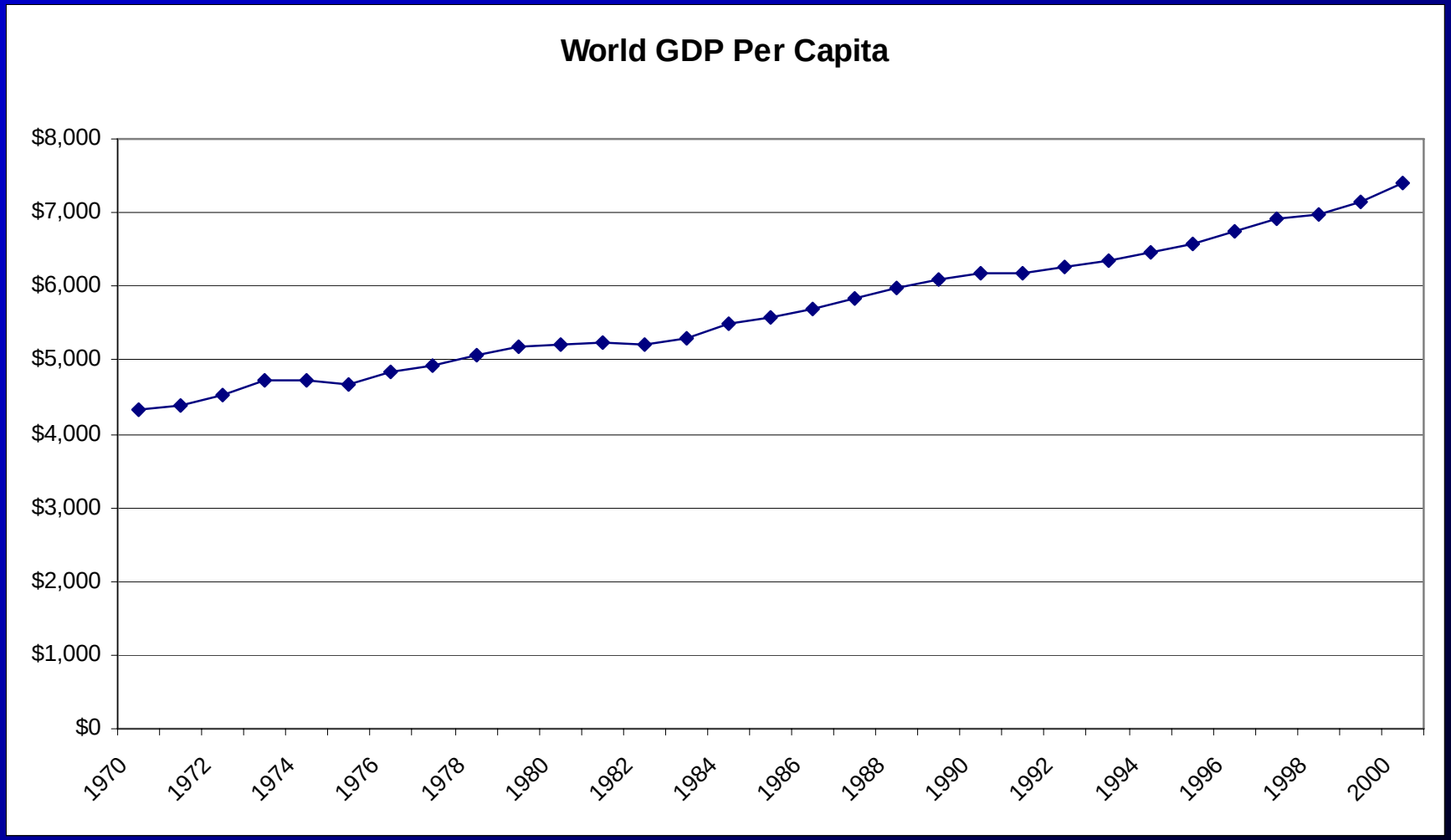
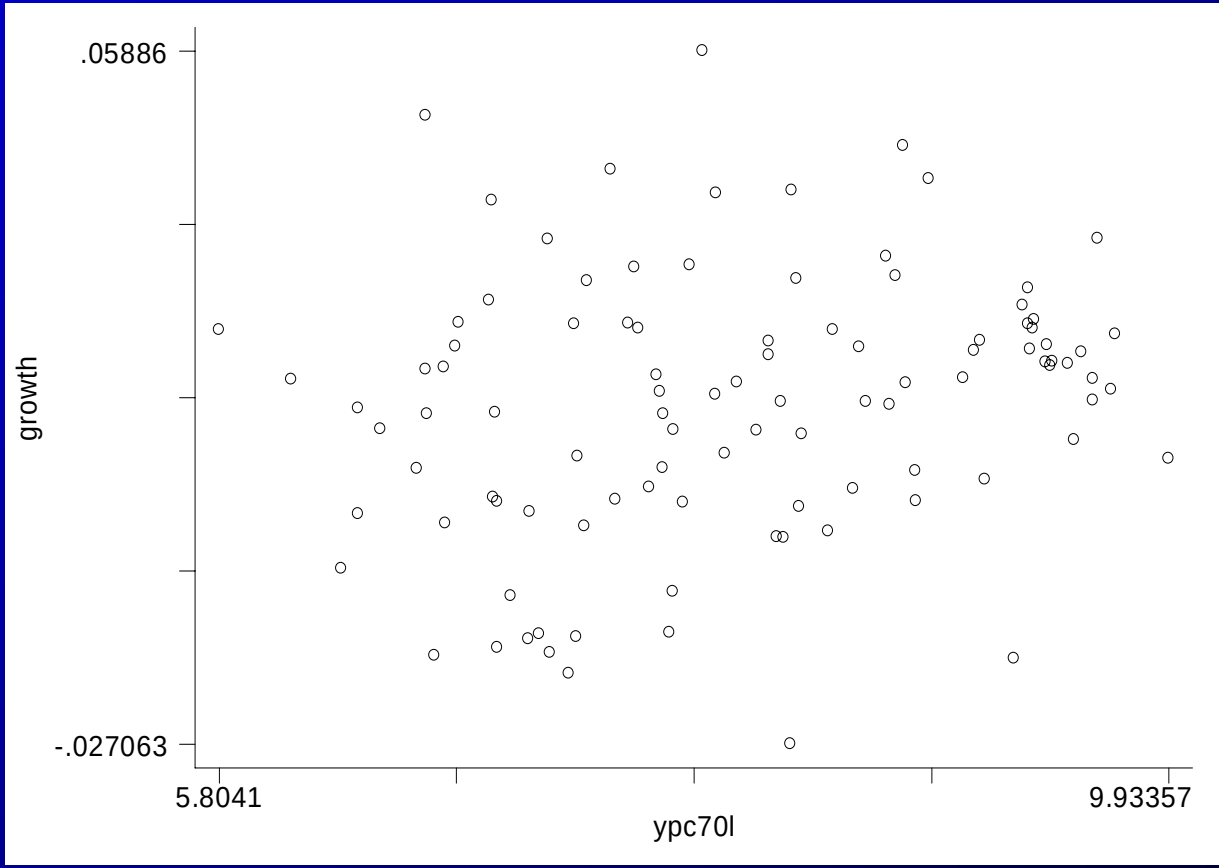
Growth and the World Distribution of Income

By Xavier Sala-i-Martin

GDP Per Capita Since 1970



β-Divergence



☞-Divergence

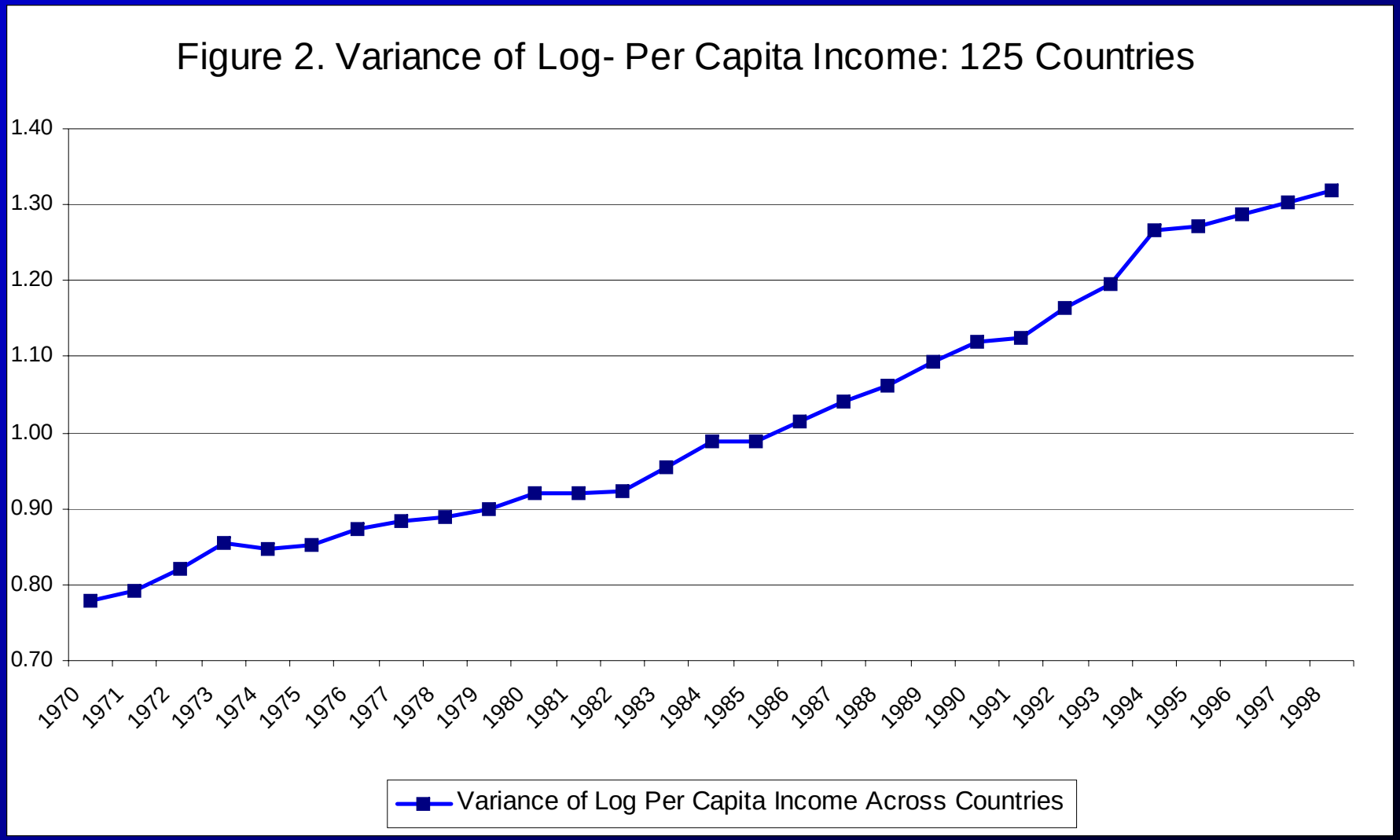
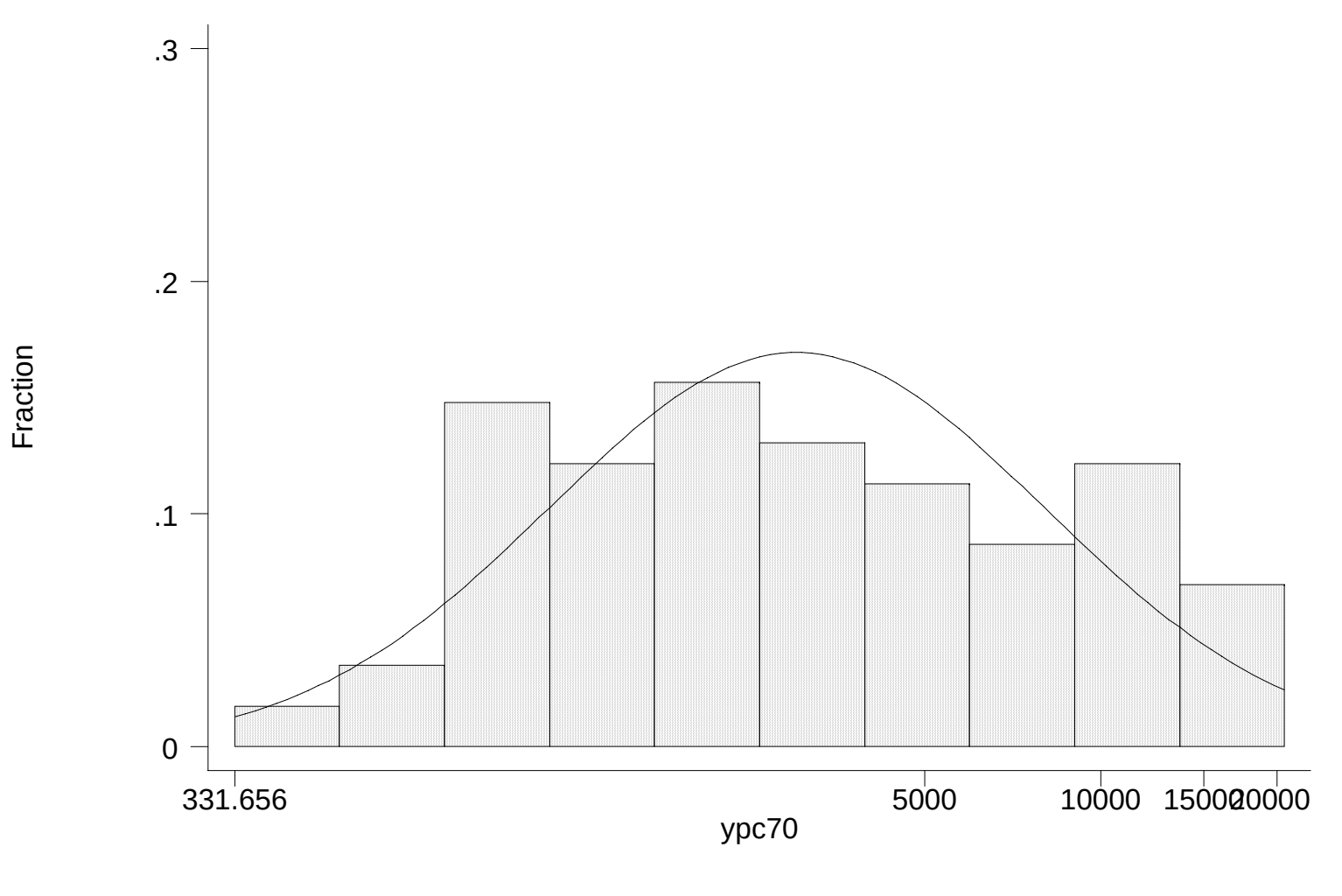


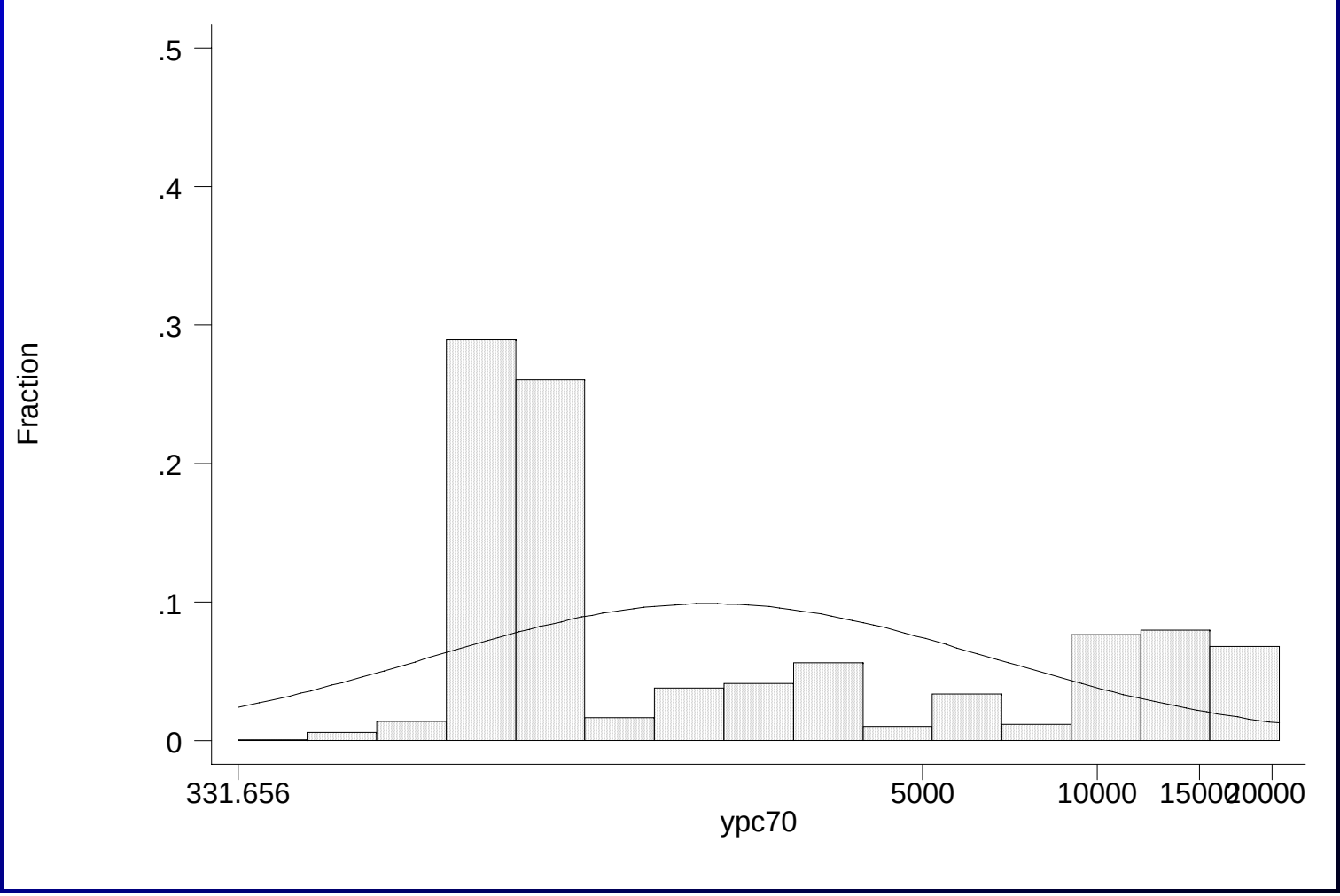
Figure 2. Variance of Log- Per Capita Income: 125 Countries
1.40
1.30
1.20
1.10
1.00
0.90
0.80
0.70
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
Variance of Log Per Capita Income Across Countries

