

Inequality
Positive 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 landholdings.

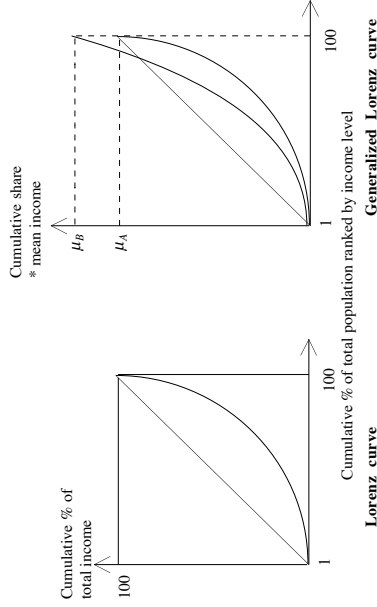


Figure 1. Lorenz curves

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 (Dalton):

- 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 population size.
- Relative income principle: Index should be unaffected by changes in absolute income levels, only by relative incomes.

An inequality index is said to be Lorenz-consistent if it satisfies these four properties.

- Define: n = number of persons in the population
 r_i = income rank of household i , $1 \leq r_i \leq n$
 y_i = income of household i
 μ = average income.
 σ = standard deviation of income.
 Y = total income of the population.
 For group data:
 $k = 1, \dots, m$ 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: $G = \frac{A}{A+B} = \frac{2}{n\mu} \text{cov}(y, r)$.
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 = $0 \leq T \leq \ln n$ = maximum inequality.
Does not satisfy the population principle.

- Income shares and Kuznets ratios
Income shares: 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_i ; 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

$$\sum_i \frac{\mu_i}{\mu} \frac{CV_i}{CV} \rho = \sum_i w_i c_i = 1$$

μ_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 = μ_i/μ .
 c_i = relative concentration coefficient
 ρ = $\text{corr}(y_i, y)$

2.2. Decomposition of the Gini coefficient by sources of income

$$G = \frac{2}{n\mu} \text{cov}(y, r) = \sum_i \frac{\mu_i}{\mu} \left[\frac{2}{n\mu_i} \text{cov}(y_i, r_i) \right] \frac{\text{cov}(y_i, r)}{\text{cov}(y, r)} = w_i G_i R_i$$

$$\sum_i w_i R_i = \sum_i w_i g_i = 1$$

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,
 g_i = relative concentration coefficient
 If $g_i > 1$, i -th source increases inequality;
 If $g_i < 1$, i -th source decreases inequality.
 $w_i g_i$ = share of total inequality contributed by income source i .

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

	Weight of income source	Agriculture	Sources of income Non Agriculture	Remittances	Total
Decomposition of coefficient of variation	$w_i = \mu_i/\mu$	0.578	0.326	0.096	1.000
Overall CV	CV				0.392
Corr(y, y) * CV of income source	$\rho_i CV_i$	0.267	0.335	1.340	
Relative concentration coefficients CV	$c_i = \rho_i CV_i / CV$	0.681	0.855	3.418	
Decomposition of CV	$w_i c_i$	0.393	0.279	0.328	1.000
Decomposition of Gini coefficient					
Gini of income source	G_i	0.509	0.675	0.932	
Ratio of correlations	R_i	0.626	0.161	0.924	
Overall Gini	G				0.302
Relative concentration coefficients Gini	$g_i = R_i G_i / G$	1.054	0.359	2.848	
Decomposition of Gini	$w_i g_i$	0.609	0.117	0.273	1.000

Source: R. Adams, IFPRI Research Report No. 86, 1991.

Comments:

- Role of w_i : Agricultural is the most important source of income.
 - Role of g_i : Remittances ($g_i > 1$) contribute to increase total inequality; non-agriculture ($g_i < 1$) contributes to reduce total inequality; agriculture is about neutral (g_i near 1).
 - Role of G_i : Remittances have the highest source Gini (as few households get them, and they are very large).
 - Role of R_i : Remittance income is highly correlated to total inequality, increasing inequality.
- Conclusion:
- Agriculture makes the highest contribution to inequality (60.9%, measured by $w_i g_i$) due to its high income share (w_i). Remittances contributes 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 (R_i).

3. Relationship between level of income (GNPpc) and inequality

Empirical evidence on the Kuznets curve (inverted-U).

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

- Kuznets, *AER*, 1955.
- Paukert, *International Labor Review*, 1973. 56 countries. Confirms Kuznets inverted U.
- Ahluwalia, *JDE*, 1976. 60 countries. Confirms Kuznets.
- Adelman and Fuwa, *Economie Appliquée*, 1994. Confirms Kuznets, but weakening between the 1970s (growth) and the 1980s (debt crisis and recession).
- Jha, *World Development*, 1996. Confirms Kuznets.
- Anand and Kanbur, *Journal of Development Economics*, 1993. Reject Kuznets based on choice of functional form.

From time series data

Bowman, *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 (GDPpc)

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: de Janvry and Sadoulet, *Review of Income and Wealth*, 2000.

Asymmetrical relation between growth and recession; contrast between old (ISI) 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

de Janvry and Sadoulet, *Review of Income and Wealth*, 2000

$$\dot{P} = \beta(1 - I_0)GDPPc \text{ where } I_0 = \text{initial level of inequality}$$

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 (Banerjee and Newman, *RES*, 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

Persson 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. Median 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 tunnel effect; Rabin unfairness and sabotage) that reduces investment.