The Importance of Cognitive Skills and Majors in Determining Future Earnings

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Choice of Major Determines Unemployment and Earnings

- Non-technical majors like Art (11.1%), Architecture (13.9%), and Social Science (8.9%) generally have high unemployment rates.
Our Contribution

- Question the seemingly tight connection between majors and earnings
- Consider the role of **cognitive skills** on earnings
- Consider 2 dimensions of Human capital
  - General (numeracy, literacy)
  - Specific (college majors)
Cognitive Skills

- The core skills your brain uses to **think, read, learn, remember, and reason**
- E.g., Numeracy, Literacy
- **General, flexible** skills that can be developed regardless of academic major
Literature Review

- Earnings vary across majors
- Rarely takes into account cognitive skills
- Tends to assume majors determine "human capital"
Research Question

- Do general cognitive skills explain within-major differences in earnings?
- How do general cognitive skills interact with specific skills acquired in majors to explain earnings?
Why it matters…

- Lead to better informed decisions
- Contribute to more productive policy discussions
- Implications for curricular development
PIAAC 2012/2014

Sample
- USA; 4-yr degree & above; Age 25-65
- Full-time wage earners
  - Work at least 30 hrs/week
  - Exclude self-employed
- N=970.
OLS Model

Dependent Variable: Monthly income (logged)

Independent Variables
• Academic Majors (dummy variables)
  - major of highest degree attained
• Cognitive skill (standardized)
• Interaction of Majors and Cognitive skill
• Note: Numeracy and Literacy separately
Findings
<table>
<thead>
<tr>
<th>Major</th>
<th>Numeracy</th>
<th>Literacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education (omitted)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humanities</td>
<td>0.144* (0.072)</td>
<td>0.138 (0.072)</td>
</tr>
<tr>
<td>Social sciences</td>
<td>0.340*** (0.057)</td>
<td>0.344*** (0.057)</td>
</tr>
<tr>
<td>STEM</td>
<td>0.309*** (0.065)</td>
<td>0.323*** (0.064)</td>
</tr>
<tr>
<td>Health and welfare</td>
<td>0.324*** (0.069)</td>
<td>0.310*** (0.068)</td>
</tr>
<tr>
<td>Cogn. skill (standardized)</td>
<td>0.119*** (0.026)</td>
<td>0.118*** (0.022)</td>
</tr>
</tbody>
</table>

Dependent Variable: Log (Monthly Earnings)
## Interaction Between Majors and Numeracy

<table>
<thead>
<tr>
<th>Major</th>
<th>Numeracy Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humanities</td>
<td>9.3%</td>
</tr>
<tr>
<td>Social sciences</td>
<td>17.6%***</td>
</tr>
<tr>
<td>STEM</td>
<td>13.0%*</td>
</tr>
<tr>
<td>Health and welfare</td>
<td>15.0%</td>
</tr>
</tbody>
</table>

*** p<0.001, ** p<0.01, * p<0.05

Reference Group: Education × Numeracy
Interaction Between Majors and Literacy

Reference Group: Education × Literacy

*** p<0.001, ** p<0.01, * p<0.05
Numeracy and Predicted Earnings

The graph illustrates the relationship between standardized numeracy scores and predicted earnings, with controls for various fields of study: Education, Humanities, Social Sciences, STEM, and Health. The y-axis represents the log of monthly income, and the x-axis shows the standardized numeracy score with controls. The lines indicate different fields, with Education showing a positive relationship and Health showing a negative relationship with numeracy.
Limitations

- Data does not disentangle cognitive skill developed before / during / after college
- “Academic major” is the major of the highest level of education (not necessarily bachelor’s degree)
- Do not consider institutional selectivity
- Other non-controllable factors that may affect earnings
Conclusion

- College majors are not the end all be all when thinking about earnings – cognitive skills matter

- Future research:
  - Consider skill-job match
  - Consider non-cognitive skills
  - International comparisons
Thank you.

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