Human capital-specific old-age dependency ratio
the case of Italy

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Research topic:
related to the more general thought that rise in human capital boosts economic growth and hence is expected to alleviate (negative) economic consequences of ageing

Research Questions:
- How do changes in the educational composition of a population influence population ageing?
- How can these changes be measured?
  • In this presentation the age composition is considered.

Note: to fix ideas pay-as-you-go assumed; private pensions not considered.
**Method of measurement:**

start with the conventional OADR and make it education-specific (Ed-OADR)

**Conventional OADR** = \( \frac{P(65+)}{P(20-64)} \)

**Assumptions underlying the conventional OADR:**

- Cutting ages: *we keep it*

- Denominator indicates production, numerator indicates consumption, i.e. everyone in the denominator works, everyone in the numerator consumes (gets a pension): *we keep it*

- …
Assumption:
-One person aged 20-64 contributes one person-year to the denominator; one person aged 65+ contributes one person-year to the numerator.

We change this assumption:
1. A worker contributes to the denominator a number of person-years in accordance with his/her educational degree measured with income (pre-tax)
2. An elderly contributes to the numerator a number of person-years according to the level of education measured with the public pension received.
<table>
<thead>
<tr>
<th>Level of education</th>
<th>Labour Income (20-64)</th>
<th>Public Pensions (65+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISCED 0-2</td>
<td>18 900</td>
<td>10 700</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>ISCED 3-4</td>
<td>22 300</td>
<td>19 500</td>
</tr>
<tr>
<td></td>
<td>1.18</td>
<td>1.81</td>
</tr>
<tr>
<td>ISCED 5-6</td>
<td>27 800</td>
<td>27 500</td>
</tr>
<tr>
<td></td>
<td>1.47</td>
<td>2.55</td>
</tr>
</tbody>
</table>

Source: EUSILC
## Population – initial distribution (2007)

<table>
<thead>
<tr>
<th>Level of education</th>
<th>Age group 20-64</th>
<th>Age group 65 and higher</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number (th)</td>
<td>%</td>
</tr>
<tr>
<td>ISCED 0-2</td>
<td>16,714</td>
<td>46%</td>
</tr>
<tr>
<td>ISCED 3-4</td>
<td>13,140</td>
<td>41%</td>
</tr>
<tr>
<td>ISCED 5-6</td>
<td>4,718</td>
<td>13%</td>
</tr>
</tbody>
</table>

*Source: ISTAT*
Projections

Multi-state method;

Assumptions based on ISTAT medium variant:

**TFR:** 2007-8: 1.39 [ISCED 0-1: 1.7 ; ISCED 2-6: 1.37]  
2056-7: 1.60 [ISCED 0-1: 1.95; ISCED 2-6: 1.58] (constant afterwards)

**Net number of migrants to Italy**  
(following ISTAT assumptions over the next 50 years)

**Life expectancy at birth** (no differentials by education):  
2007-8: Male 78.6; Female 84.1; 2056-7: Male 85.0; Female 90.0

*Note: assumptions about fertility and migration are less relevant for our study*
Period of projection: 50 + 50 years; after 2057 all components of change remain constant

Two scenarios:
- **Constant:** transition rates as in 2004-2007
Distribution of the population by 3 levels of education 2057

<table>
<thead>
<tr>
<th>Level of education</th>
<th>Constant Scenario</th>
<th>Trend Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age group 20-64</td>
<td>Age group 65 and higher</td>
</tr>
<tr>
<td>ISCED 0-2</td>
<td>29%</td>
<td>37%</td>
</tr>
<tr>
<td>ISCED 3-4</td>
<td>53%</td>
<td>45%</td>
</tr>
<tr>
<td>ISCED 5-6</td>
<td>18%</td>
<td>18%</td>
</tr>
</tbody>
</table>
Improving age composition by education: use of HC function:
\[ E(\text{Labour income}) = \text{Education} + \text{Age} + \text{Age} \times \text{Age} \]

Women

Men

Basic unit: woman, 20-years old, ISCED 0-2
Age composition between ages 20 and 80 of the observed population distributed by sex and education (left), and of the human capital-specific population (right), Italy 2007
Trends in the conventional OADR and the HC-OADR, 2007-2057, absolute values (left) and relative values (right).

HC-OADR(c) = constant scenario
HC-OADR(t) = trend scenario
In the long term: towards stability
Understanding the results (constant scenario): changes in numerator and denominator
Change in population aged 65+

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2057 const.</th>
<th>2057 trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISCED 0-2</td>
<td>85</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>ISCED 3-4</td>
<td>11</td>
<td>45</td>
<td>43</td>
</tr>
<tr>
<td>ISCED 5-6</td>
<td>4</td>
<td>18</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>100 %</td>
<td>100 %</td>
<td>100 %</td>
</tr>
</tbody>
</table>

*Note: understanding results through schooling reforms in Italy towards increase in secondary education*
Alternative measurement of HC

- Consider length of schooling only: not income, nor length of practice
- Suppose lower education = 8 years, secondary = 12 years, and higher = 16 years
- The ratio of 1 : 1.5 : 2.0 can be used.
- Estimates lead to similar findings
Conclusions (1)

• In Italy, population aging is faster when effect of changes in human capital are considered.
• Increase in education can aggravate, not mitigate, consequences of aging.
• The unexpected result is due to age-specific changes in the population age structure when HC is specified by age.
Conclusions and further research (2)

• We discussed public pensions; yet economic consequences of ageing include problems related to health and care for the elderly; they are independent of education…

-…Or: higher education implies increased demand for higher-quality, hence more expensive, services.

• Use of age-specific national transfer accounts specified by education can be informative
Conclusions and further research (3)

• Towards human-capital population dynamics
• What inferences about other countries?
• Relevance to the 2\textsuperscript{nd} demographic dividend?