Measurement, Causes and Consequences of Economic Inequality: A whirlwind tour

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Measurement, causes and consequences of economic inequality

(Warning: A heroic and likely unwise attempt to summarize a broad set of literatures in a single talk – thus inevitably incomplete and idiosyncratic...)

I. Description and measurement

II. Determinants

III. Consequences

IV. Brief remark on normative issues
I. Description and Measurement

• Inequality is about differences (in something, among certain individuals or groups)

• One (of many) feature(s) of a distribution: “dispersion”
  
i. The “what”: the variable of interest (“the individual well-being indicator”)
  
ii. The “whom”: the recipient unit / unit of analysis

iii. Depicting / describing the distribution

iv. Measurement

v. Robustness

vi. Covariates
The “what”: the variable of interest

Examples include income, wealth, education, life expectancy, land ownership, etc.

The devil is in the detail

- Crucial to be aware of what it captures, and what it does not.
  - In terms of the welfare aggregate
  - In terms of characteristics of the data set: coverage, representativeness, non-response, etc.
The “what”: the variable of interest
Examples include income, wealth, education, life expectancy, land ownership, etc.
The devil is in the detail
Crucial to be aware of what it captures, and what it does not.

- Income / consumption:
  - Net or gross?
  - Per capita or equivalized?
  - What price deflators?
  - Publicly provided goods and services?
  - Imputed rent?

- Education: attainment or achievement?

- Wealth: includes pension rights? Deducts all liabilities?

- Etc.

In terms of the welfare aggregate
In terms of characteristics of the data set: coverage, representativeness, non-response, etc.
The “what”: the variable of interest
Examples include income, wealth, education, life expectancy, land ownership, etc.
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Crucial to be aware of what it captures, and what it does not.
In terms of the welfare aggregate
In terms of characteristics of the data set: coverage, representativeness, non-response, etc.

• Three time-series for the Gini coefficient for Brazil yield differences in both levels and trends depending on what data source is used.

• There are also differences in the welfare aggregate among them.

• Not clear which one is superior.

Figure 3.21: Gini Coefficients in Brazil: 1976–2016

The “whom”: the recipient unit / unit of analysis

Example:
What: years of schooling

Whom:
a) countries
b) countries, weighted by population

Depicting / describing the distribution

- **Discrete:** \( y = \{y_1, y_2, y_3, \ldots, y_N\} \)

- **Continuous:** The distribution function \( F(y) \) of a variable \( y \), defined over a population, gives the measure of that population for whom the variable has a value less than or equal to \( y \).

**The density function:** \( f(x) \)

**The cumulative distribution function:** \( p = F(y) = \int_{0}^{y} f(x) dx \)

**Figure 2: Income Distributions for Brazil, Mexico and The United States**

Sources: PNAD/IBGE 1999, CPS/ADS 2000

Note: Gaussian Kernel Estimates (with optimal window width) of the density functions for the distributions of the logarithms of household per capita incomes. The distribution were scaled so as to have the brazilian mean. Brazil and Mexico are urban areas only. Incomes were converted to US dollar at PPP exchange rates (see Appendix).
The Lorenz curve:

When people are ranked by their income levels, this gives the share of total income accruing to people up until that quantile.

\[ GL(p) = \frac{1}{\mu_y} \int_0^p y dF(\pi) \]
The Lorenz curve: When people are ranked by their income levels, this gives the share of total income accruing to people up until that quantile.
The Lorenz curve:

When people are ranked by their income levels, this gives the share of total income accruing to people up until that quantile.

Line of perfect equality
iv) Measurement: Summarizing information about the distribution in a scalar

Inequality

- Seeks to capture **dispersion**
- Unconcerned with position of the distribution
- Aggregate distances among incomes, or between them and a ‘center’ of the distribution.
- Not a uniquely defined concept: different scalar indices.

**Figure 2: Income Distributions for Brazil, Mexico and The United States**

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Note: Gaussian Kernel Estimates (with optimal window width) of the density functions for the distributions of the logarithms of household per capita incomes. The distribution were scaled so as to have the brazilian mean. Brazil and Mexico are urban areas only. Incomes were converted to US dollar at PPP exchange rates (see Appendix).
iv) Measurement:
Summarizing information about the distribution in a scalar

- Candidate measures: Some options from basic statistics:

\[
\text{range} = y_{\text{max}} - y_{\text{min}}
\]

- Completely insensitive to changes in incomes between the extremes.

\[
\text{Variance}(y) = \frac{1}{n} \sum_{n}(y_i - \bar{y})^2
\]

- Varies with scale of measurement: dollars and cents...
iv) Measurement:  
Summarizing information about the distribution in a scalar

**Axiomatic approach:** list desirable properties; find which classes of measures satisfy them.

**Five commonly adopted axioms:**

1. **Symmetry (or anonymity)**  
   - Demands impartial treatment once needs have been accounted for.

2. **Pigou-Dalton Transfer Principle**  
   - A regressive transfer (from a poorer to a richer person) makes inequality rise.

