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Ancient Inequality

Jeffrey G. Williamson
Harvard University and University of Wisconsin

Comments guided by research with
Branko Milanovic [IBRD] and
Peter Lindert [UC Davis]

Questions

How should inequality be measured?

Is inequality caused by Industrial Revolutions?

Is inequality in poor pre-industrial economies today the same as in ancient pre-industrial economies?

Have some parts of the world always been more unequal than others?

Does inequality breed violence?

Does inequality inhibit economic growth?

Does democracy breed equality?

What will future inequality look like?

For want of sufficient data, we don't (yet) have the answers.

But if we are willing to use *social tables*, we can!

First three observations: E&W 1688, 1759 and 1801-2 from Lindert and Williamson (1982)

Fourth observation: Nueva España c1790 from Manuel Abad y Queipo, shared with me by Carlos Bazdresch and Jaime Salgado when I was at CIDE (Mexico City) September 2004.

27th observation: Peru 1876 just added to the sample. Note, 26 years collecting! Young scholars beware.

An example of a social table: France 1788

Social Group	Population (in 000)	Per capita income (<i>livres</i> per annum)	Population %
Nobles and Clergy	540	724.1	1.9
Bourgeoisie	2160	724.1	7.7
Shopkeepers and artisans	3240	150.0	11.6
Workers (non agricultural)	1500	66.7	5.4
Servants (non agricultural)	1080	92.6	3.9
Small scale farmers	5250	64.6	18.8
Large scale farmers	2250	219.6	8.0
Agricultural day laborers and servants	10150	39.4	36.3
Mixed workers	1800	75.0	6.4
Total	27970	143.3	100

Data Sources, Estimated Demographic Indicators and GDI Per Capita

Country/territory	Source of data	Year	Number of social classes	Population (in 000)	Estimated GDI per capita
Roman Empire	Social tables	14	11	55000	844
Byzantium	Social Tables	1000	8	15000	710
South Serbia (w/o foreign)	Tax census of villages	1455	615	80	591
Holland	Tax census dwelling rents	1561	10	983	1129
England and Wales	Social tables	1688	31	5700	1418
Holland	Tax census dwelling rents	1732	10	2023	2035
Moghul India	Social tables	1750	4	182000	530
Old Castille	Income census	1752	33	1980	745
France	Social tables	1788	8	27970	1135
Nueva España	Social tables	1790	3	4500	755

Notes: GDI per capita is in 1990 Geary-Khamis PPP dollars (equivalent to those used by Maddison 2003 and 2004).

Data Sources, Estimated Demographic Indicators and GDI Per Capita

Country/territory	Source of data	Year	Number of social classes	Population (in 000)	Estimated GDI per capita
England and Wales	Social tables	1801-3	44	9277	2006
Bihar (India)	Monthly census of expenditures	1807	10	3362	533
Holland	Dwelling rents	1808	20	2100	1800
Kingdom of Naples	Tax census dwelling rents	1811	12	5000	752
Brazil	Professional census	1872	813	10167	721
Peru	Social tables	1876	9		816
China	Social tables	1880	3	377500	540
Java	Social tables	1880	32	20300	661
Java (w/o foreign)	Social tables	1924	12	34984	909
British India	Social tables	1947	8	346000	617

With 7 others already added to
make the sample = 27 ...

England 1290

England 1759

Siam 1929

Levant 1596

Chile 1861

Meiji Japan 1886

Tuscany 1427

... and some more coming

Just got ...

Maghreb 1880

Kenya 1914 and 1927

And will get soon ...

American colonies 1776/1800

Next summer Peter Lindert and I will start constructing social tables and comparative living standards for three points in time for the early Republic: 1776, 1798 and 1860).

... and some maybes

Tsarist Russia circa 1864

Tsarist Russia 18th c

Poland 18th c

Peru circa 1560

Madagascar late 19th c

Three Ottoman regions 1562-73

Constraints on the Elite in Ancient Pre-Industrial Societies

Fact: Ancient pre-industrial societies had average income levels usually twice, but sometimes 4-5 times, the subsistence level.

Fact: Low average income, combined with the requirement that few fall below subsistence, meant that the elite's surplus (and thus inequality) could not be very large.

Query: What happened when average income and the potential surplus rose? Did the poor subsistence workers get any of the added surplus or did the elite grab it all?

A New Measure: The Inequality Possibility Frontier

To illustrate, divide society into 2 groups: those getting subsistence income and the elite getting the residual surplus (shared equally among themselves).

Assume that there is no overlap between the two classes, and that there is no inequality within either one. Thus, only variance between classes matters, not within.

Under these assumptions, the Gini simplifies to:

$$G = \frac{1}{\mu} (y_j - y_i) p_i p_j$$

where

G = gini

μ = overall average income

p_i = percent of people in the i^{th} class

y_i = average income in the i^{th} class

Per capita income of the elite (h for high) is:

$$y_h = \frac{\mu N - sN(1 - \varepsilon)}{\varepsilon N} = \frac{1}{\varepsilon} [\mu - s(1 - \varepsilon)]$$

where N =total population, μ =overall mean income, s =subsistence, and population shares are ε for the elite and $(1-\varepsilon)$ for the rest.

Substituting all of this into the Gini expression gives

$$G^* = \frac{1 - \varepsilon}{\mu} [(\mu - s(1 - \varepsilon)) - s\varepsilon] = \frac{1 - \varepsilon}{\mu} (\mu - s)$$

If, in addition, we express μ as a multiple (α) of the subsistence level, the Gini becomes

$$G^* = \frac{1 - \varepsilon}{\alpha s} s(\alpha - 1) = \frac{\alpha - 1}{\alpha} (1 - \varepsilon)$$

G^* = the **maximum Gini** compatible with mean income = αs , an elite fraction ε , and no inequality among elite or non-elite.

When ε tends to 0 (e.g. one Idi Amin), $G^* = (\alpha - 1)/\alpha$. Inequality among the elite does not affect (much) the maximum Gini.

