Age groups and the measure of population aging

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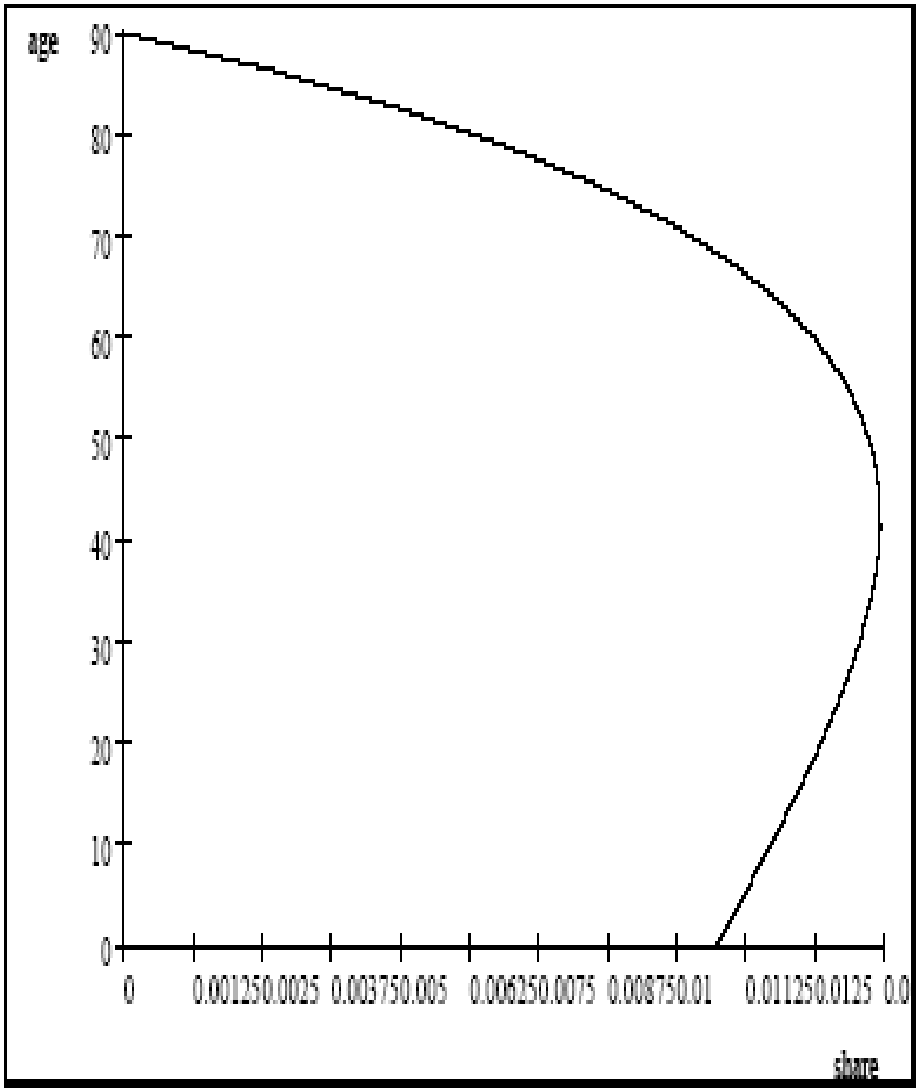
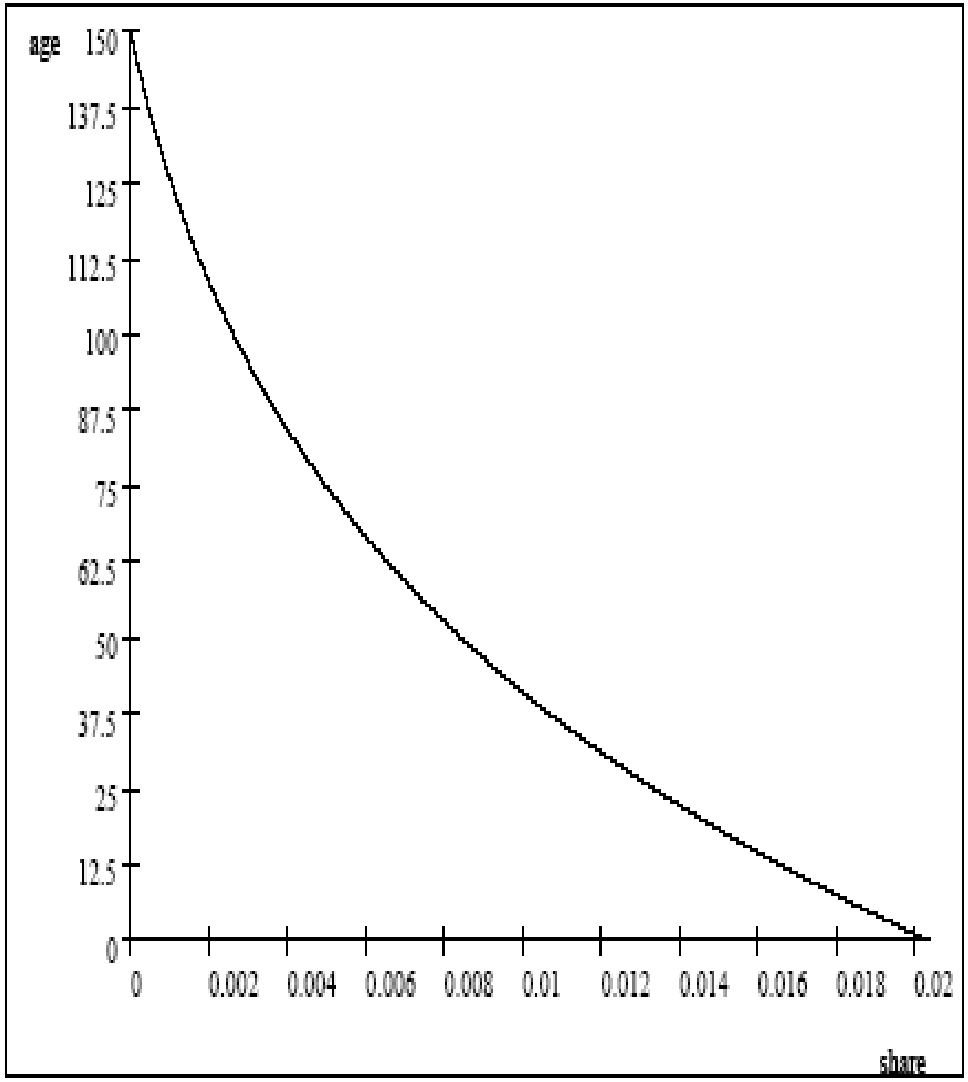
Main distinction:

An aged population:

- is not a population composed of individuals who live for a long time,
- is a population in which old individuals are proportionally numerous.

