“Uniting Souls” and Numeracy Skills. 
Age Heaping in the First Italian National Censuses, 1861-1881

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Introduction and background

Debate on North/South gap at the time of the Unification (1861).

1. GDP per capita

2. General consensus on the existence of North/South Gap in broader dimensions of living standards (Life Expectancy, Literacy, Heights, HDI)
   ➔ Felice (2007) and Felice & Vasta (2012)
New estimates of age heaping for the period 1861-1881

We consider age heaping as an indicator of relatively basic numeracy skills (A’Hearn, Baten & Crayen, 2009)

Note also the debate between Lynn (2009) and Felice & Giuliano (2010) on Intelligence (see also Daniele & Malanima, 2011). Lynn argues that differences in IQ levels between North/South (reflecting genetic components) are responsible for the gap between regions

Age heaping at first glance

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Measuring age heaping

Two main indicators:

1.  Whipple Index:  \[ W = \frac{(n_{25} + n_{30} + n_{35} + \ldots + n_{65} + n_{70})}{\frac{1}{5} \sum_{i=23}^{72} n_i} \times 100 \]

2.  ABCC Index:  \[ ABCC = \left\{ 1 - \frac{(W-100)}{400} \right\} \times 100 \text{ for } W \geq 100 \]

\[ ABCC = 100 \text{ elsewhere} \]

Indicators are computed over [23,72] interval in order to limit spurious effects that can influence age awareness at specific moments in life.

Geographical scope: provincial level (similar to NUTS 3: 59 provinces in 1861; 69 in 1871 and 1881)

The first three national censuses:

- **1861**: MAIC - Ministero di Agricoltura, Industria e Commercio (1866). *Censimento generale, vol. II. Popolazione*.
- **1871**: MAIC - Ministero di Agricoltura, Industria e Commercio (1876). *Censimento della popolazione del Regno d’Italia al 31 dicembre 1871, vol. II. Popolazione classificata per età sesso, stato civile e istruzione elementare*.
- **1881**: MAIC - Ministero di Agricoltura, Industria e Commercio (1884). *Censimento della popolazione del Regno d’Italia al 31 dicembre 1881, vol. II. Popolazione classificata per età sesso, stato civile e istruzione elementare*.

- In **1891** the census was not carried out because of the financial difficulties of the country.
- The censuses for **1901** and **1911** do not report complete 1-year age distributions but 5-year age distribution.
- In **1881**: 1-year age distributions are reported only for the province “capital”.

Data were collected by self-enumeration. The head of the household was in charge of filling the census form; in case of illiteracy, (s)he could ask for help to a literate person.
### Table 2: Literacy and Age-Heaping in Italian provinces, 1861-1881

<table>
<thead>
<tr>
<th>Sample</th>
<th>ABCC coefficient</th>
<th>$R^2$</th>
<th>Mean literacy</th>
<th>Mean Numeracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pooled sample (1861-1881)</td>
<td>2.570***</td>
<td>0.554</td>
<td>30.44</td>
<td>88.97</td>
</tr>
<tr>
<td></td>
<td>(0.165)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Men</td>
<td>2.889***</td>
<td>0.621</td>
<td>36.20</td>
<td>90.22</td>
</tr>
<tr>
<td></td>
<td>(0.162)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Women</td>
<td>2.212***</td>
<td>0.474</td>
<td>24.82</td>
<td>87.72</td>
</tr>
<tr>
<td></td>
<td>(0.167)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Census 1861</td>
<td>1.554***</td>
<td>0.453</td>
<td>19.88</td>
<td>86.75</td>
</tr>
<tr>
<td></td>
<td>(0.226)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Men</td>
<td>1.839***</td>
<td>0.508</td>
<td>25.37</td>
<td>88.01</td>
</tr>
<tr>
<td></td>
<td>(0.240)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Women</td>
<td>1.267***</td>
<td>0.381</td>
<td>14.37</td>
<td>85.48</td>
</tr>
<tr>
<td></td>
<td>(0.214)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Census 1871</td>
<td>1.873***</td>
<td>0.506</td>
<td>25.10</td>
<td>88.26</td>
</tr>
<tr>
<td></td>
<td>(0.226)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Men</td>
<td>2.273***</td>
<td>0.607</td>
<td>31.01</td>
<td>89.55</td>
</tr>
<tr>
<td></td>
<td>(0.224)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Women</td>
<td>1.444***</td>
<td>0.365</td>
<td>19.24</td>
<td>86.96</td>
</tr>
<tr>
<td></td>
<td>(0.233)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Census 1881</td>
<td>3.225***</td>
<td>0.580</td>
<td>44.82</td>
<td>91.60</td>
</tr>
<tr>
<td></td>
<td>(0.335)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Men</td>
<td>3.446***</td>
<td>0.634</td>
<td>50.66</td>
<td>92.78</td>
</tr>
<tr>
<td></td>
<td>(0.320)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Women</td>
<td>2.884***</td>
<td>0.541</td>
<td>39.33</td>
<td>90.38</td>
</tr>
<tr>
<td></td>
<td>(0.324)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Age heaping and literacy (3)