Distribution: Individuals

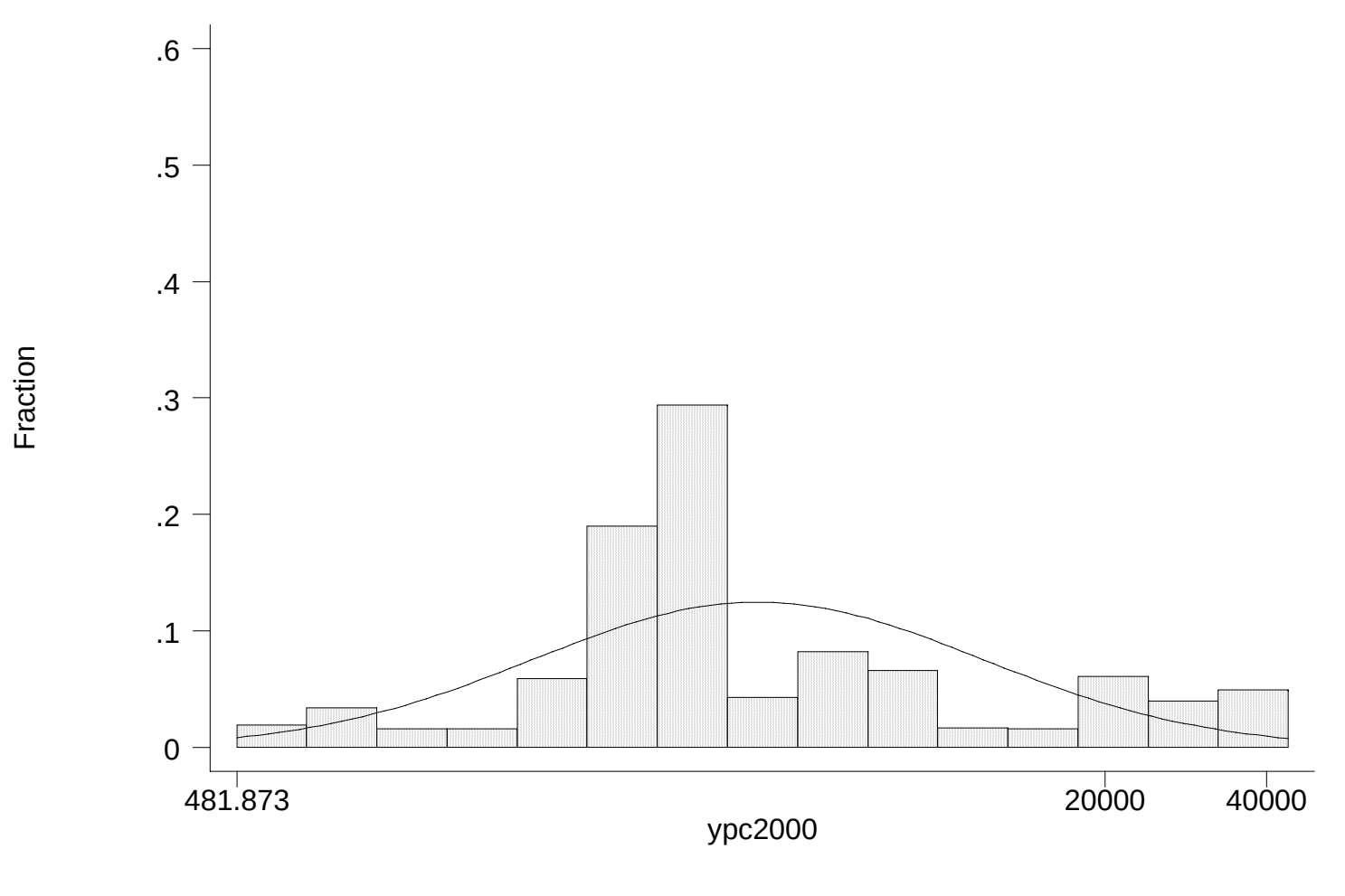
Histogram Income Per Capita (countries)



Histogram: Population Weighted WDI (1970)



Histogram: Population Weighted WDI (2000)



Aggregate Numbers do not show Personal Situation: Need Individual Income Distribution

- Problem: we do not have each person's income
- We have
  - (A) Per Capita GDP (PPP adjusted)
  - (B) Income Shares for some years
- We can combine these two data sources to estimate the WORLD DISTRIBUTION OF INCOME

Method

- Use micro surveys to anchor the dispersion
- Use GDP Per Capita to anchor de MEAN of the distribution.
  - This is subject to CONTROVERSY.

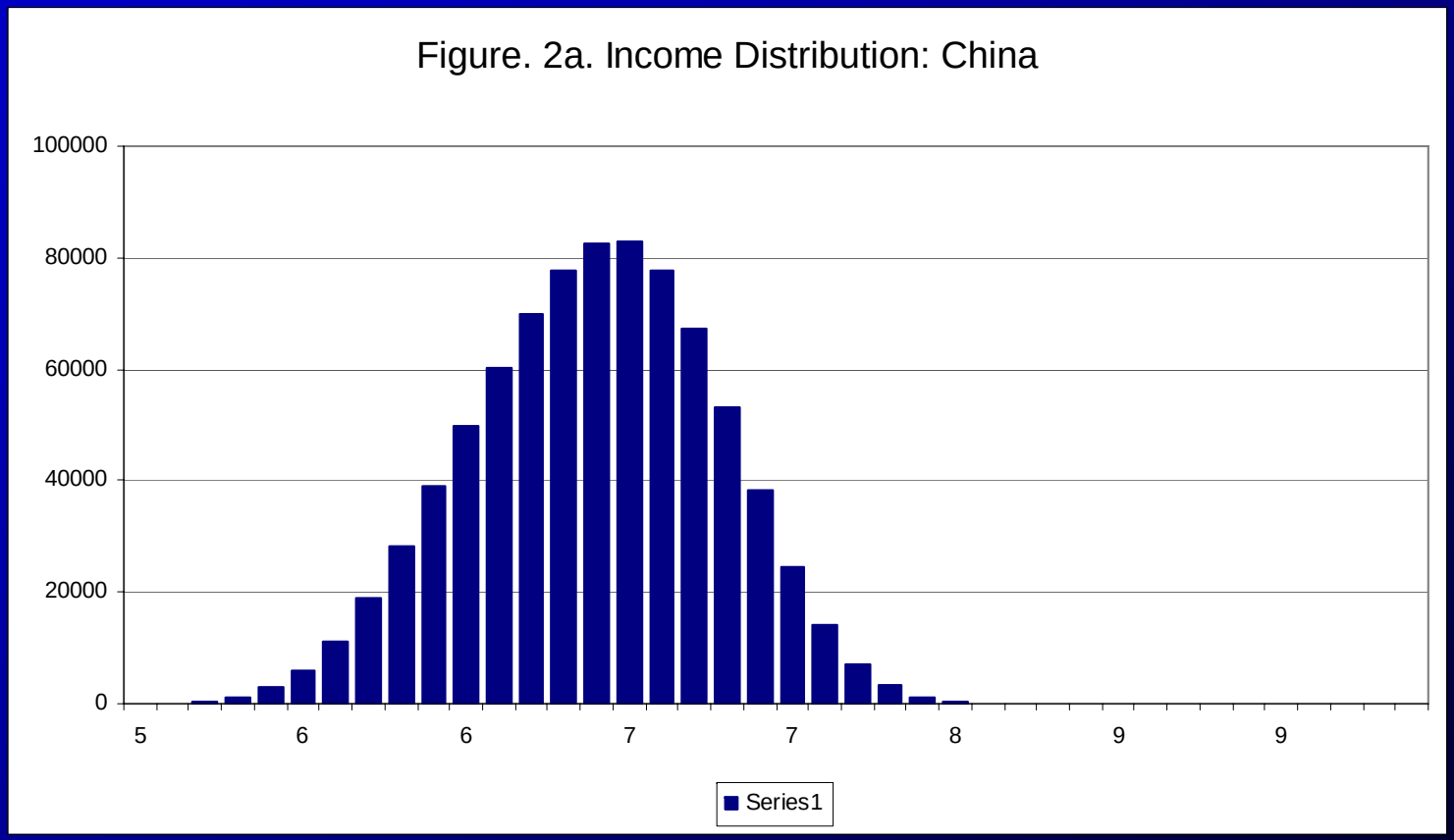
Again: Parametric or Non-Parametric?

- To estimate individual country distributions, we can:
- (A) Assume a functional form (say lognormal), use the variance from surveys and the mean from NA (or from surveys) and estimate the distribution
  - Bhalla (2002) "smooths out" the Lorenz curve using an underlying two-parameter distribution
  - Quah (2002) estimates distribution for India and China for 1988 and 1998 assuming the distributions are log-normal

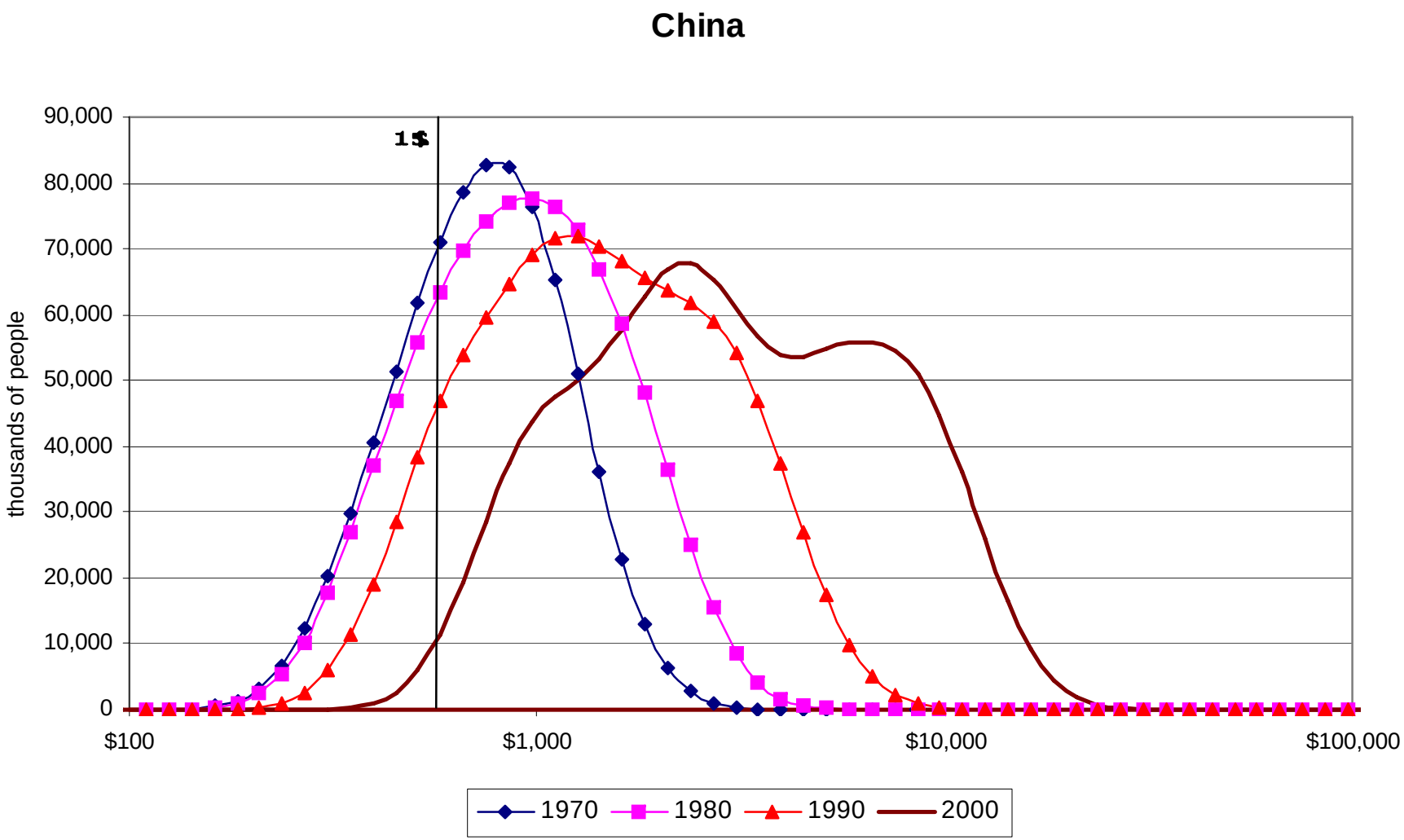
Kernels

- (B) Estimate non-parametric kernels
- Which one is better? I will do both (you will see that the results are quite similar)
- Bandwidth $=w=0.9*sd*(n^{-1/5})$, where *sd* is the standard deviation of (log) income and *n* is the number of observations
- I also used Silverman's optimal bandwidth
- I did allow for a different bandwidth for every country and year and I also forced all to have the same bandwidth. Results largely the same.

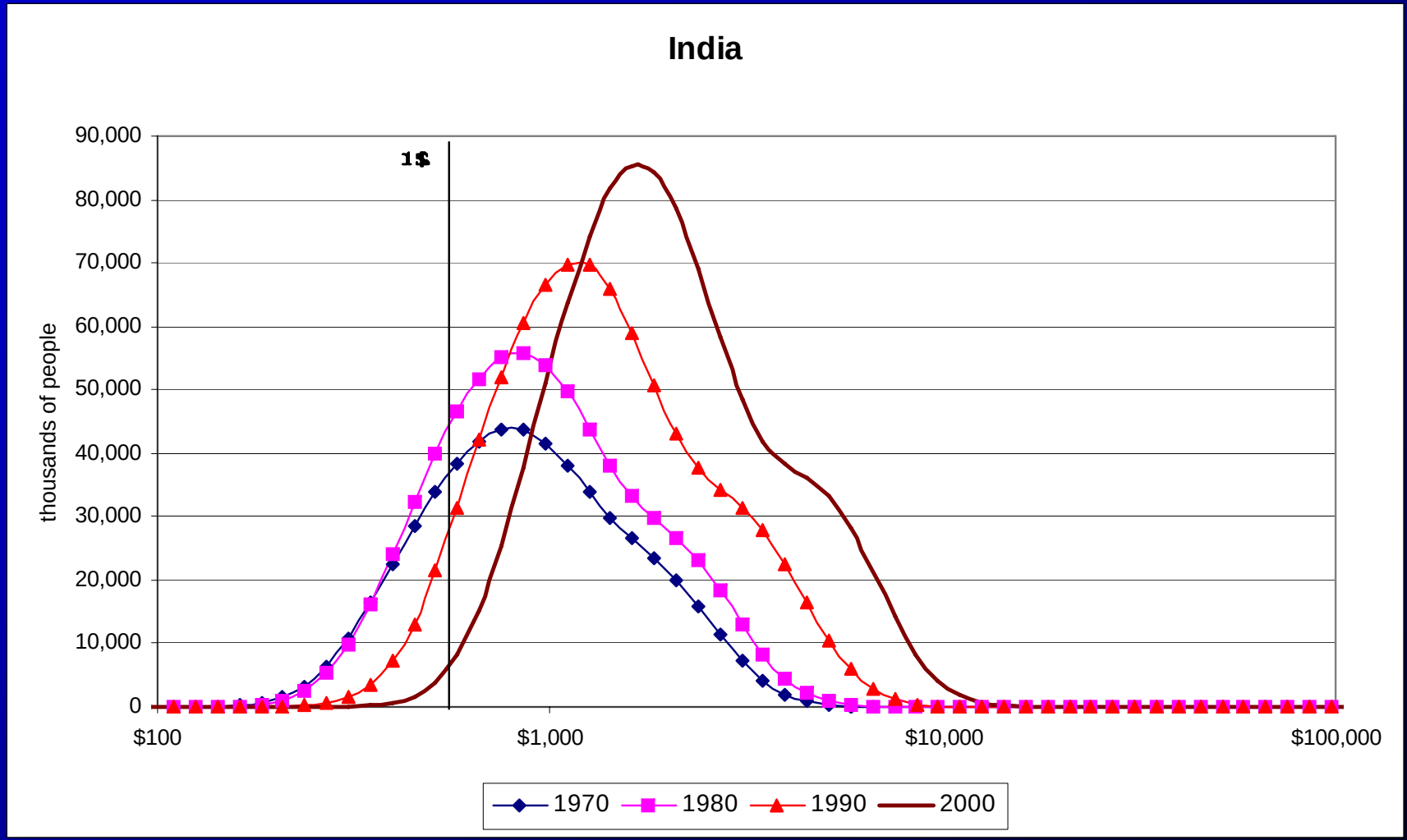
Start with a Histogram



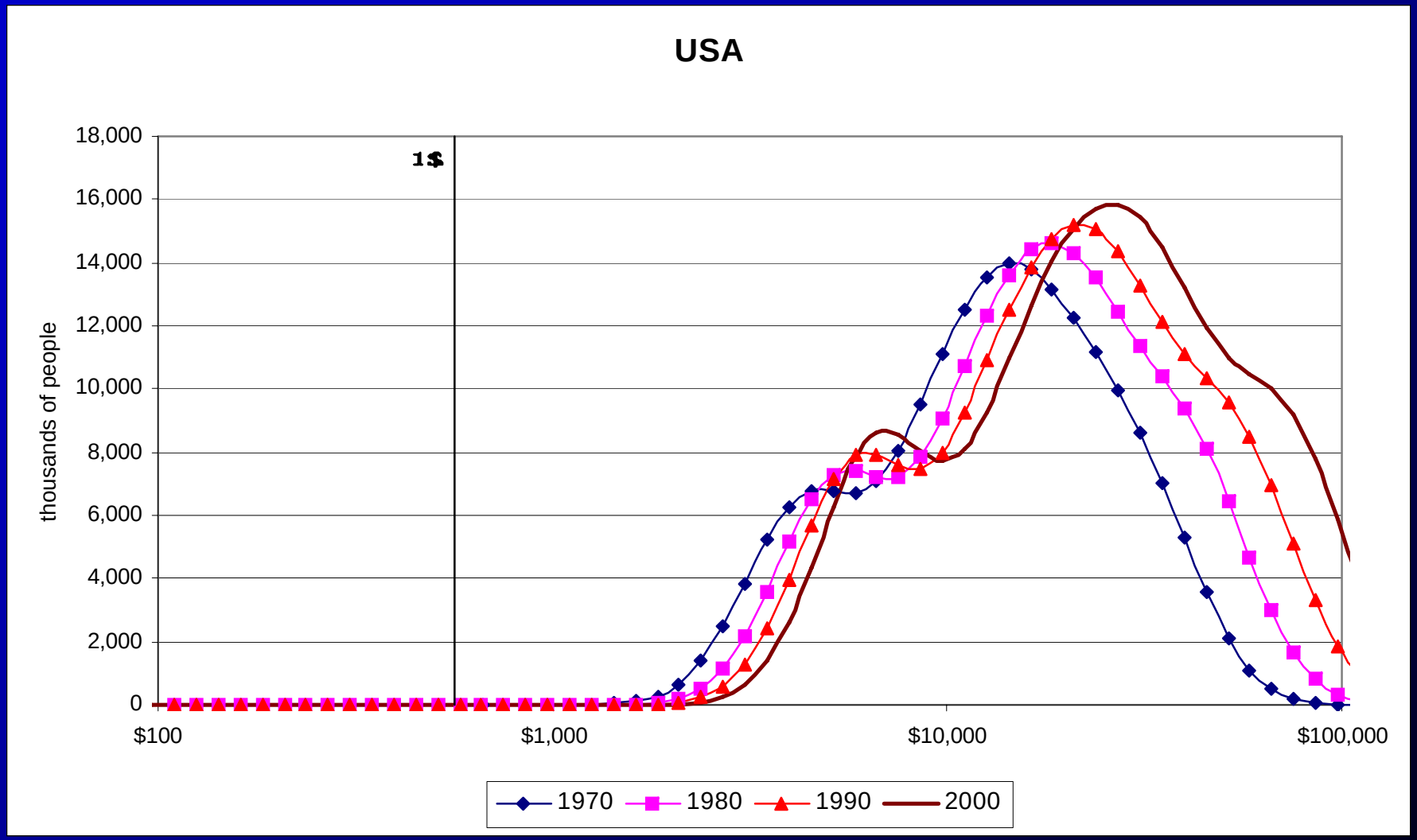
China


China
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
thousands of people
1$
$100
$1,000
$10,000
$100,000
1970
1980
1990
2000