Two populations with the <u>same</u> share of 60+ (.23)





An appropriate measure of population aging hence should:

- not have an exogenous cutoff age,
- reflect the entire age distribution.

Especially:

- when studying long run data,
- when comparing countries.

Remark: an appropriate measure should <u>not</u> restrict to human population.

What we do in the paper

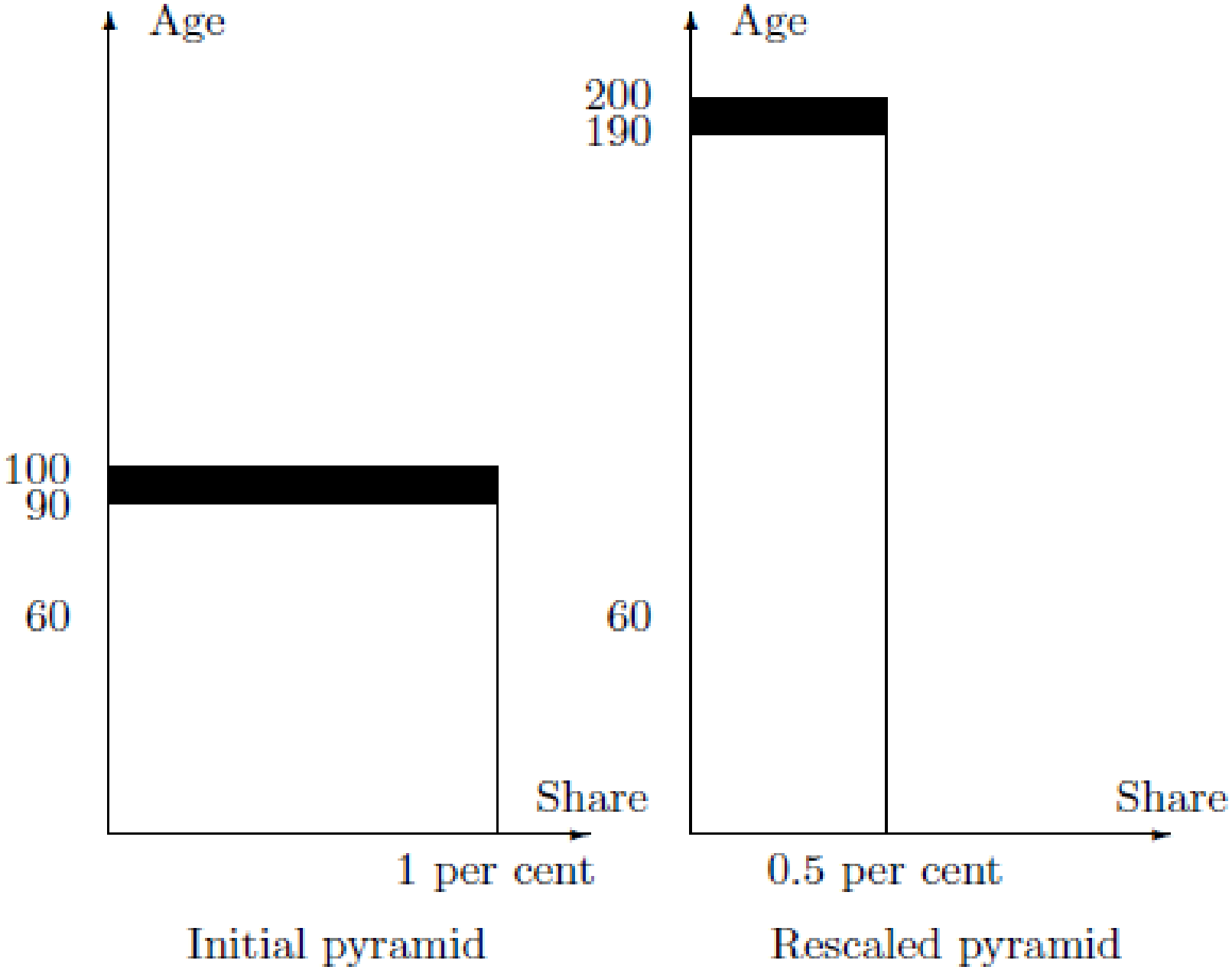
- We propose a new measure to assess population aging.
- This measure relies on Optimal Grouping technics.
- We apply this measure to historical data of 12 developed countries.

Previous works

Computing the age with the remaining number of years: Ryder (1975), Sanderson and Scherbov (2005, 2010), Shoven (2010)

Remarks on indicators using prospective age:

- Period vs. cohort life expectancy
- Proportional rescaling (example)


Age
100
90
60
Share
1 per cent
Initial pyramid
Age
200
190
60
Share
0.5 per cent
Rescaled pyramid

Other works (for specific age distributions)

