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.

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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.

- 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.

The “what”: the variable of interest

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

The devil is in the detail

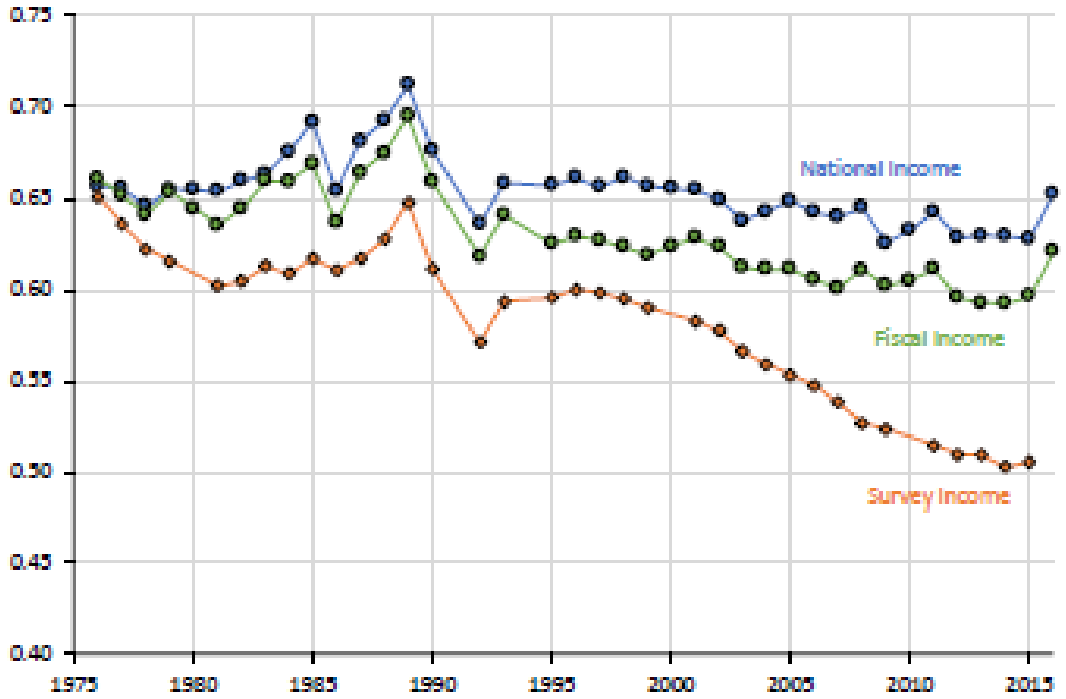
Crucial to be aware of what it captures, and what it does not.

In terms of the welfare aggregate

In terms of characteristics of the data set: coverage, representativeness, non-response, etc.

- 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



Source: Marc Morgan (2018): Essays on Income Distribution: Methodological, Historical and Institutional Perspectives with Applications to the Case of Brazil, 1996-2016”, PhD thesis, Paris School of Economics

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

Example:

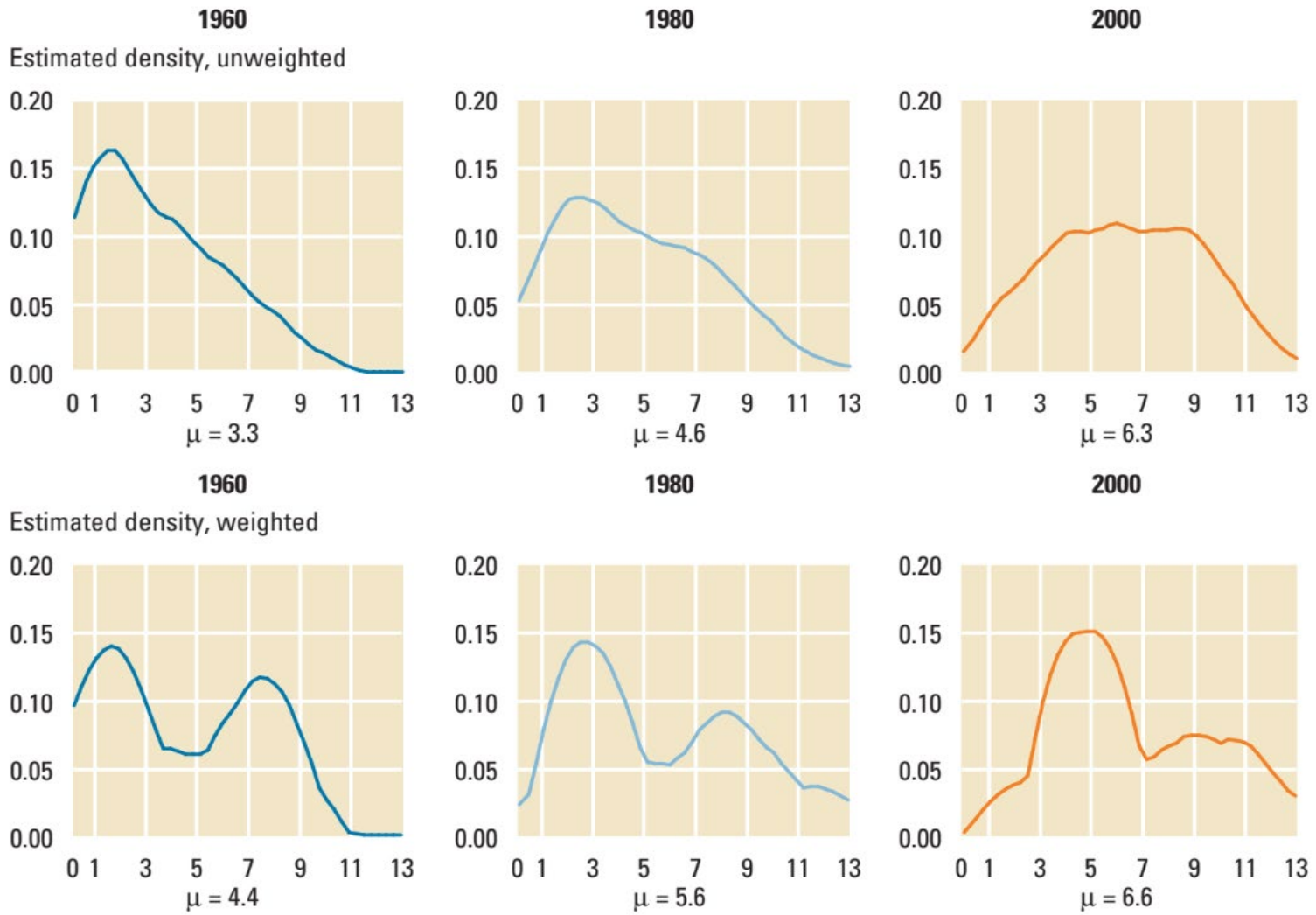
What: years of schooling

Whom:

a) countries

b) countries, weighted by population

Figure 3.3 The distribution of years of schooling improved greatly in the second half of the twentieth century



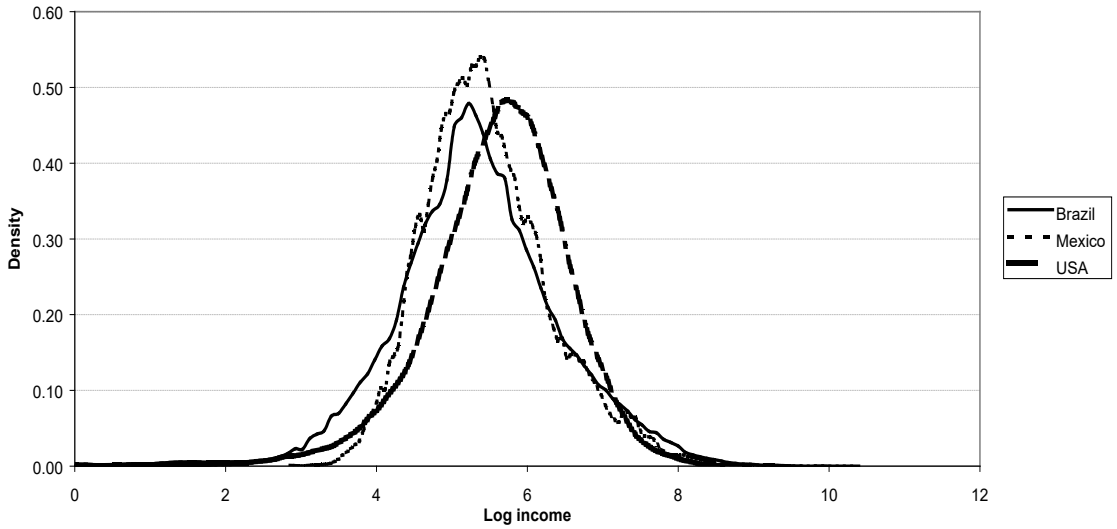
Source: World Bank (2005): World Development Report 2006: Equity and Development

Depicting / describing the distribution

- Discrete: $\mathbf{y} = \{y_1, y_2, y_3, \ldots, y_N\}$
- 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.

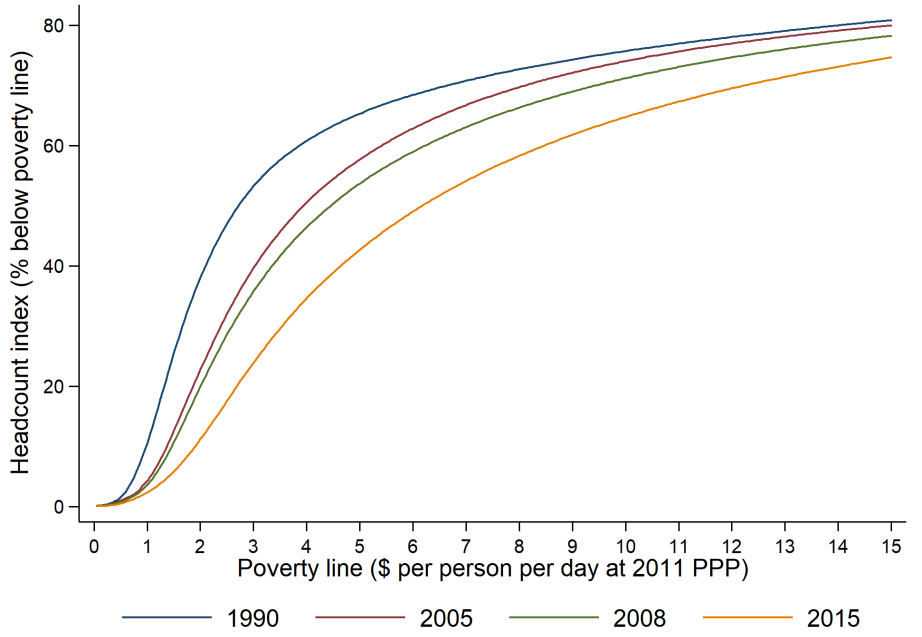
The density function: *f(x)*

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 cumulative distribution function: $p = F(y) = \int_0^y f(x)dx$



