of total inequality contributed by income source i

Example: Decomposition of inequality measures, Egypt, 1986-87

Weight of income source	$w_i = \mu_i / \mu$	Absolute contribution	Source of income	Total
Decomposition of coefficient of variation				
μ variability				
Condy μ + CV of income source	CV			0.302
Absolute contribution and total CV	$\mu_i = \mu_i \cdot CV_i$			
μ variability and CV	$\mu_i \cdot CV_i$	0.279	0.279	1.000
Decomposition of Gini coefficient				
G into fractions	G_i	0.209	0.675	0.972
Units of households	μ_i	0.026	0.024	0.302
μ variability	G			
Absolute contribution and total G in	$\mu_i \cdot G_i$	1.054	0.320	2.048
μ variability and total	$\mu_i \cdot G_i$	0.609	0.117	0.273

Source: B. Adams, IFRS Research Report No. 86, 1991.

Comments:

- Role of w_i : Agriculture is the most important source of income
- Role of μ_i : Remittances ($\mu_i > 1$) contribute to increase total inequality; non-agriculture ($\mu_i < 1$) contributes to reduce total inequality; agriculture is about neutral ($\mu_i \approx 1$)
- Role of G_i : Remittances have the highest source Gini (as few households get them, and they are very large)
- Role of G : Remittances income is highly correlated to total inequality, increasing inequality
- Conclusion: Agriculture makes the highest contribution to inequality (60.9%, measured by $w_i \mu_i$) due to its high income share (w_i). Remittances contribute 27.3% of total inequality in spite of its low income share because it has a large Gini (G_i) and a high correlation with overall income inequality (G_i)

3. Relationship between level of income (GNP/cp) and inequality

Empirical evidence on the Kuznets curve (inverted-U)

From cross section data (relationship reflects the Latin America effect)

- Kuznets, *AER*, 1955
- Pattent, *International Labor Review*, 1973, 56 countries Confirms Kuznets inverted U
- Altiwalla, JDE, 1976, 60 countries Confirms Kuznets
- Adelman and Fusa, *Economic Applications*, 1994 Confirms Kuznets, but weakening between the 1970s (growth) and the 1980s (debt crisis and recession)
- Jha, *World Development*, 1996 Confirms Kuznets
- Rand and Kahlert, *Journal of Development Economics*, 1998 Reject Kuznets based on choice of fractional form

From time series data

Rowman, *World Development*, 1997. Rejects Kuznets

From panel data

Deininger and Squire, *World Bank Economic Review*, 1996, JDE, 1998 Work with panel data and country fixed effects. Reject Kuznets

4. Relationship between inequality and growth in income (GDP/cp)

From inequality to growth Deininger and Squire, *World Bank Economic Review*, 1996 higher inequality of assets (land) reduces growth (but is land inequality a meaningful factor for OECD countries?)

From growth to inequality deJaryny and Saloner, *Review of Economic Studies*, 2000

Asymmetrical relation between growth and recession; contrast between old (OE) and new (open economy) growth. Ratchet effect on inequality

5. Role of (the initial level of) inequality in affecting the income elasticity of poverty

Ravallion, *Economic Letters*, 1997

deJaryny and Saloner, *Review of Economic Studies*, 2000

$$\dot{P} = \beta(1 - I_0)C_i \Delta P_{pc} \text{ where } I_0 = \text{initial level of inequality}$$

Hence, the income elasticity of poverty $\beta(1 - I_0)$ is reduced by the initial level of inequality

6. Role of inequality on growth

i) Does income inequality increase or decrease the aggregate rate of savings?

It depends on whether marginal savings rates increase or decrease with income

- Keynes: increase
- Recent evidence: the poor can have high rates of savings (due to high risk aversion and the need to self-insure). Hence, income redistribution may not decrease the rate of savings

ii) Can redistribution of assets increase economic growth?

- Yes if inverse relation between TFP (yields) and assets (farm size) due to labor market imperfections (family labor is more productive as it is a residual claimant on effort; decreasing inequality decreases market failures)
- No if positive relation (Barro and Newman, *RIS*, 1997). Imperfect capital markets and collateral constraints on poor. Collateral is needed to access credit markets. Hence, those without collateral are locked out of the credit market, creating both inefficiencies (good projects are left un-financed) and the deepening of inequality

iii) Impact of inequality on incentives

Person and Tabellini (*AER* 1994): Political economy of redistribution through taxation if inequality. Under higher inequality, the median voter is relatively poorer. Hence, the median voter demands a higher tax rate. Rational expectation of taxation on incremental earnings discourages savings and investment, thus slowing down growth

Empirical support rejected by Deininger and Squire, JDE 1998. Mod is a voter model requires democracy. The negative effect of Gini on growth does not hold under democratic regimes, but holds under non-democratic regimes!

Alesina and Rodrik, *QJE* 1994. Same result

iv) Inequality creates political instability (Hirschman's tunnel effect; Rabin's fairness and subjects get that reduces investment