The Growing Importance of Social Skills in the Labor Market

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SBTC and Job Polarization

Smoothed Changes in Employment by Occupational Skill Percentile 1979-2007

Source: Acemoglu and Autor (2011)
Slowdown in demand for cognitive skills among college grads

Source: Beaudry, Green and Sand (2014)
**Lower return to cognitive skills in later NLSY cohort**

<table>
<thead>
<tr>
<th></th>
<th>NLSY79 (1)</th>
<th>NLSY97 (2)</th>
<th>NLSY79 (3)</th>
<th>NLSY97 (4)</th>
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<tbody>
<tr>
<td>Men:</td>
<td></td>
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<tr>
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<td>.1901</td>
<td>.1239</td>
<td>.1679</td>
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<td>(.0193)</td>
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<td>.2727</td>
<td>.4143</td>
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<td>(.0445)</td>
<td>(.0357)</td>
<td>(.0446)</td>
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<td>.6520</td>
<td>.8552</td>
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<td>(.0824)</td>
<td>(.0531)</td>
<td>(.0819)</td>
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<tr>
<td>$R^2$ (adjusted)</td>
<td>.1405</td>
<td>.1498</td>
<td>.1661</td>
<td>.1535</td>
</tr>
</tbody>
</table>

Source: Castex and Dechter (2014)
Motivation Overview

Labor Market Trends

Model and NLSY Results

Implications

Change in Employment Share, 2000-2012

Science, Engineering and Technical Occupations

- Engineers
- Programmers & Technical Support
- Engineering And Science Technicians
- Drafters
- Architects
- Physical Scientists
- Biological Scientists
- Surveyors & Cartographers
- Air Traffic Controllers
- Airplane Pilots & Navigators
- Mathematicians & Statisticians
- Medical Scientists
- Operations Researchers
- Actuaries
- Computer Scientists

2000 Census, 2011-2013 ACS
Computers are substituting for tasks of rapidly increasing cognitive complexity. What tasks do computers complement? Can everything be automated?
Growing Importance of Social Skills

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• Social interaction
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- Social interaction

- Skill in social settings is based on tacit knowledge and evolved over thousand of years - we don’t know “the rules” (Autor 2015)
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**Computers** are substituting for tasks of rapidly increasing cognitive complexity. What tasks do computers *complement*? Can everything be automated?

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- Skill in social settings is based on tacit knowledge and evolved over thousand of years - we don’t know “the rules” (Autor 2015)

- Theory of mind
Growing Importance of Social Skills

Three key facts about the U.S. labor market:
Growing Importance of Social Skills

**Three** key facts about the U.S. labor market:

1. Employment growth in social skill-intensive occupations *throughout the wage distribution*
Growing Importance of Social Skills

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2. Growing complementarity between cognitive skills and social skills (Weinberger 2014)
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Three key facts about the U.S. labor market:

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3. Negative correlation between social skill intensity and routineness of an occupation
Candidate explanations / models

**Why** would firms be willing to pay more for workers with higher social skills?
Candidate explanations / models

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1. Social networks - rent-seeking
Candidate explanations / models

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4. Social skill aids teamwork by lowering the cost of coordinating with others
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2. Customer service - the human touch

3. Communication specialists - but what is a communication task?

4. Social skill aids teamwork by lowering the cost of coordinating with others
   
   4.1 Communication is not a task - it’s the price paid to realize the benefits of teamwork
Team production with social skills

“Trading tasks” to exploit comparative advantage (Ricardo 1891, Eaton and Kortum 2002)
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- Predictions match the data
  - Gains from trade for all workers through horizontal specialization (not vertical as in GH 2006, 2008)
  - Complementarity between cognitive and social skills emerges naturally
  - Returns increasing in variance of productivity over tasks (i.e. non-routineness)
Taking the model to NLSY79 data

- Standard wage regressions for prime-age adults
Taking the model to NLSY79 data

- Standard wage regressions for prime-age adults
  - AFQT, social skills (summary index)

1. Positive return to social skills - controls for cog. and non-cog. skill, education/occupation
2. Skill complementarity
3. Increasing returns in non-routine, social skill-intensive occupations
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- Test and find support for three main predictions:
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  1. Positive return to social skills - controls for cog. and non-cog. skill, education/occ/industry
  2. Skill complementarity
  3. *Increasing returns* in non-routine, social skill-intensive occupations
    3.1 Worker fixed effects
Three implications

1. ICT and shifting of the organization of work (e.g. Lindbeck and Snower 2000, Bresnahan et al 2002, Dessein and Santos 2006, Bartel et al 2007, Bloom and van Reenen 2011)

2. Social skills and gender gaps in labor market outcomes (e.g. Author and Wasserman 2013, Kirkland et al 2013)

3. Early childhood interventions and non-cognitive skills (e.g. Heckman et al 2013)
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1. **ICT and shifting of the organization of work** (e.g. Lindbeck and Snower 2000, Bresnahan et al 2002, Dessein and Santos 2006, Bartel et al 2007, Bloom and van Reenen 2011)