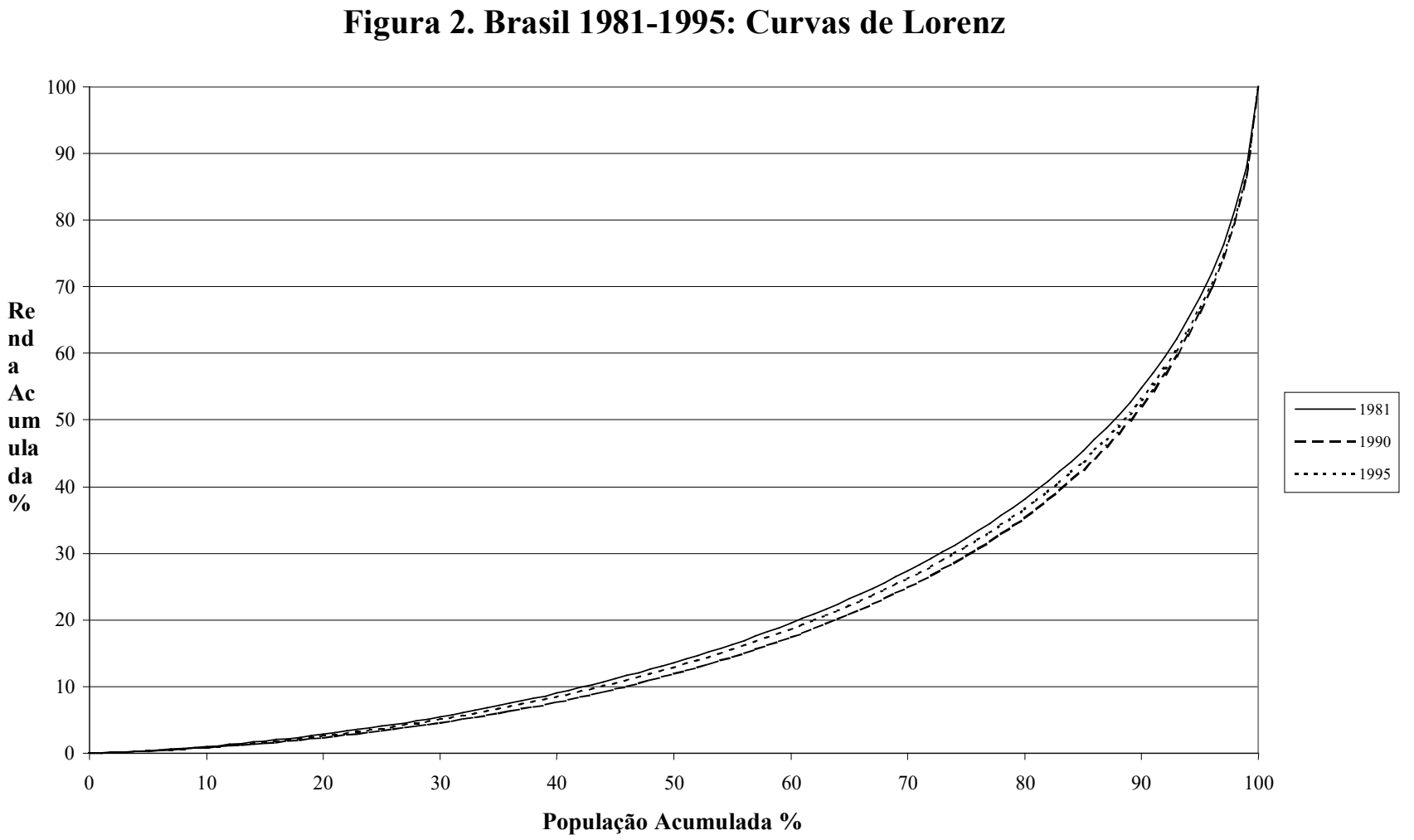
Source: global CDFs from the PovcalNet database

Depicting / describing the distribution

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.

FMI $GL(p) = \frac{1}{\mu_y} \int_0^p y dF(\pi)$



Depicting / describing the distribution

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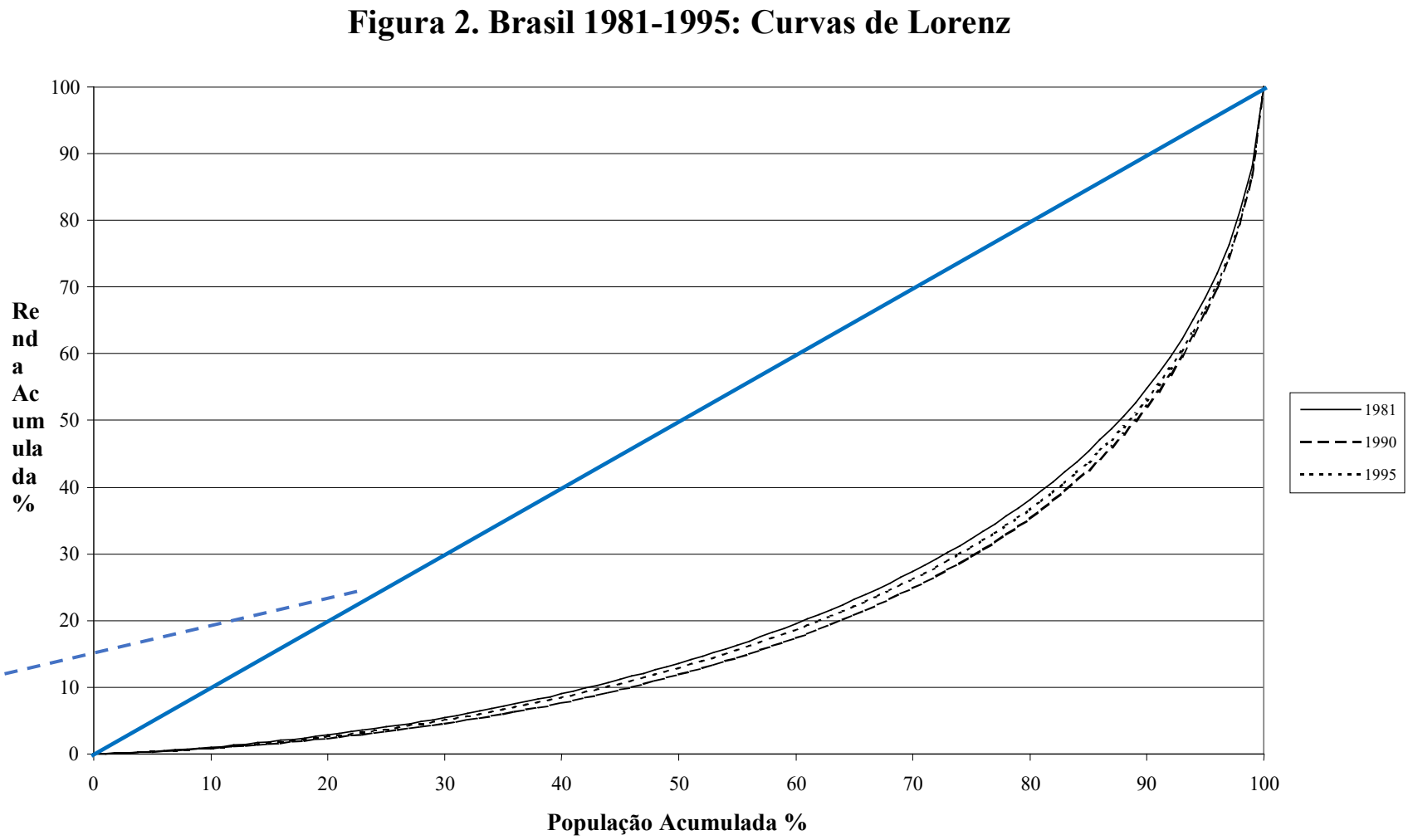
Line of perfect equality



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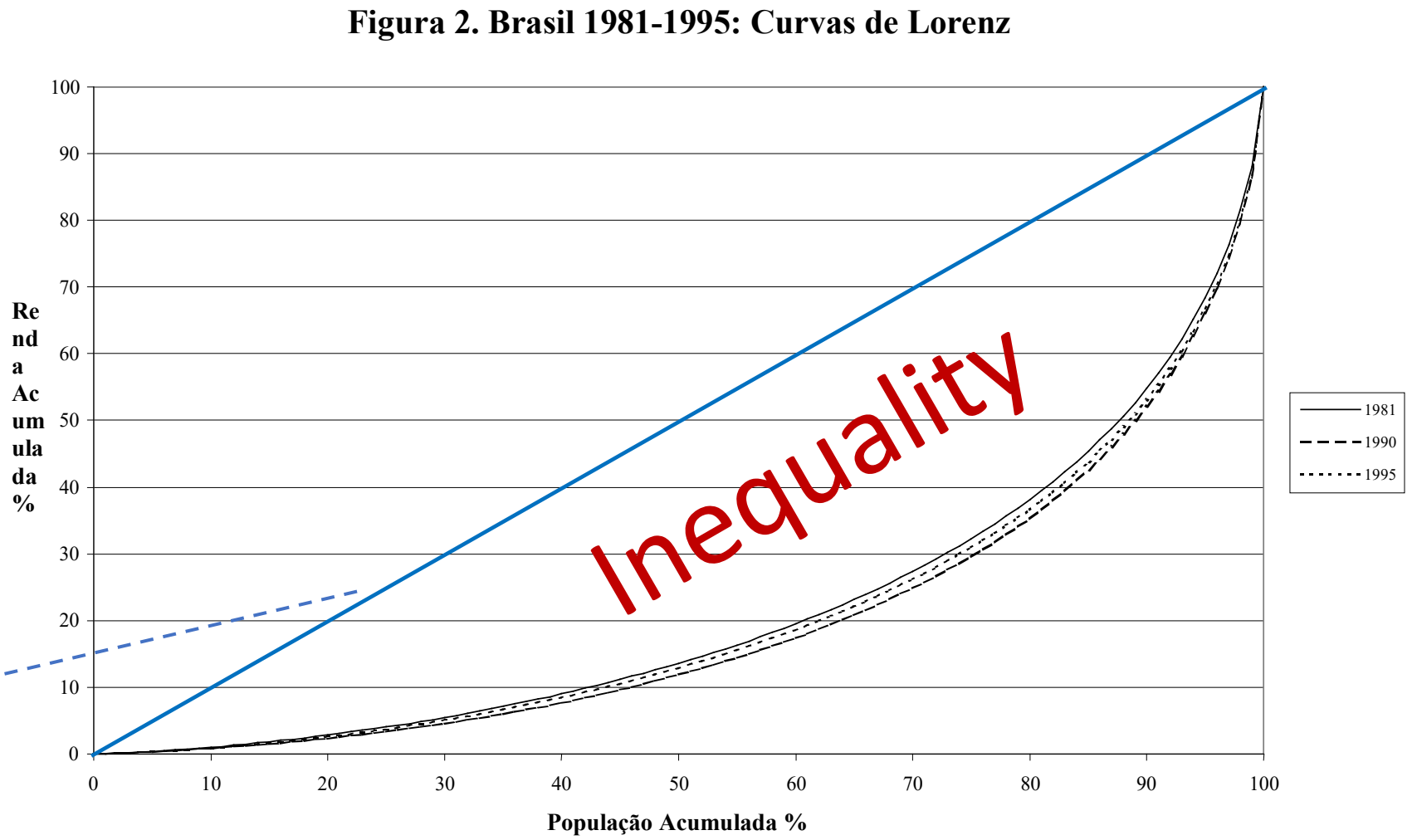
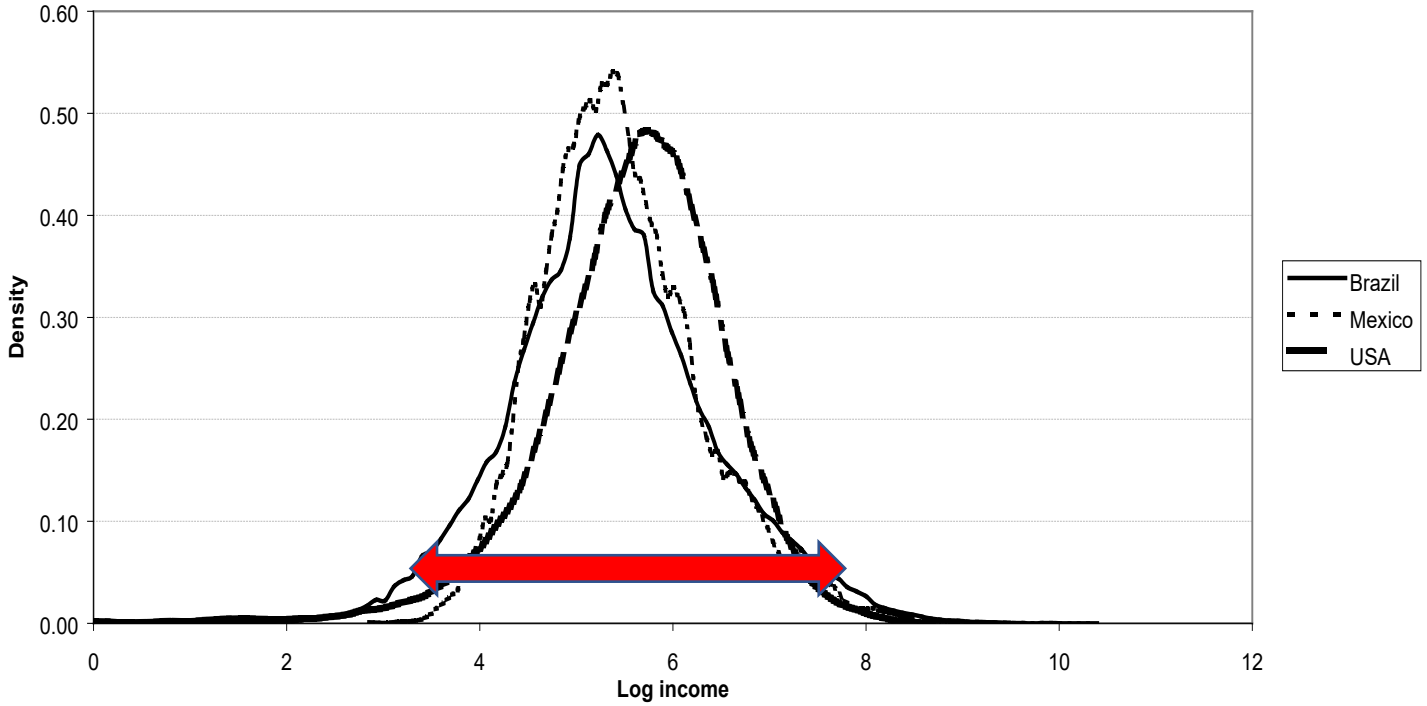


iv) Measurement:
Summarizing information about the distribution in a scalar

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



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).

iv) Measurement:
Summarizing information about the distribution in a scalar

- Candidate measures: Some options from basic statistics:

$$range = y^{\max} - y^{\min}$$

  - Completely insensitive to changes in incomes between the extremes.