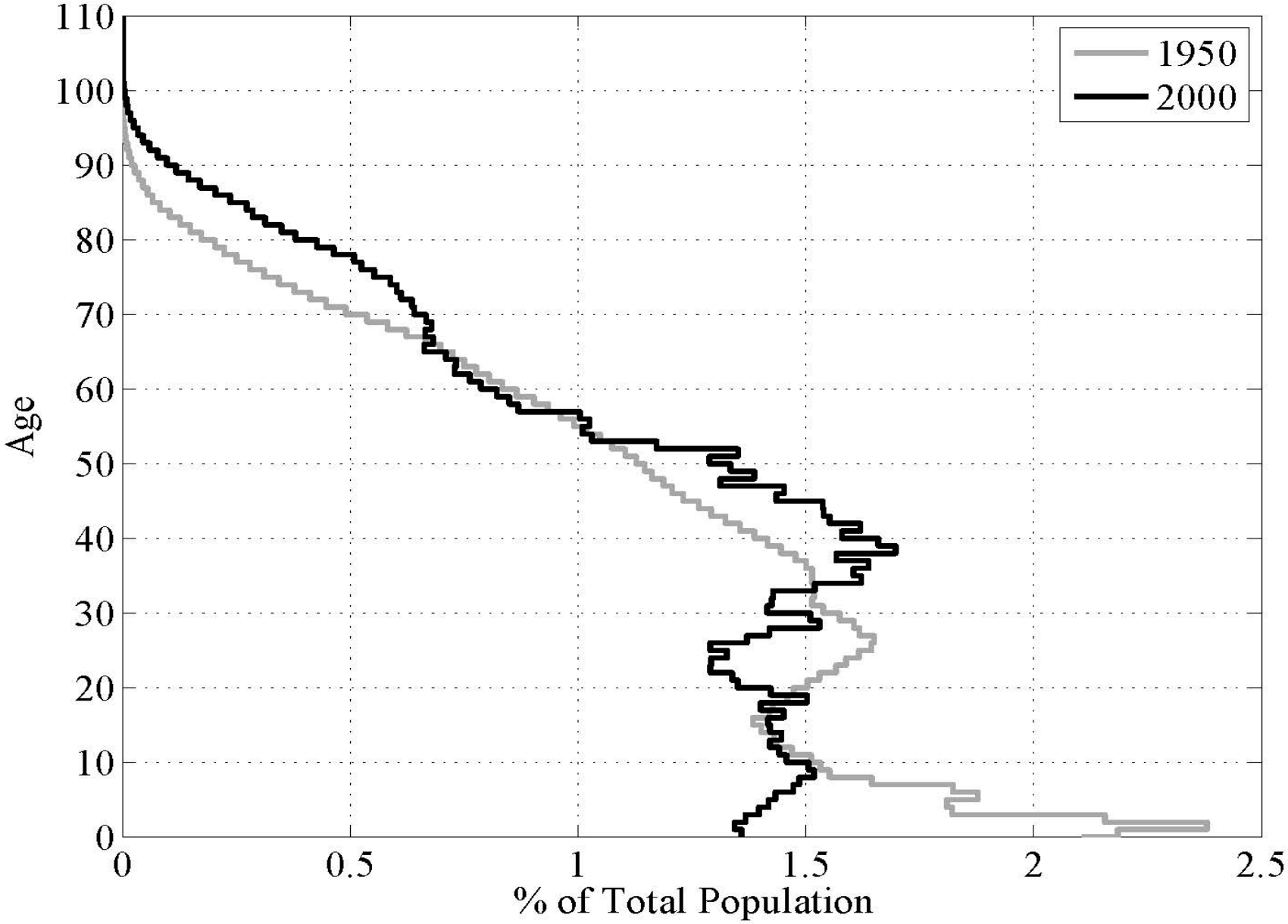
- Coulson (1968), Kii (1982): linear regression of the frequency of each age in the population (need monotonic age distribution)

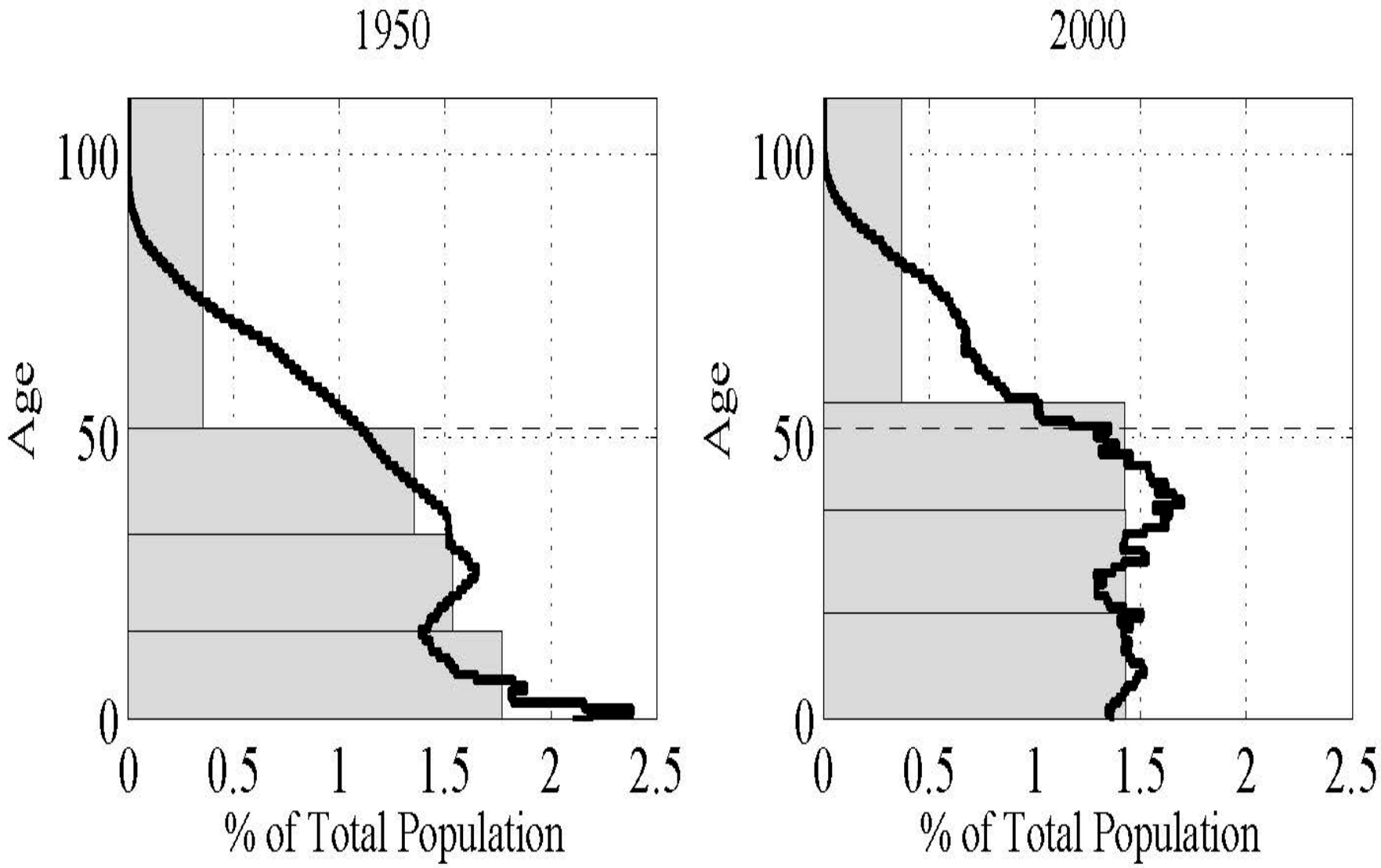
- Chu (1997), Nath and Islam (2009): CDF of ages should satisfy the first-order stochastic dominance property

What we do

- we predefine a certain number of age groups,
- then "optimally" divide single age-classes among these different groups.

