Education for Future Jobs

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Arnold & Porter Kay Scholar, December 12, 2017
Linking job impact of AI to education

• Shift focus away from jobs to skills
  o What transition is required?
  o Is it feasible?

• Evaluate AI using standardized tests
  o Uses explicit tasks, not vague topics
  o Allows direct comparison with people
  o Contrast to Oxford, McKinsey analyses
Example: OECD’s Survey of Adult Skills (PIAAC)

- PIAAC measures 3 widely-used work skills
  - Literacy, numeracy, problem solving with computers
  - 75% OECD workers use these skills every day
  - Huge investment in education to develop them
Example PIAAC Literacy Questions

• **International calls**  *Level 3*
  o Text: website describing how to make international calls
  o Question: When would you need to dial 098?
  o Instruction: Highlight information to answer the question

• **Library search**  *Level 4*
  o Text: results of library search with titles and brief descriptions of books about genetically modified foods
  o Question: What book suggests that the claims for and against genetically modified foods are both unreliable?
## PIAAC Literacy: OECD Adults

<table>
<thead>
<tr>
<th>Proficiency Level</th>
<th>OECD Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 and below</td>
<td>53%</td>
</tr>
<tr>
<td>3</td>
<td>35%</td>
</tr>
<tr>
<td>4-5</td>
<td>11%</td>
</tr>
</tbody>
</table>
### PIAAC Literacy: OECD Adults vs. AI

<table>
<thead>
<tr>
<th>Proficiency Level</th>
<th>OECD Adults</th>
<th>AI</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 and below</td>
<td>53%</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>35%</td>
<td>Close</td>
</tr>
<tr>
<td>4-5</td>
<td>11%</td>
<td>No</td>
</tr>
</tbody>
</table>

Simple model of skill adjustment

- Cognitive skills – developed in education
- Physical skills – developed outside of education

<table>
<thead>
<tr>
<th>Cognitive Skills</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td></td>
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</tr>
</tbody>
</table>
### Simple model of skill adjustment

#### Distribution of Current US Employment by Cognitive and Physical Skills (using O*NET)

<table>
<thead>
<tr>
<th>Cognitive Skills</th>
<th>Physical Skills</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td></td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Medium</td>
<td></td>
<td>7%</td>
<td>74%</td>
<td>1%</td>
</tr>
<tr>
<td>High</td>
<td></td>
<td>1%</td>
<td>17%</td>
<td>0%</td>
</tr>
</tbody>
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Simple model of skill adjustment

Use computers as cognitive assistants

<table>
<thead>
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<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
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<td>7%</td>
</tr>
<tr>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>1%</td>
</tr>
</tbody>
</table>
Simple model of skill adjustment

But the physical skills may develop at the same time

<table>
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<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>7%</td>
<td><strong>74%</strong></td>
<td>1%</td>
</tr>
<tr>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>1%</td>
<td><strong>17%</strong></td>
<td>0%</td>
</tr>
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Simple model of skill adjustment

Also use computers as physical assistants

<table>
<thead>
<tr>
<th>Cognitive Skills</th>
<th>Physical Skills</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>81%</td>
<td></td>
<td></td>
<td>1%</td>
</tr>
<tr>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>18%</td>
<td></td>
<td></td>
<td>0%</td>
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Simple model of skill adjustment

Potential large-scale automation

<table>
<thead>
<tr>
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<th>Physical Skills</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Low</td>
<td><strong>81%</strong></td>
<td></td>
<td>1%</td>
</tr>
<tr>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>18%</td>
<td></td>
<td>0%</td>
</tr>
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Simple model of skill adjustment

But we don’t expect massive unemployment

<table>
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<tbody>
<tr>
<td></td>
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</tr>
<tr>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td></td>
</tr>
<tr>
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Simple model of skill adjustment

Instead: long-term expansion of remaining jobs

<table>
<thead>
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<tbody>
<tr>
<td></td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>Low</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>95%</td>
<td></td>
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</tbody>
</table>
Simple model of skill adjustment

- Scenario 1: cognitive automation but not physical
  - Need less education

- Scenario 2: both cognitive and physical automation
  - Need much more education

- Conclusion: more education not necessarily the right response
  - It depends on what happens with skills developed outside of education
Improving Skills: PIAAC Literacy Level 4-5

• We can do better than the OECD average of 11%
  o Adults with higher education: 21%
  o Adults in Japan with higher education: 37%

• But improvements are hard
  o Decreased 2 percentage points since 1990s

• No examples at scale with most adults at Level 4-5
We need more information

- What we don’t know
  - Do we need more or less education?
  - Can we move many more people to higher skills?
- Proposed OECD-National Academies program
  - Assess capabilities of AI and robotics in all work skills
  - Compare to human skills and education potential
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