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

  - 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

Fail at least one of the axioms	Satisfy all five axioms
$Gini = \frac{1}{2n^2\mu(y)}\sum_{i=1}^{n}\sum_{j=1}^{n}\left\|y_i - y_j\right\|$	$E_0 = \frac{1}{n}\sum_{i=1}^{n}\log\frac{\mu_y}{y_i}$
Variance of logarithms	$E_2 = \frac{1}{2n\mu_y^2}\sum_{i=1}^{n}(y_i - \mu_y)^2$
	$A_\varepsilon = 1 - \left[\frac{1}{n}\sum_i\left(\frac{y_i}{\mu_y}\right)^{1-\varepsilon}\right]^{\frac{1}{1-\varepsilon}}$

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 3: Descriptive Statistics: Monthly Household Incomes per				
	1987	**1990**	**1992**	**1994**
Mean	55,367	63,293	75,371	78,281
Median	29,148	34,153	40,378	43,277
Gini	0.5603	0.5563	0.5534	0.5454
E(0)	0.5611	0.5495	0.5287	0.5212
E(1)	0.6349	0.6509	0.6551	0.6194
E(2)	1.3903	1.7447	1.6680	1.7121

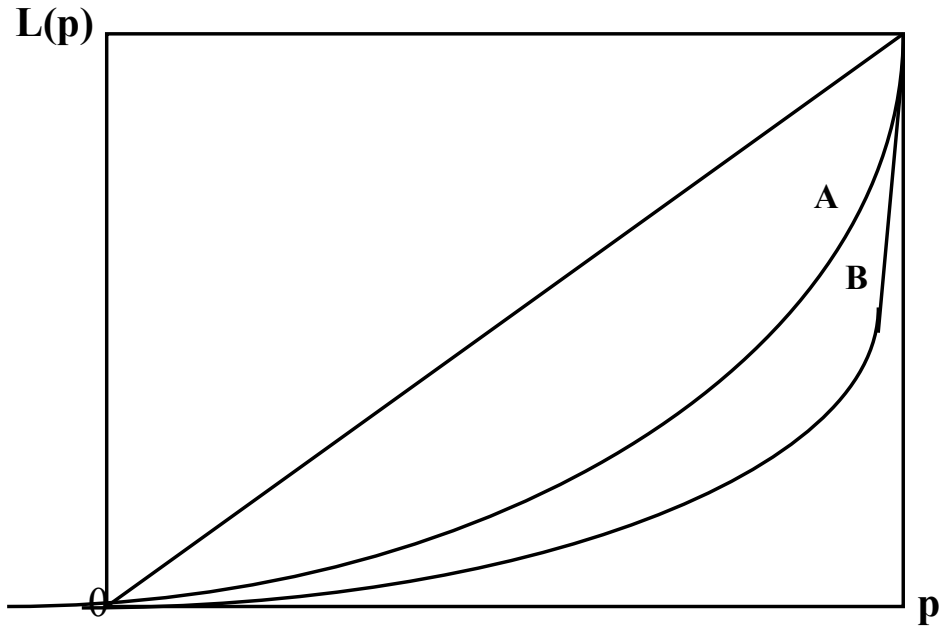
Source: Chile's CASEN. (Ferreira & Litchfield, WBER 1999).

Robustness: can all meaningful measures ever agree?

Theorem by Atkinson (1970):

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

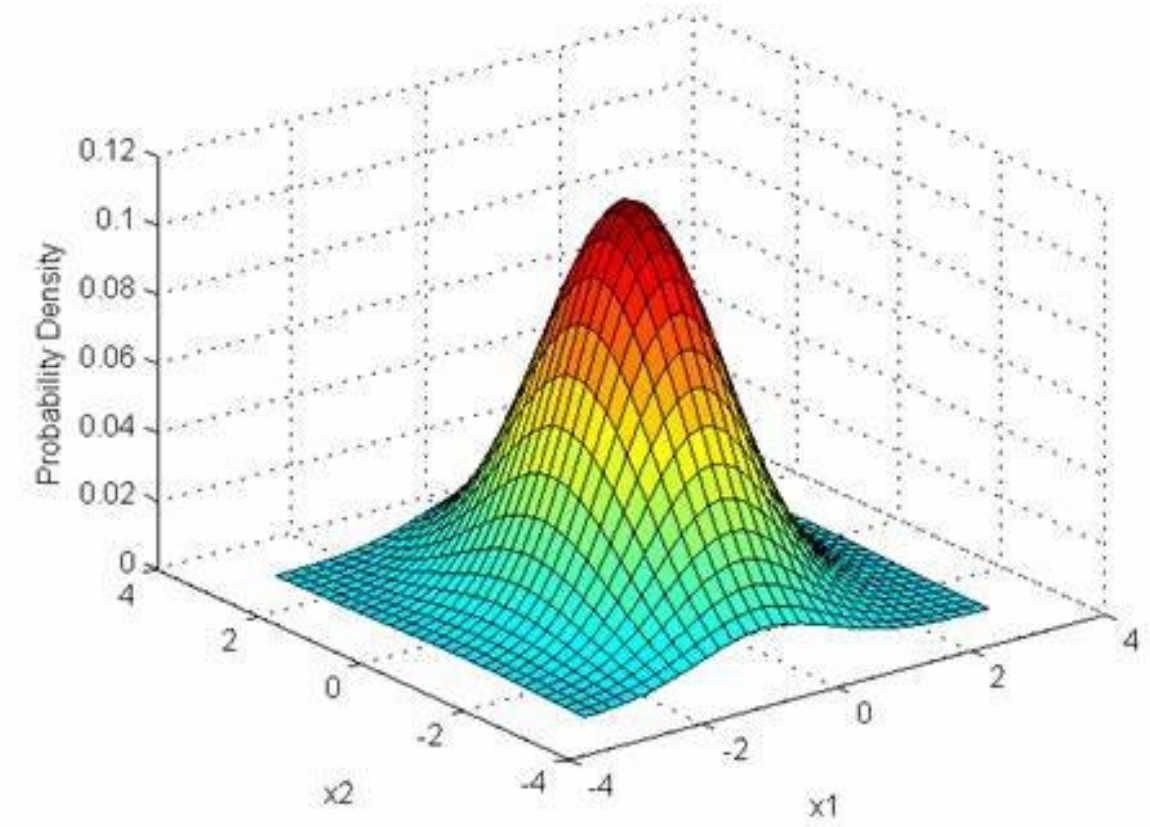
-- Multivariate distributions / multidimensional inequality

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.**



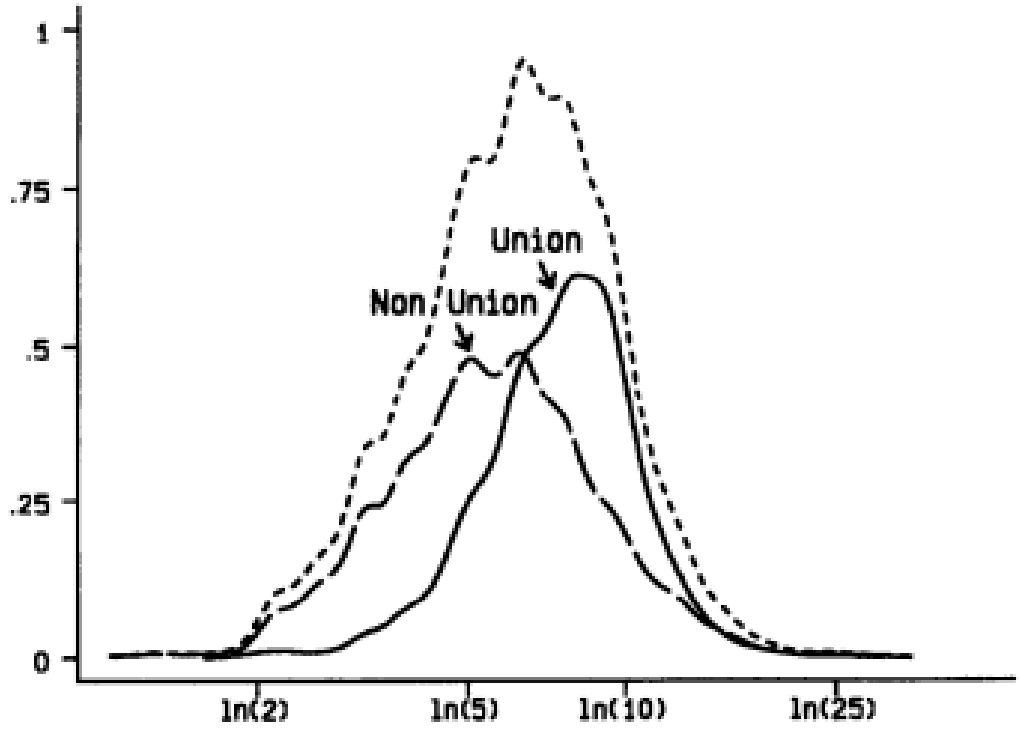
Covariates: (ii) breaking anonymity / “intersectionality”

-- Mixtures of distributions, inequality decompositions and more

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.



a) Densities from the union and non-union sector in 1988

Source: DiNardo, Fortin and Lemieux, Econometrica, 1996.