- we use all the statistical information contained in the population age distribution
- the age group-based representation gives the “best” portrayal of the initial distribution


1950
2000
Age
% of Total Population
0
10
20
30
40
50
60
70
80
90
100
110
0
0.5
1
1.5
2
2.5

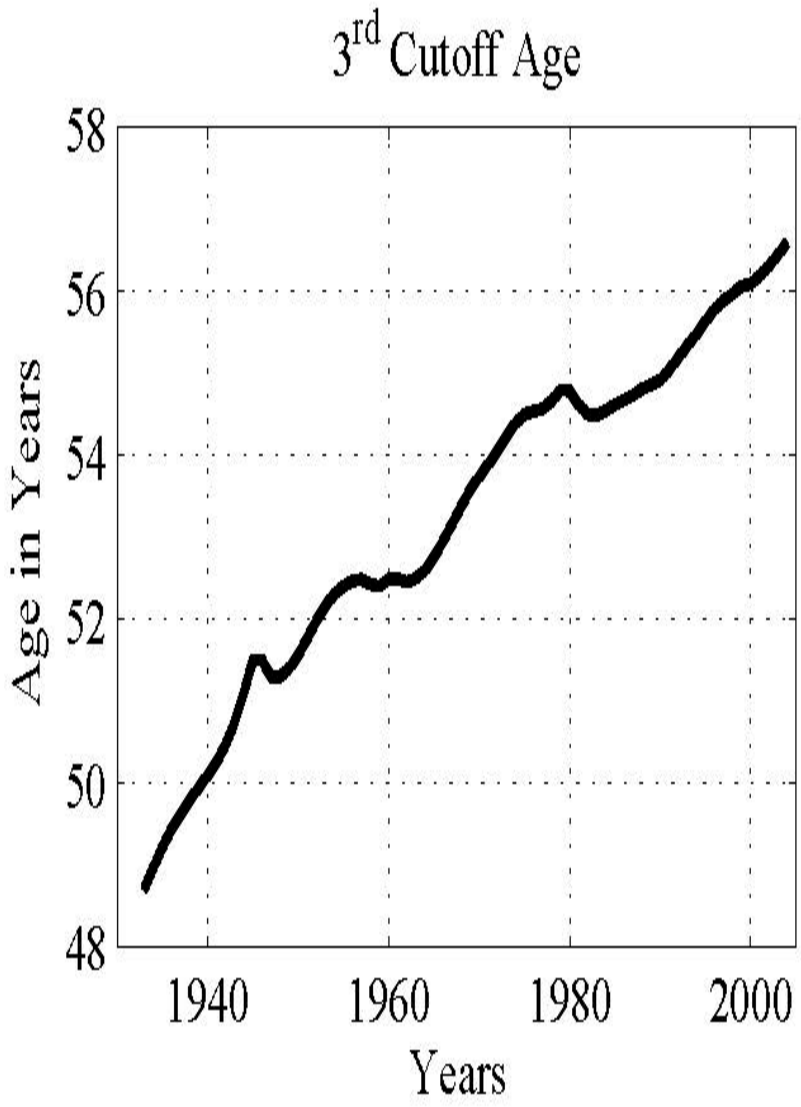

1950
2000
Age
100
50
0
0
0.5
1
1.5
2
2.5
% of Total Population

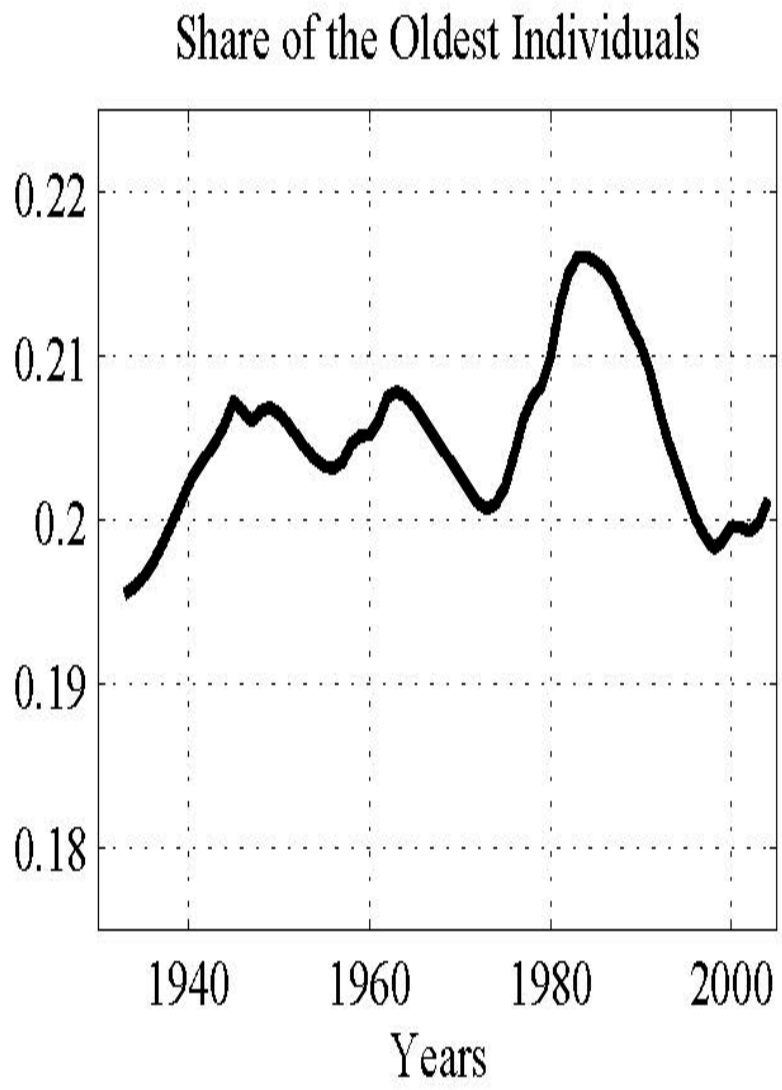