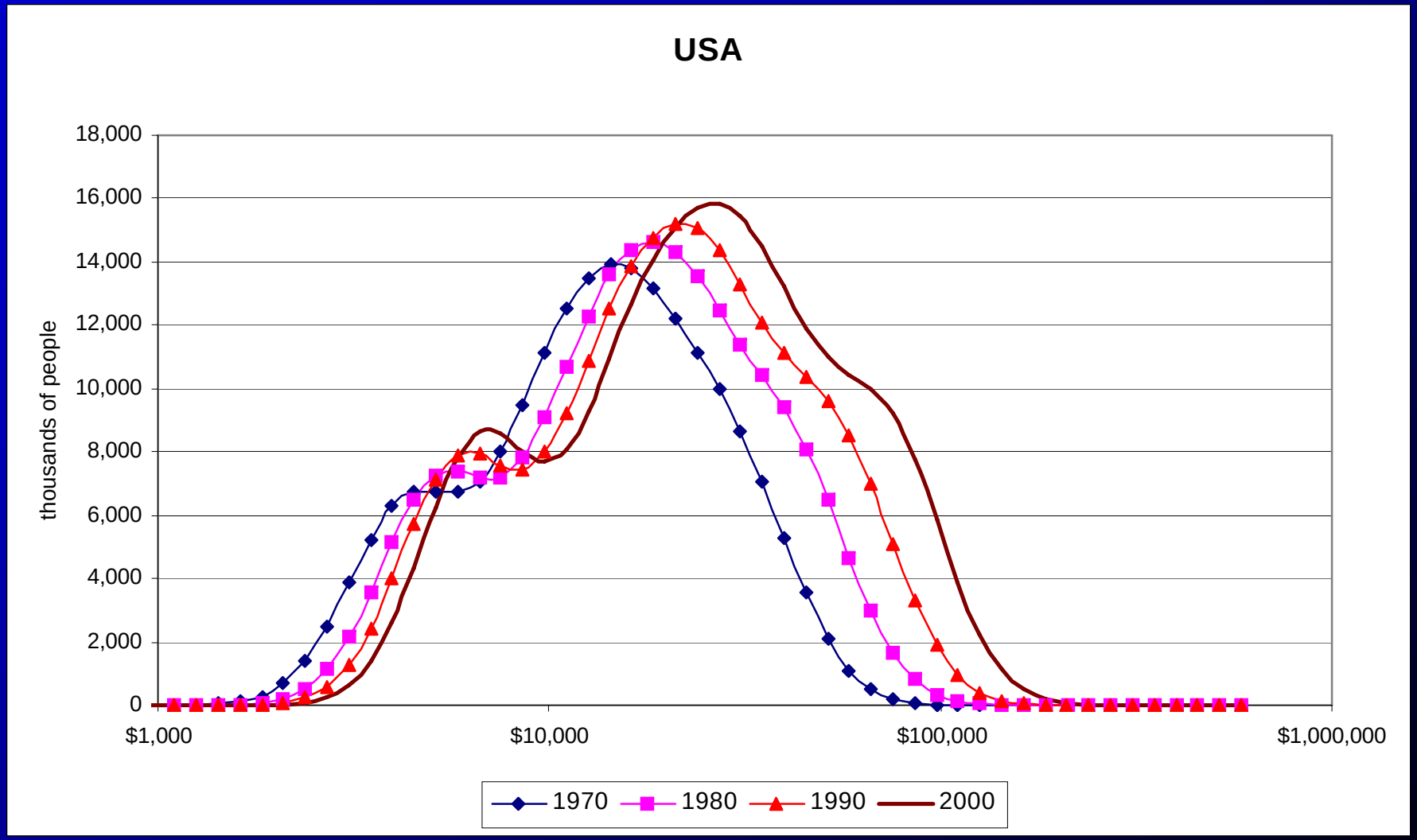
India


India
1$
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
thousands of people
$100
$1,000
$10,000
$100,000
1970
1980
1990
2000

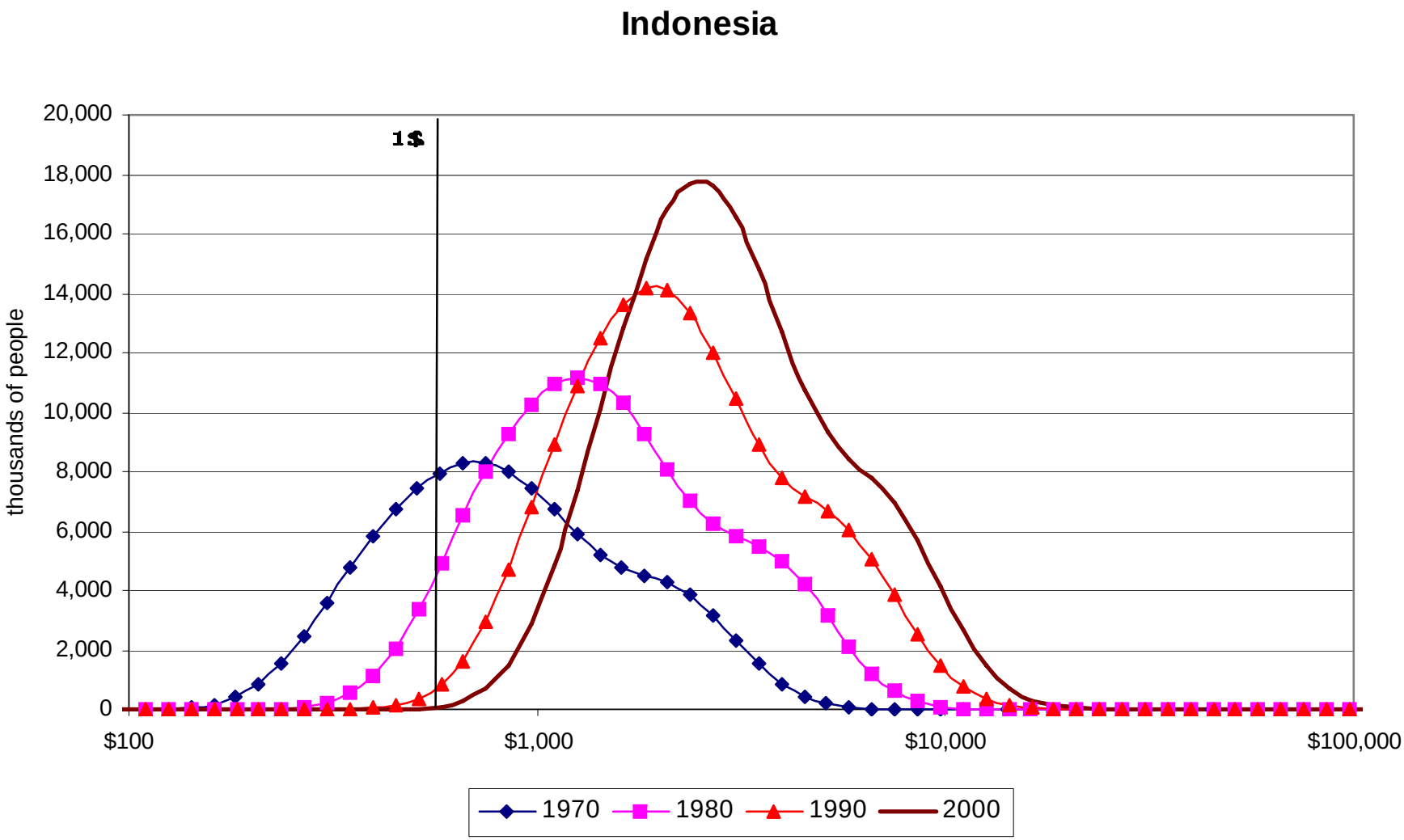
USA


USA
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
thousands of people
1$
$100
$1,000
$10,000
$100,000
1970
1980
1990
2000

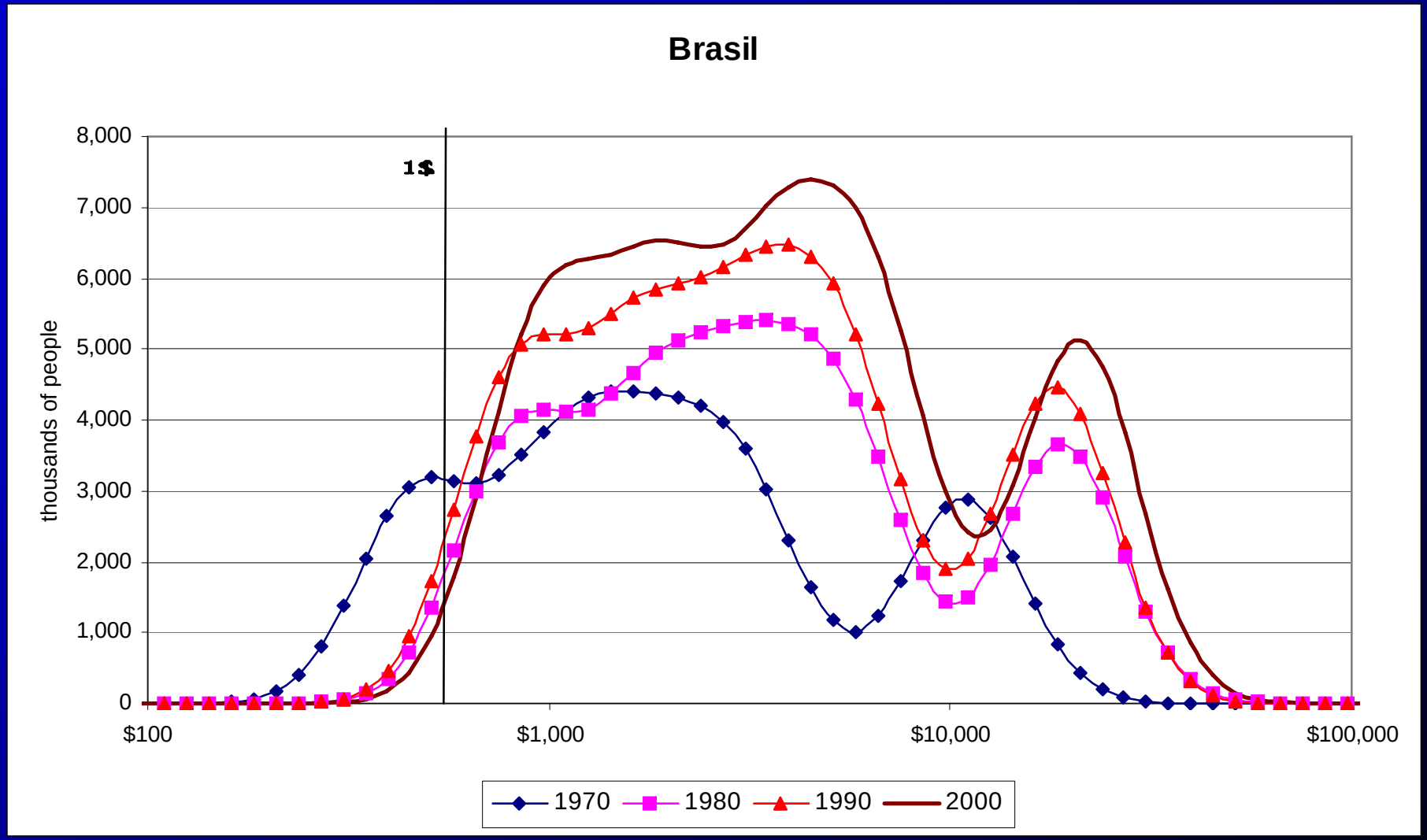
USA (corrected scale)



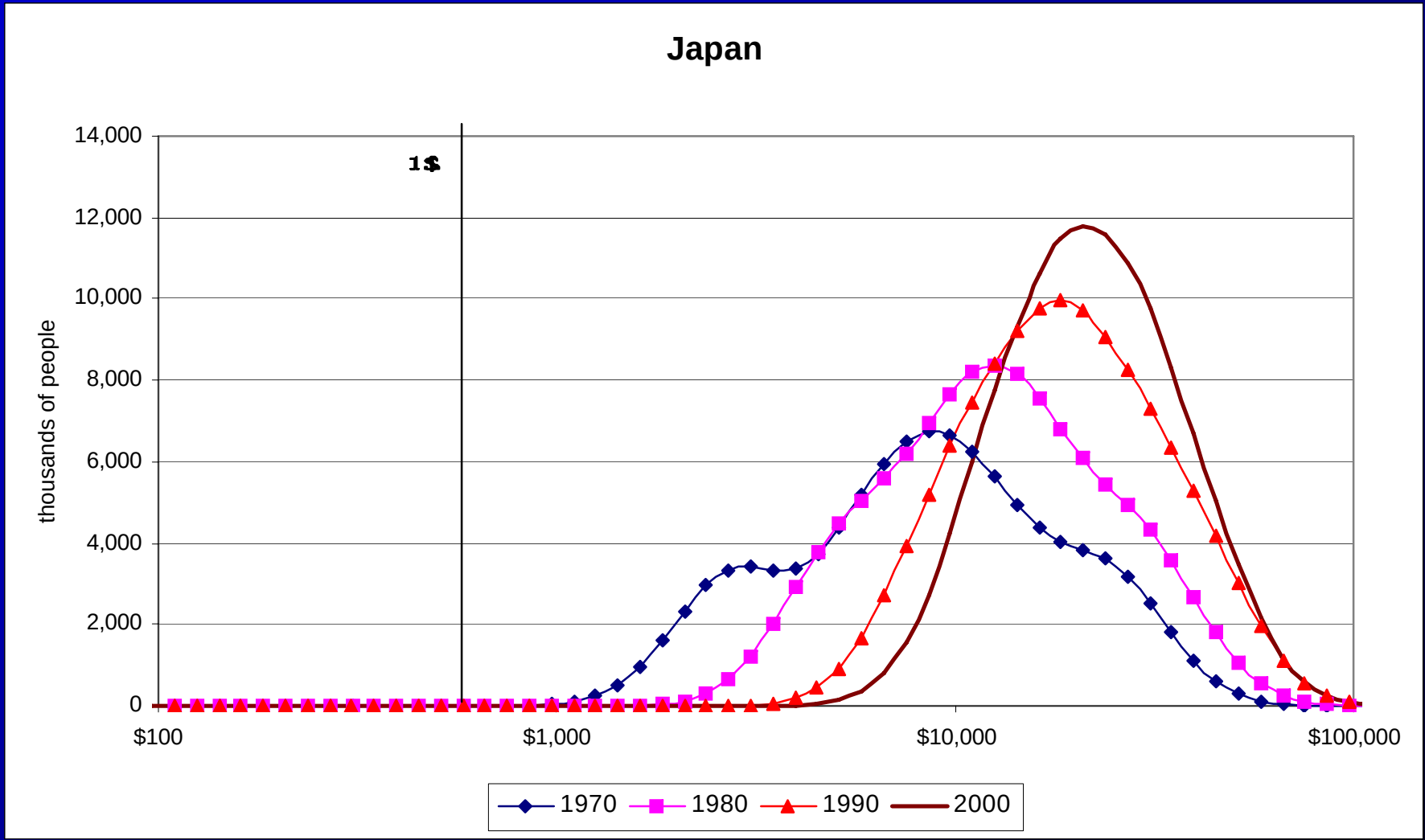
Indonesia


Indonesia
1$
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
thousands of people
$100
$1,000
$10,000
$100,000
1970
1980
1990
2000

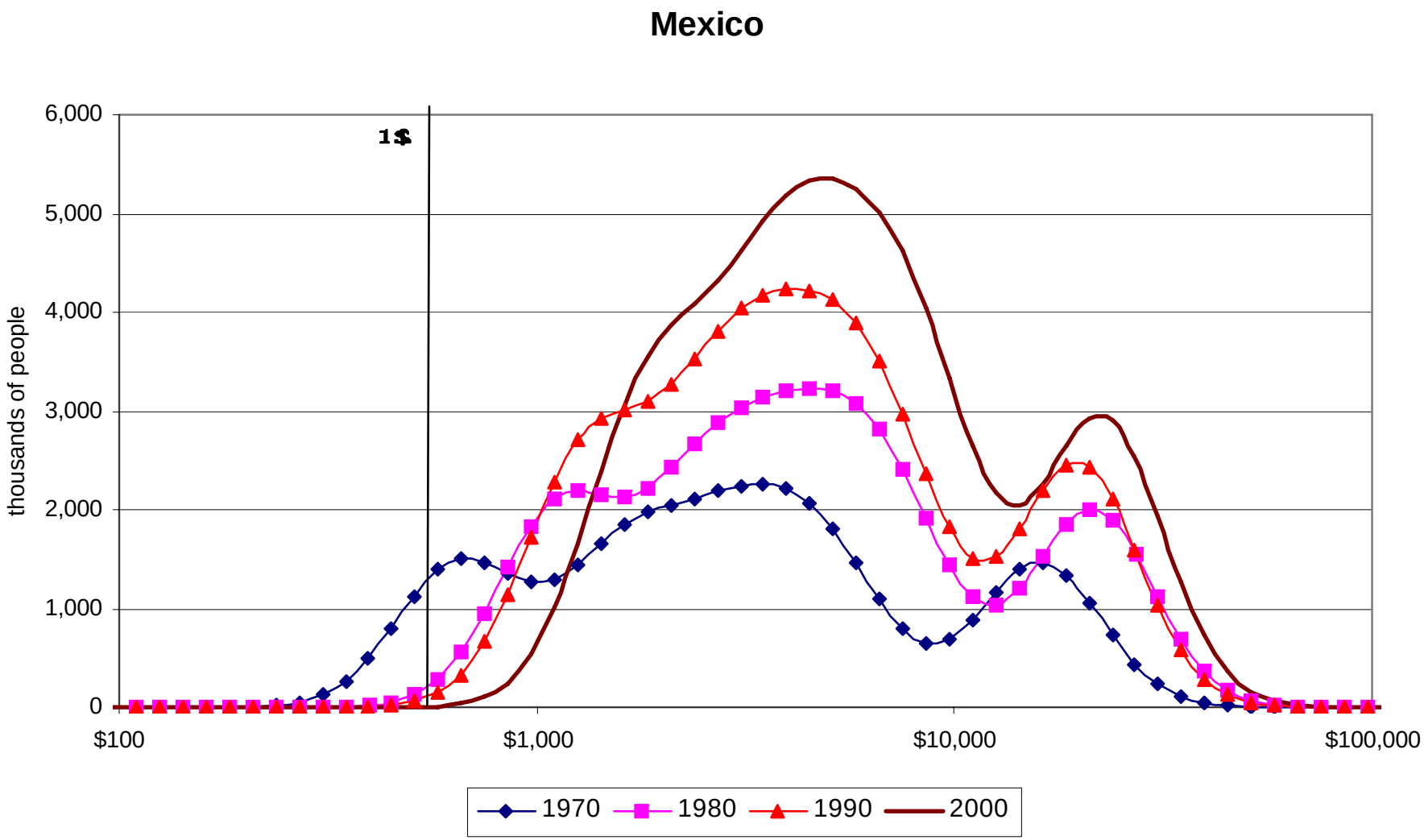
Brazil


Brasil
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
thousands of people
1$
$100
$1,000
$10,000
$100,000
1970
1980
1990
2000