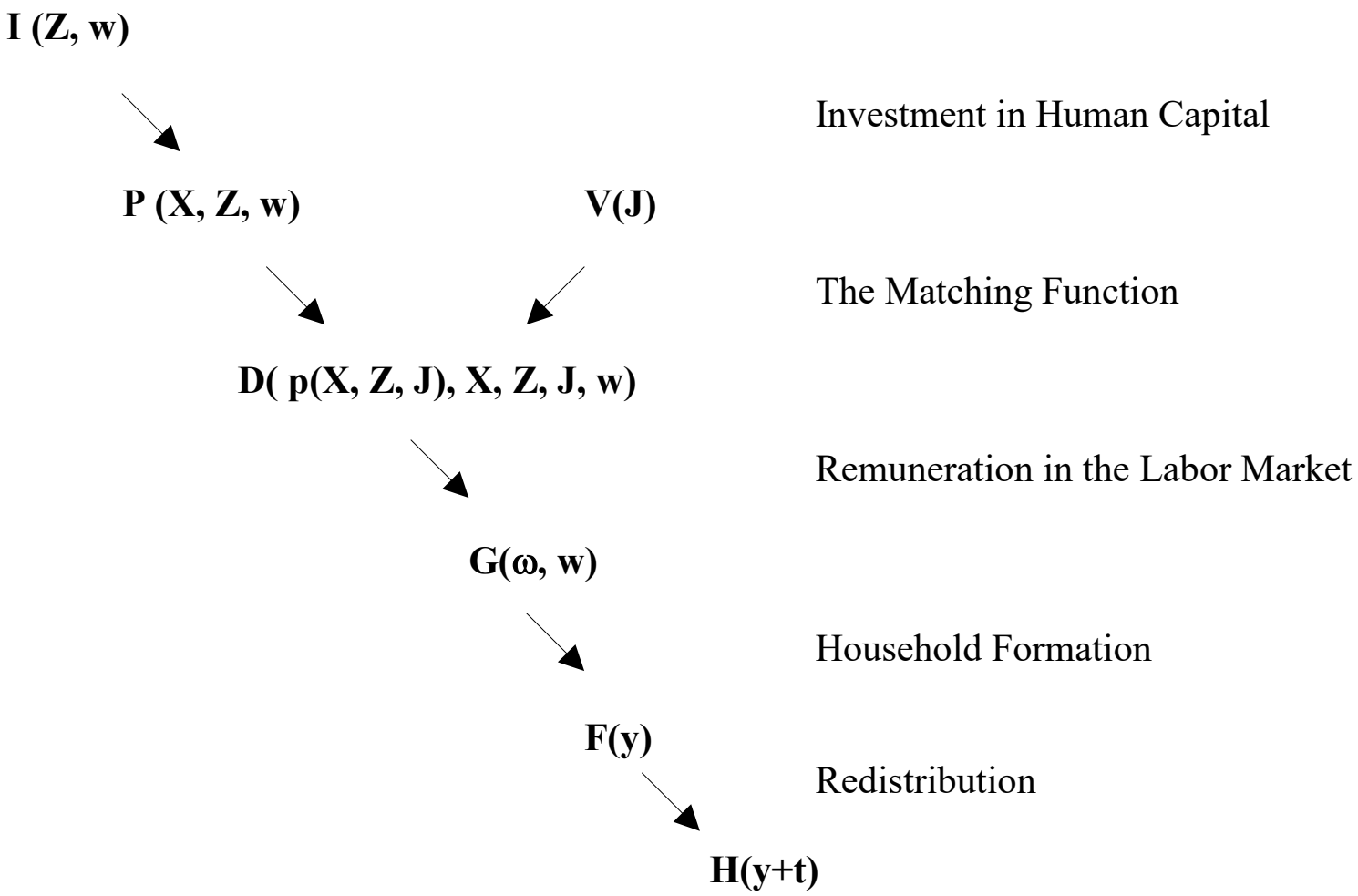
II: The determinants of inequality

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



"Inheritances": wealth; family; innate characteristics

Distribution of skills: cognitive, socio-emotional

People in jobs

Distribution of personal earnings

Household primary incomes

Household disposable incomes

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

Figure 4.9 The Labor Market: Combining Price and Occupational-Choice Effects

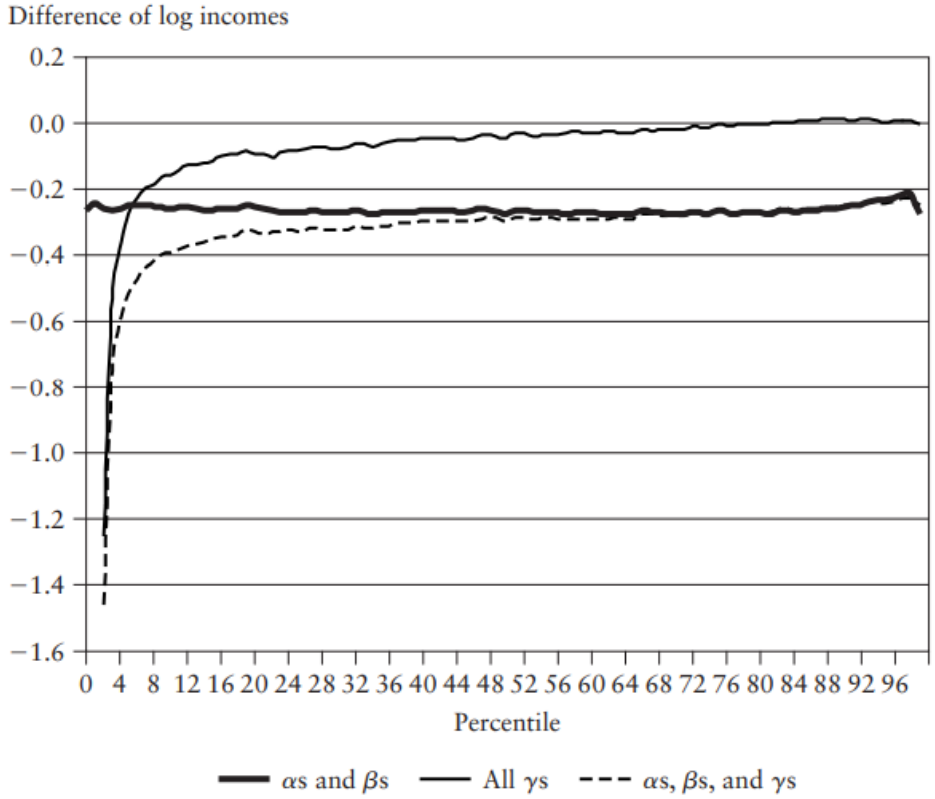
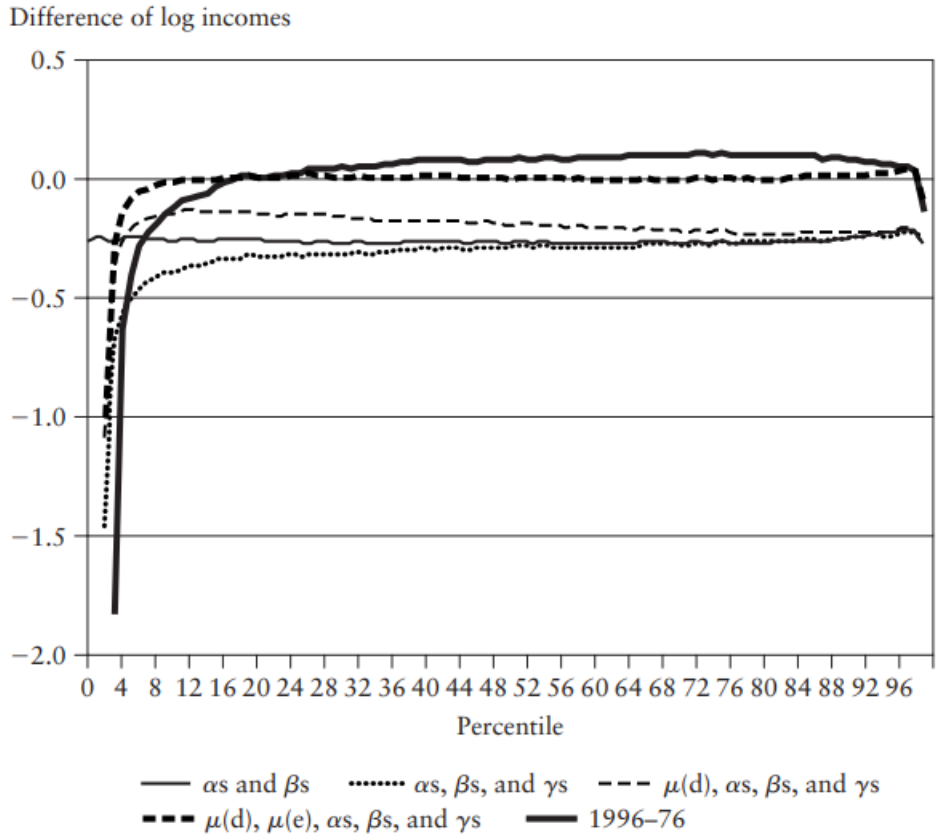


Figure 4.13 A Complete Decomposition



Source: Ferreira, F. and R. Paes de Barros (2005) "The Slippery Slope: Explaining the Increase in Extreme Poverty in Urban Brazil, 1976-96", Ch.4 in Bourguignon, Ferreira and Lustig (eds.) *The Microeconomics of Income Distribution Dynamics* (OUP & World Bank)

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.

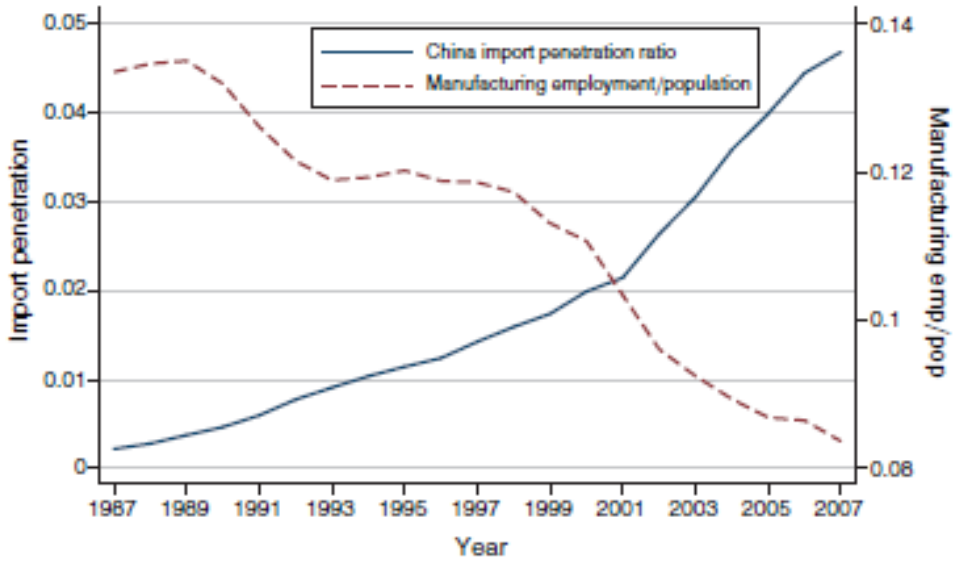


FIGURE 1. IMPORT PENETRATION RATIO FOR US IMPORTS FROM CHINA (*left scale*), AND SHARE OF US WORKING-AGE POPULATION EMPLOYED IN MANUFACTURING (*right scale*)

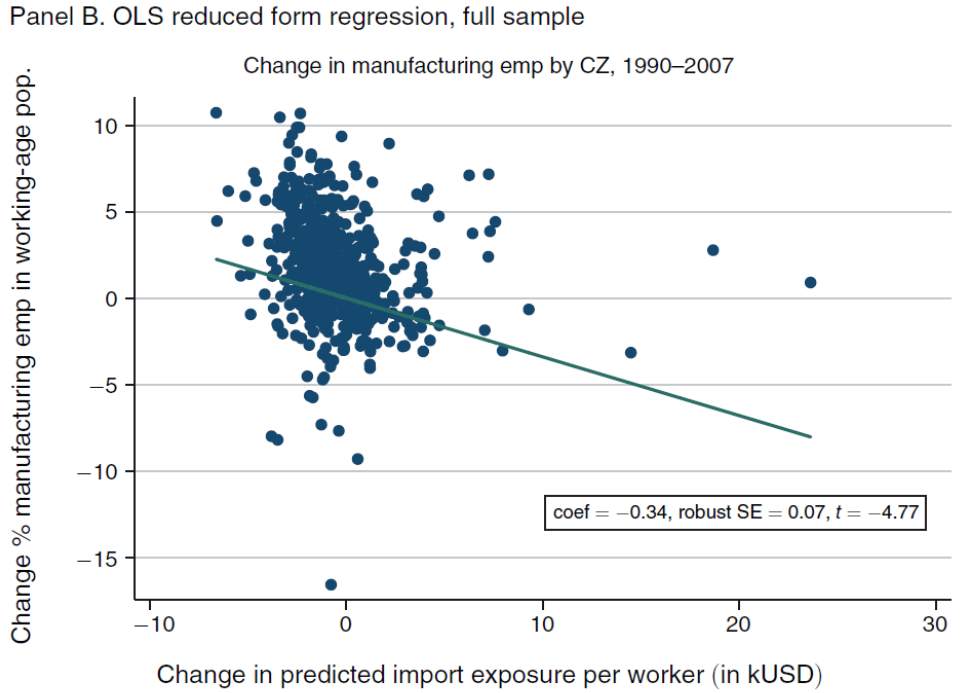


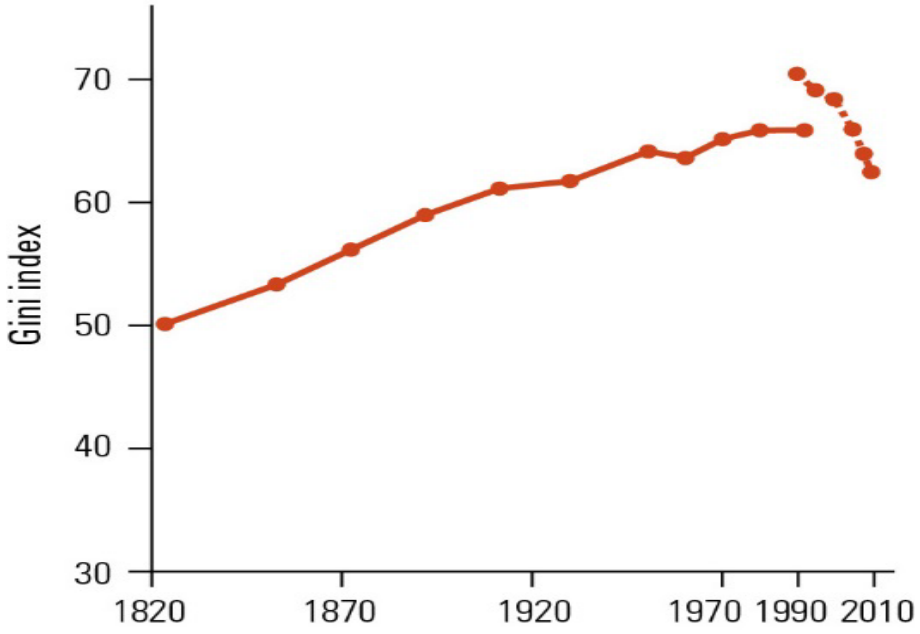
FIGURE 2. CHANGE IN IMPORT EXPOSURE PER WORKER AND DECLINE OF MANUFACTURING EMPLOYMENT: ADDED VARIABLE PLOTS OF FIRST STAGE AND REDUCED FORM ESTIMATES