3. **Scale Invariance**  
   - Multiply everyone’s income by some factor \( \lambda > 0 \) : inequality is unchanged

4. **Population Replication Independence**  
   - Clone the population n times: inequality is unchanged

5. **Decomposability**  
   - The index can be exactly broken up into inequality within and between groups.
iv) Measurement:  
Summarizing information about the distribution in a scalar

Lots of different measures

<table>
<thead>
<tr>
<th>Fail at least one of the axioms</th>
<th>Satisfy all five axioms</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Gini = \frac{1}{2n^2 \mu(y)} \sum_{i=1}^{n} \sum_{j=1}^{n}</td>
<td>y_i - y_j</td>
</tr>
<tr>
<td>Variance of logarithms</td>
<td>$E_2 = \frac{1}{2n\mu_y^2} \sum_{i=1}^{n} (y_i - \mu_y)^2$</td>
</tr>
<tr>
<td>$A_\varepsilon = 1 - \left[ \frac{1}{n} \sum_{i} \left( \frac{y_i}{\mu_y} \right)^{1-\varepsilon} \right]^{\frac{1}{1-\varepsilon}}$</td>
<td></td>
</tr>
</tbody>
</table>

Mean log deviation, or Theil-L

Members of the Generalized Entropy Class

The Atkinson Class
Robustness: can all meaningful measures ever agree?

**Key point:** Even after narrowing down the set of candidate measures by imposing a set of axioms, a large number of plausible acceptable measures remains, some of which may rank distributions in opposite ways.

This is quite legitimate. It reflects the fact that indices are sensitive to different parts of the distribution – reflecting different degrees (or kinds) of inequality aversion. **There is an unavoidable normative core to inequality measurement.** (Atkinson)

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Mean</td>
<td>55,367</td>
<td>63,293</td>
<td>75,371</td>
<td>78,281</td>
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<tr>
<td>Median</td>
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<td>34,153</td>
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<td>43,277</td>
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<tr>
<td>Gini</td>
<td>0.5603</td>
<td>0.5563</td>
<td>0.5534</td>
<td>0.5454</td>
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<tr>
<td>E(0)</td>
<td>0.5611</td>
<td>0.5495</td>
<td>0.5287</td>
<td>0.5212</td>
</tr>
<tr>
<td>E(1)</td>
<td>0.6349</td>
<td>0.6509</td>
<td>0.6551</td>
<td>0.6194</td>
</tr>
<tr>
<td>E(2)</td>
<td>1.3903</td>
<td>1.7447</td>
<td>1.6680</td>
<td>1.7121</td>
</tr>
</tbody>
</table>

Source: Chile’s CASEN. (Ferreira & Litchfield, WBER 1999).

Inequality will be ranked lower in distribution A than in distribution B for all inequality indices satisfying Symmetry, Scale Invariance and the Pigou-Dalton Transfer Principle if and only if A Lorenz-dominates B.

Figure 3

Distribution A displays mean-normalized second-order stochastic dominance (also known as Lorenz dominance) over distribution B, if the Lorenz curve associated with it lies nowhere below, and at least somewhere above that associated with B.
Covariates: (i) outcomes

-- Multivariate distributions / multidimensional inequality

Naturally, people are typically interested in the distribution of more than one thing.

*Multivariate distributions* depict the distribution of two or more “whats” amongst the same “whom”.

Analysing them yield measures of *multidimensional* poverty or inequality.

An “extension” of univariate analysis *plus* a concern with *association*. 
We are often interested in how the distribution of income or wealth varies not only over the entire population, but among groups.

e.g. by sex; race; ethnicity; class; occupation; parental background; etc.

The overall distribution is a mixture of various component distributions and their differences can also be studied.

II: The determinants of inequality

Two broad approaches
The final distribution of incomes (or wealth) is an outcome of the general equilibrium of that economy - Complex interaction of multiple forces as individuals interact in households, markets and state

Box 1: Schematic Representation of Household Income Determination

I (Z, w)  

→  

P (X, Z, w)  

→  

V(J)  

The Matching Function

D(p(X, Z, J), X, Z, J, w)  

→  

Remuneration in the Labor Market

G(ω, w)  

→  

Household Formation

F(y)  

→  

Redistribution

H(y+t)
Two broad categories of empirical approaches

• **Decompositions**
  • Take an inequality level or change and attribute shares of it to various factors
  • Often generalize Oaxaca-Blinder decompositions

• **Disentangling specific causal effects**
  • Take a particular policy or shock and seek to identify its (causal) impact on inequality (or other features of the distribution)
The decomposition approach: an example

Uses parametric and semiparametric methods to decompose changes in distribution into various “endowment” and “price” effects.

The specific causal effects approach: an example

“Rising imports cause higher unemployment, lower labor force participation, and reduced wages in local labor markets that house import-competing manufacturing industries”

- Autor, Dorn and Hanson, AER 2013, p.2121.

**Figure 1.** Import Penetration Ratio for US Imports from China (left scale), and Share of US Working-Age Population Employed in Manufacturing (right scale).