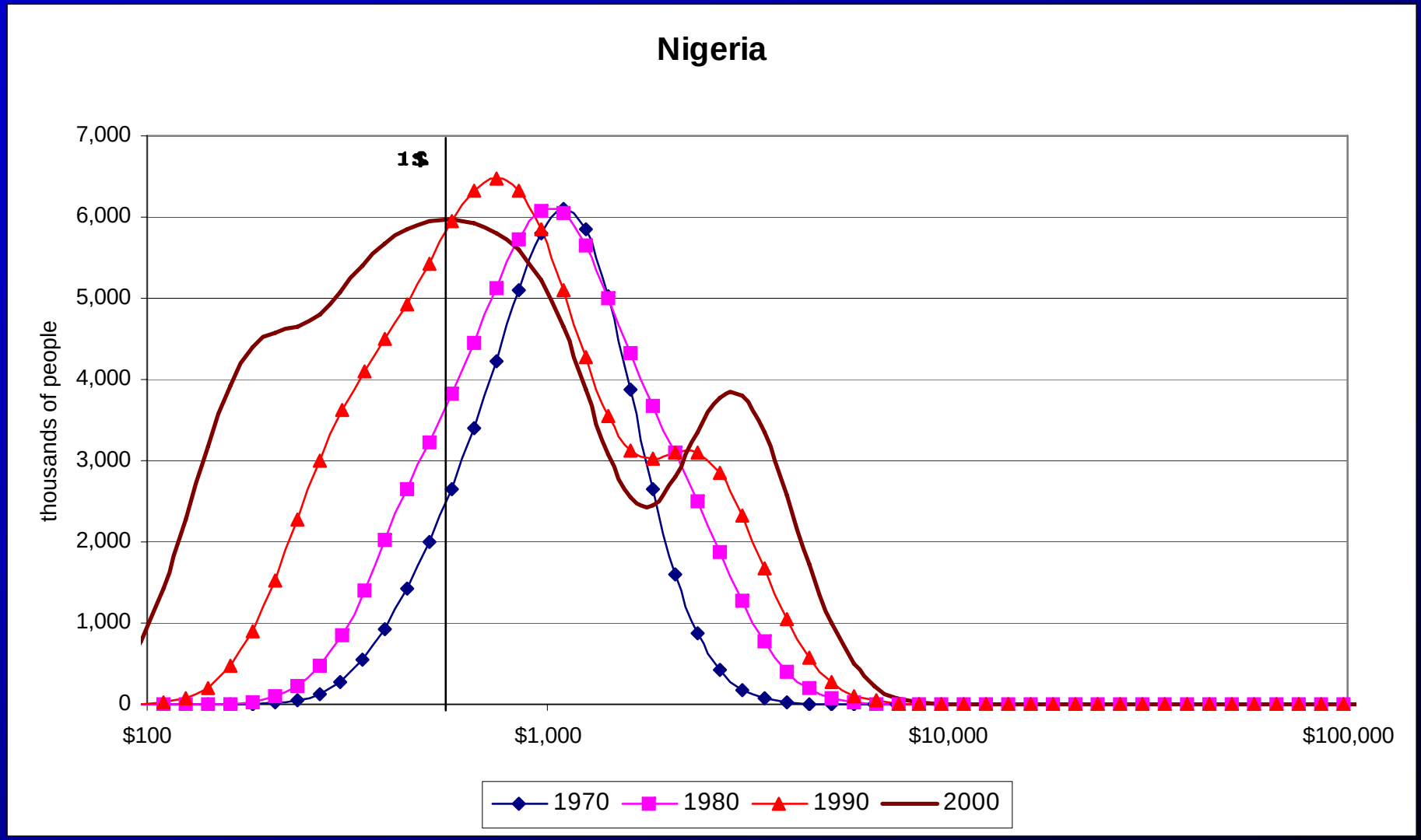
Japan


Japan
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
thousands of people
1$
$100
$1,000
$10,000
$100,000
1970
1980
1990
2000

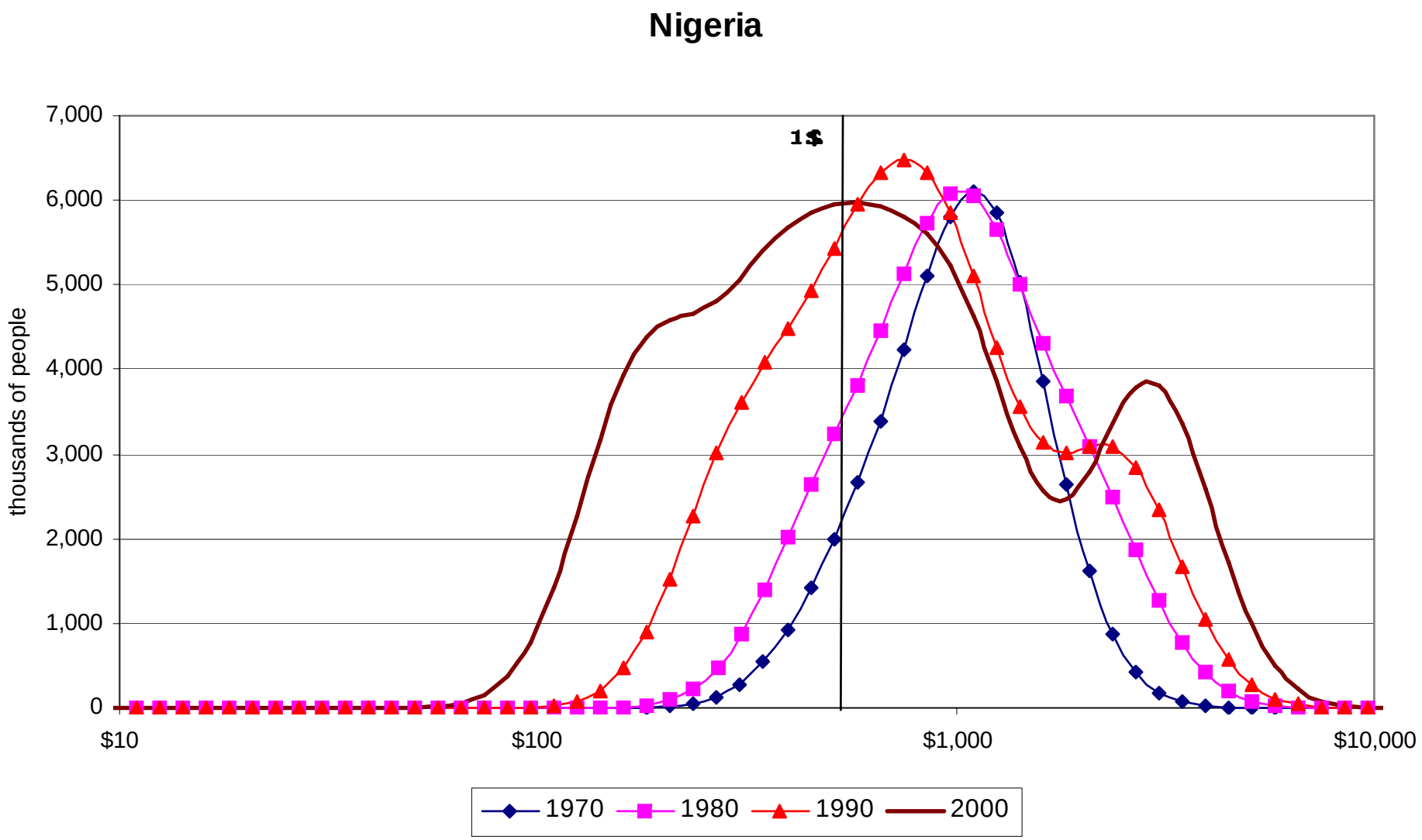
Mexico


Mexico
1$
6,000
5,000
4,000
3,000
2,000
1,000
0
thousands of people
$100
$1,000
$10,000
$100,000
1970
1980
1990
2000

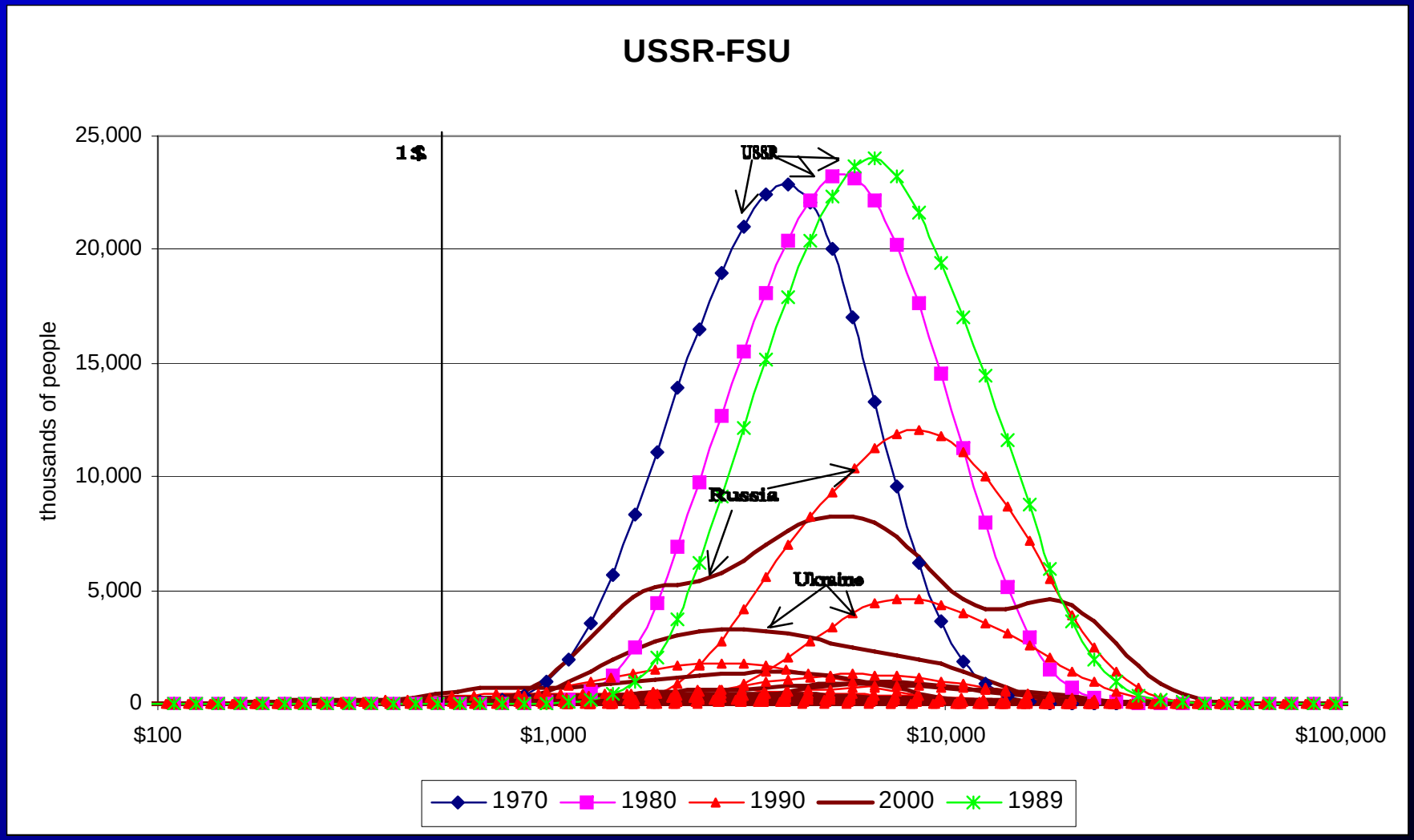
Nigeria


Nigeria
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
thousands of people
1$
$100
$1,000
$10,000
$100,000
1970
1980
1990
2000

Nigeria (corrected scale)



The Collapse of the Soviet Union



USSR and FSU

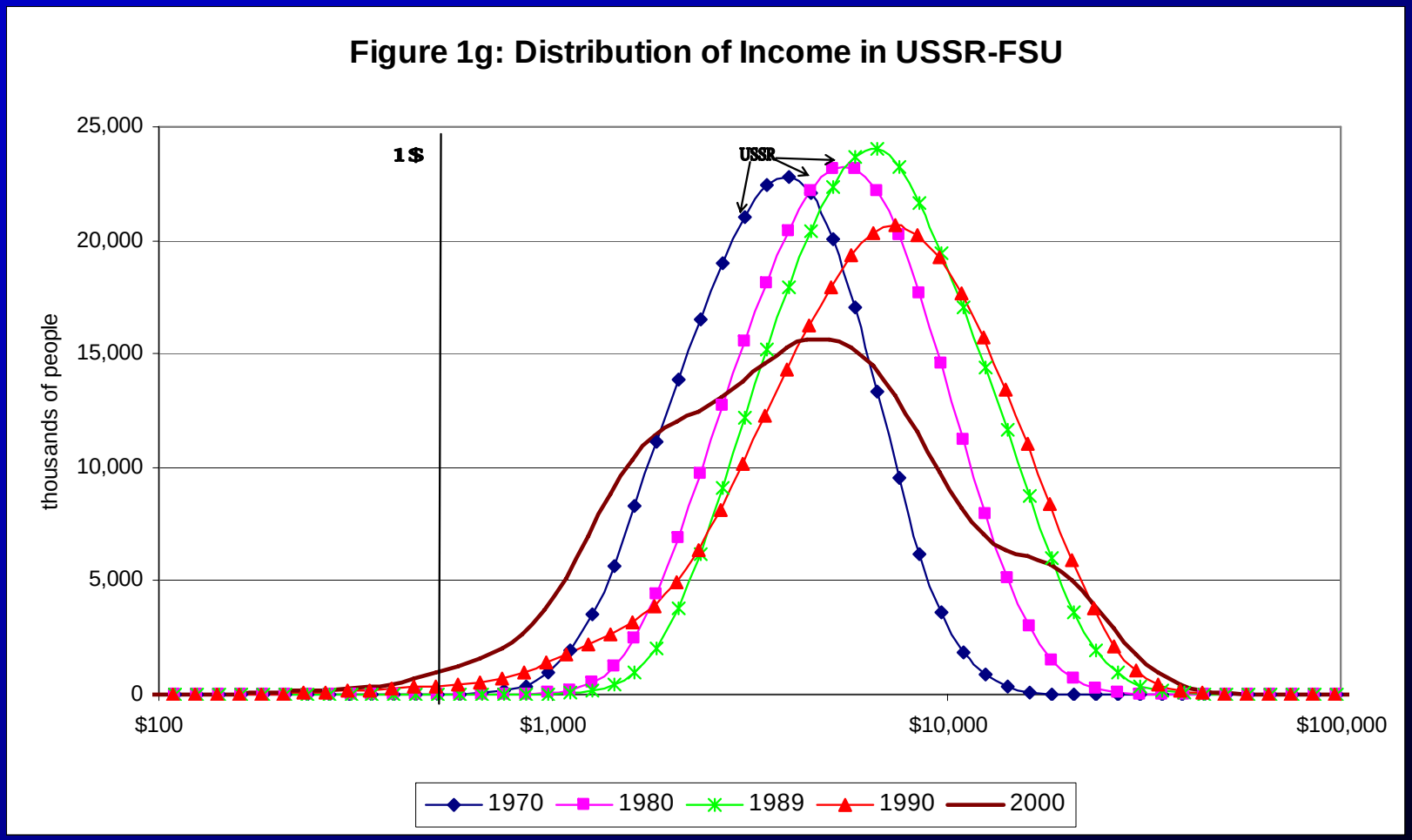
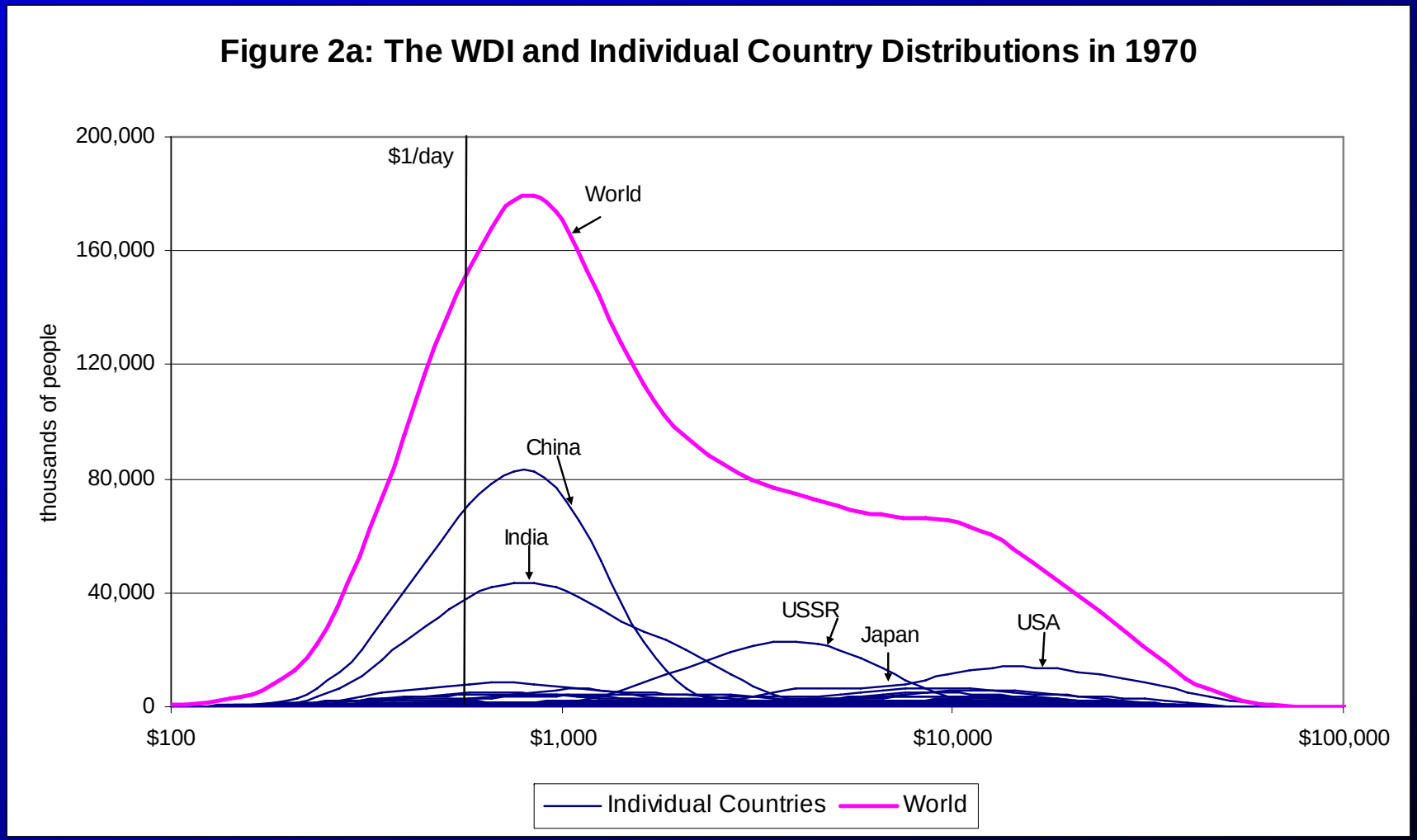
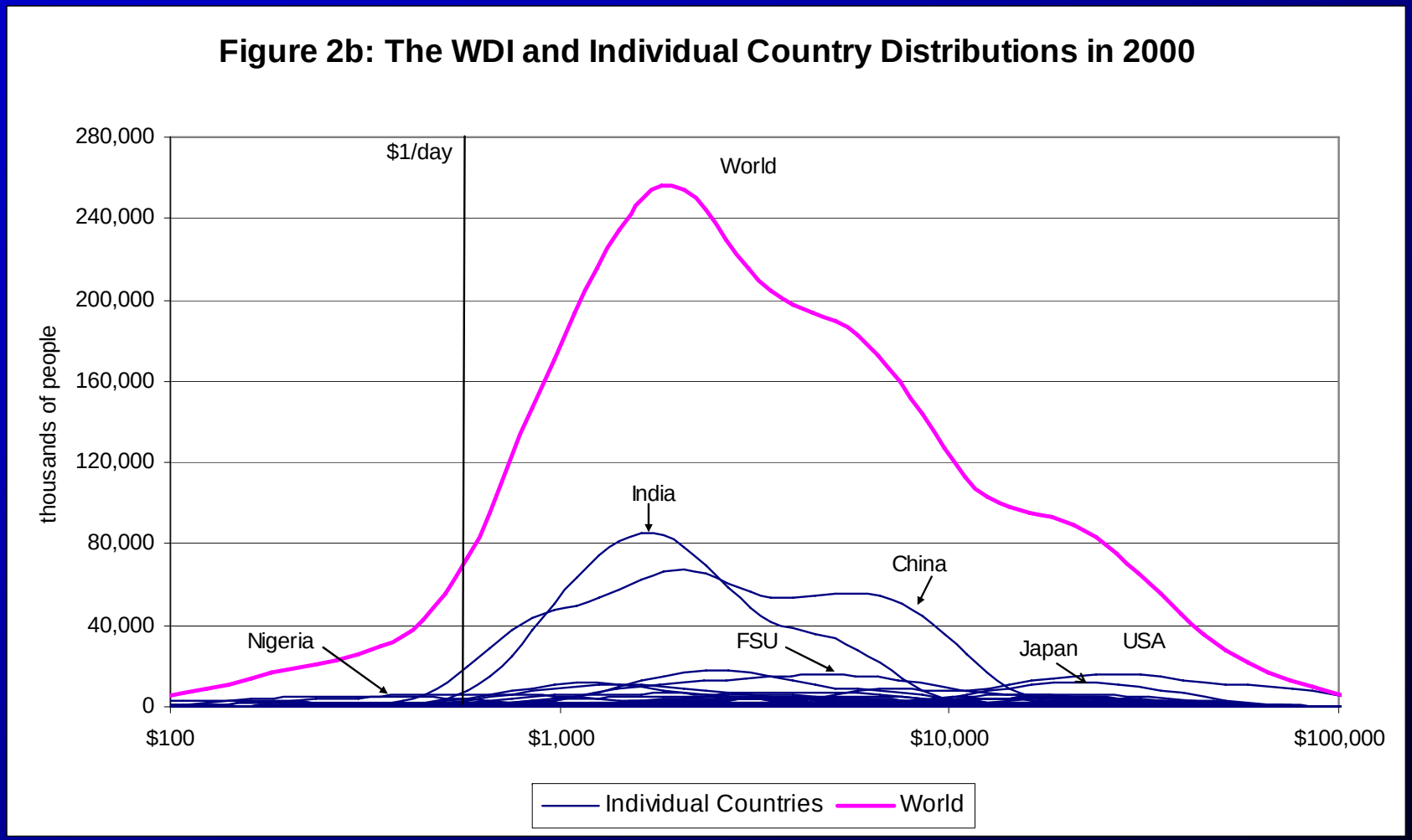