Methodology Aghevli and Mehran (1981),

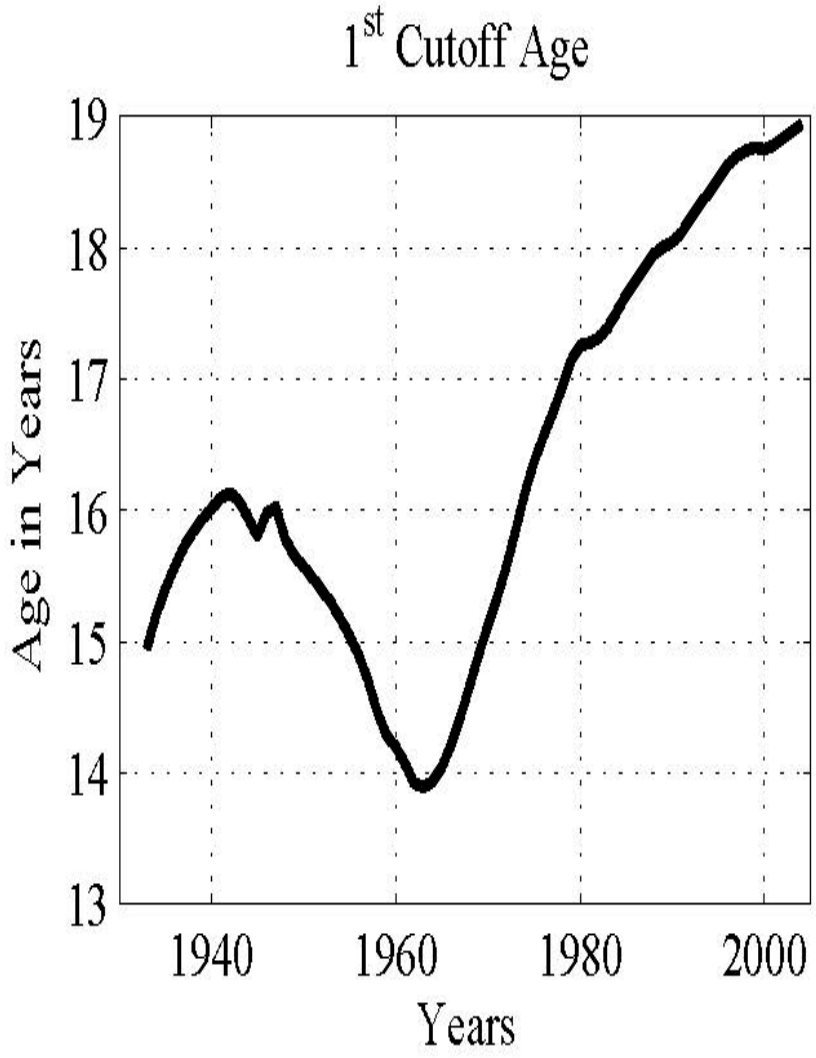
- select cutoff ages for groups such that age differences are a minimum within each group and a maximum between groups.
- Information loss arising from the grouping of data is therefore minimal.

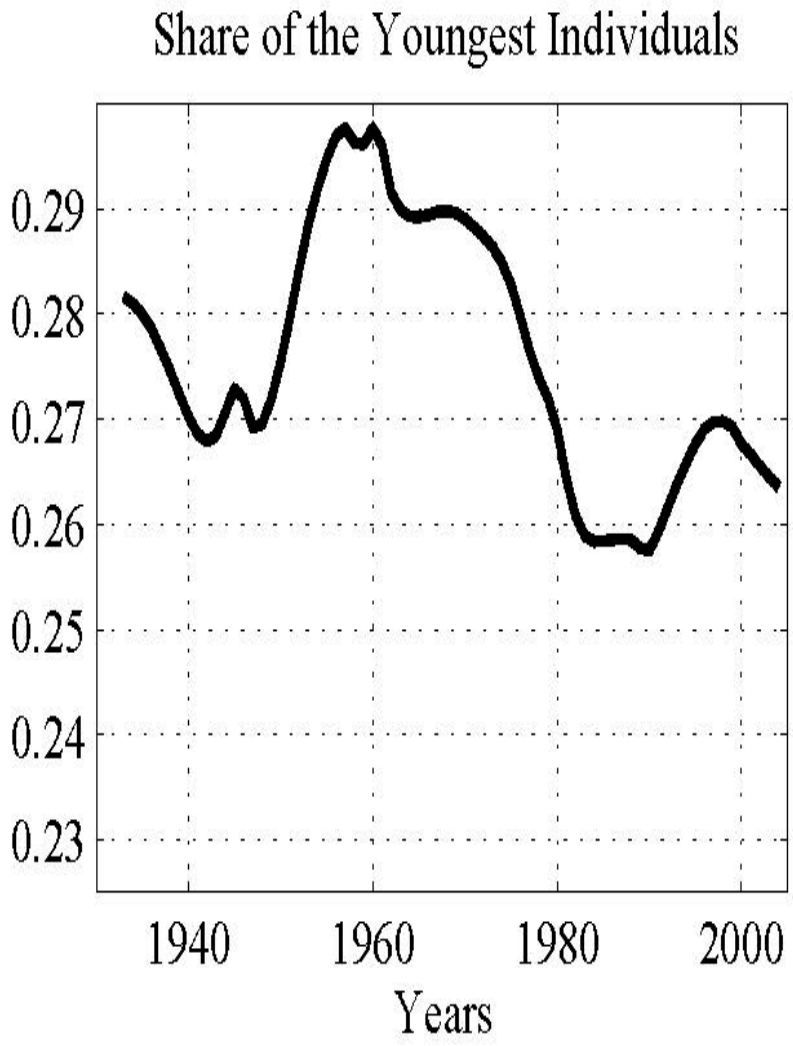
- Take the cumulative distribution of the total years lived by a population (the 45° line is the uniform distribution)