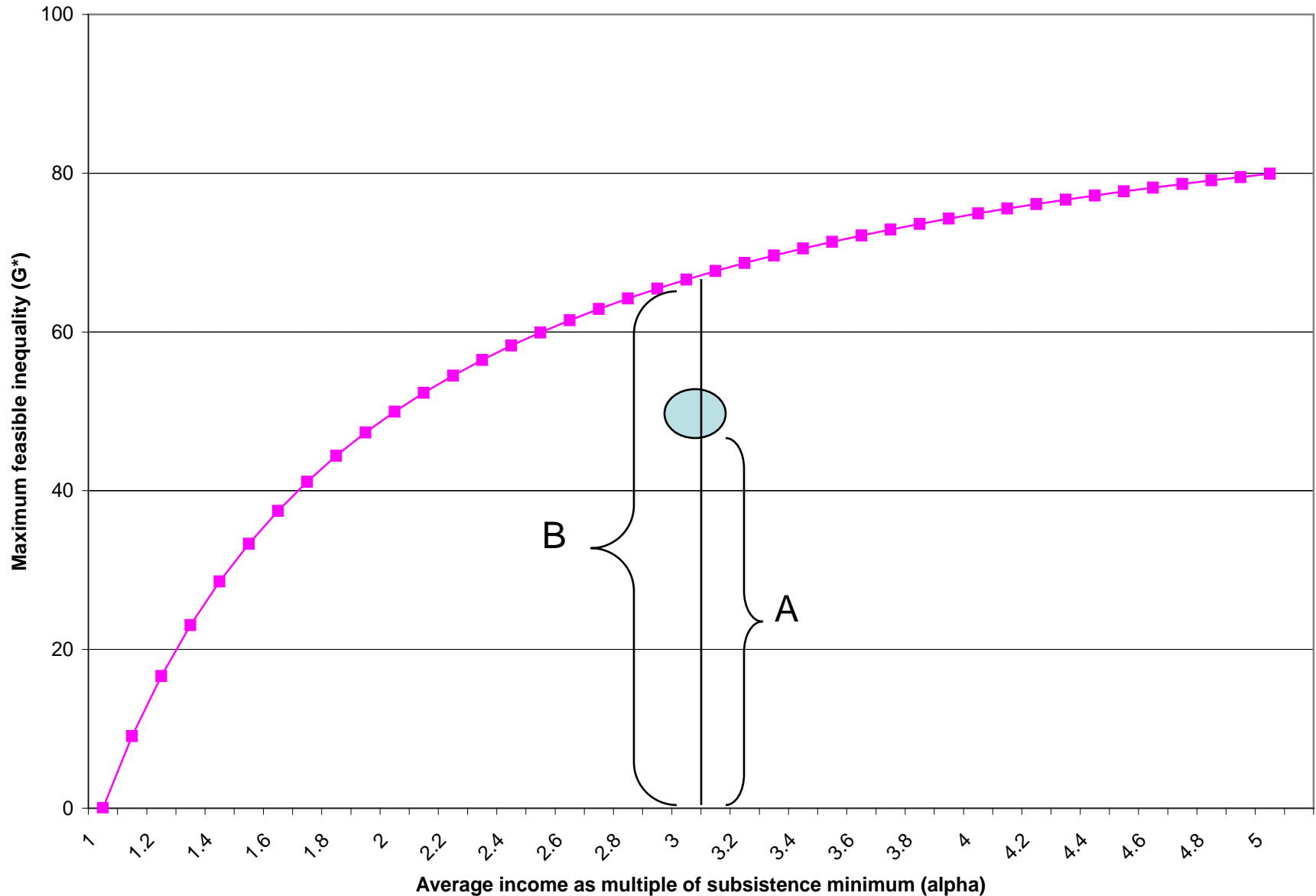
This is the **maximum feasible inequality** given average income and the entire surplus appropriated by a dictator.

Thus, average income limits measured inequality, and **maximum feasible inequality** rises with development.

A New Measure of Inequality

- The ratio between the actual Gini and the maximum Gini (a point on the IPF) is the ***inequality extraction ratio***.
- The ***inequality extraction ratio*** shows what percentage of ***maximum feasible inequality*** an elite is able (or wishes) to extract.
- It is a realistic variant on a standard Gini since it requires that it, and the society which produced it, be ***sustainable***.

The locus of the inequality possibility frontier.



Note: Vertical axis shows maximum possible Gini attainable with a given α .

Studying ancient inequality

To repeat, there are no household survey data, but there are **social tables** akin to Gregory King's 1688 data for England and Wales.

Inequality (Gini) calculated from such tables assumes that (i) all members of a group have the same income, and (ii) groups are non-overlapping (i.e., all members of an upper group have higher incomes than all members of a lower group). This gives a **lower-bound Gini1**.

We can relax assumption (i) by estimating a within-group income range, thus allowing for some estimated within-group inequality. This is our **upper-bound Gini2**.

The ratio **Actual Gini/Maximum Gini** estimates a country's ***inequality extraction ratio***.

All countries are included for which a social (class) table with estimated mean class incomes and population shares could be found.

Observations for cities only are excluded (eg, no medieval Paris or 1752 Jerez for which data exist).

This leaves us with 27 observations (with more to come, we hope), ranging in time from Rome 14 to India 1947.