Figure 1g: Distribution of Income in USSR-FSU
25,000
20,000
15,000
10,000
5,000
0
thousands of people
1$
USSR
$100
$1,000
$10,000
$100,000
1970
1980
1989
1990
2000

World Distribution 1970

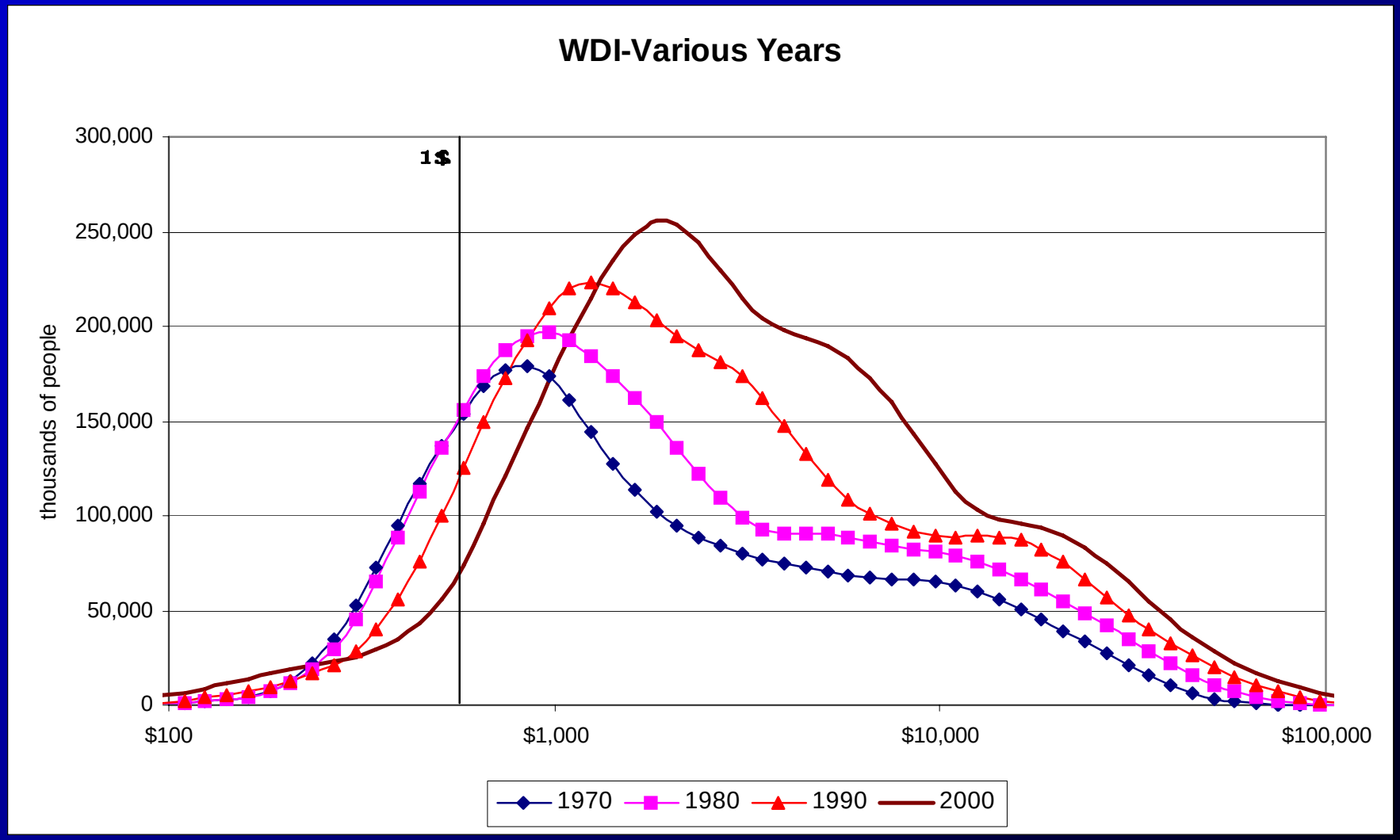


World Distribution 2000



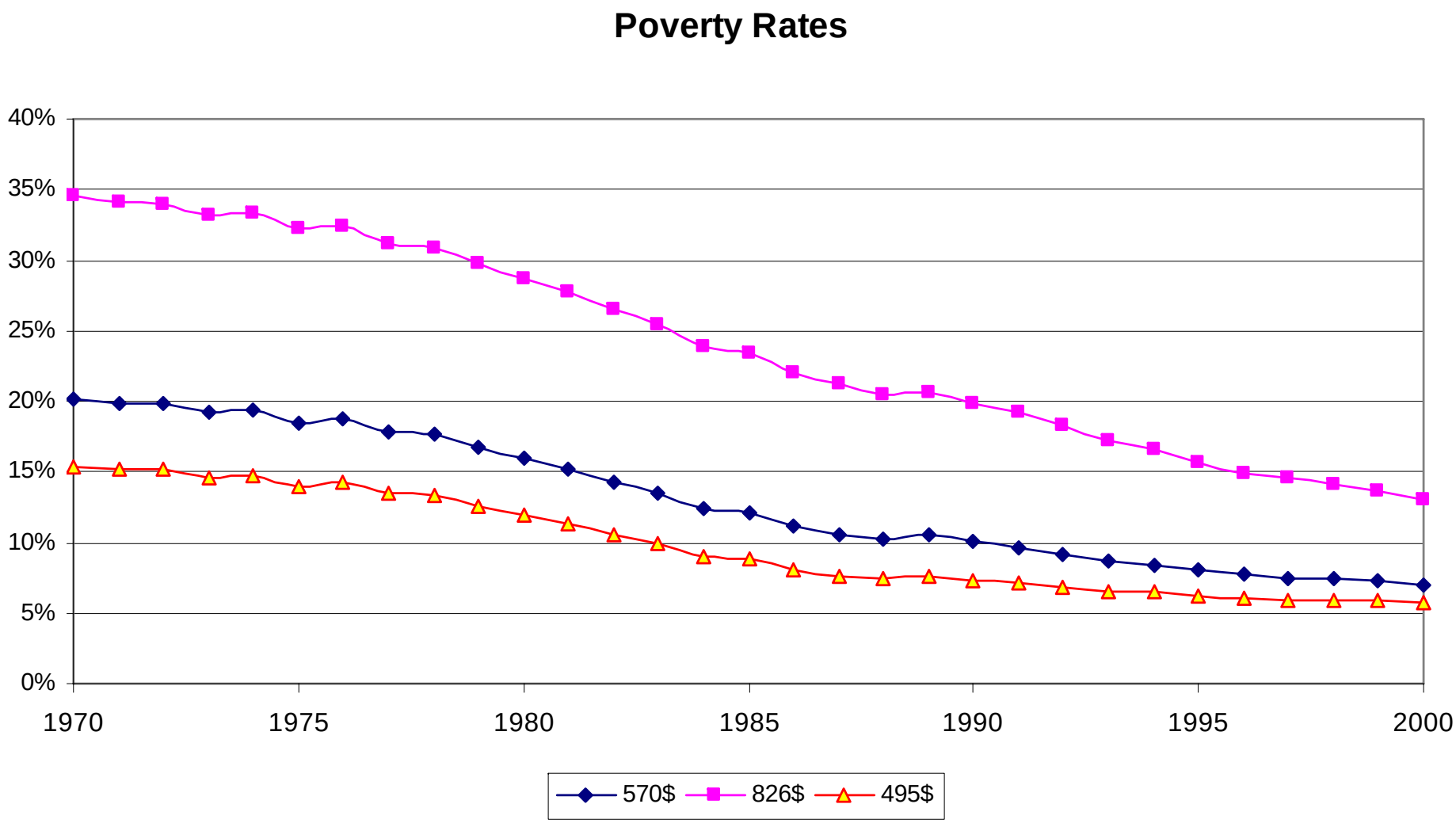
See Graph

World Distribution Over Time

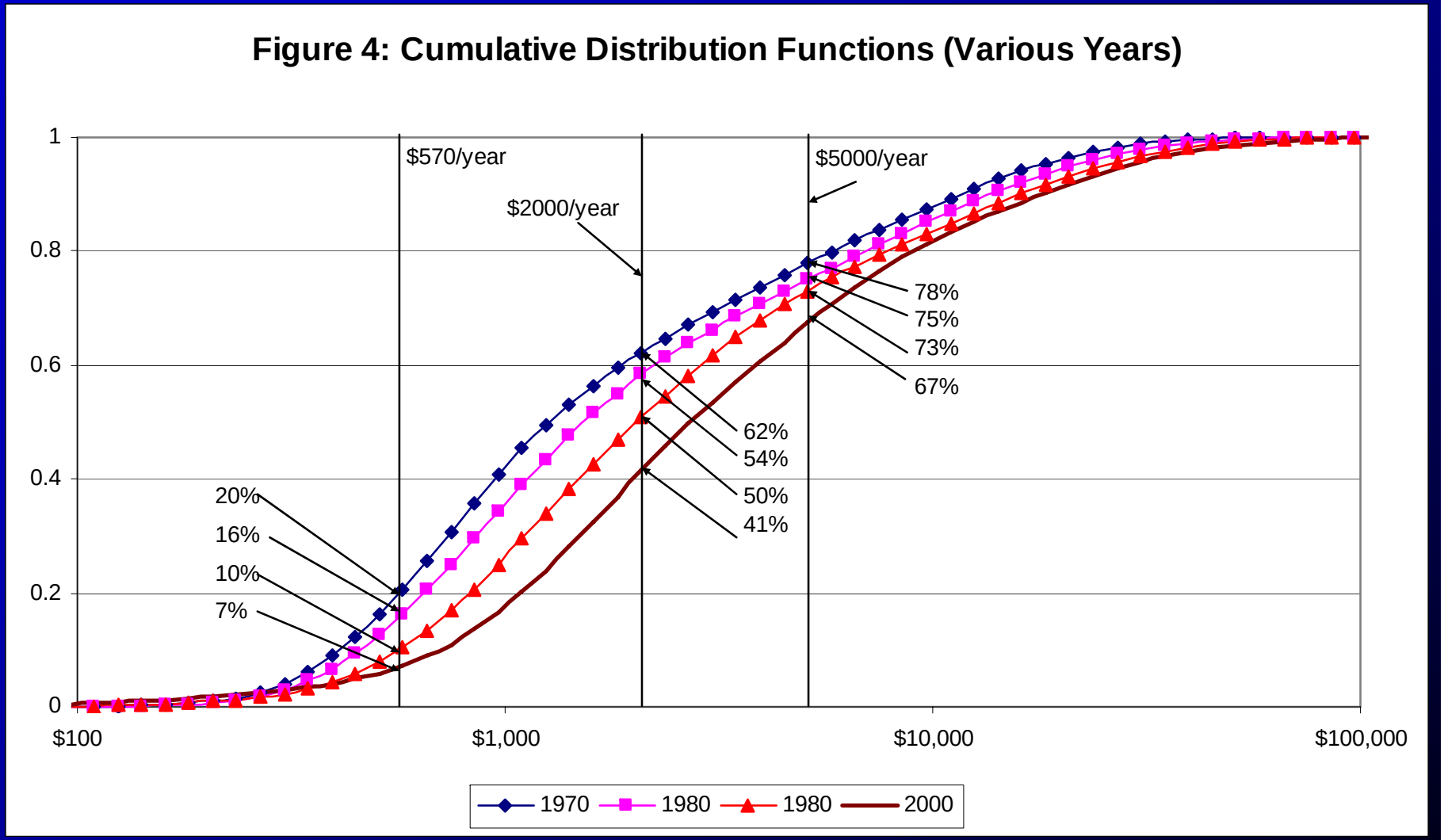


Poverty

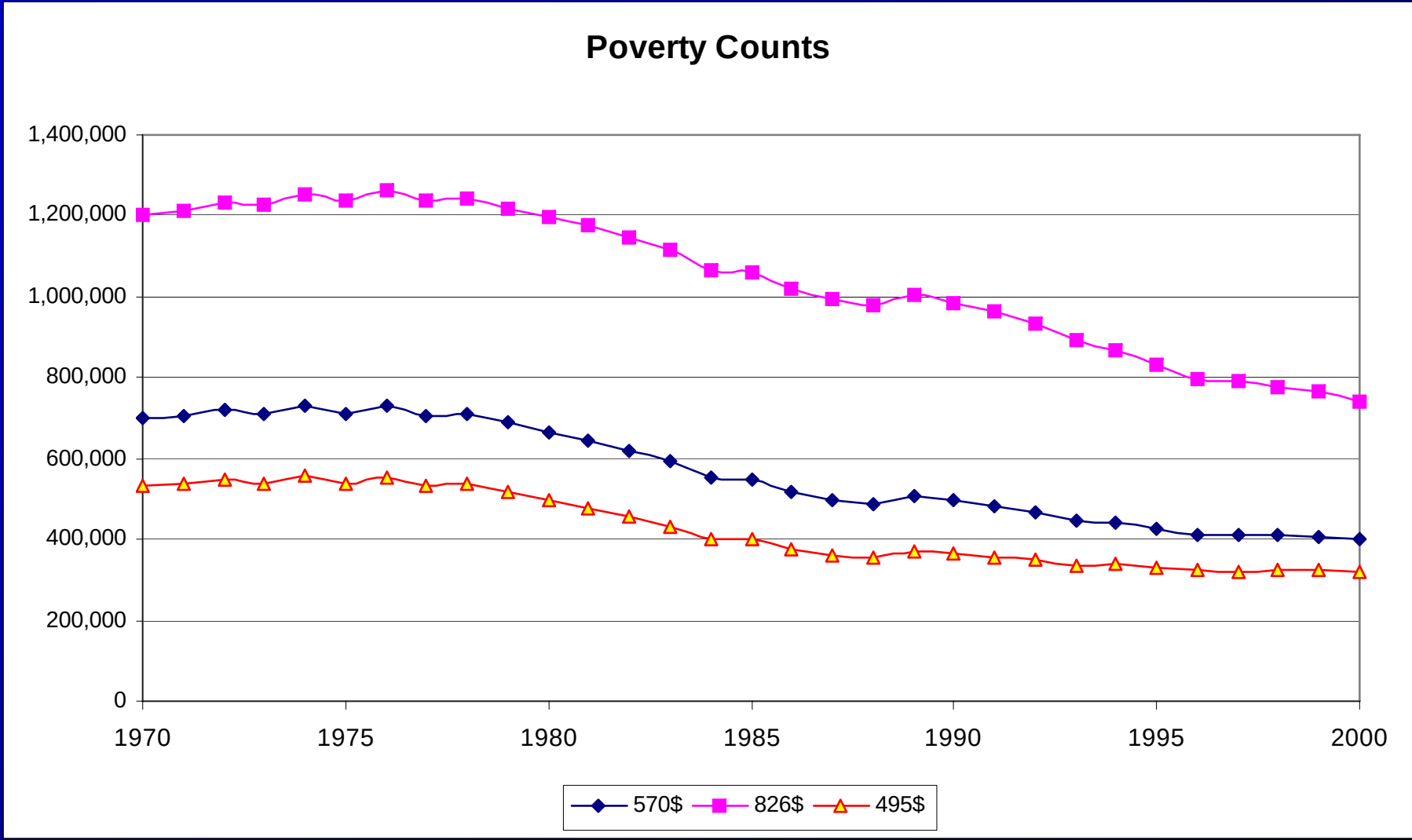
Poverty Rates



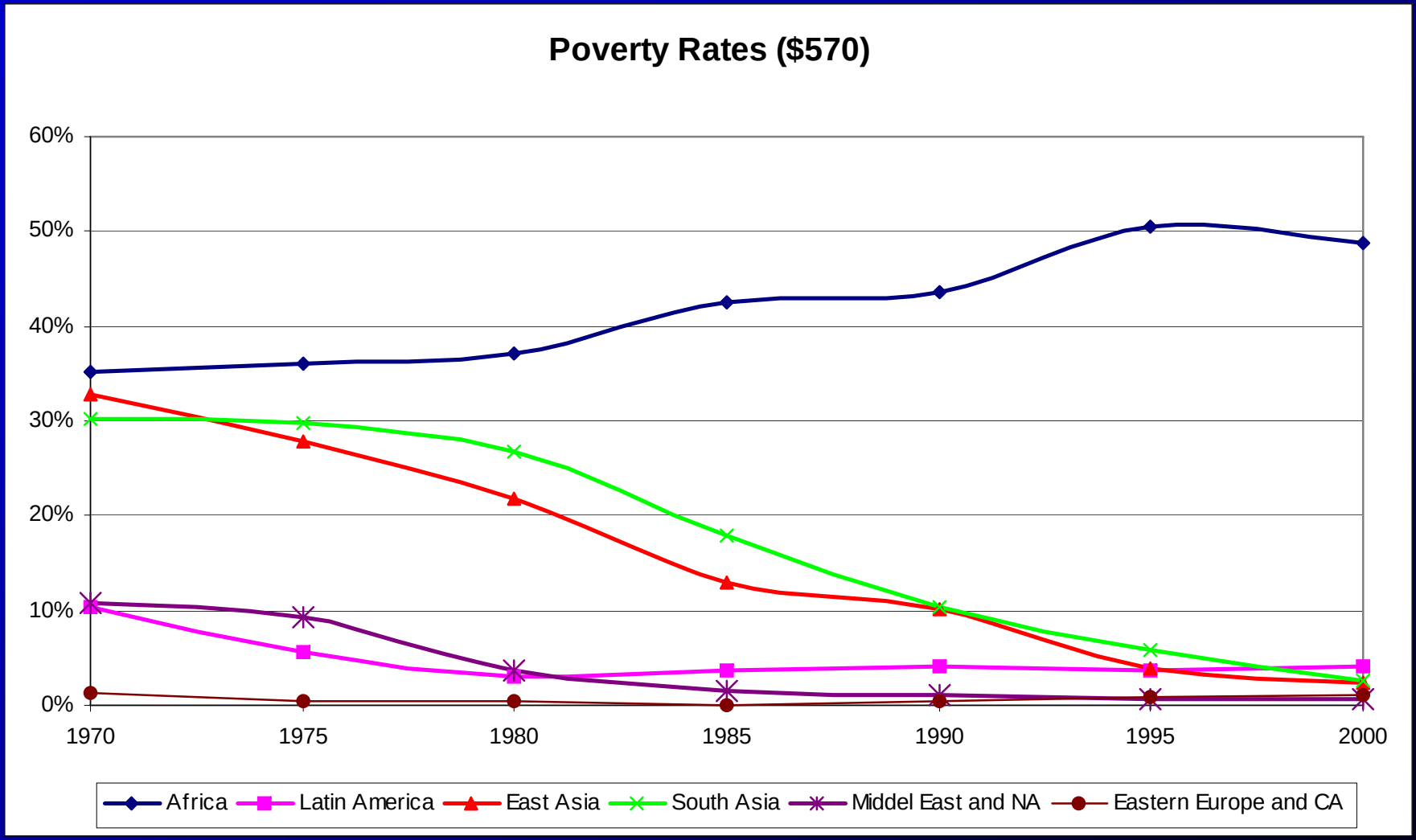
Cumulative Distribution Function



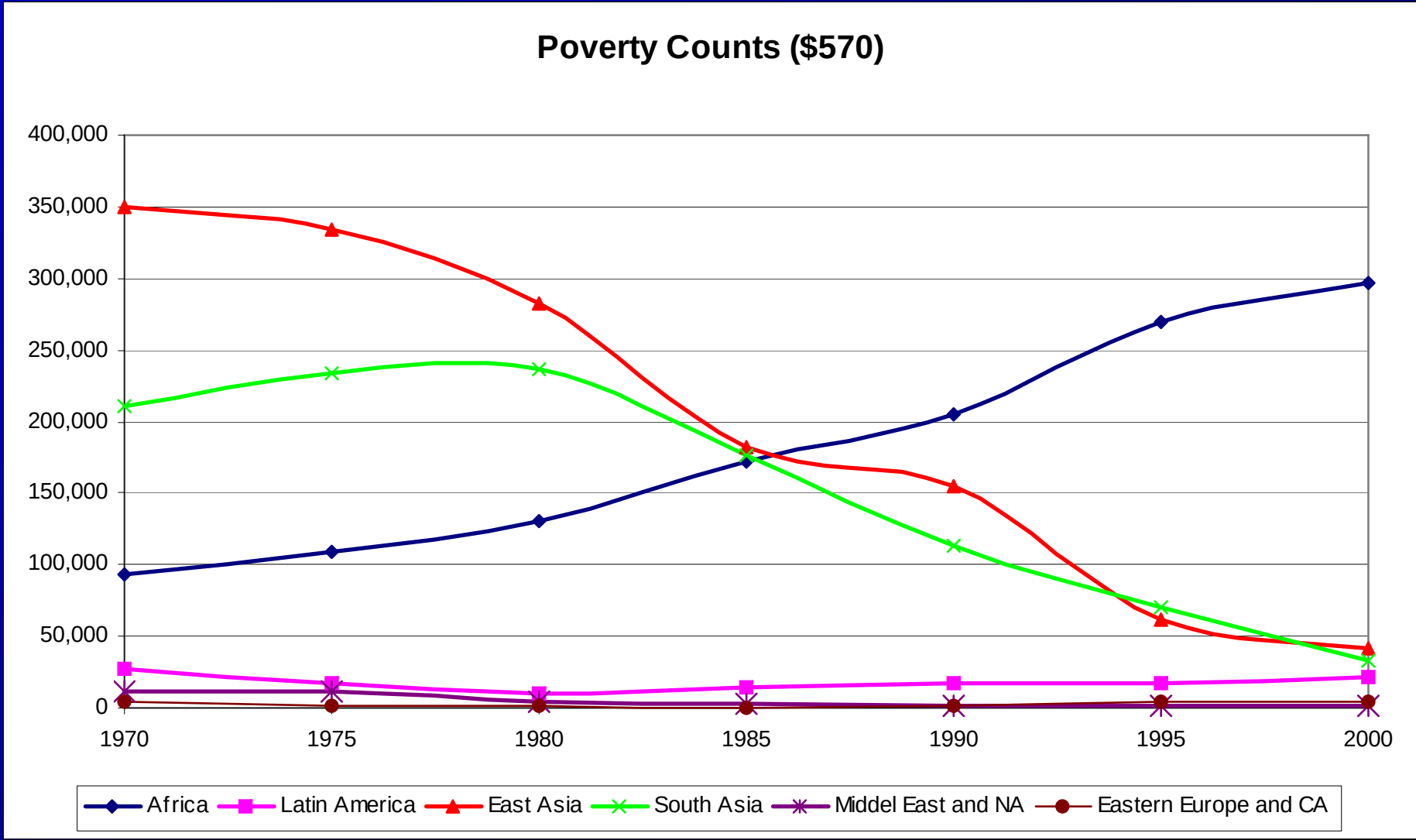
Poverty Headcounts



Regional Poverty



Regional Poverty



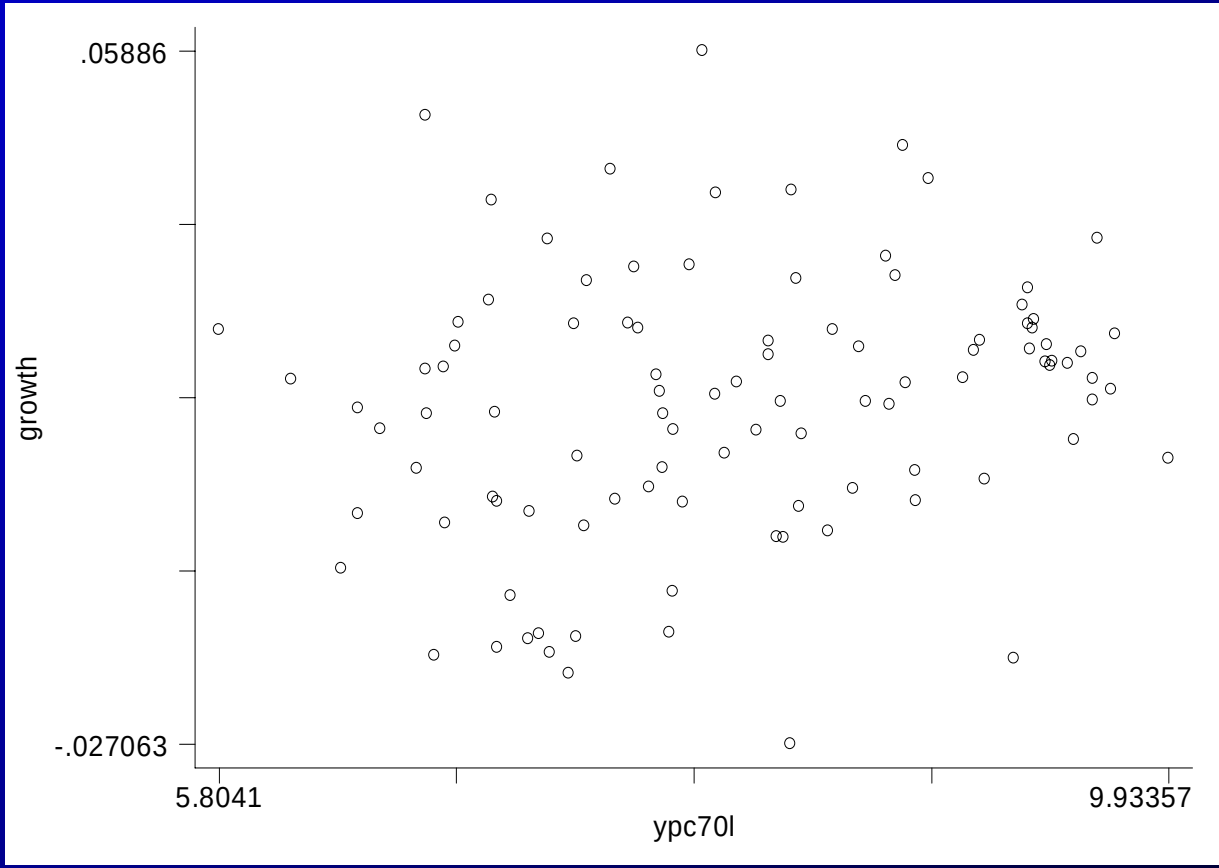
Inequality

- UNDP 1999 Methodology:
  - Step 1: Show that Inequality within countries has been increasing (cite USA, China, Latin America, etc.)