Numeracy among illiterates and literates, 1871-1881

Age heaping and heights (1)
### Table 3: Heights and Age Heaping, 1871-1881

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Height</strong></td>
<td>-6.577*** (0.512)</td>
<td>-7.800*** (0.648)</td>
<td>-5.230*** (0.565)</td>
</tr>
<tr>
<td><strong>Constant</strong></td>
<td>1,203*** (83.09)</td>
<td>1,407*** (105.2)</td>
<td>978.2*** (91.72)</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>136</td>
<td>68</td>
<td>68</td>
</tr>
<tr>
<td><strong>R-squared</strong></td>
<td>0.552</td>
<td>0.687</td>
<td>0.565</td>
</tr>
</tbody>
</table>

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
What does age heaping really mean?

To the extent, therefore, that the degree of age-heaping ...[is]...correlated with other qualities such as arithmetical ability ("numeracy"), a respect for accuracy, or a more serious attitude toward time, age heaping measure valuable human attributes which have the potential to create important economic externalities and play a role in development (Mokyr, 1983, p. 246)

We find pieces of evidence supporting:

• Age heaping as an indicator of individual numerical skills ("arithmetical ability")
  → Correlation with literacy and heights
  → Considerable variation of age heaping for low literacy levels ("rudimentary capability")

• Age heaping as an indicator of environmental or contextual factors ("respect for accuracy")
  → Age heaping among literates and age effects are higher in the South

In any case, age heaping is a proxy for (valuable) qualities either individual or social

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According to Crayen and Baten (2010):

- “Advanced” countries in Europe (UK, Germany, Sweden, Netherlands) in 1800-1850 are characterized by Whipple Index <125

- Algeria-Tunisia in 1900-1920 are characterized by Whipple Index in the 150-200 range
Before the Unification

It is possible to compute Whipple Indices across different age cohorts, stretching the time-coverage of the data (Crayen & Baten, 2010)

<table>
<thead>
<tr>
<th>1861 Age cohort</th>
<th>Birth year</th>
<th>Birth decade</th>
</tr>
</thead>
<tbody>
<tr>
<td>[23,32]</td>
<td>[1829-1838]</td>
<td>1830s</td>
</tr>
<tr>
<td>[33,42]</td>
<td>[1819-1828]</td>
<td>1820s</td>
</tr>
<tr>
<td>[43,52]</td>
<td>[1809-1818]</td>
<td>1810s</td>
</tr>
<tr>
<td>[53,62]</td>
<td>[1799-1808]</td>
<td>1800s</td>
</tr>
<tr>
<td>[63,72]</td>
<td>[1789-1798]</td>
<td>1790s</td>
</tr>
</tbody>
</table>

Age effects across birth cohorts, 1861-1881

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The adjustment for age effects

1. We take as baseline the Whipple Index for the age cohort [23,32]

2. We use as adjustment the difference between the Whipple Index of the 1871 census and the 1861 census of corresponding age cohorts

3. We set these bounding constraints:
   - Whipple Index cannot improve
     (min. adjustment=0)
   - The adjusted Whipple cannot be lower than the baseline
Historical trends in age heaping, 1790-1830

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Concluding remarks

• We find a sizable gap in age heaping (basic numeracy skills) between North and South at the Unification

• This is consistent with gaps in other dimensions of living standards

• This can perhaps have even more implications than literacy for the diverging growth trajectories of the two regions

  Traditional view of the Kingdom of the Two Sicilies: “negation of God erected into a system of government” (Gladstone, 1850)
**Age effects adjustment: an example**

<table>
<thead>
<tr>
<th>Age Cohorts</th>
<th>Birth year for 1861 cohorts</th>
<th>1861 census</th>
<th>1871 census</th>
<th>Age effect</th>
<th>Adjustment coefficient for [23,32] baseline</th>
<th>Adjusted Whipple</th>
</tr>
</thead>
<tbody>
<tr>
<td>age group [23,32]</td>
<td>1830</td>
<td>155</td>
<td>155</td>
<td>-</td>
<td>155</td>
<td>155</td>
</tr>
<tr>
<td>age group [33,42]</td>
<td>1820</td>
<td>209</td>
<td>181</td>
<td>26</td>
<td>26</td>
<td>183</td>
</tr>
<tr>
<td>age group [43,52]</td>
<td>1810</td>
<td>214</td>
<td>202</td>
<td>-7</td>
<td>26</td>
<td>188</td>
</tr>
<tr>
<td>age group [53,62]</td>
<td>1800</td>
<td>257</td>
<td>215</td>
<td>1</td>
<td>27</td>
<td>230</td>
</tr>
<tr>
<td>age group [63,72]</td>
<td>1790</td>
<td>180</td>
<td>-77</td>
<td>27</td>
<td>27</td>
<td>209</td>
</tr>
</tbody>
</table>

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