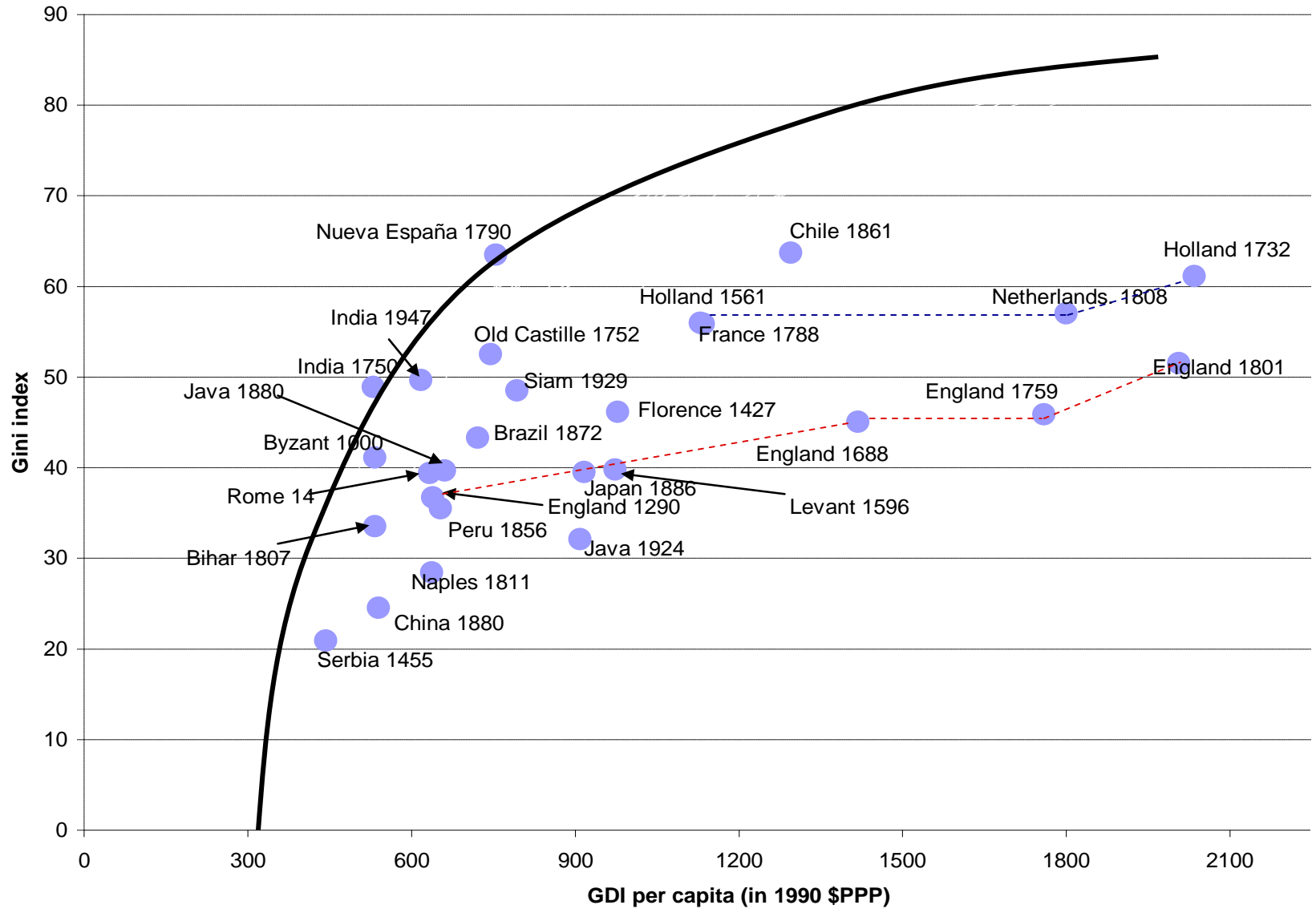
Number of social classes is mostly in double digits except Nueva España and China (3 classes), Moghul India (4) and Byzantium (8). Does number of classes matter? Sensitivity analysis suggests not. See below.

Estimated per capita incomes in 1990 \$PPP almost all from Maddison; if not, we use the ratio (α) between source-reported mean income and subsistence, and then price the latter at 1990 \$PPP 300 (e.g. IBRD and Ravallion \$1 per day).

Examples of Inequality Measures

Country/territory/ year	Gini1	Gini2	Maximum feasible Gini with s=400	Actual Gini as % of the maximum	Actual Gini as % of the maximum (with s=300)
England/Wales 1801-3	51.2	51.5	80.0	64	60
Bihar (India) 1807	32.8	33.5	24.9	134	77
Netherlands 1808	56.3	57.0	77.7	73	69
Naples 1811	28.1	28.4	46.8	61	47
Brazil 1872	38.7	43.3	44.5	97	74
Peru 1876	41.3	42.2	38.7	109	78
China 1880	23.9	24.5	25.9	95	55
Java 1880	38.9	39.7	39.4	101	73
Java (w/o foreign) 1924	25.3	25.7	55.9	46	38
British India 1947	48.0	49.7	35.1	141	96

Figure 2
Ancient Inequalities: Estimated Gini Coefficients,
and the Inequality Possibility Frontiers