  - Step 2: Show Per Capita Income Across countries has been diverging (so cross-country inequality has been increasing and cite Pritchett's (1997) "Divergence Big Time" –you could also cite Barro and Sala-i-Martin (1992) or (1994).)
  - Conclude: THEREFORE, global income inequality has been increasing!!!
- Right?

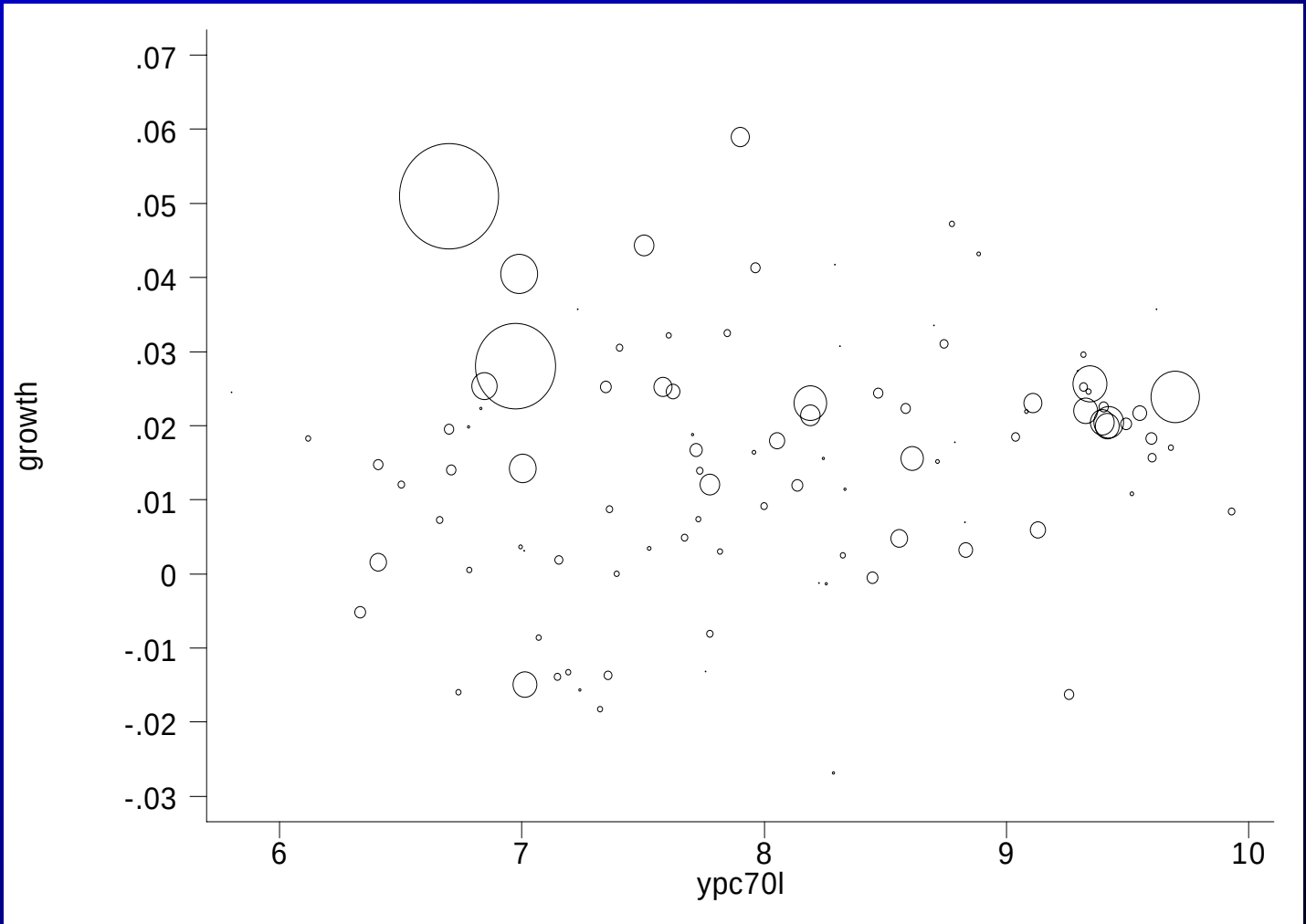
Wrong!

- Step 1: refers to citizens
- Step 2: refers to countries
- Steps 1 and 2 cannot be “added up” to come up with global income inequality!
- The concept of “cross country” inequality should be “inequality that would exist in the world if all citizens within each country had same level of income, but different per capita incomes across countries”. The difference? POPULATION SIZES!

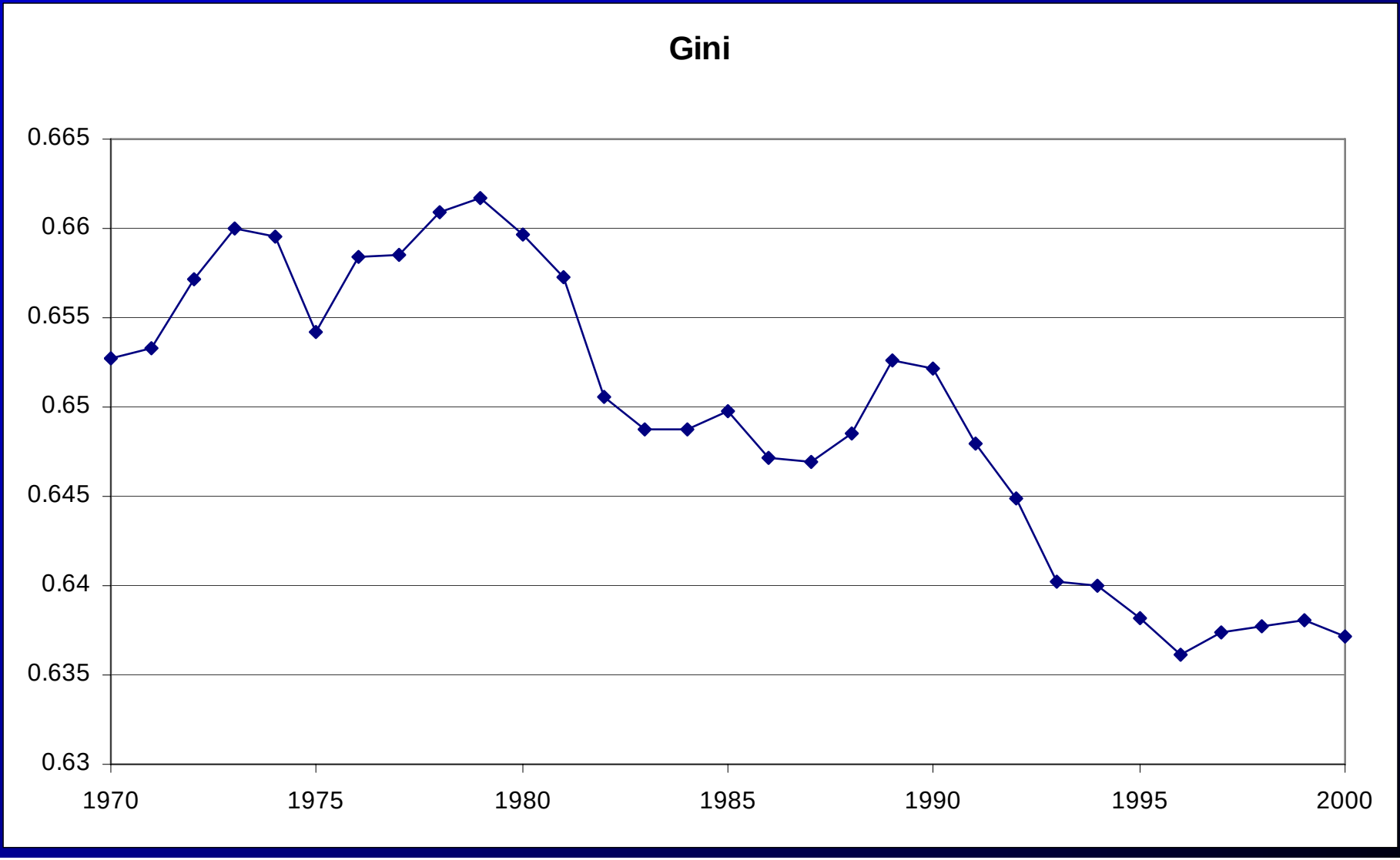
Recall β-convergence



Population-Weighted β-convergence



Gini


Gini
0.665
0.66
0.655
0.65
0.645
0.64
0.635
0.63
1970
1975
1980
1985
1990
1995
2000