II: The determinants of inequality

Recent developments (a whirlwind tour)

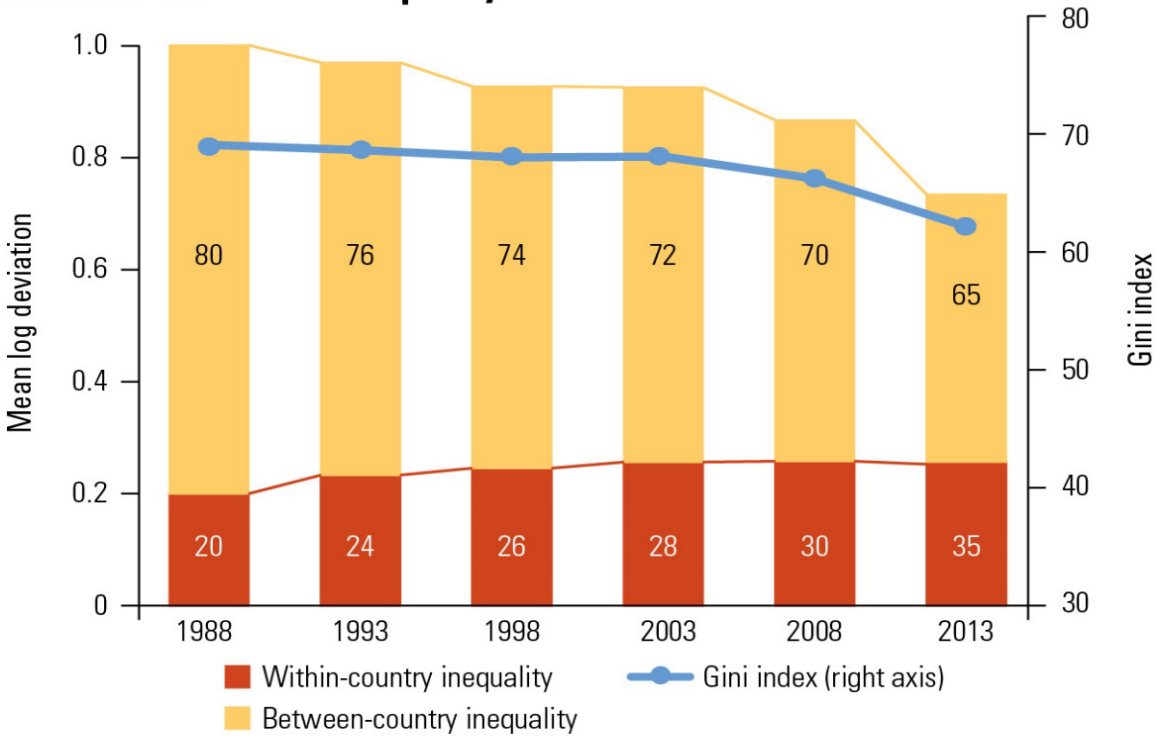
Global Inequality: A historic reversal, driven by btw-country convergence

FIGURE 4.3 Global Income Inequality, 1820–2010



Source: Based on figure 1 (p. 27) of *The Globalization of Inequality* by Francois 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



Sources: Lakner and Milanović 2016a; 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 GE(0) (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

	Long-run (1990-2015)					
	Number of countries with:				Mean Gini	
	↑	+/-1pp	↓	Total	1990	2015
East Asia and Pacific	2	1	3	6	39.1	38.4
Eastern Europe and Centr	7	0	2	9	27.5	31.4
Latin America and Caribb	3	1	10	14	51.4	47.0
Middle East and North Af	0	2	2	4	38.8	35.9
South Asia	3	1	0	4	31.5	35.3
Sub-Saharan Africa	3	0	4	7	44.2	42.7
Industrialized Countries	14	2	2	18	30.2	32.4
World	32	7	23	62	37.7	37.7

Source: Unpublished work with C. Laker and A. Silwal

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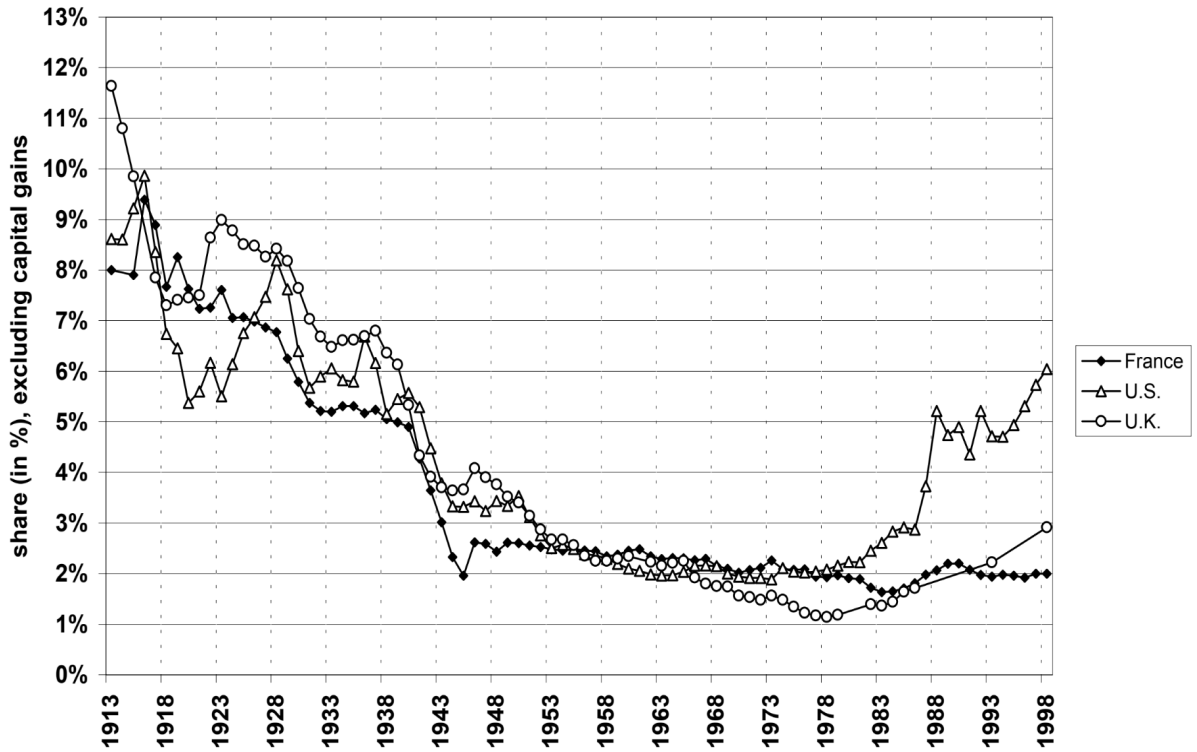
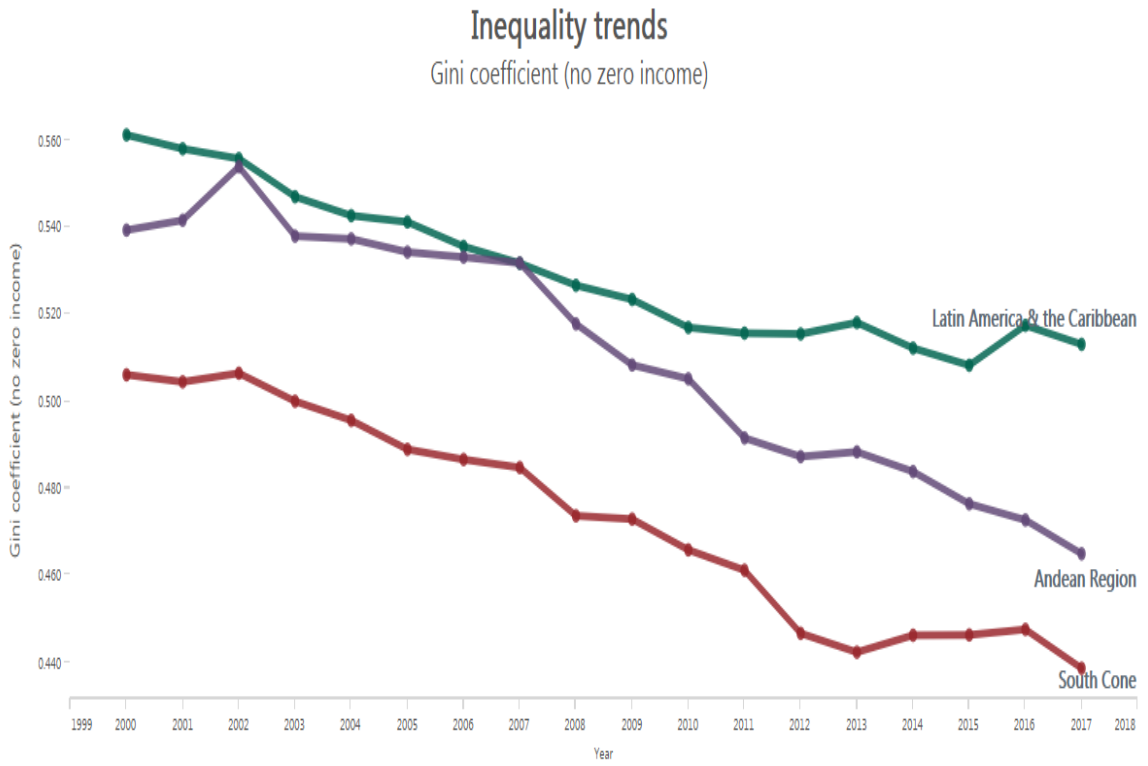
Figure 21: The top 0.1% income share in France, the U.S. and the U.K.,1913-1998



Source: Authors' computations based on income tax returns (France: see Piketty (2001b, table A1, col. P99-100); U.S.: see this paper, table A1, col. P99-100); U.K. See Atkinson (2001).

Source: Piketty and Saez, QJE, 2003.