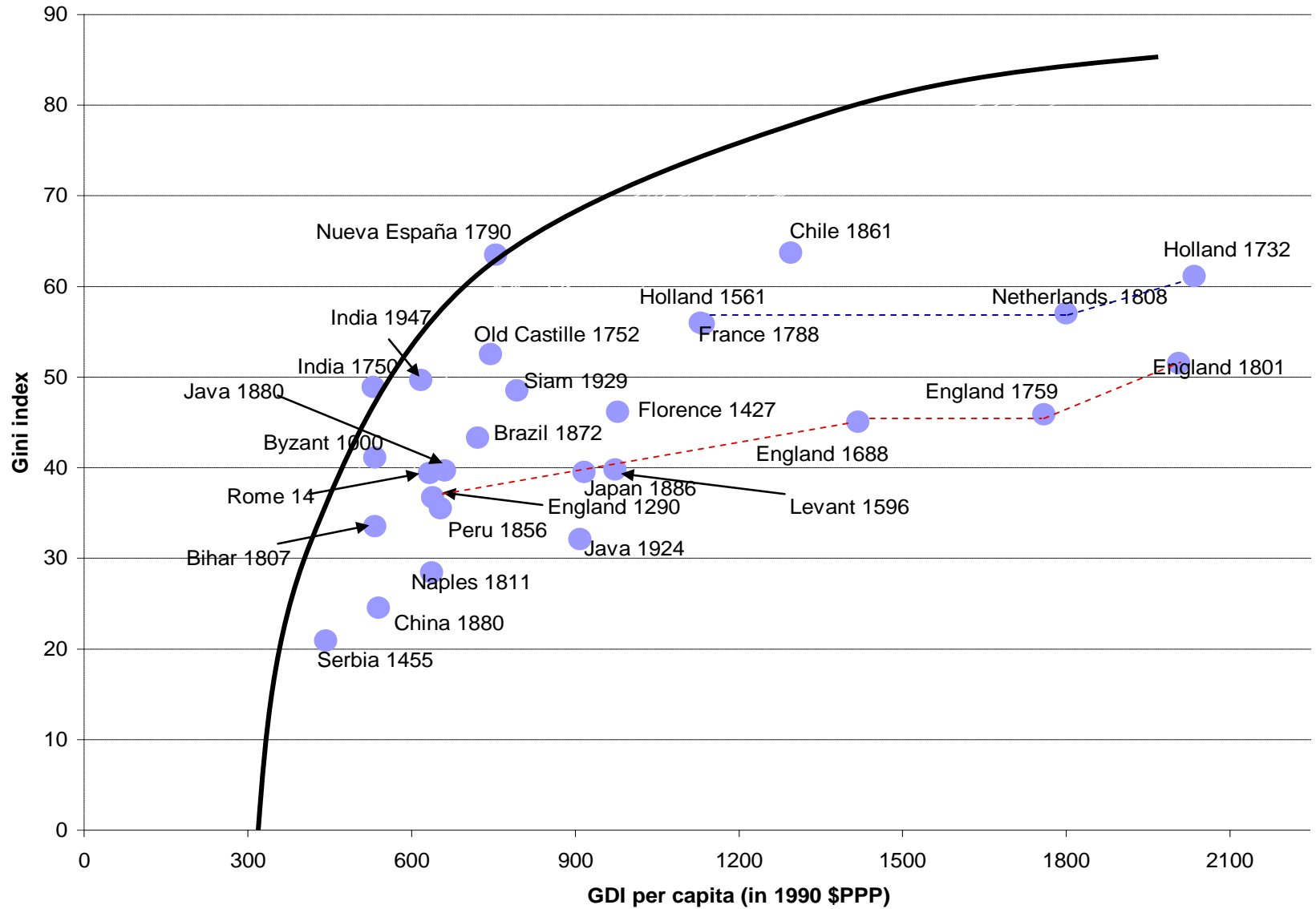
At GDI per capita \$300-\$900, Gini ranges from low 20s to high 50s and are clustered around the IPF. These countries “extract” a very large share of maximum feasible inequality.

Indeed, for two data points (Moghul India and Nueva España), the extraction ratio is about equal to 100%.

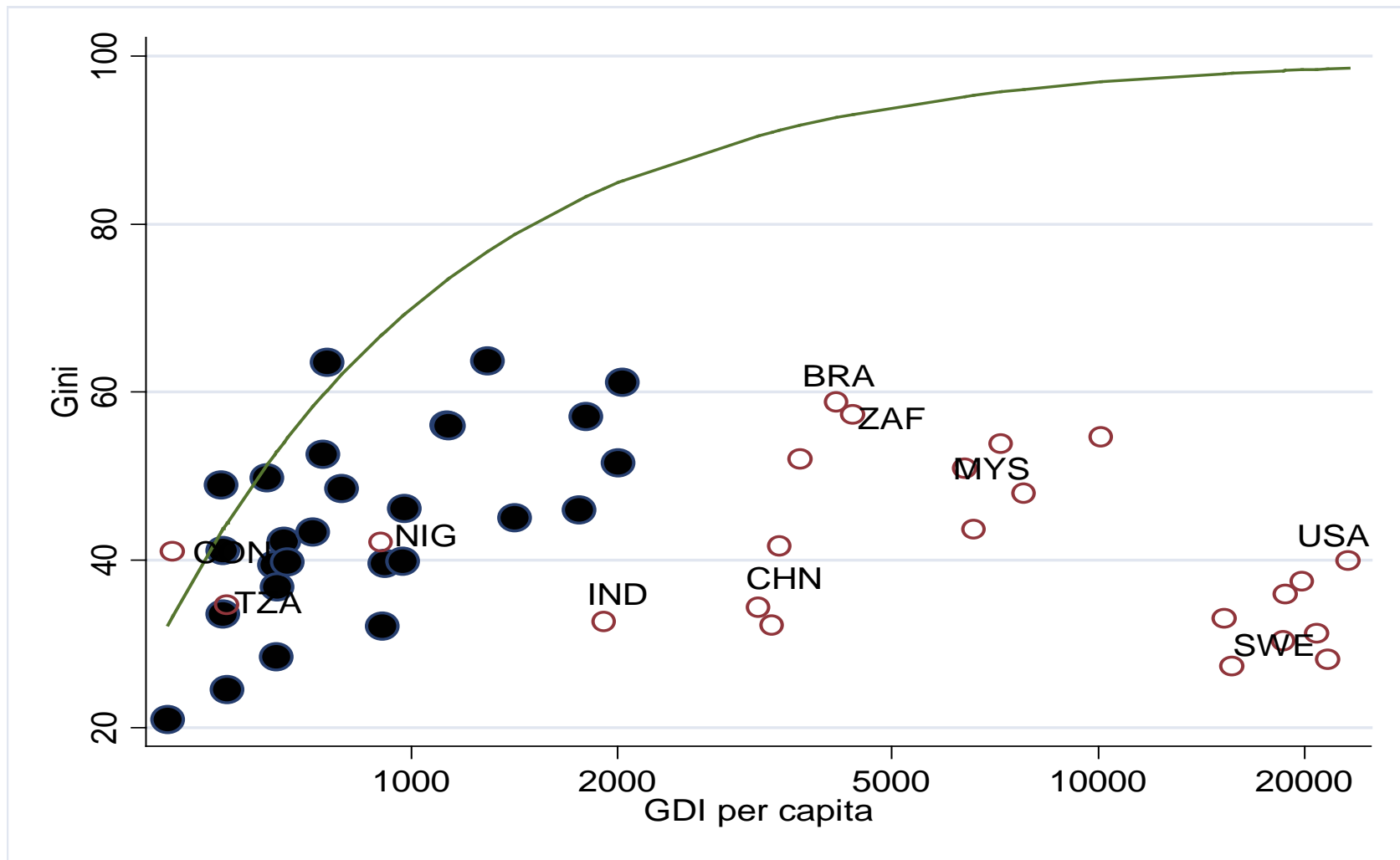
The rise in the Gini slows down and flattens out in high pre-industrial income levels