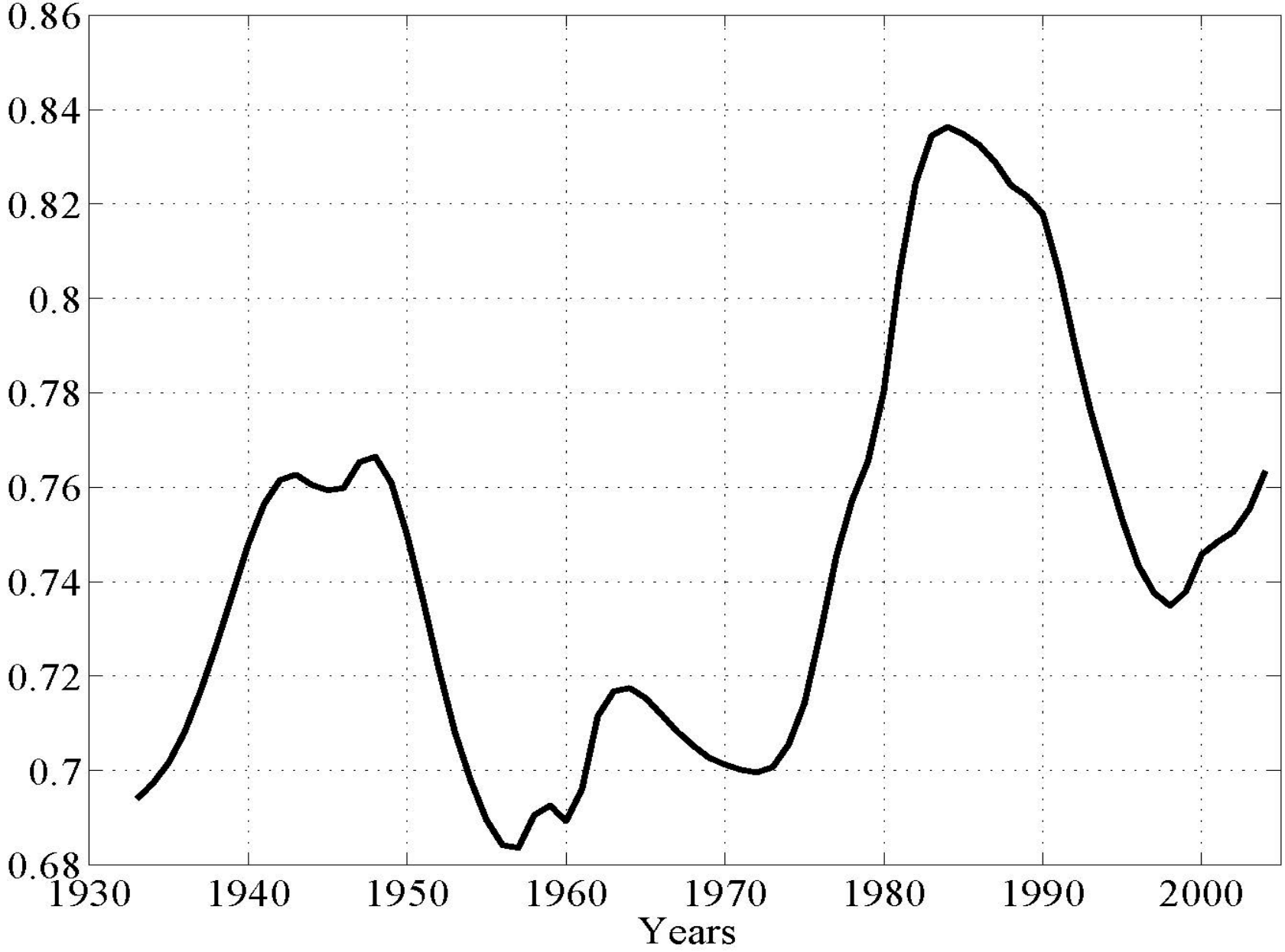
Aging in the US


3rd Cutoff Age
Age in Years
58
56
54
52
50
48
1940
1960
1980
2000
Years


Share of the Oldest Individuals
0.22
0.21
0.2
0.19
0.18
1940
1960
1980
2000
Years


1st Cutoff Age
Age in Years
19
18
17
16
15
14
13
1940
1960
1980
2000
Years


Share of the Youngest Individuals
0.29
0.28
0.27
0.26
0.25
0.24
0.23
1940
1960
1980
2000
Years


0.86
0.84
0.82
0.8
0.78
0.76
0.74
0.72
0.7
0.68
1930
1940
1950
1960
1970
1980
1990
2000
Years

What about the number of groups?