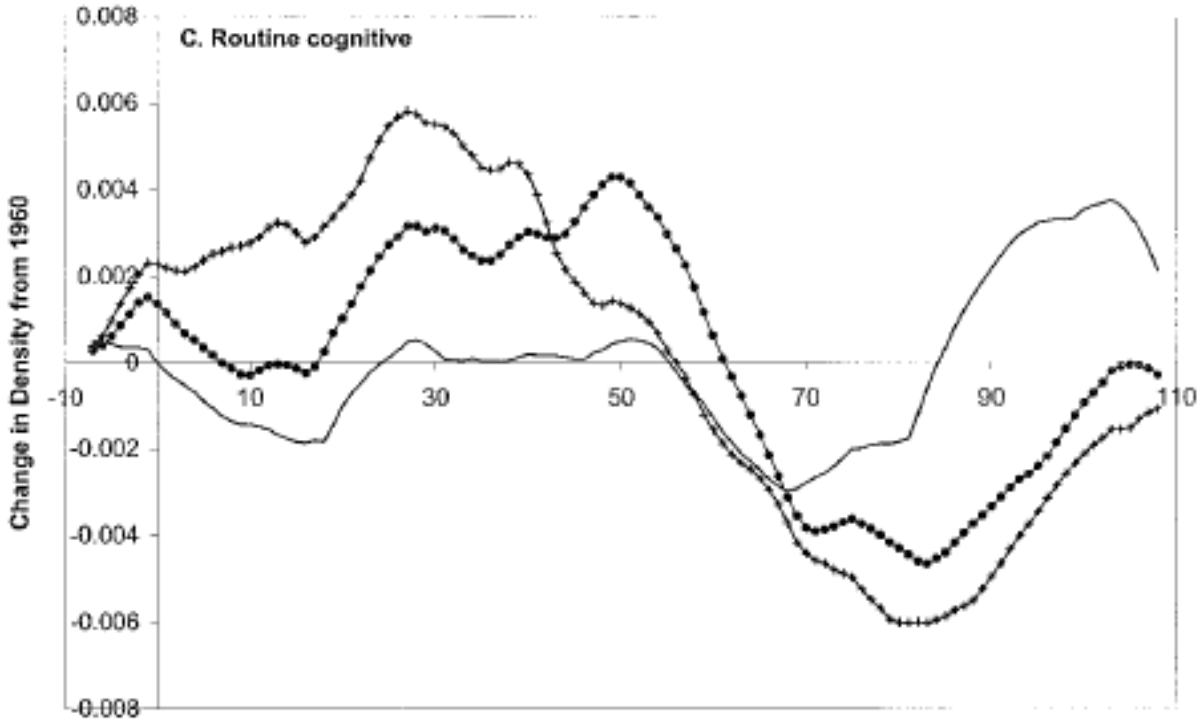


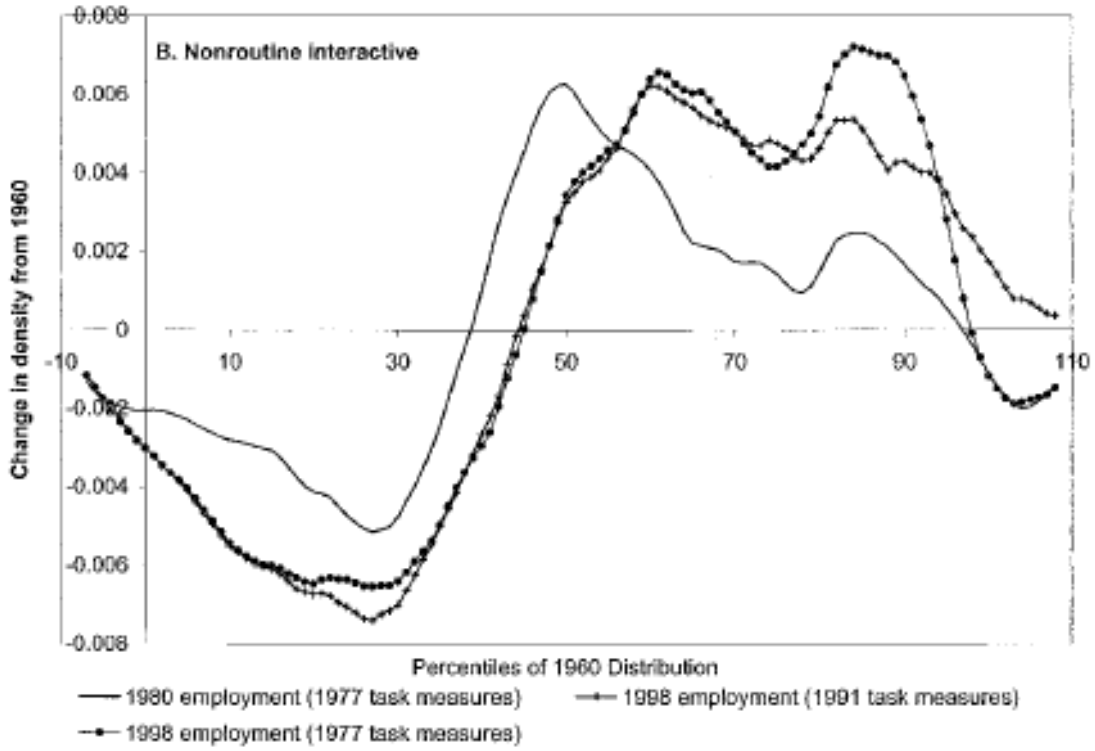
Source: LAC Equity Lab tabulations of SEDLAC (CEDLAS and the World Bank) and World Development Indicators (WDI).

Gini coefficients, South America: 2000-2017

Drivers of rising inequality in rich countries

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

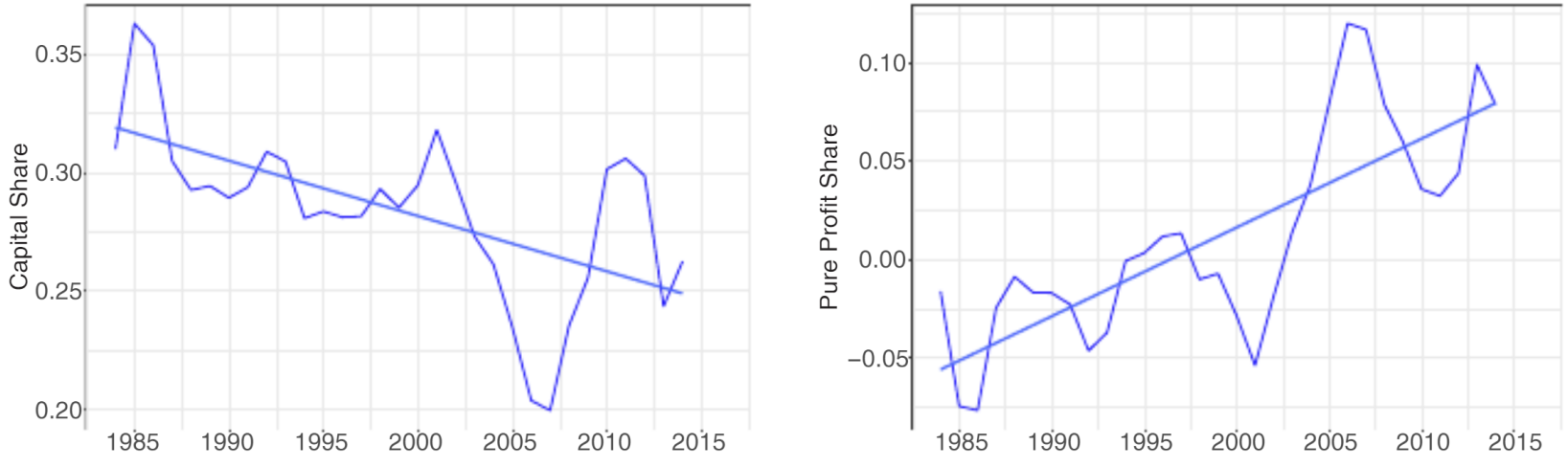




Source: Autor, Levy and Murnane (QJE, 2003)

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.



Panel A. Capital Share

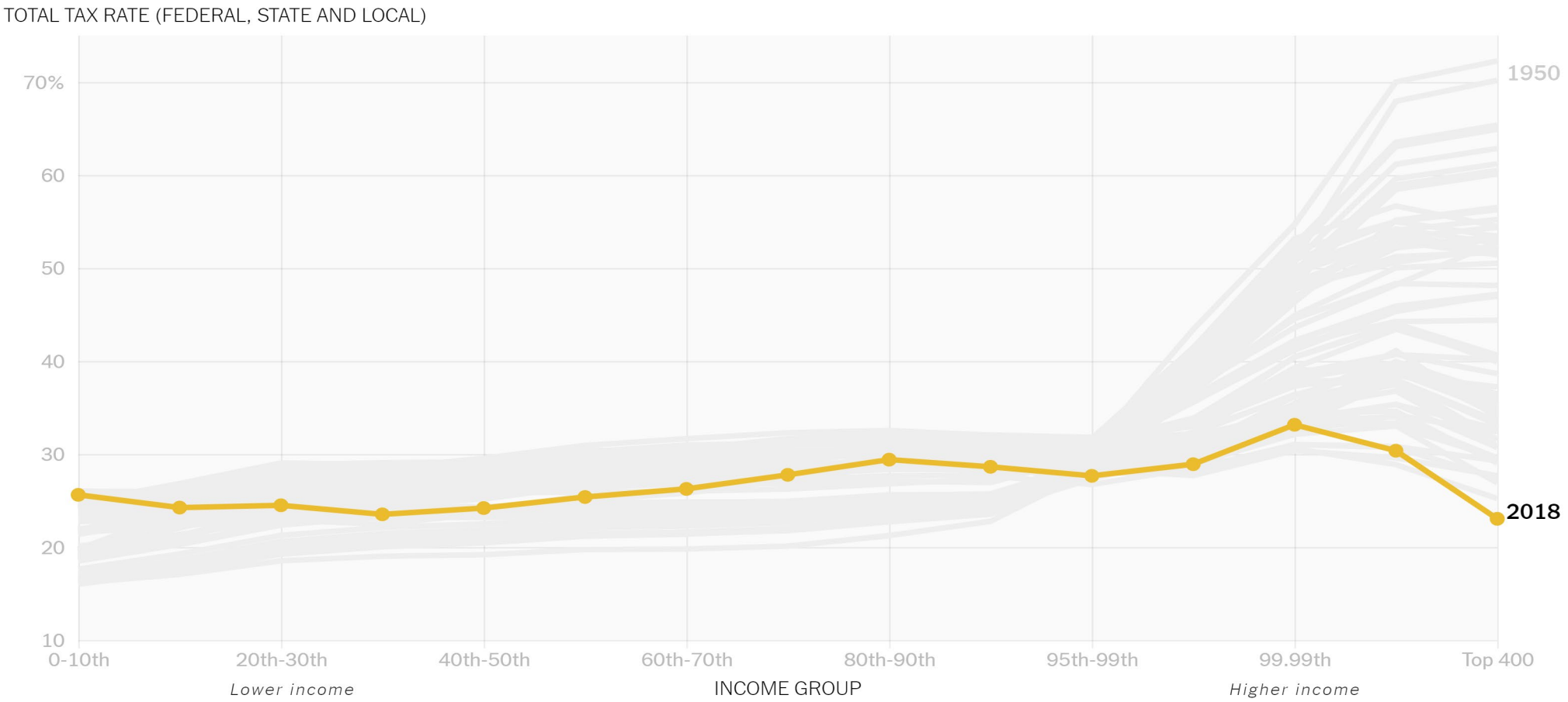
Panel B. Pure Profit Share

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

Source: S. Barkai (2020): "Declining Labor and Capital Shares", *Journal of Finance*, **LXXV** (5): 2421-2463

Drivers of rising inequality in rich countries

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

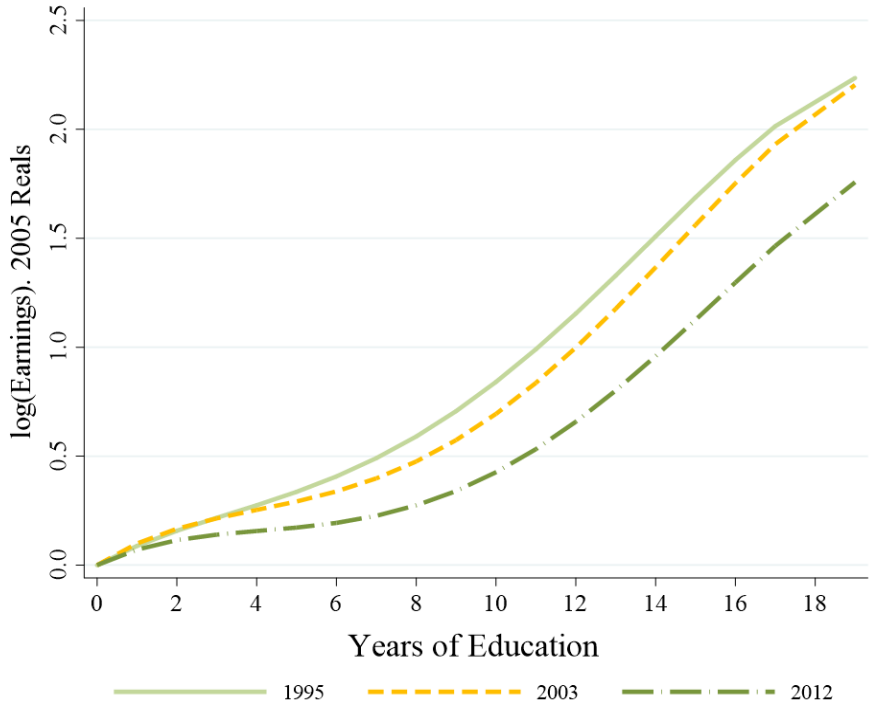


Source: New York Times, 6 October 2019 – based on Saez, E. and G. Zucman: *The Triumph of Injustice*