Thus, generally speaking, the Gini does not rise to the same extent as does mean income with development.

Figure 2
Ancient Inequalities: Estimated Gini Coefficients,
and the Inequality Possibility Frontiers



Ginis and the Inequality Possibility Frontier for the Ancient Society Sample and Selected Modern Societies



Note: Modern societies are drawn with hollow circles. IPF drawn on the assumption of $s = \$PPP$ 300 per capita per year. Horizontal axis in logs.

To repeat, the Gini does not rise to the same extent as does mean income, and thus the ***extraction ratio*** falls with development.

The falling extraction ratio holds ...

when we compare ancient with modern pre-industrial societies, but also true between ancient and between modern societies.

Thus, actual inequality is not a sufficient measure of social justice.

A Gini of (say) 40 in Rome and 40 in the US do not mean the same thing. In Rome, that Gini extracts 70 percent of feasible inequality, while in the US it's less than 40 percent.

Two propositions

Proposition 1. While the estimated Ginis for pre-industrial societies falls in the same range as inequality levels observed today, ancient inequality was much greater when expressed in terms of the *maximum feasible inequality*

Proposition 2. Under conditions of economic growth, particularly in poor or middle-income societies, constant inequality reflects great restraint on exploitation because the *inequality extraction ratio* is falling. The reverse is true during periods of economic decline.

What about the Top 1%?

Recent work (Atkinson, Piketty etc) and Leigh (2007) argues that there is a strong 20th century positive correlation between the top 1% income share and overall inequality.

Was this true in ancient societies?

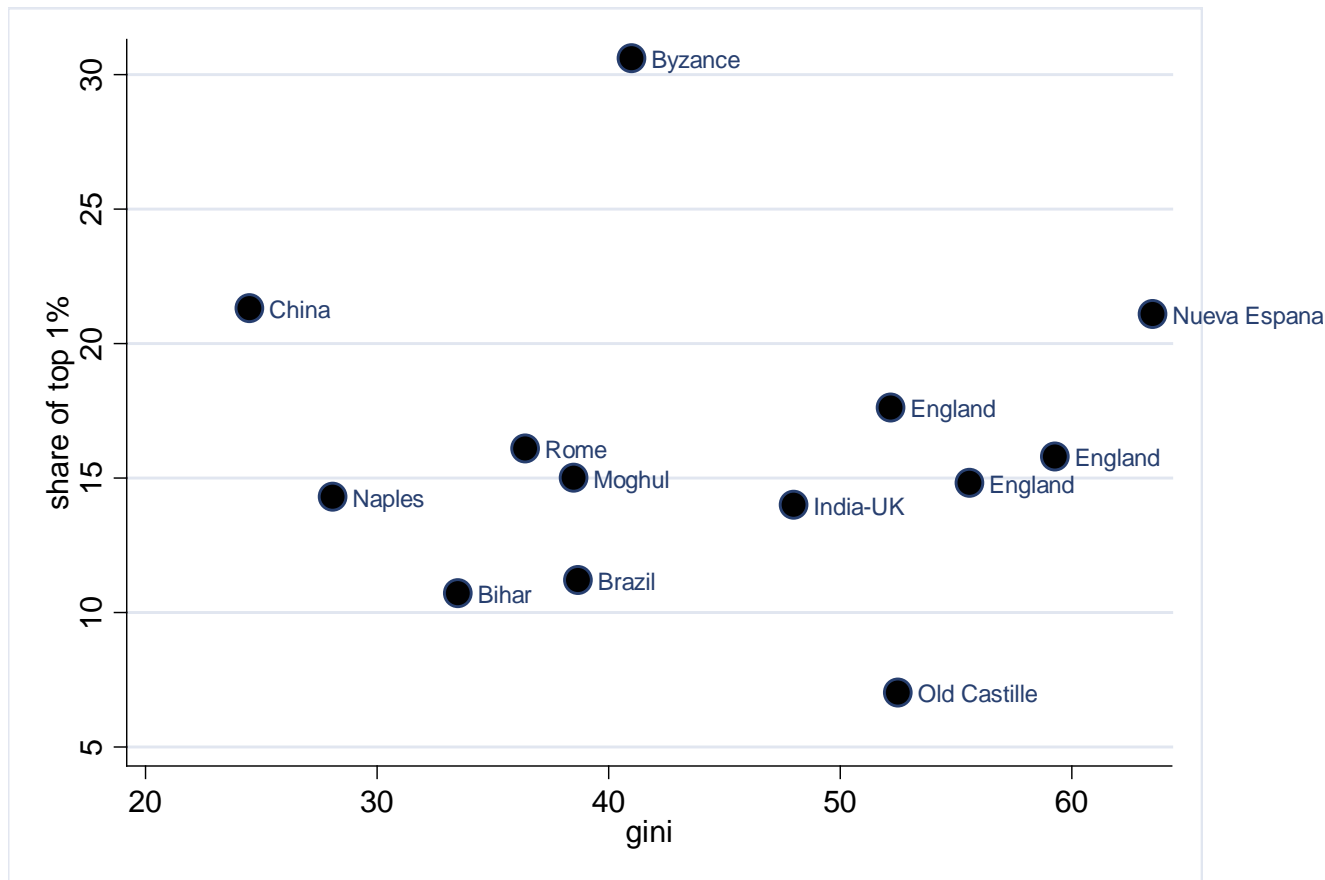
Caveat one: these are not true distributions of people or families but of social classes.