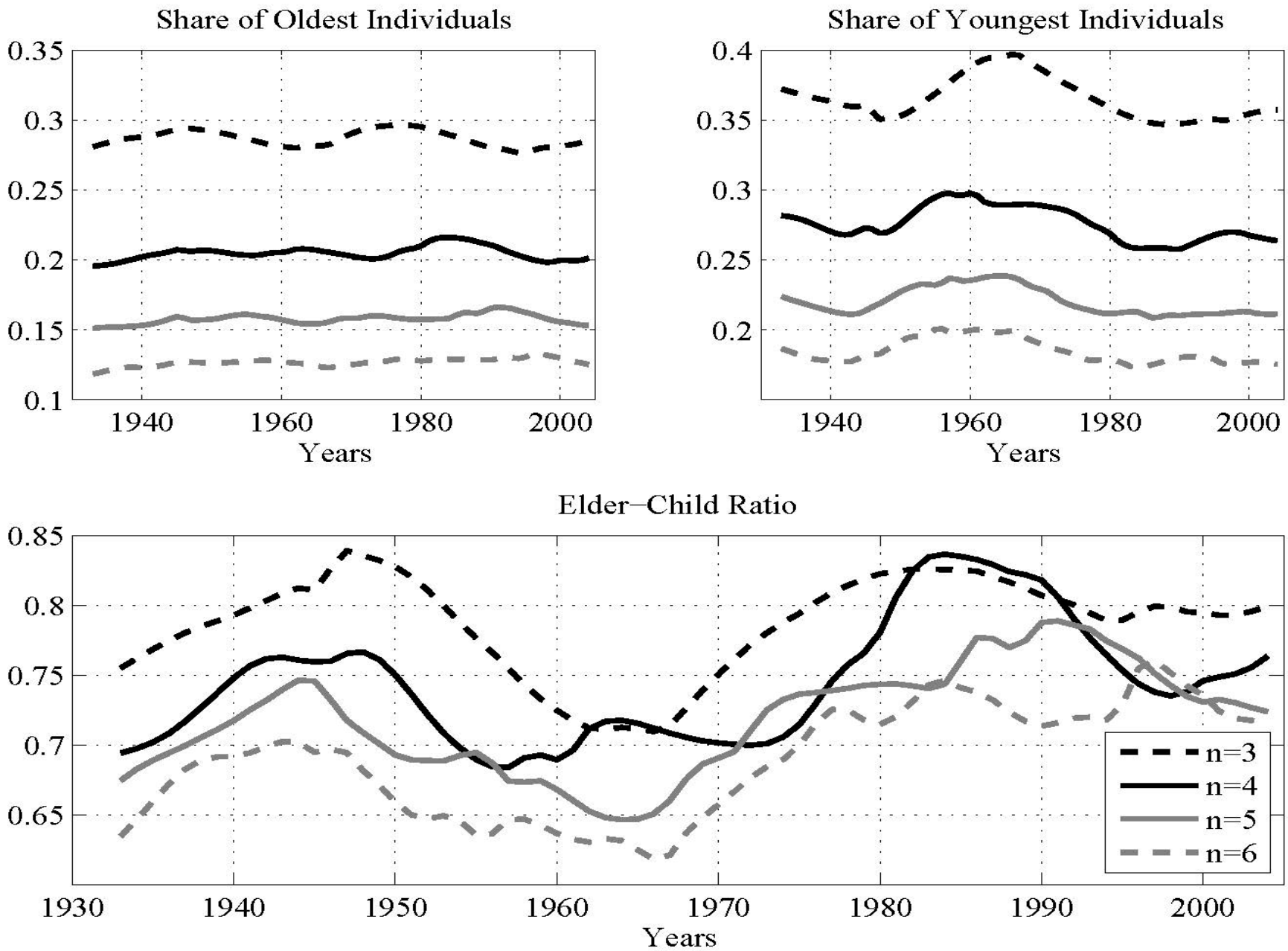
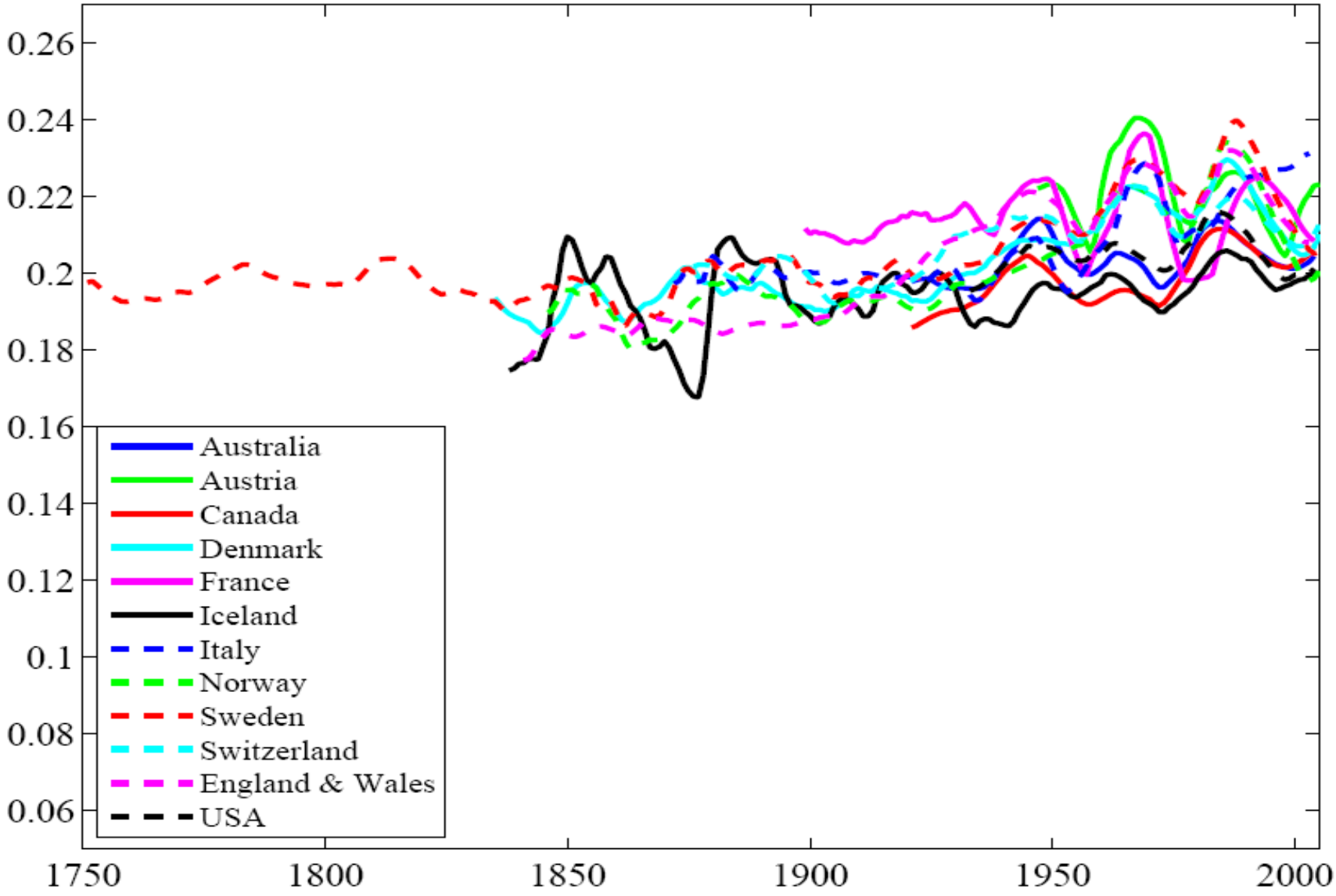

Share of Oldest Individuals
0.35
0.3
0.25
0.2
0.15
0.1
1940
1960
1980
2000
Years
Share of Youngest Individuals
0.4
0.35
0.3
0.25
0.2
1940
1960
1980
2000
Years
Elder−Child Ratio
0.85
0.8
0.75
0.7
0.65
1930
1940
1950
1960
1970
1980
1990
2000
Years
n=3
n=4
n=5
n=6

Table 1: Correlation of Elder–Child Ratios

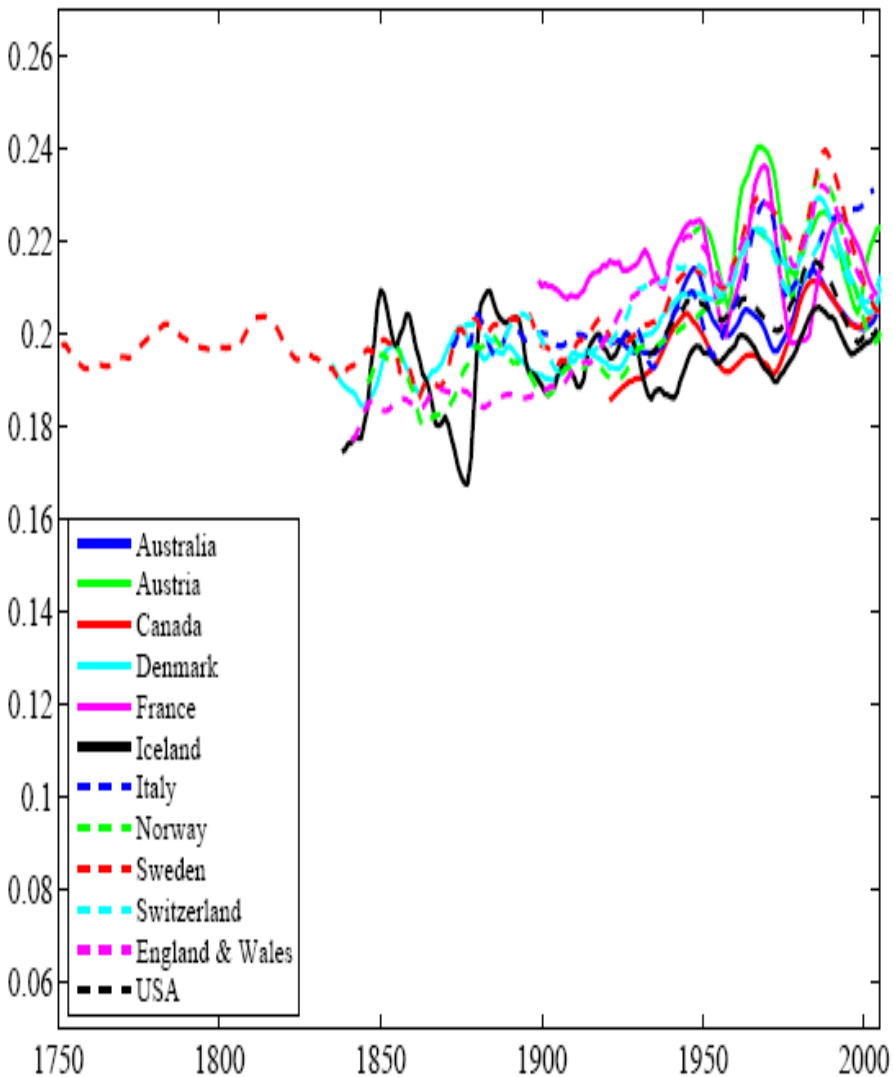
n	3	4	5	6
3	1.00	0.71	0.75	0.73
4	–	1.00	0.77	0.74
5	–	–	1.00	0.89
6	–	–	–	1.00

