Age groups and the measure of population aging

H. d’Albis and F. Collard

Demographic Research
29 (23), 617-640, 2013
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 same 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 **not** 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)
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
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
What about the number of groups?
Table 1: Correlation of Elder–Child Ratios

<table>
<thead>
<tr>
<th>n</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1.00</td>
<td>0.71</td>
<td>0.75</td>
<td>0.73</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>1.00</td>
<td>0.77</td>
<td>0.74</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td>1.00</td>
<td>0.89</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>1.00</td>
</tr>
</tbody>
</table>
Aging in developed countries
(c) OGA index

(d) Cutoff Age (Optimal Grouping)
<table>
<thead>
<tr>
<th>Country</th>
<th>Share of the oldest</th>
<th>Share of the youngest</th>
<th>Elder-child ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>0.0429</td>
<td>-0.2846</td>
<td>0.3275</td>
</tr>
<tr>
<td>Austria</td>
<td>-0.0963</td>
<td>-0.2393</td>
<td>0.1430</td>
</tr>
<tr>
<td>Canada</td>
<td>0.1652</td>
<td>-0.4264</td>
<td>0.5916</td>
</tr>
<tr>
<td>Denmark</td>
<td>-0.0414</td>
<td>-0.2835</td>
<td>0.2421</td>
</tr>
<tr>
<td>England &amp; Wales</td>
<td>-0.0010</td>
<td>-0.1428</td>
<td>0.1418</td>
</tr>
<tr>
<td>France</td>
<td>0.0383</td>
<td>-0.2212</td>
<td>0.2595</td>
</tr>
<tr>
<td>Iceland</td>
<td>0.0547</td>
<td>-0.3203</td>
<td>0.3750</td>
</tr>
<tr>
<td>Italy</td>
<td>0.2323</td>
<td>-0.3575</td>
<td>0.5898</td>
</tr>
<tr>
<td>Norway</td>
<td>-0.0619</td>
<td>-0.2157</td>
<td>0.1538</td>
</tr>
<tr>
<td>Sweden</td>
<td>-0.0210</td>
<td>-0.1464</td>
<td>0.1254</td>
</tr>
<tr>
<td>Switzerland</td>
<td>-0.0440</td>
<td>-0.2335</td>
<td>0.1895</td>
</tr>
<tr>
<td>USA</td>
<td>-0.0173</td>
<td>-0.2937</td>
<td>0.2764</td>
</tr>
</tbody>
</table>

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”.