Caveat two: We estimate the top share using Pareto interpolation (assumes Pareto distribution at the top):

Estimated top of income distribution

	Top 1% share in total income (in %)	The cut-off point (in terms of mean income)	Gini coefficient
Byzantium 1000	30.6	3.7	41.0
China 1880	21.3	5.6	24.5
Nueva España 1790	21.1	9.8	63.5
England 1759	17.6	9.0	52.2
Rome 14	16.1	12.4	36.4
England 1801	15.8	9.4	59.3
India-Moghul 1750	15.0	15.0	38.5
K. of Naples 18	14.3	5.5	28.1
India British 1947	14.0	16.9	48.0
Bihar 1807	11.5	3.8	38.7
Brazil 1872	11.2	5.7	33.5
England 1801	8.9	6.2	51.5
England 1688	8.7	6.1	45.0
Old Castille 1752	7.0	6.2	52.5
UK 1999	7.0	4.3	37.4
US 2000	6.6	4.7	40.2
Germany 2000	4.9	3.6	30.3

No correlation between Gini and top 1% income share!



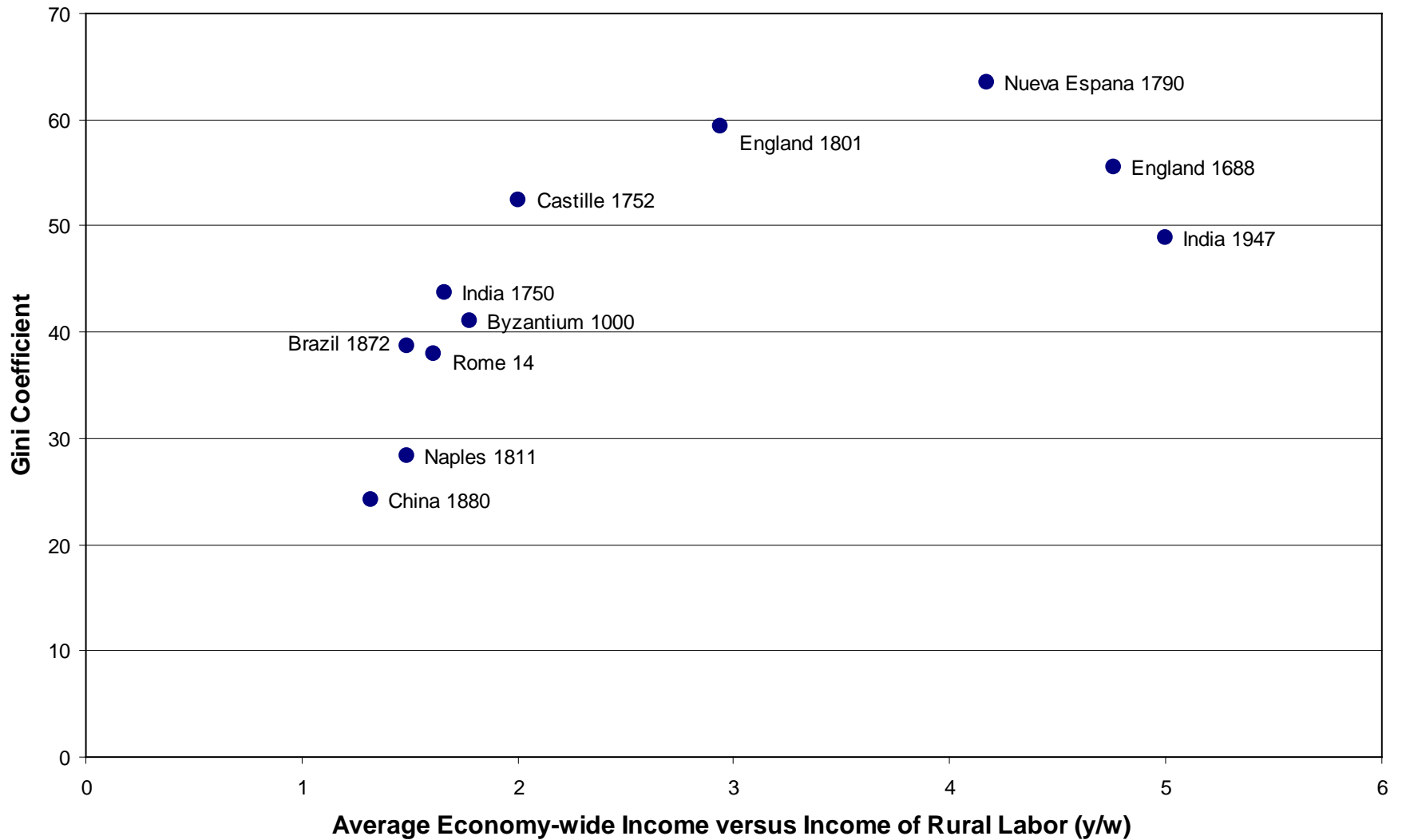
A third proposition

Fact: The share of the top percentile in ancient societies is not highly correlated with overall inequality in contrast with modern societies.

Why?

Proposition 3. What drove ancient inequality was not the top share, but rather the size of the income gap between elite and poor, or between average income (y) and the average income of poor (w) = y/w . Why?

Figure 7. Gini vs the y/w Ratio in an Ancient Sample of Eleven



Explaining ancient inequality with a small sample ($n=27$) results in ...