Aging in developed countries

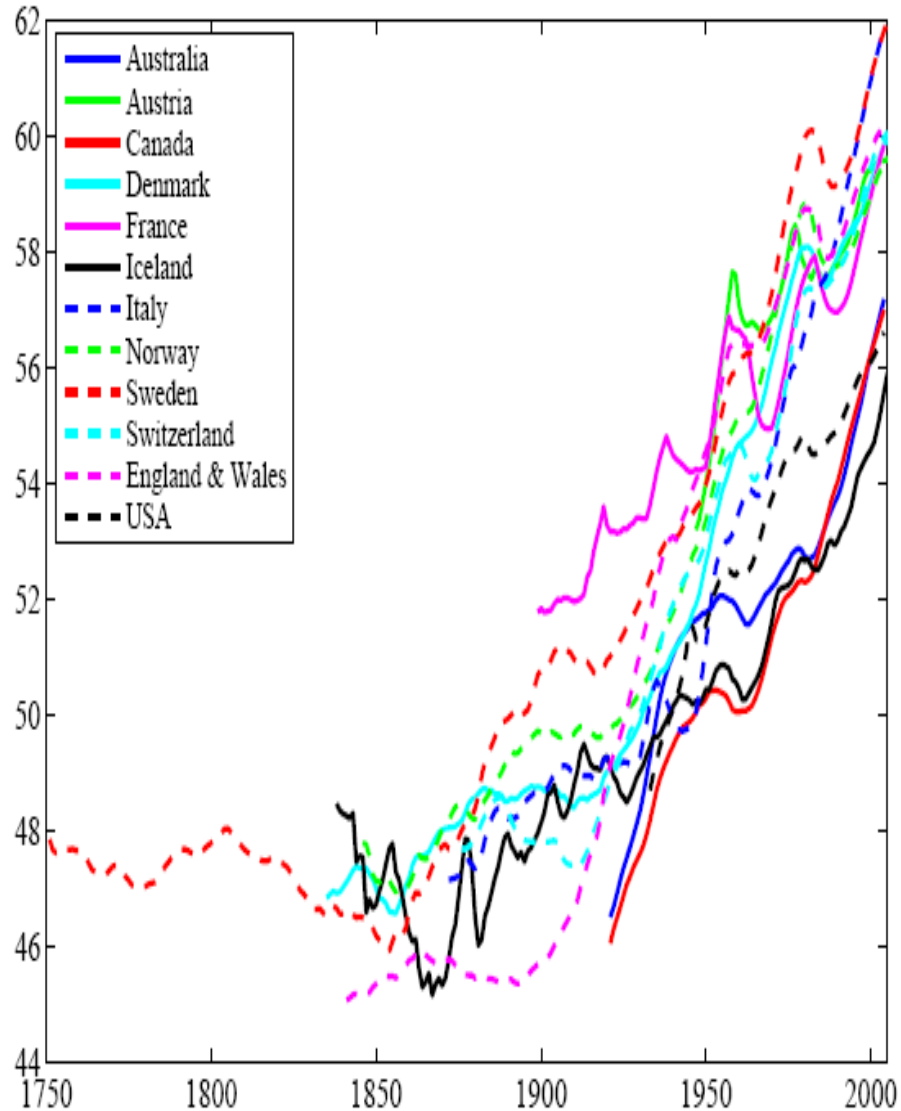
(c) OGA index


0.26
0.24
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
1750
1800
1850
1900
1950
2000
Australia
Austria
Canada
Denmark
France
Iceland
Italy
Norway
Sweden
Switzerland
England & Wales
USA

(c) OGA index



(d) Cutoff Age (Optimal Grouping)



Country	Share of the oldest	Share of the youngest	Elder-child ratio
Australia	0.0429	-0.2846	0.3275
	[0.0422]	[0.0000]	[0.0000]
Austria	-0.0963	-0.2393	0.1430
	[0.0311]	[0.0000]	[0.0452]
Canada	0.1652	-0.4264	0.5916
	[0.0000]	[0.0000]	[0.0000]
Denmark	-0.0414	-0.2835	0.2421
	[0.1676]	[0.0000]	[0.0000]
England & Wales	-0.0010	-0.1428	0.1418
	[0.9756]	[0.0001]	[0.0158]
France	0.0383	-0.2212	0.2595
	[0.4493]	[0.0000]	[0.0010]
Iceland	0.0547	-0.3203	0.3750
	[0.0057]	[0.0000]	[0.0000]
Italy	0.2323	-0.3575	0.5898
	[0.0000]	[0.0000]	[0.0000]
Norway	-0.0619	-0.2157	0.1538
	[0.1486]	[0.0000]	[0.0266]
Sweden	-0.0210	-0.1464	0.1254
	[0.6051]	[0.0002]	[0.0867]
Switzerland	-0.0440	-0.2335	0.1895
	[0.0404]	[0.0000]	[0.0001]
USA	-0.0173	-0.2937	0.2764
	[0.4646]	[0.0000]	[0.0000]

Note: Growth rate in % of a given indicator as obtained from an OLS regression of the log of the indicator on a constant term and a linear trend. p-value of nullity test is in brackets.

Conclusion

- An alternative measure of population aging.
- The age of entree in old age is defined by:
  - the entire age distribution,
  - the age distribution only.
- This age has significantly increased over the last 50 years. This should affect the political economy of the “life ages”.