Gini

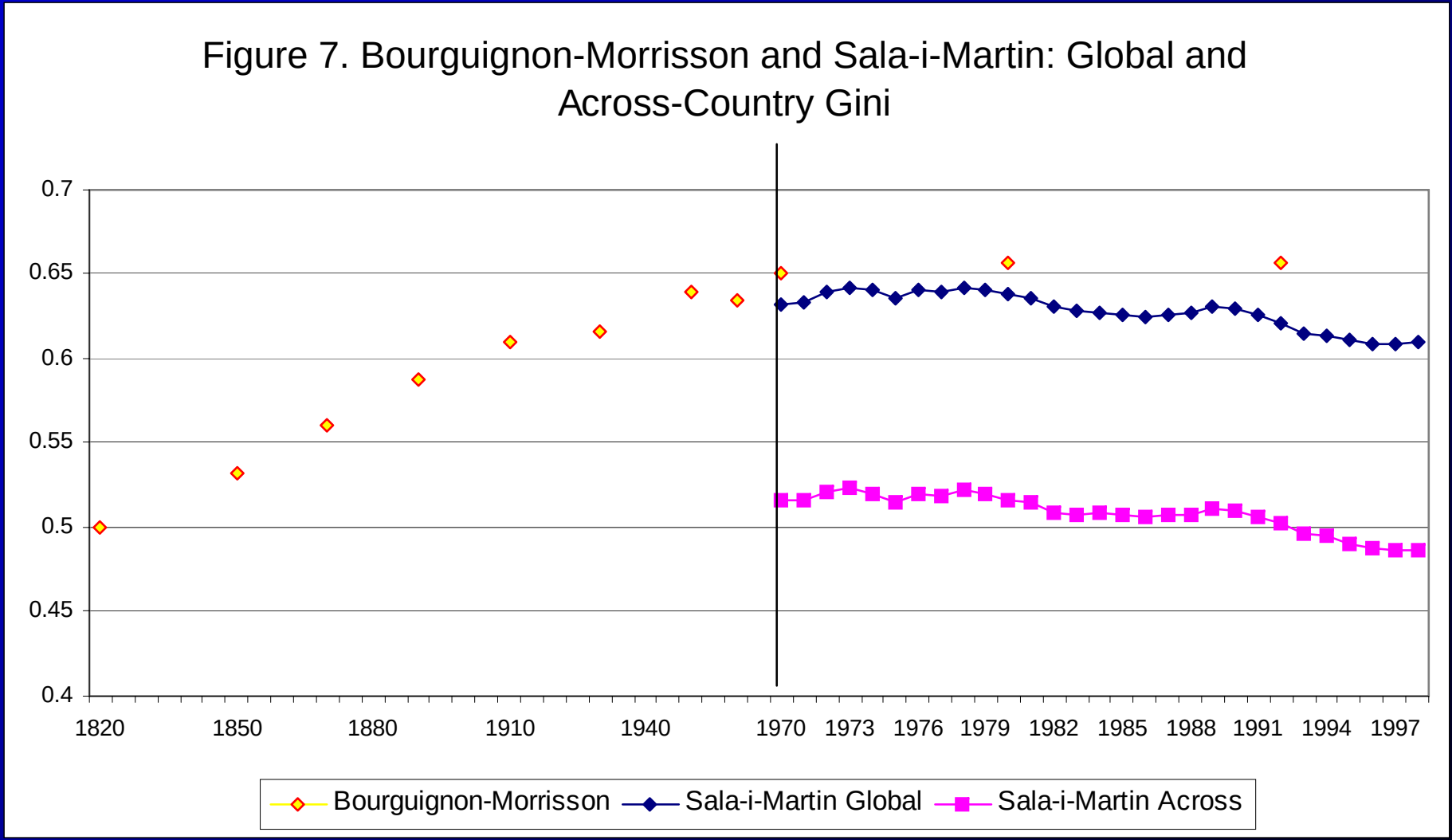
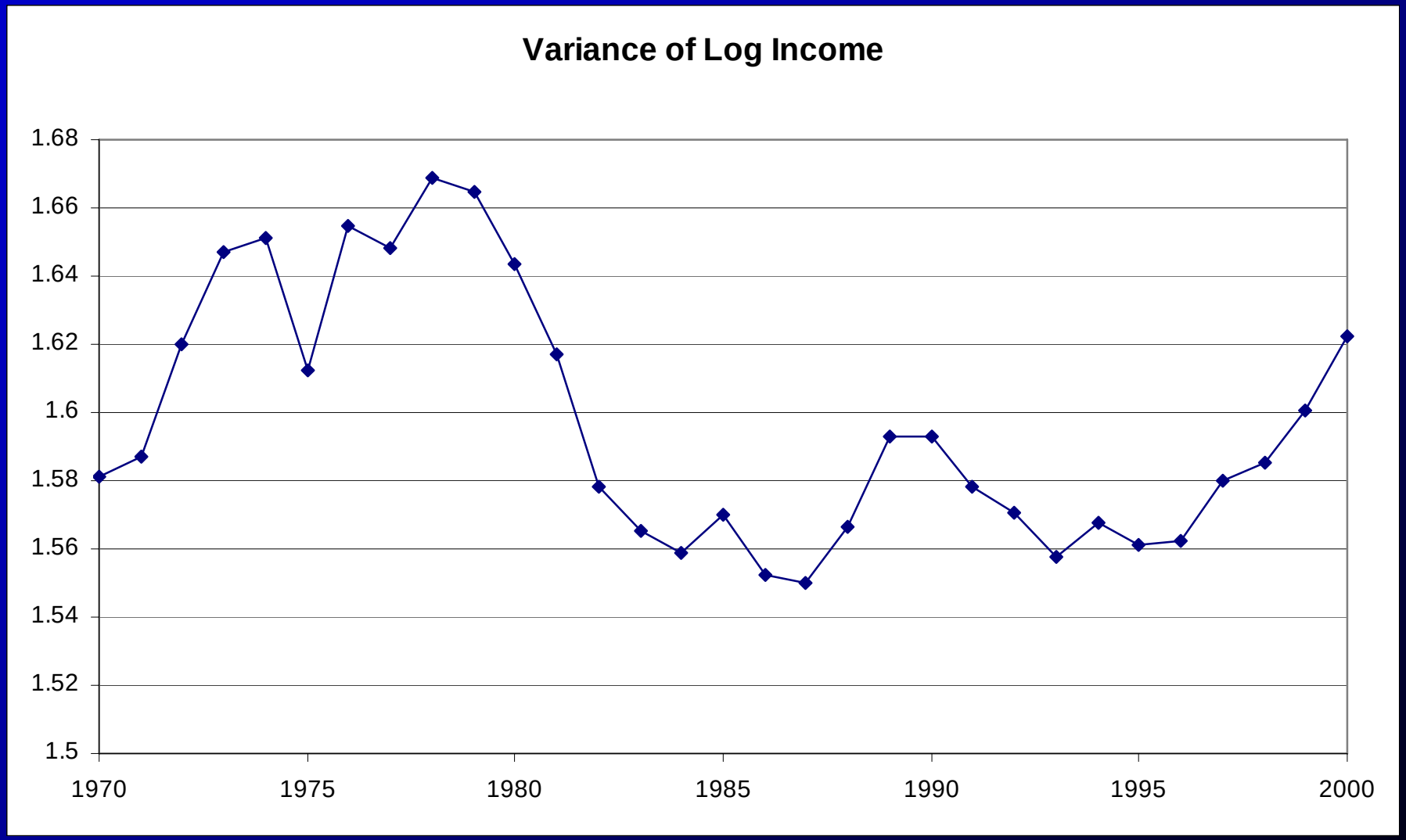
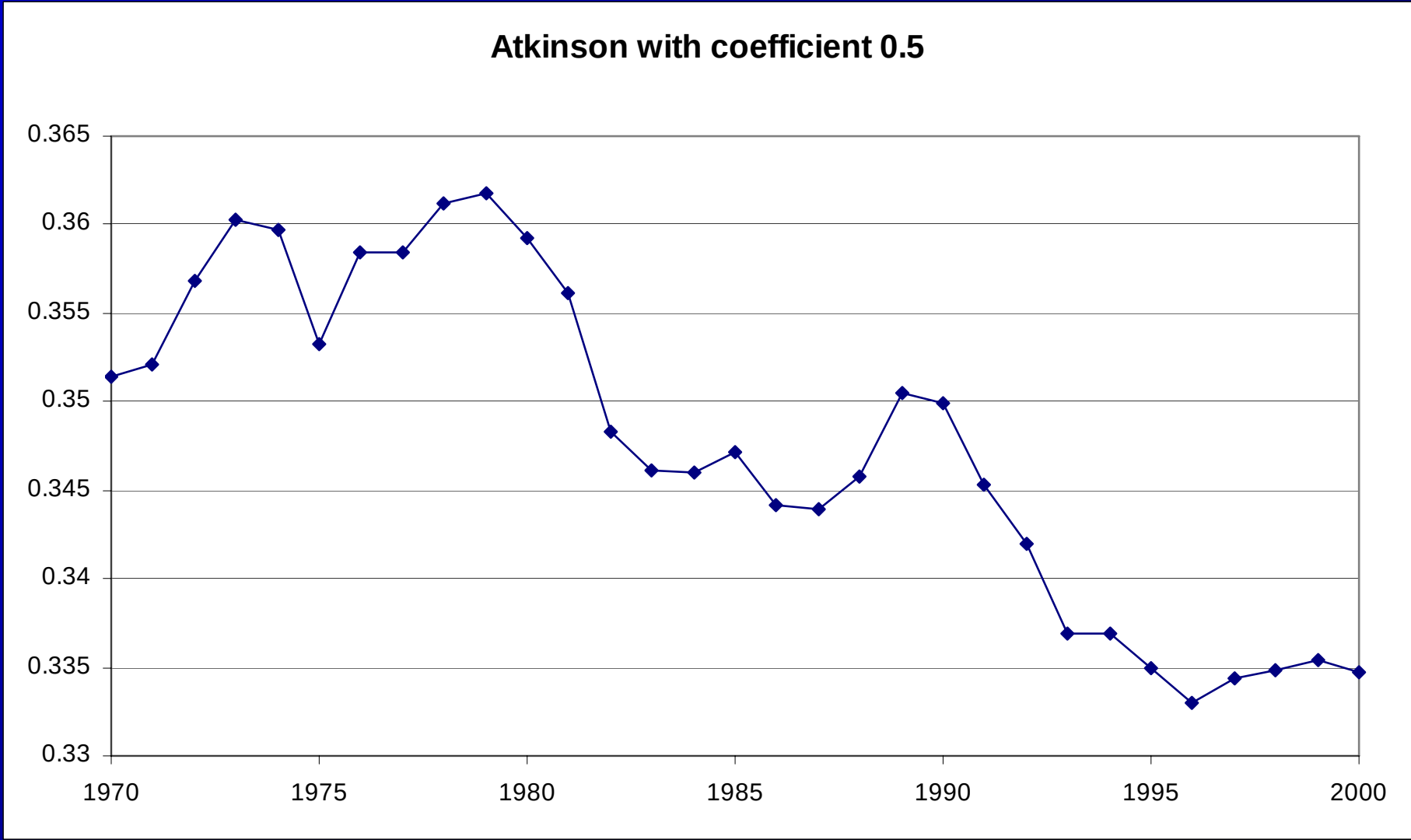


Figure 7. Bourguignon-Morrisson and Sala-i-Martin: Global and Across-Country Gini
0.7
0.65
0.6
0.55
0.5
0.45
0.4
1820
1850
1880
1910
1940
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
Bourguignon-Morrisson
Sala-i-Martin Global
Sala-i-Martin Across

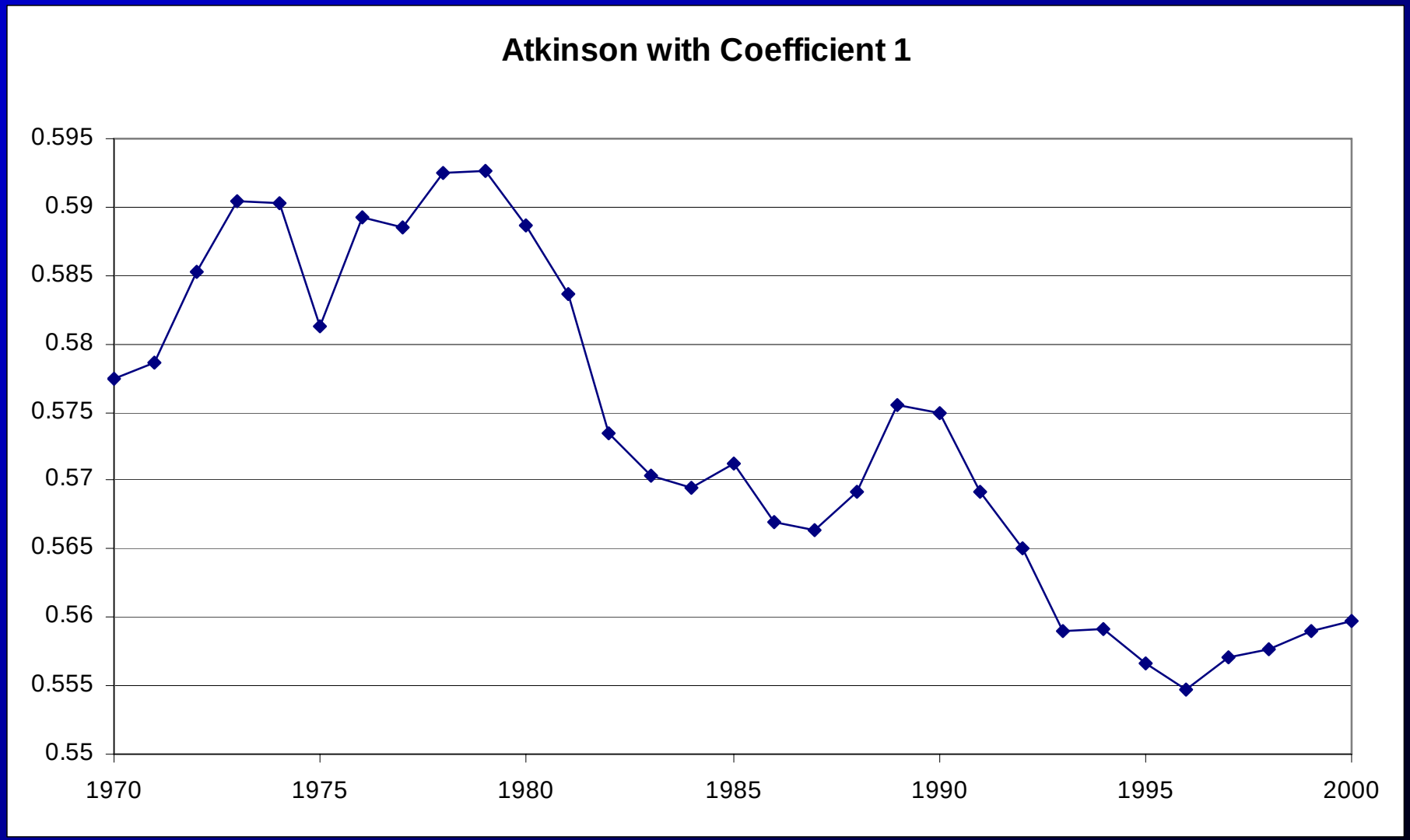
Variance of Log Income



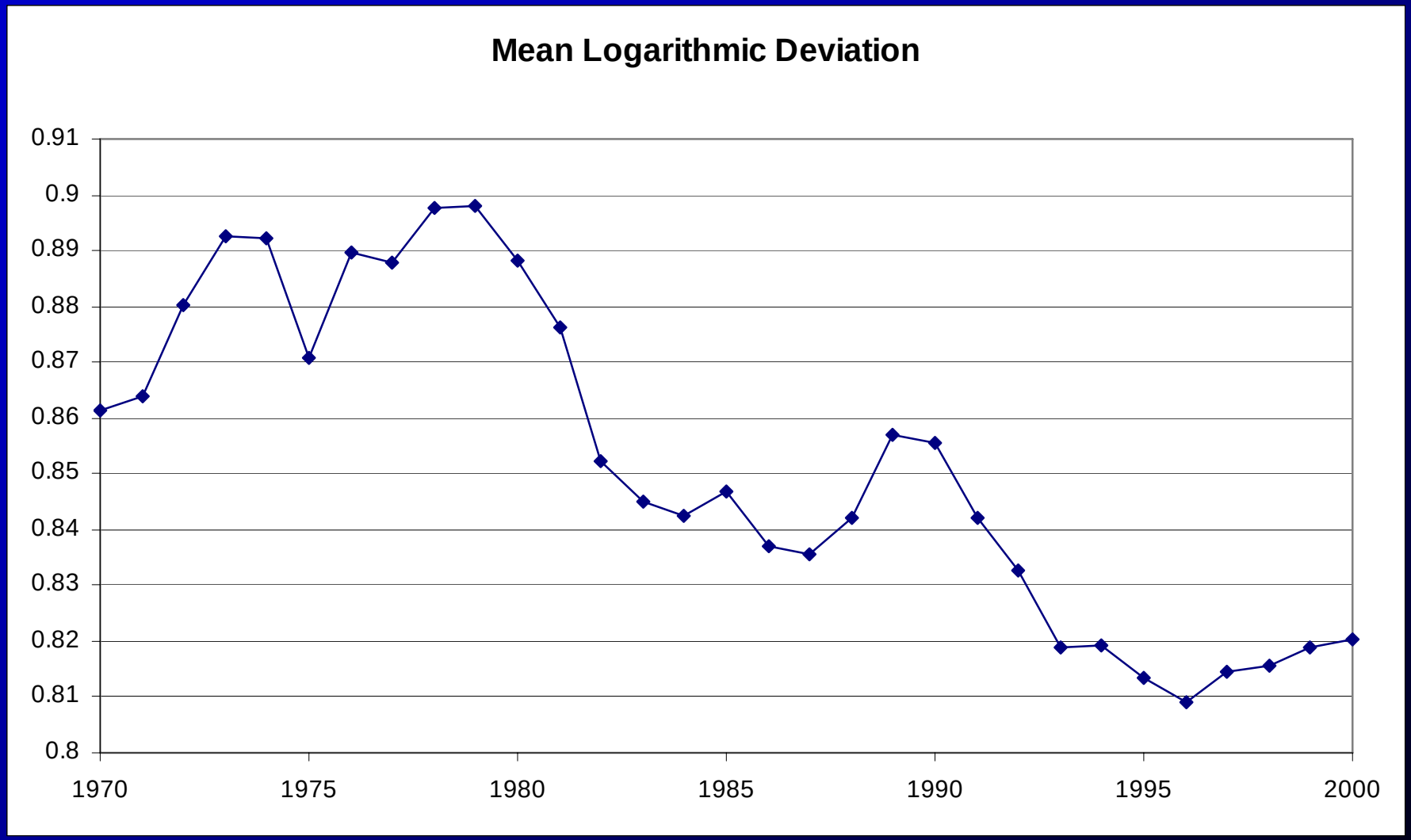
Atkinson (0.5)


Atkinson with coefficient 0.5
0.365
0.36
0.355
0.35
0.345
0.34
0.335
0.33
1970
1975
1980
1985
1990
1995
2000

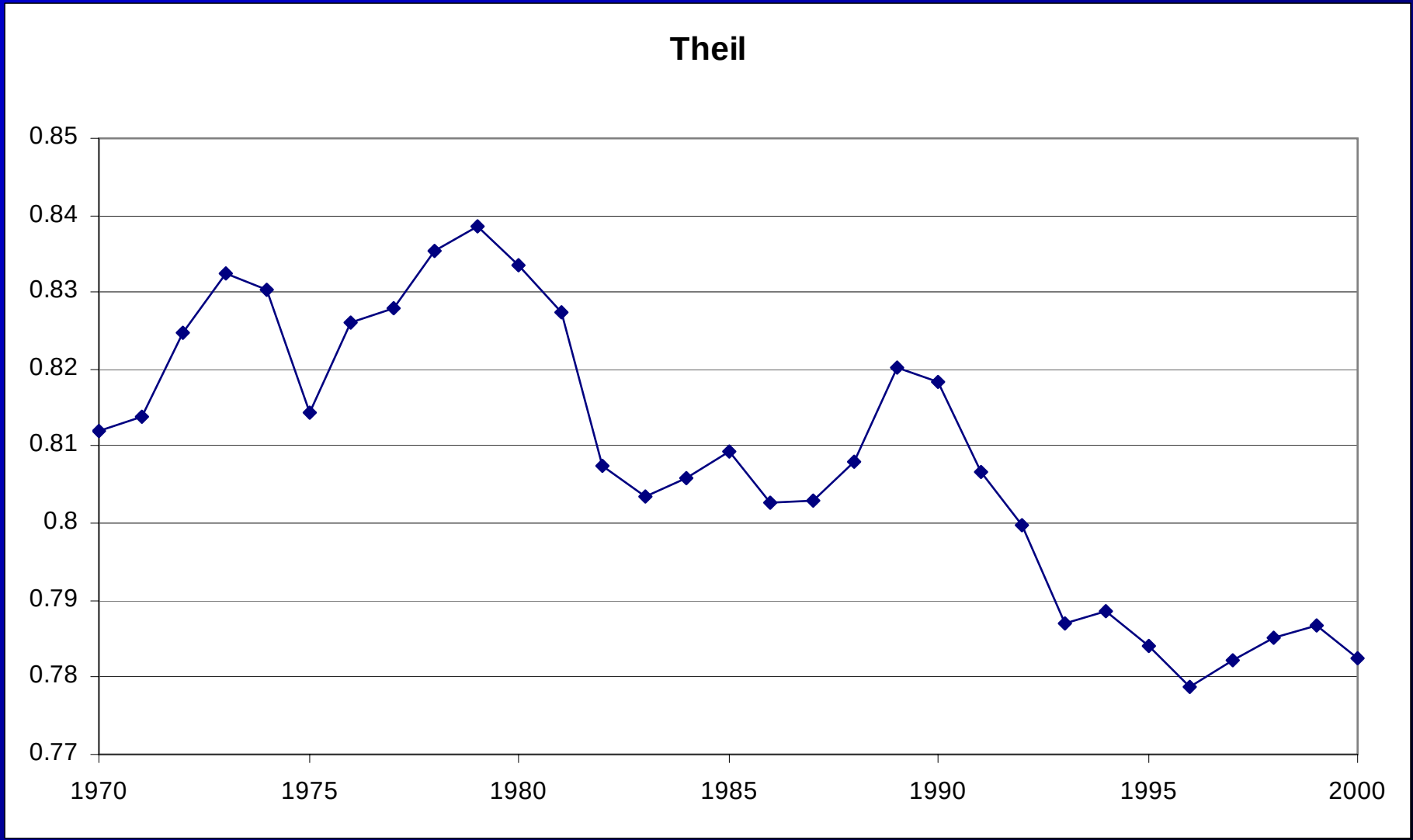
Atkinson (1)


Atkinson with Coefficient 1
0.595
0.59
0.585
0.58
0.575
0.57
0.565
0.56
0.555
0.55
1970
1975
1980
1985
1990
1995
2000