**Table 3 Regression Results for the Gini Coefficient
and the Inequality Extraction Ratio**

	Gini Coefficient		Extraction Ratio	
	1	2	3	4
GDI per capita	304.7** (0.014)	310.4** (0.014)	-20.31** (0.03)	-7.09 (0.35)
GDI per capita squared	-20.94** (0.019)	-21.40** (0.019)		
Urbanization rate	0.369* (0.10)	0.357 (0.12)	0.692* (0.07)	0.372 (0.21)
Population density	-0.104*** (0.004)	-0.097** (0.01)		-0.189*** (0.001)
Colony (0-1)	13.62*** (0.004)	14.75** (0.004)	13.83* (0.07)	27.27*** (0.000)
Dno-foreign (0-1)	-11.96 (0.23)	-13.30 (0.20)	-22.55* (0.06)	-40.30*** (0.000)
Asia (0-1)		-2.71 (0.47)		
Number of groups	-0.008 (0.27)	-0.007 (0.36)		
Tax survey (0-1)	-2.77 (0.57)	-2.54 (0.60)		
Constant	-1055.6** (0.013)	-1073.1** (0.014)	197.2*** (0.002)	119.9** (0.02)
No of obs	26	26	26	26
Adjusted R ²	0.70	0.69	0.25	0.57

Note: GDI per capita is in natural logs. Coefficients significant at 10, 5 and 1 percent level denoted by 3, 2 and 1 asterisks. *p* values between brackets.

A word about Engerman-Sokoloff and the big debate about growth fundamentals

- Engerman and Sokoloff (1997, 2000) offered a hypothesis to account for Latin American growth underachievement during the two centuries following independence.
- It begins with high levels of income inequality and thus of political power which favors rich landlords and rent-seekers, producing institutions incompatible with economic growth.
- ES argue that the inequality has its roots in the natural resource endowments present after Iberian colonization five centuries ago. Exploitation of the native population and African slaves meant subsequent disenfranchisement, thus reinforcing the persistence of institutions incompatible with growth.
- ES never offered comparative inequality evidence with western Europe. So, what's the evidence?

Table 1 Inequality in Pre-Industrial Latin America and Western Europe Compared

Country	Year	Population	Ratio Peasant Mean Income	Actual Gini	Maximum Feasible Gini	Extraction Ratio
Brazil	1872	10,167	0.67	43.3	58.3	0.743
Chile	1861	1,702	0.28	63.7	76.8	0.829
Nueva España	1790	4,500	0.24	63.5	60.5	1.052
Peru	1856	2,469	na	35.5	54.0	0.657
Latin America		18,838				
Unweighted average			0.40	51.5	62.4	0.825
Weighted average			0.51	48.9	59.9	0.816
England	1688	5,700	0.21	45.0	78.8	0.571
England	1759	6,463	0.37	45.9	82.9	0.554
England	1801	9,053	0.34	51.5	85.0	0.606
France	1788	27,970	0.27	55.9	73.5	0.761
Holland	1561	983	na	56.0	73.4	0.766
Holland	1732	2,023	na	61.1	85.2	0.717
Western Europe		52,192				
Unweighted average			0.30	52.6	79.8	0.659
Weighted average			0.29	52.9	77.7	0.681

Source: Revision and extension of B. Milanovic, P. H. Lindert, and J. G. Williamson, "Ancient Inequality," NB 13550, National Bureau of Economic Research, Cambridge, Mass. (October 2007).

Take-aways from the past

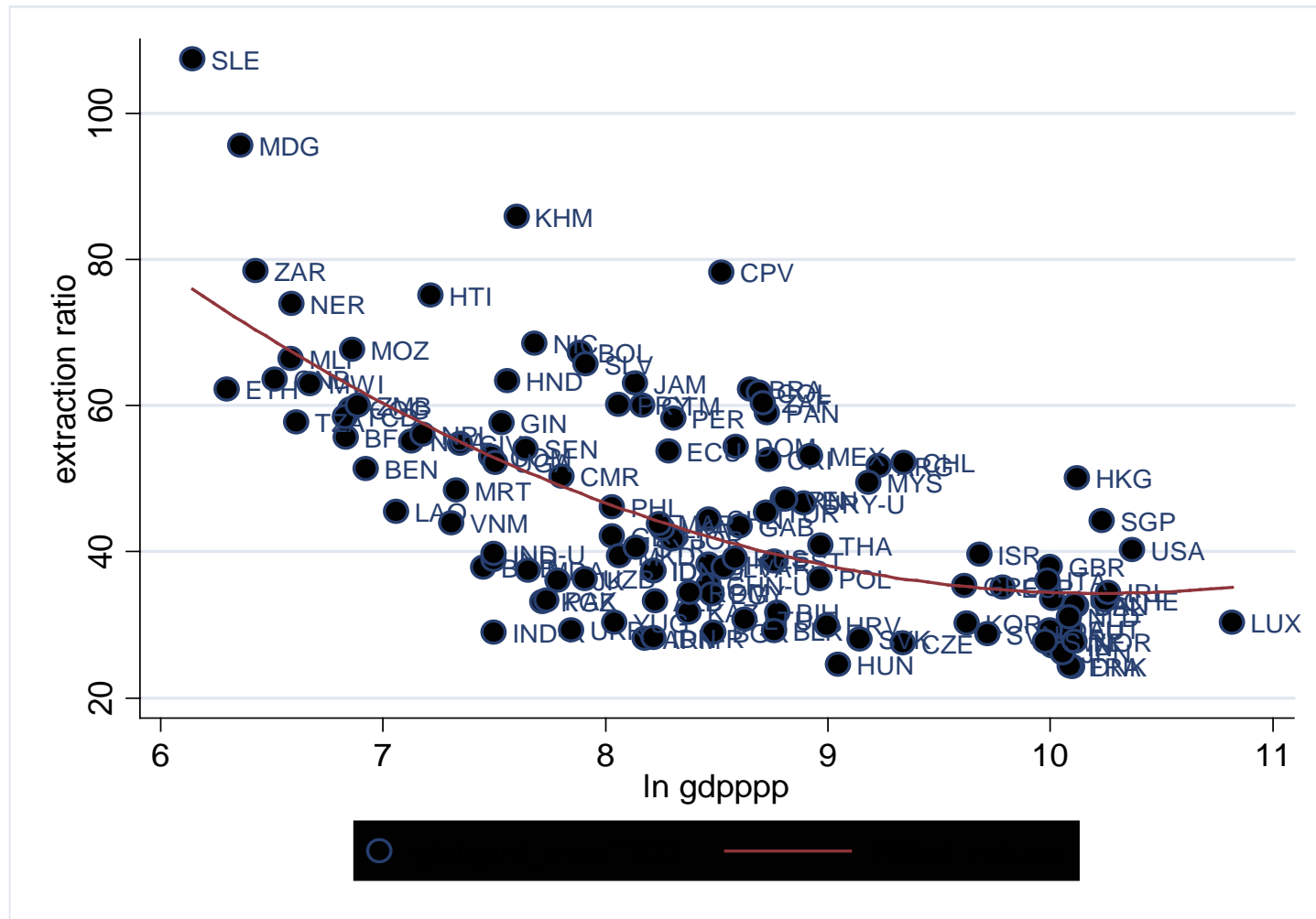
Measured **annual** inequality is not very different in pre-industrial societies today than it was in ancient societies.