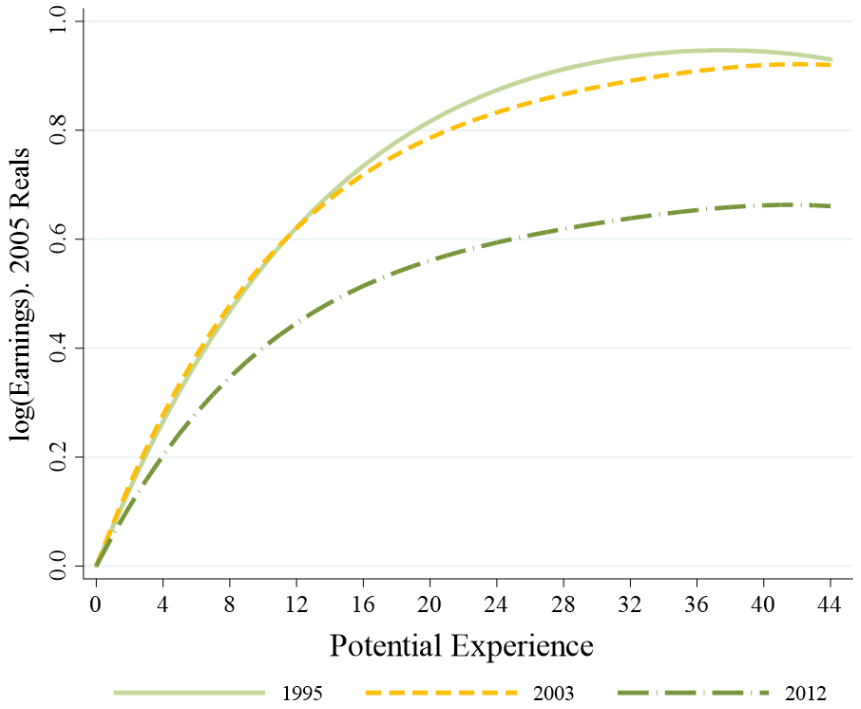
Drivers of falling inequality in (some) poor countries

- 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

Panel A. Education



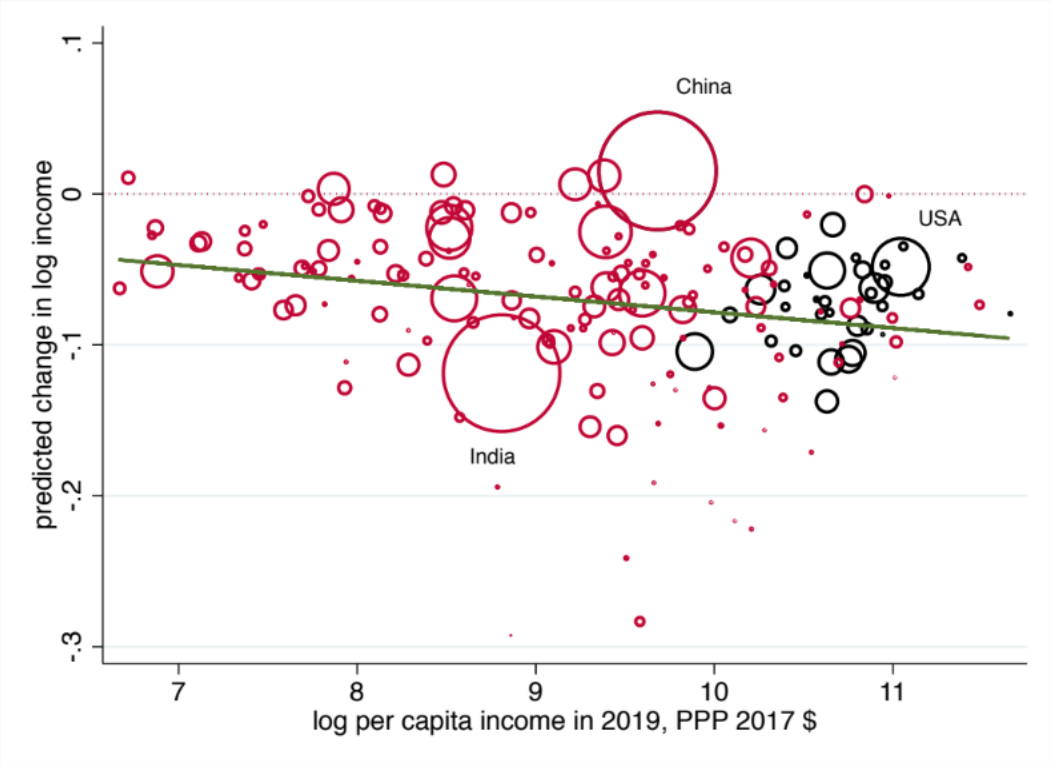
Panel B. Potential Experience

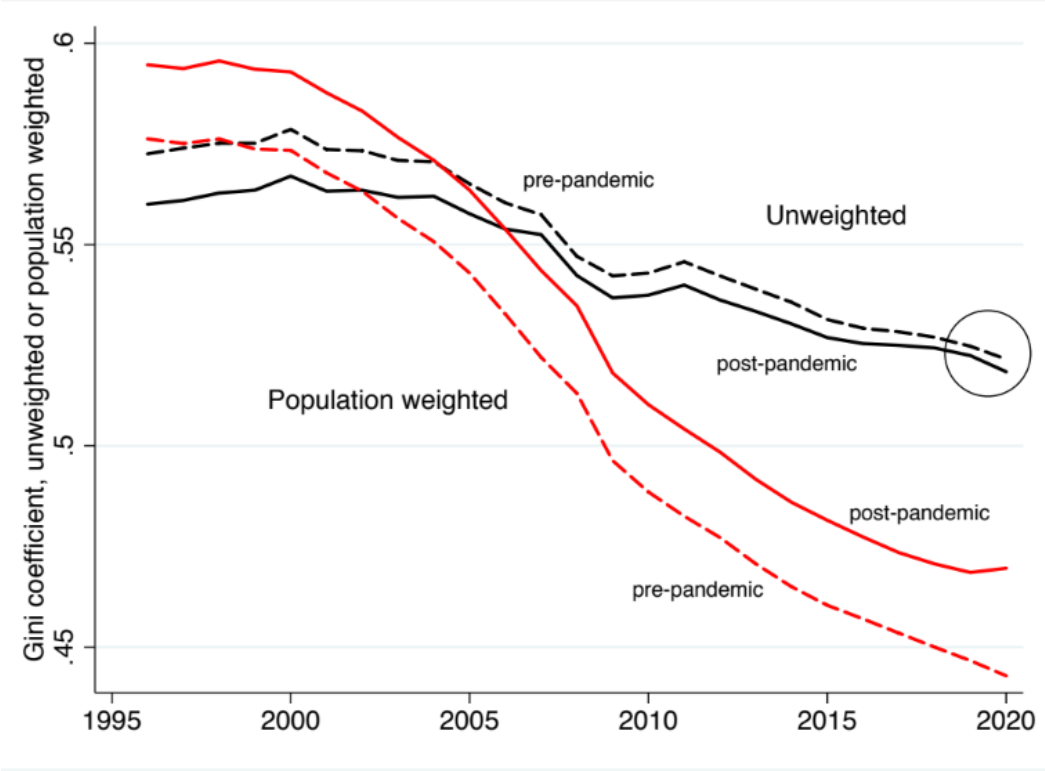


Source: Ferreira, Firpo and Messina (2017): "Aging Poorly? Accounting for the Decline in Earnings Inequality in Brazil, 1995-2012", WB PRWP 8018

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*

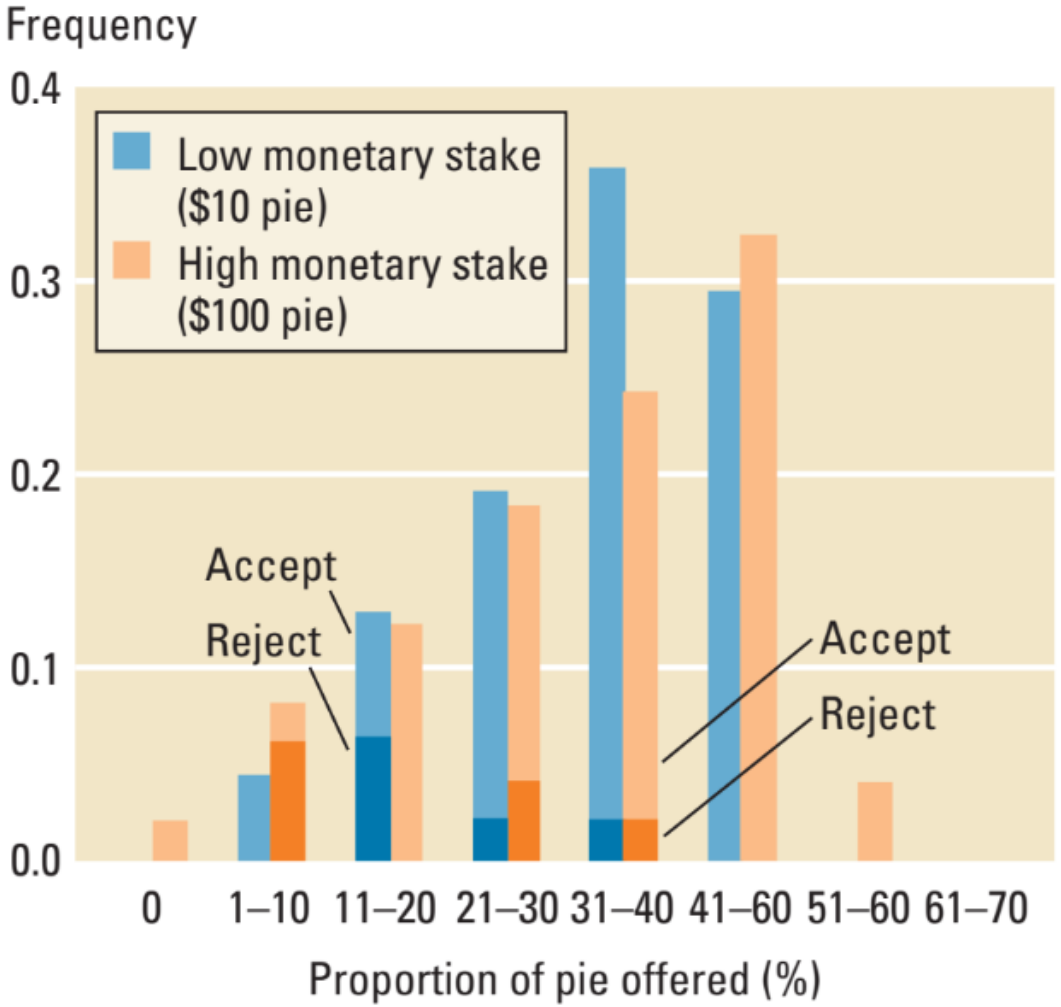
III: Some consequences of inequality

Intrinsic (1): an innate preference for equality

1. The capuchin monkey experiment ("Monkeys Reject Unequal Pay", Brosnan and de Waal, *Nature* 2003)

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)

Figure 4.1 The distribution of observed offers in Ultimatum Games
Offers and rejections in high- and low-stakes ultimatum games



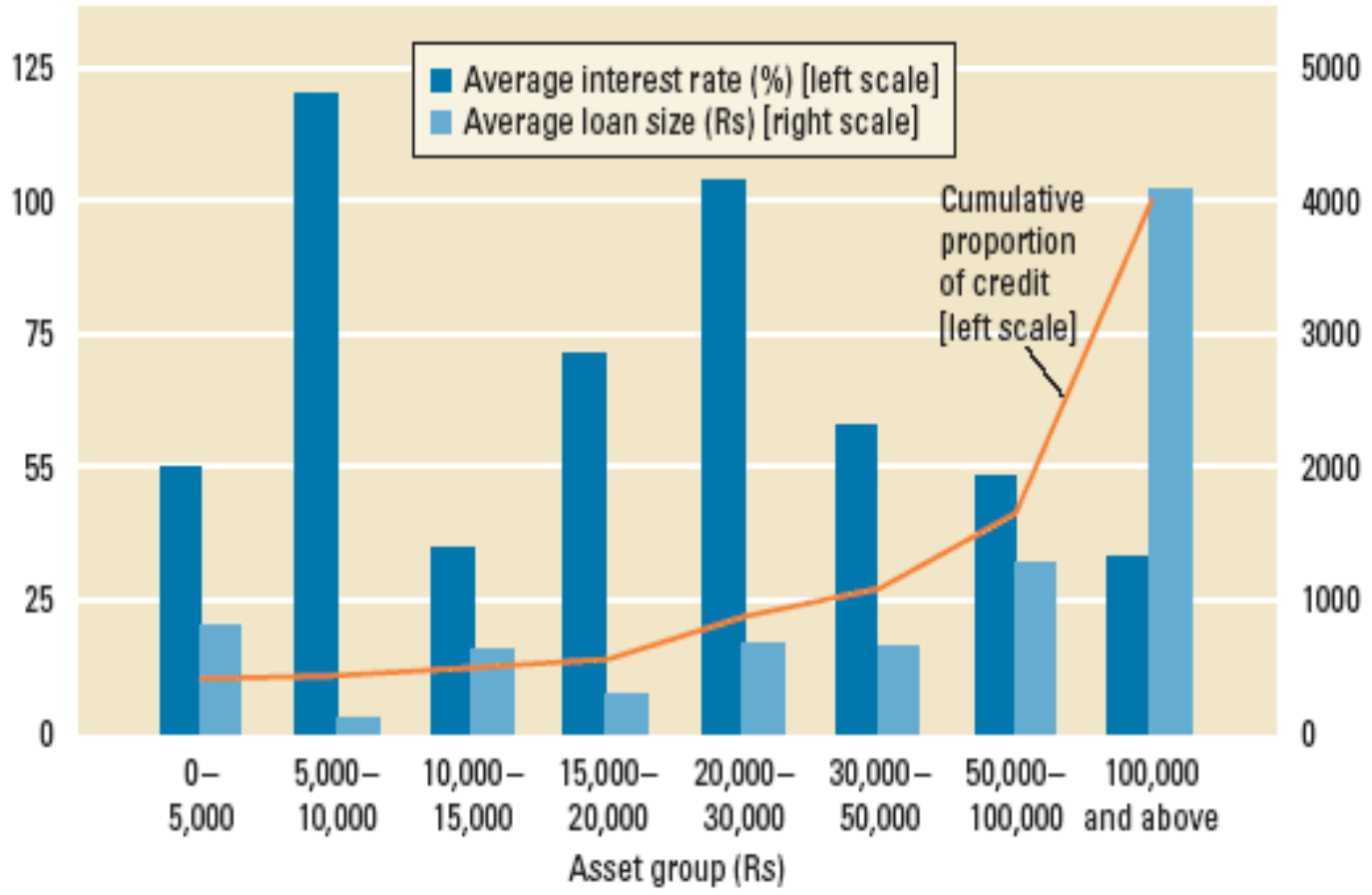
Source: Based on data from Hoffman, McCabe, and Smith (1996).