**Figure 2.** Change in Import Exposure per Worker and Decline of Manufacturing Employment: Added Variable Plots of First Stage and Reduced Form Estimates.
II: The determinants of inequality

Recent developments (a whirlwind tour)
Global Inequality: A historic reversal, driven by btw-country convergence

**FIGURE 4.3** Global Income Inequality, 1820–2010

![Graph showing Gini index from 1820 to 2010](image)

Source: Based on figure 1 (p. 27) of The Globalization of Inequality by François Bourguignon (Princeton University Press 2015). Used with permission.

Note: The discontinuity in the series represents the change in the base year of the purchasing power parity (PPP) exchange rates from 1990 to 2005. The figure uses GDP per capita in combination with distributional statistics from household surveys. Figure 4.5 uses income (or consumption) per capita directly from household surveys, expressed in 2011 PPP exchange rates.

**FIGURE 4.5** Global Inequality, 1988–2013

![Graph showing global inequality trends from 1988 to 2013](image)

Sources: Lakner and Milanović 2018a; Milanović 2016; calculations based on PovcalNet (online analysis tool), World Bank, Washington, DC. http://iresearch.worldbank.org/PovcalNet/

Note: For each country, household income or consumption per capita is obtained from household surveys and expressed in 2011 PPP exchange rates. Each country distribution is represented by 10 decile groups. The line (measured on the right axis) shows the level of the global Gini index. The height of the bars indicates the level of global inequality as measured by GE0 (the mean log deviation). The red bars show the corresponding level of population-weighted inequality within countries. The level of between-country inequality, which captures differences in average income across countries, is shown by the yellow bars. The numbers in the bars refer to the relative contributions (in percent) of these two sources to total global inequality.
Within-country inequality: (i) no longer rising on average; (ii) heterogeneous trends across regions

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<thead>
<tr>
<th>Region</th>
<th>↑</th>
<th>+/-1pp</th>
<th>↓</th>
<th>Total</th>
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<th>Mean Gini 2015</th>
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<td>1</td>
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<td><strong>World</strong></td>
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<td>37.7</td>
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Source: Unpublished work with C. Laker and A. Silwal
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Drivers of rising inequality in rich countries

• SBTC (Computers and automation leading to occupational polarization)
• Labor market institutions (DiNardo et al., 1996)

Source: Autor, Levy and Murnane (QJE, 2003)
Drivers of rising inequality in rich countries

- **The demise of competition**: The decline in the labor share of income in the US is accompanied by a decline in the capital share. What rises is the share of pure or economic profits, reflecting growing market power.

![Graph showing capital share and pure profit share over time](image)

**Figure 3. Capital and pure profit shares.** The figure shows the capital share and pure profit share of gross value added for the U.S. nonfinancial corporate sector over the period 1984 to 2014. Capital costs are the product of the required rate of return on capital and the value of the capital stock. Pure profits are gross value added less compensation of employees less capital costs less taxes on production and imports plus subsidies. Panel A: the capital share is the ratio of capital costs to gross value added. Panel B: the pure profit share is the ratio of pure profits to gross value added.

Drivers of rising inequality in rich countries

- Dramatic reduction in the progressivity of taxation (in some countries, e.g. the US)

Drivers of falling inequality in (some) poor countries

- Educational expansions and age-biased technical change (?) have led to falling returns to education and experience in the labor market
- A silent social protection revolution

The Covid-19 Pandemic and Inequality

- Deaths and recessions positively correlated with initial incomes
- Pop-weighted international income inequality reverses downward trend, largely because of India

Source: Deaton, *LSE Public Policy Review*. 2021
III: Some consequences of inequality
Intrinsic (1): an innate preference for equality


2. It is now well-established that individuals value ‘fairness’, in the sense that many are prepared to give up private monetary gains to achieve what they perceive as a just allocation.
   - Offers made and rejected in ultimatum and dictator games.
   - Fehr and Gachter (2000); Fehr and Fischbacher (2003); Henrich et al. (2004)
Instrumental (1): When capital markets are imperfect, wealth inequality will typically lead to **sub-optimal allocation of resources**

Some key early theoretical references:


Instrumental (2): Horizontal inequalities and discrimination lead not only to misallocation, but to lower individual performance

Figure 1. Average Number of Mazes Solved, Round 2

Instrumental (3): Through *elite capture*, inequality leads to weaker, dysfunctional institutions

Some key early theoretical references:


Instrumental (4): Inequality and growth

Long and often inconclusive evidence on macroeconomic association between inequality and growth

Plenty of micro-evidence on channels 2 and 3 above, which should imply this association

Some more recent evidence that inequality of opportunity is particularly bad for growth (Channel 2)

Source: Marrero and Rodriguez (2013) for the US.
Instrumental (5): At any given growth rate, inequality weakens the poverty-reducing power of growth

IV: Brief remark on normative issues

• Most of the above is supposedly “positive” analysis
  • Although we discussed how inequality measurement has an inherently normative component (in building / choosing a summary measure)
  • Other choices along the way also reflect normative values

• Beyond that, can we use findings from these kinds of research to inform policies?
  • That depends, among other things, on what it is we are trying to achieve.
  • Utilitarianism as the ‘default programme’ for economists (Sen)
  • Broader perspectives: Rawls’s hierarchic basal space; Sen’s capabilities; Roemer’s equality of opportunity, etc.
Thank you