The **extraction ratio** – how much of potential inequality was converted into actual – was much bigger in ancient societies.

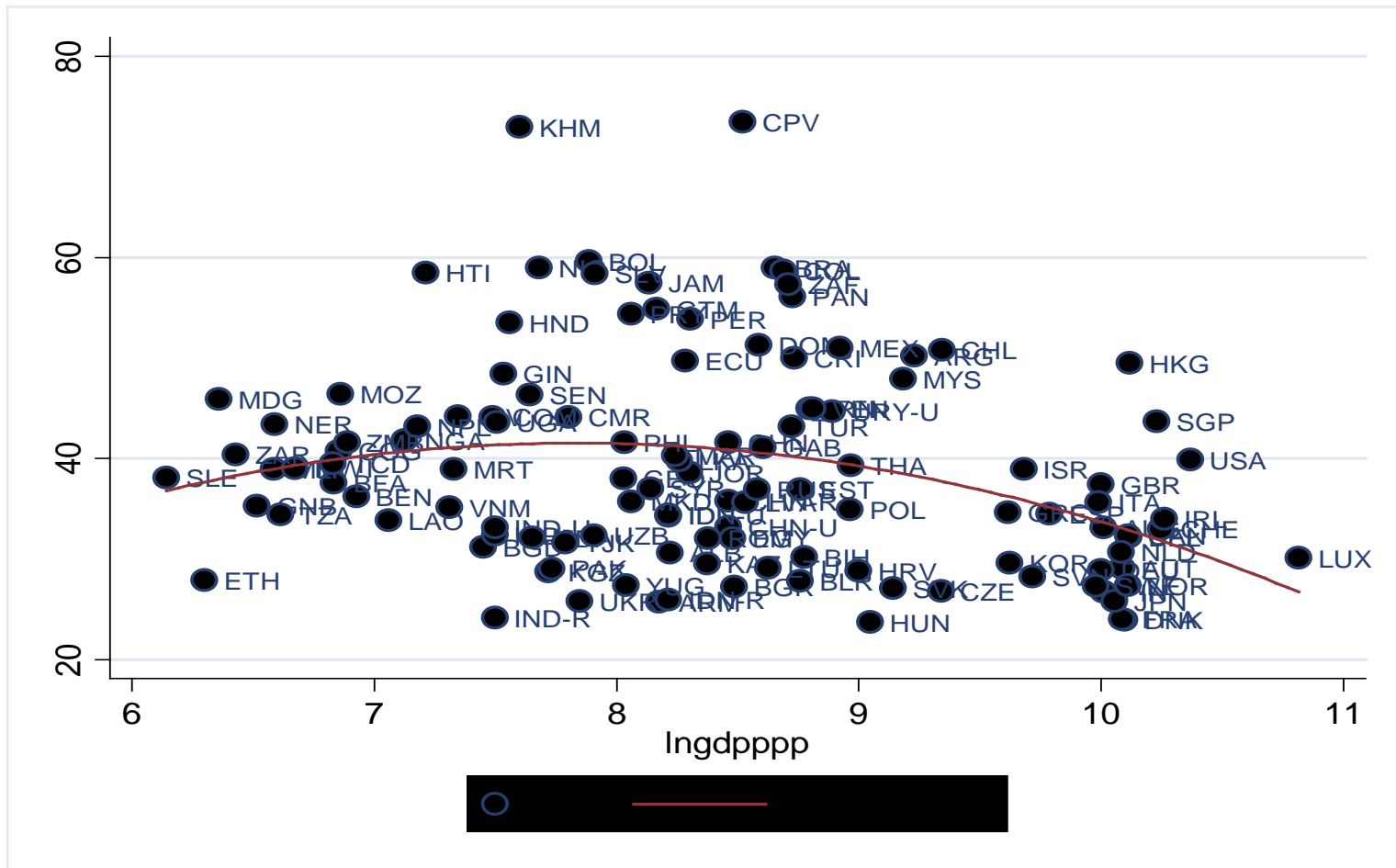
In contrast with modern societies, the top 1% share was not correlated with overall inequality in ancient societies. But the gap between elite or average income and poor people's incomes was highly correlated with overall inequality.

What about the extraction ratio today?

Downside of the 2002 Kuznets Curve



What about the standard Gini Today? The Kuznets Curve Evaporates!



jwilliam@fas.harvard.edu
6426 Social Science

Go Badgers!