PP253/ARE253 Alain de Janvry & Elisabeth Sadoulet
Fall 2007

Inequality
Positive analysis: Indicators and determinants

By contrast to measurement of poverty, an inequality measure does not require specification of a poverty line. On the other hand, it requires information on all incomes, not just income of the poor.

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.

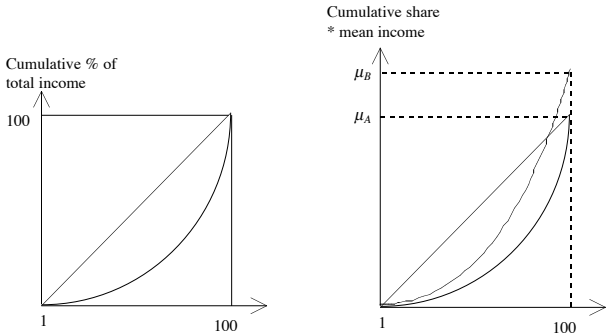


Figure 1. Lorenz curves

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, $1 \le r_i \le n$
y_i = income of household i
μ = average income.
σ = standard deviation of income.
Y = total income of the population.

For group data:
$k = 1, ..., m$ groups
n_k = number of households in group k.
μ_k = average income in group k.

- Coefficient of variation: $CV = \dfrac{\sigma}{\mu}$.

CV index is Lorenz-consistent.

- Gini coefficient: $G = \dfrac{A}{A+B} = \dfrac{2}{n\mu}\text{cov}(y\ , r\ )$.

Gini index is Lorenz-consistent.

- Theil entropy index: $T = \sum_{i=1}^{n} \dfrac{y_i}{Y} \ln\left(\dfrac{y_i / Y}{1/n}\right)$

Limits: equality = $0 \le T \le \ln n$ = 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 the Gini coefficient by sources of income

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

$$\sum_i w_i \frac{G_i}{G} R_i = \sum_i w_i g_i = 1$$

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.

Comments on decomposition of GINI for Egypt by sources of income (Table 1):
- 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).

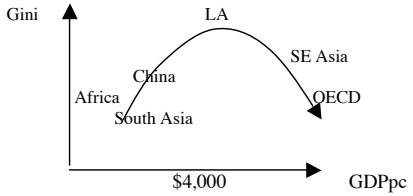
Example: Decomposition of inequality measures, Egypt, 1986-87

		Sources of income			
		Agriculture	Non Agriculture	Remittances	Total
Weight of income source	$w_i = \mu_i/\mu$	0.578	0.326	0.096	1.000
Decomposition of coefficient of variation					
Overall CV	CV				0.392
Corr(y_i, 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.

3. Relationship between level of income (GNPpc) and inequality: Empirical evidence on the Kuznets curve (inverted-U).

Kuznets hypothesis: Inverted U curve between Gini and GDPpc. If true, inevitable rise in inequality at low levels of income. Need reach critical level of GDPpc for inequality to fall with income. Policy implication: growth will take care of inequality



Does it hold?

Cross section data: In general yes due to Latin America effect at middle income level. But does not imply causality: Africa will not become Latin America; LA will not become SE Asia!

Time series data by country: In general rejected. hence, cannot simply wait for income growth to reduce inequality. Need special policy interventions if want to reduce inequality.

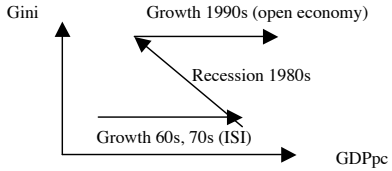
Policy implication

If holds: Growth takes care of inequality

If does not hold: Need special policy interventions to reduce inequality.

4. Role of GDPpc growth on inequality

- Growth is neutral on inequality: Dollar and Kraay (2000); Deininger and Squire. Elasticity of income of poor with respect to aggregate income = 1. Is this pro-poor growth?
- de Janvry and Sadoulet (1999) for Latin America: growth does not reduce inequality, but recession increases inequality creating a ratchet effect. Hence, importance of "socially responsible macroeconomics" to avoid the social costs of instability (Lustig and Kanbur).



5. Role of inequality on growth: six causal channels

i) Good for growth if inequality increases the aggregate rate of savings (and hence the rate of investment).
- Keynes: Marginal propensity to consume falls with income level. Hence, greater inequality leads to a grater aggregate level of savings and greater investment in physical capital.
- But new empirical evidence shows that poor people can have high rates of savings (in particular because high levels of risk aversion and the need to self-insure require them to hold large amounts of savings) if they have access to effective savings instruments (financial services).

ii) If there are market failures, equality (income distribution) is related to efficiency (growth), i.e., the non-separability theorem.
- Bad for growth if there is an inverse relation between asset concentration (e.g., farm size) and productivity (yields), then asset redistribution increases efficiency and growth. This inverse relation can come from labor market failures: family labor on small farms is cheaper as it is the residual claimant on effort.
- However, capital market failures may imply a positive relationship between asset concentration and productivity (collateral needed to access credit). In this case, the inverse relation (labor market failure) can be cancelled by a second market failure (capital market failure) (Banerjee and Newman, *RES* 1997).

iii) Political economy and voting patterns: If high inequality and democracy, the median voter is poor and wants high taxation. The higher inequality is, the more median income is to the left of average income, and the greater political pressures are to use taxation to redistribute income. Expectation of redistributive taxation on incremental earnings discourages savings and investment, thus slowing down growth (Persson and Tabellini, *AER* 1994).

iv) Access to financial capital: Capital markets are imperfect: collateral is needed to access credit markets. Hence, those without collateral are locked out of the credit market. With high inequality in asset ownership, good projects of poor entrepreneurs are left unfinanced. As a result, inequality reduces growth

v) Inequality reduces aggregate investment in human capital. This is because poor people will be constrained in investing in education. Thus rising inequality decreases aggregate investment in education and increases aggregate investment in physical capital. If growth is driven by human capital, inequality is detrimental to growth.

vi) Inequality reduces investment and effort: Inequality increases political instability which reduce investment and growth (bad investment climate, which deters FDI and FPI).
Inequality creates feelings of unfairness that reduce incentives to work and induce sabotage and crime (destruction of property) (Hirschman tunnel effect; Rabin unfairness and sabotage).

6. Role of inequality and equity on growth and poverty

Inequality Increases poverty at given GDP.
Decreases growth (see above) → Increases poverty.
Decreases benefits from growth for the poor (lowers the elasticity of poverty wrt growth).
Increases relative deprivation → Decreases intrinsic welfare of the poorer.

Role of equity in development: WDR 2006. Equalize opportunities/chances. Is it necessarily efficient in the long run?