Instrumental (1): When capital markets are imperfect, wealth inequality will typically lead to sub-optimal allocation of resources

Some key early theoretical references:

- Aghion, Philippe and Patrick Bolton (1997): "A Trickle-Down theory of Growth and Development with Debt Overhang", *Review of Economic Studies*, **64** (2), pp. 151-172.
- Banerjee, A.V. and A.F. Newman (1993): "Occupational Choice and the Process of Development", *Journal of Political Economy*, **101** (2), pp.274-298.
- Galor, O. and J. Zeira (1993): "Income Distribution and Macroeconomics", *Review of Economic Studies*, **60**, pp. 35-52.
- Glomm, Gerhard and B. Ravikumar (1992): "Public versus Private Investment in Human Capital: Endogenous Growth and Income Inequality", *Journal of Political Economy*, **100** (4), pp. 818-834.

Figure 5.1 In rural Kerala and Tamil Nadu, the rich get most of the credit and pay relatively low rates



Source: World Bank (2005): World Development Report 2006: Equity and Development

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

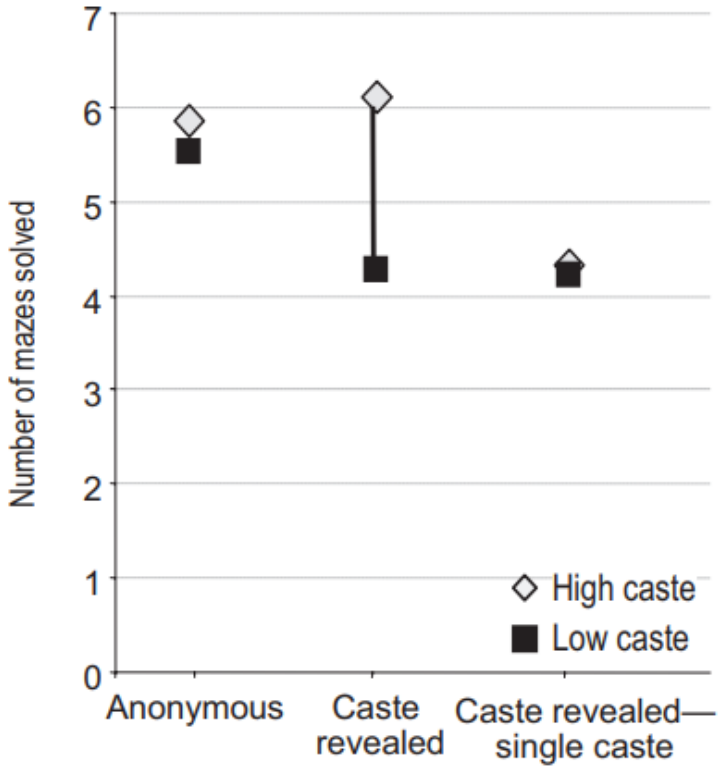


FIGURE 1. AVERAGE NUMBER OF MAZES SOLVED, ROUND 2

Source: Hoff, K. and P. Pandey (2006): "Discrimination, Social Identity, and Durable Inequalities", American Economic Review 96 (2): 206-211

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

Some key early theoretical references:

Acemoglu, Daron, Simon Johnson and James Robinson. 2001. "The Colonial Origins of Comparative Development: An Empirical Investigation." *American Economic Review* **91**(5):1369–401.

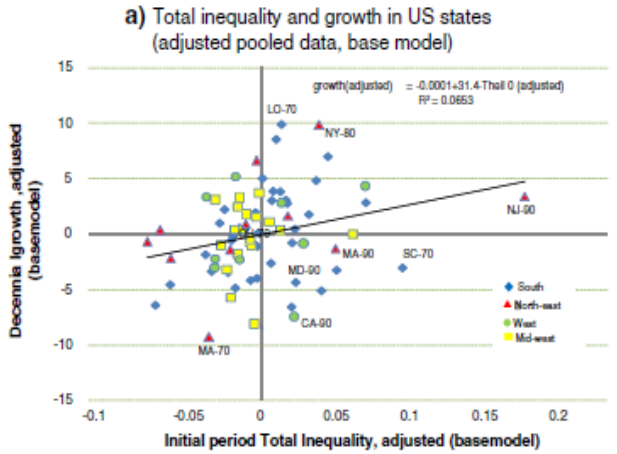
Engerman, Stanley, and Kenneth Sokoloff. 1997. "Factor Endowments, Institutions, and Differential Paths of Growth Among New World Economies: A View from Economic Historians of the United States." In Stephen Haber, eds., *How Latin America Fell Behind.* Stanford, C.A.: Stanford University Press

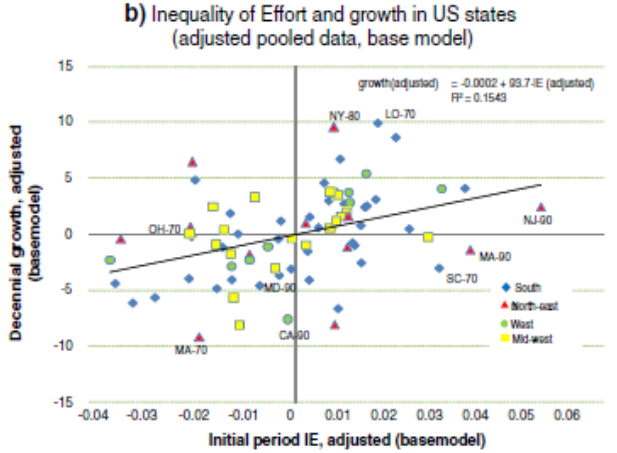
Instrumental (4):
Inequality and growth

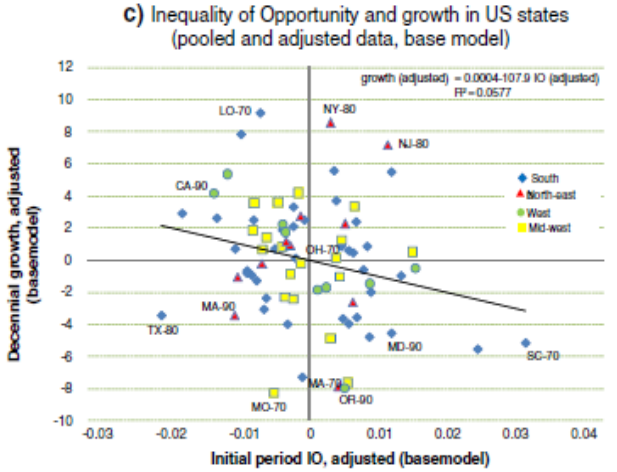
Long and often inconclusive evidence on macroeconomic association between inequality and growth

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)

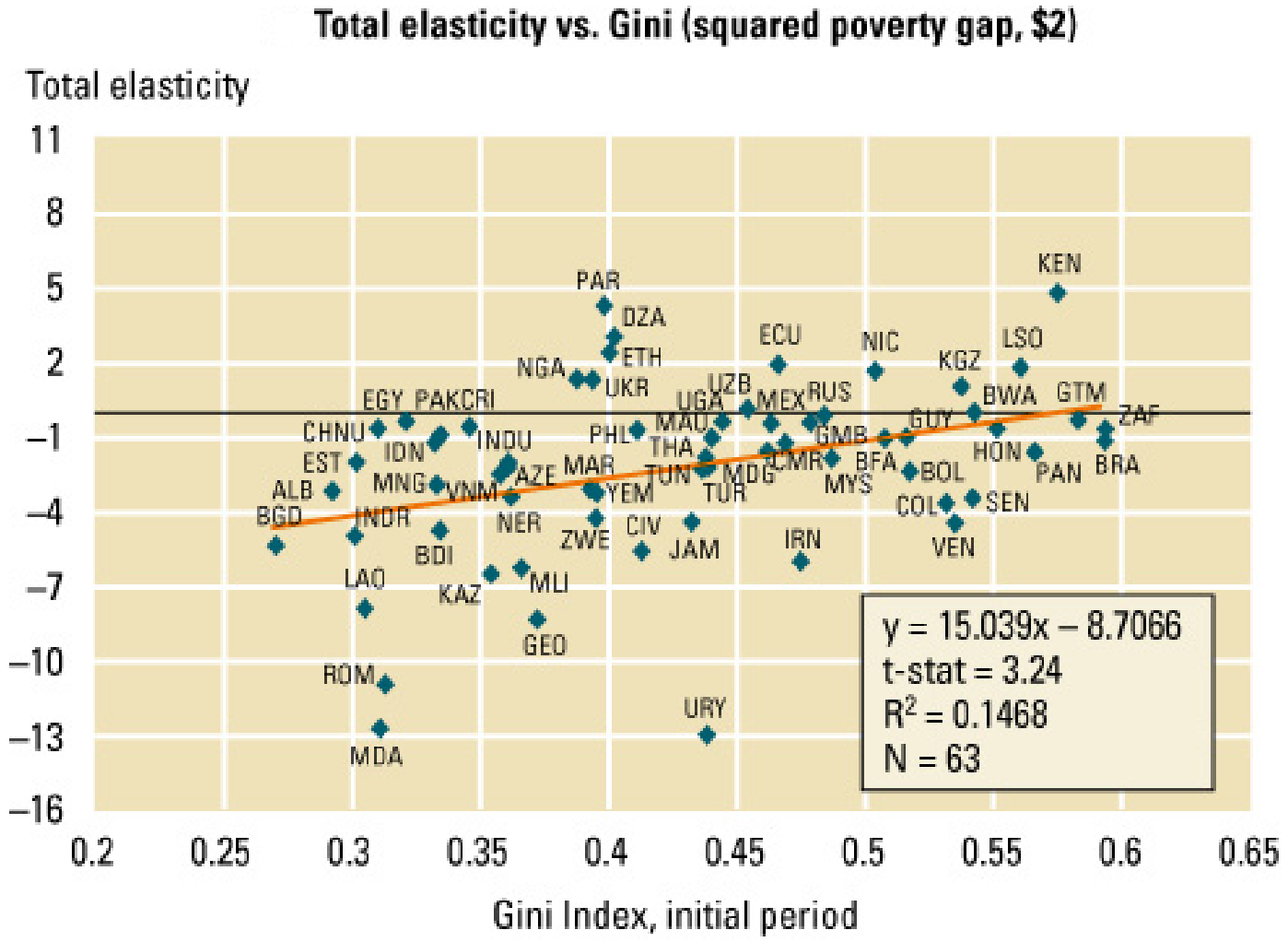






Source: Marrero and Rodriguez (2013) for the US.

Instrumental (5): At any given growth rate, inequality weakens the poverty-reducing power of growth



Source: World Bank (2005): World Development Report 2006: Equity and Development

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 kids 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