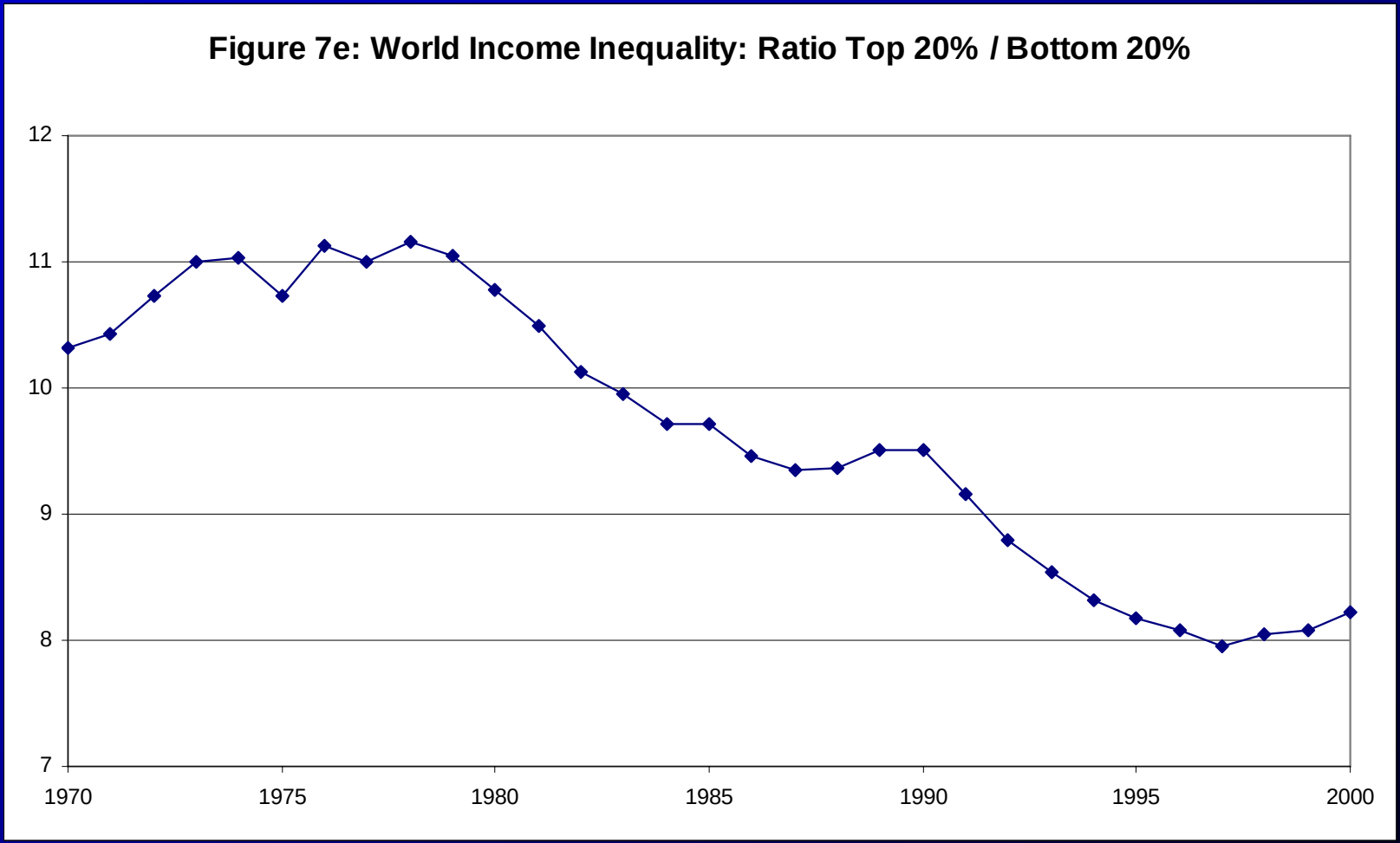
Mean Log Deviation



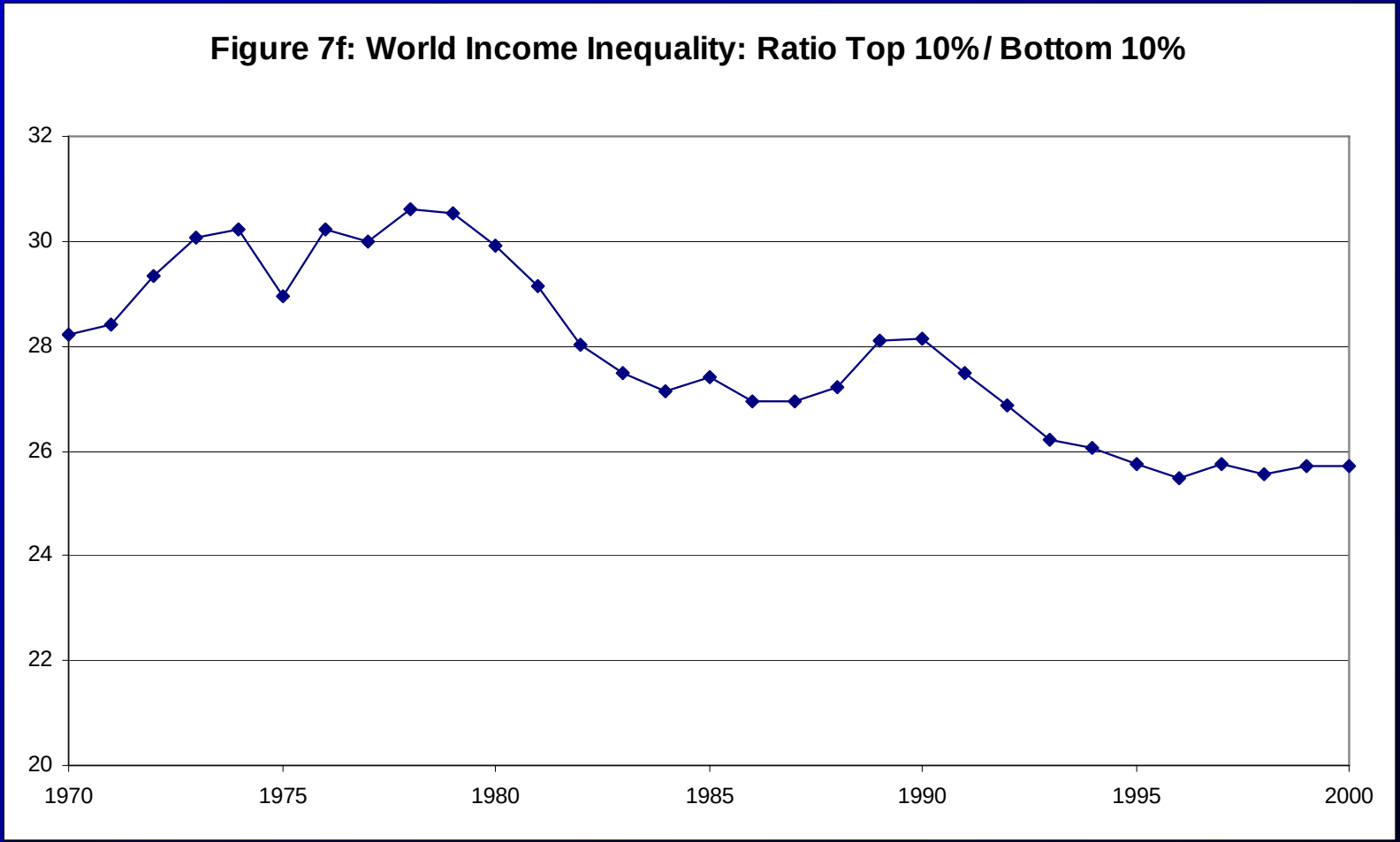
Theil Index


Theil
0.85
0.84
0.83
0.82
0.81
0.8
0.79
0.78
0.77
1970
1975
1980
1985
1990
1995
2000

Ratio Top 20% to Bottom 20%

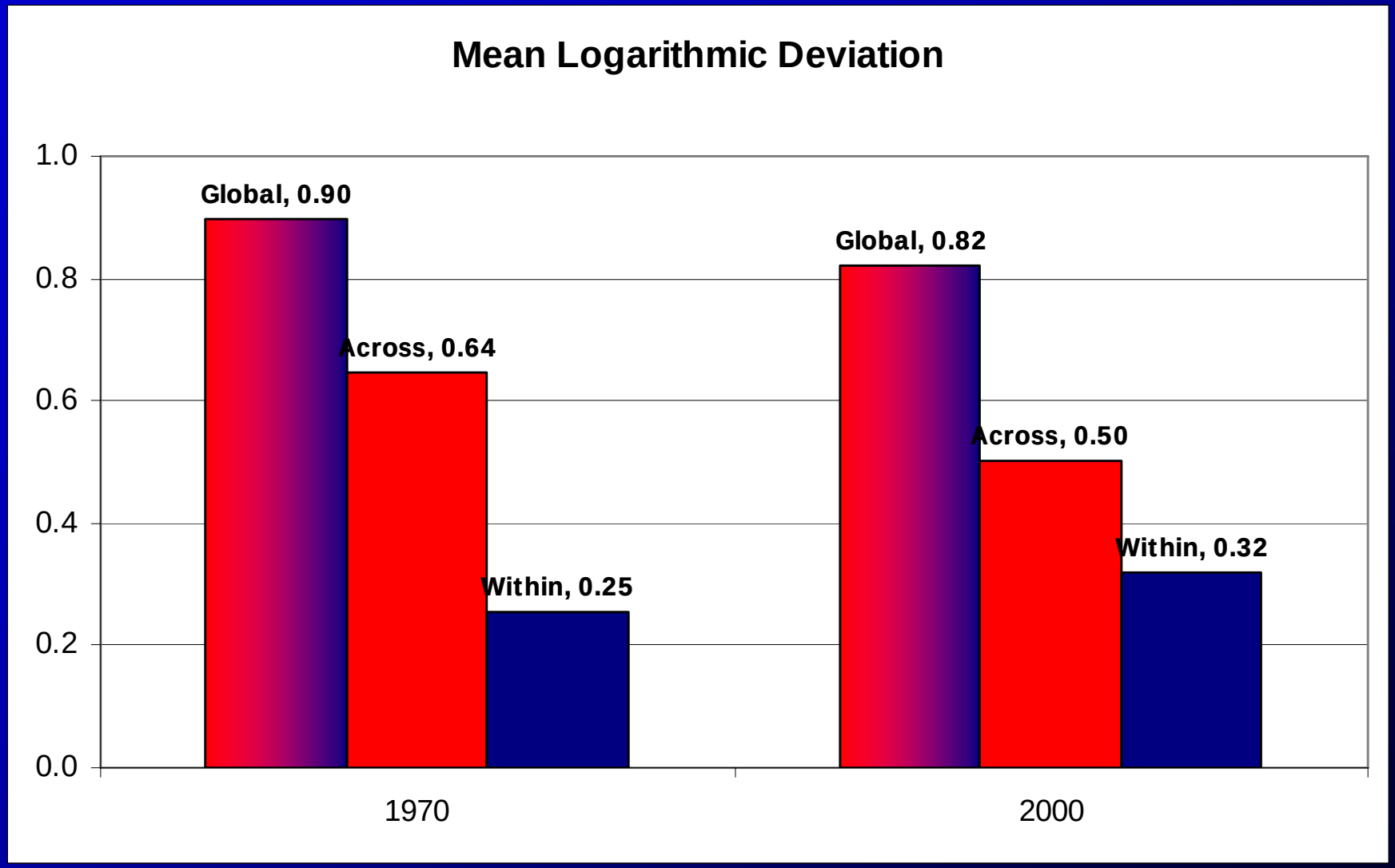


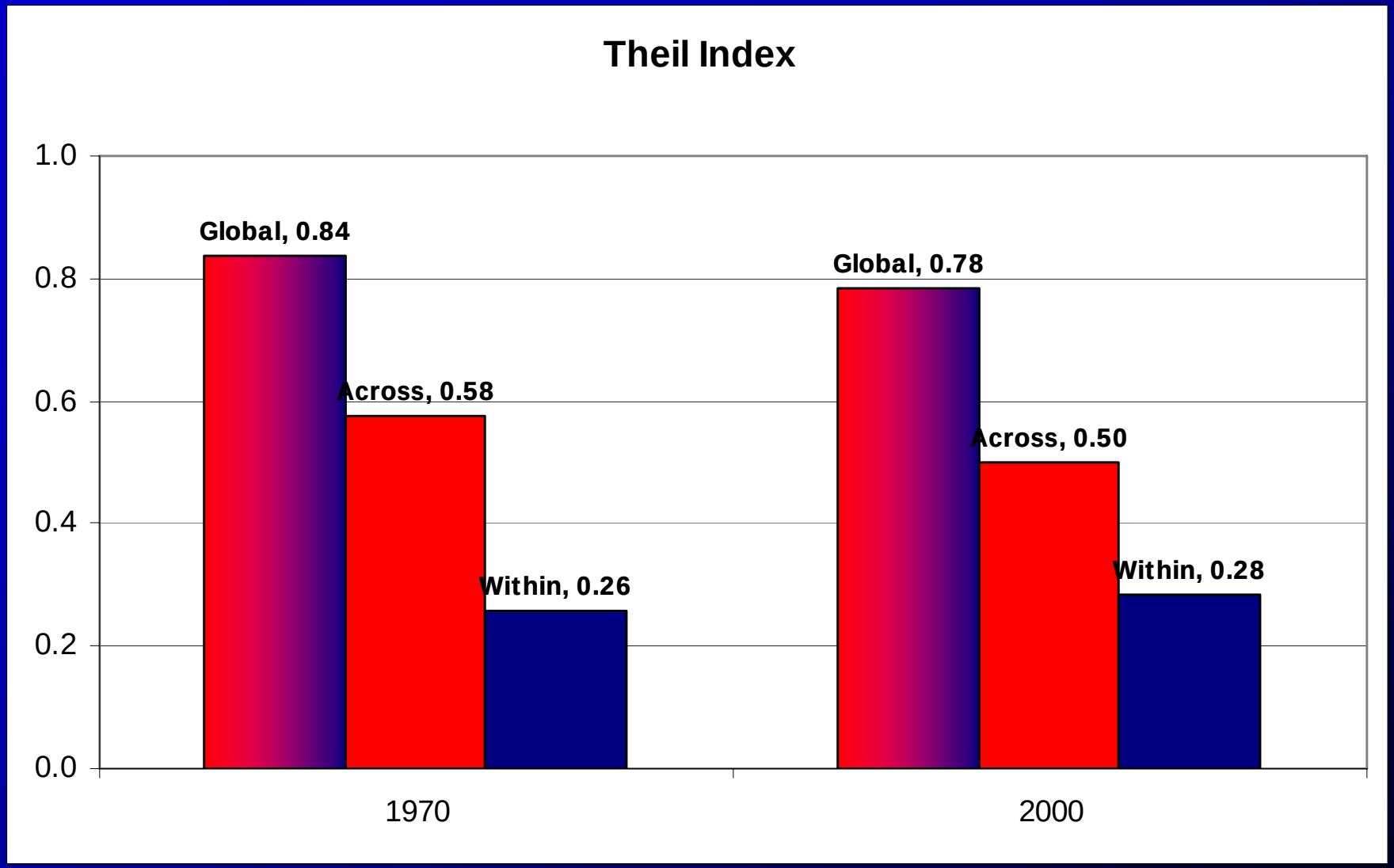
Ratio Top 10% to Bottom 10%



Decomposition

- Global Inequality = Inequality Across Countries + Inequality Within Countries
- Not all measures can be "decomposed" in the sense that the within and the across-country component add up to the global index of inequality
- Only the "Generalized Entropy" indexes can be decomposed: MLD and Theil


Mean Logarithmic Deviation
1.0
0.8
0.6
0.4
0.2
0.0
Global, 0.90
Across, 0.64
Within, 0.25
Global, 0.82
Across, 0.50
Within, 0.32
1970
2000


Theil Index
1.0
0.8
0.6
0.4
0.2
0.0
Global, 0.84
Across, 0.58
Within, 0.26
Global, 0.78
Across, 0.50
Within, 0.28
1970
2000

Lessons

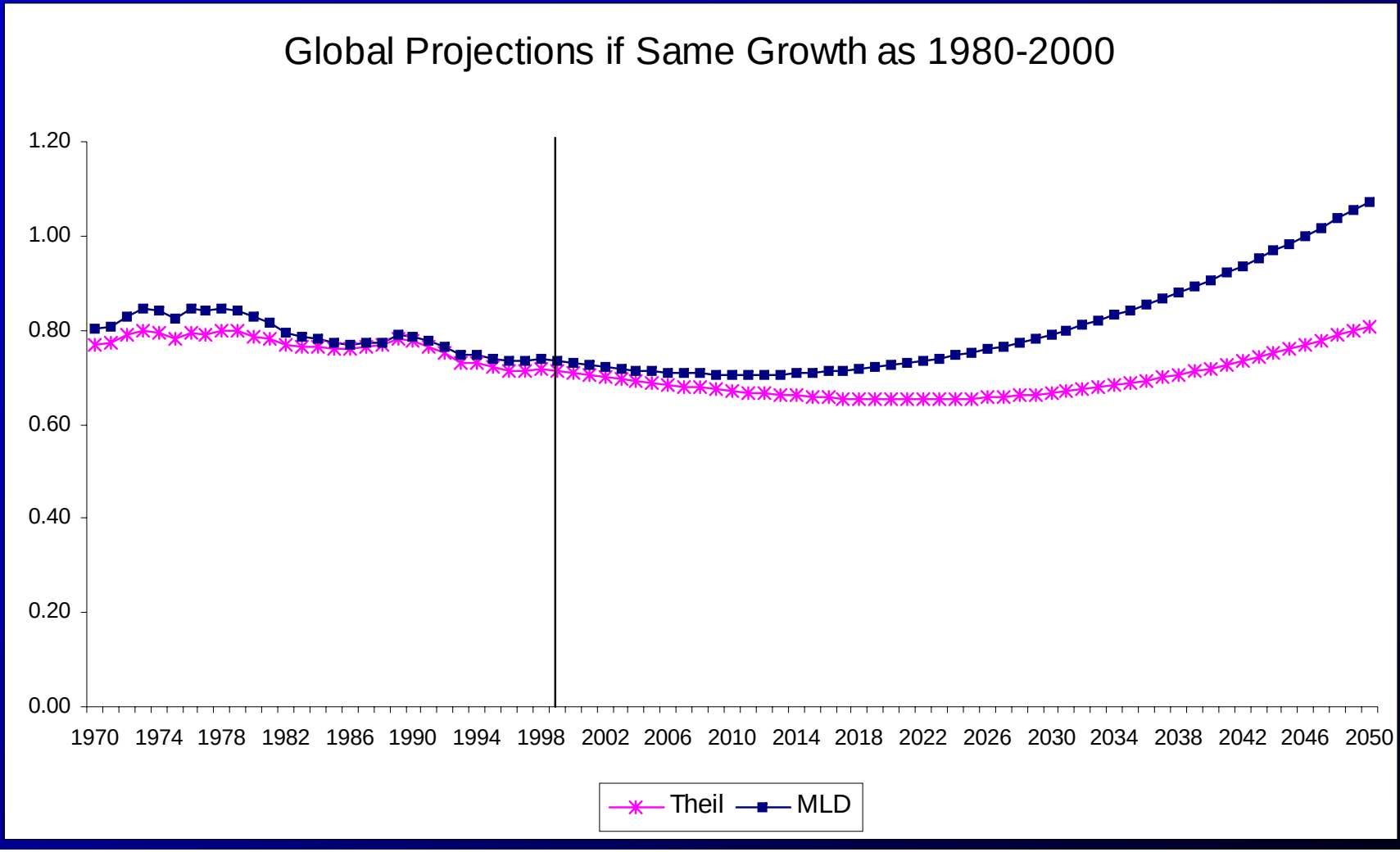
- Across-Country inequalities decline
- Within-Country inequalities increase, but not enough to offset the decline in across-country inequalities so that overall inequality actually falls
- Across-Country inequalities are much larger: if you want to reduce inequalities across citizens, promote AGGREGATE growth in poor countries!

Inequalities have fallen…

Because Asia has been catching up with OECD.

If Africa does not start growing soon, inequalities will start increasing again...

Projected Inequalities if Africa does not Grow…



Conclusions

- Poverty: key determinant is GROWTH
- Inequality: key determinant is GROWTH