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Census/ACS and O*NET Data

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- Balanced and consistent panel of occupation codes, following Autor and Dorn (2013)
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- Update ALM (2003) Figure 1, but with O*NET task measures
  - Routine
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  - Routine
  - Math (Nonroutine Analytic)
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  - Routine
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- Update ALM (2003) Figure 1, but with O*NET task measures
  - Routine
  - Math (Nonroutine Analytic)
  - Social Skill (Coordination, Negotiation, Persuasion, Social Perceptiveness)
  - Customer Service (External)
Worker Tasks in the U.S. Economy, 1980-2012
Update of Autor, Levy, and Murnane (2003) Figure 1

Occupational Task Intensity based on 1998 O*NET
Motivation

Outline

Labor Market Trends

Model

NLSY Results

Implications

Smoothed Changes in Employment by Occupational Task Intensity

1980-2012

Occupational Task Intensity based on 1998 O*NET

Sources: 1980 Census, 2011-2013 ACS
Smoothed Changes in Median Wages by Occupational Task Intensity
1980-2012

Occupational Task Intensity based on 1998 O*NET
Sources: 1980 Census, 2011-2013 ACS
Since 2000...

Smoothed Changes in Employment by Occupational Task Intensity

2000-2012

Occupation's Percentile in 1980 Wage Distribution

100 x Change in Employment Share

Occupational Task Intensity based on 1998 O*NET

Negative correlation between routine and social skill intensity

Each observation is a Census Occupation.

<table>
<thead>
<tr>
<th>Routine Task Intensity (O*NET)</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Skill Intensity</td>
<td>-0.679***</td>
<td>-0.560***</td>
</tr>
<tr>
<td></td>
<td>[0.113]</td>
<td>[0.155]</td>
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<tr>
<td>Add Other O*NET and DOT Tasks</td>
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<td></td>
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<tr>
<td>Observations</td>
<td>337</td>
<td>337</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.439</td>
<td>0.662</td>
</tr>
</tbody>
</table>

Source: Census/ACS, 1998 O*NET
Growing Importance of Social Skills

Three key facts about the U.S. labor market:

1. Employment growth in social skill-intensive occupations throughout the wage distribution - YES
2. Growing complementarity between cognitive skills and social skills - YES
3. Negative correlation between social skill intensity and routineness of an occupation - YES
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2. Growing *complementarity* between cognitive skills and social skills - *YES*

3. Negative correlation between social skill intensity and *routineness* of an occupation - *YES*
Model (simple example)

Production of research papers consists of two tasks - data analysis (D) and writing (W), with prod. fn:

$$Y = \min Y(D, W)$$

Each worker allocates one unit of effort to maximize Y. Productivity schedules (tasks completed per unit of effort):

<table>
<thead>
<tr>
<th></th>
<th>Writing</th>
<th>Data</th>
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<tbody>
<tr>
<td>Goldin</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Katz</td>
<td>6</td>
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Simple example

<table>
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<td>6</td>
<td>3</td>
</tr>
</tbody>
</table>

Producing alone:

\[ Y_G = \min[(0.667 \times 3), (0.333 \times 6)] = 2 \]
\[ Y_K = \min[(0.333 \times 6), (0.667 \times 3)] = 2 \]

Team production (with costless trade):

\[ Y_G = (e_G^W D_G, e_G^D W_G) = [(0 \times 3), (1 \times 6)] = (0, 6) \]
\[ Y_K = (e_K^W D_K, e_K^D W_K) = [(1 \times 6), (0 \times 3)] = (6, 0) \]
Adding social skills

Let $S_{i,n} \in (0,1)$ be a depreciation factor for trades between $i$ and $n$, with $S_{i,n} = S_i \ast S_n$ and $S_{i,i} = 1, \forall i$.

For the 2 task, 2 worker case, let $S^* = S_G \ast S_K$ with $S^*$ (symmetric) as the threshold for gains from task trade relative to “autarky”.

$S^* = 0.5$ in this case.
Three key implications

1. Return to social skills increasing in average productivity (absolute advantage)
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2. Returns decreasing in the across-worker correlation between task productivities (comparative advantage)
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   2.1 Threshold $S^*$ increases with a mean-preserving shift toward similarity, such as $(4, 4)$
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   2.1 Threshold $S^*$ increases with a mean-preserving shift toward similarity, such as $(4, 4)$
   2.2 Perfect correlation - i.e. $(6, 3)$ - eliminates gains from trade entirely
Three key implications

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   - Threshold $S^*$ increases with a mean-preserving shift toward similarity, such as $(4, 4)$
   - Perfect correlation - i.e. $(6, 3)$ - eliminates gains from trade entirely

3. $S$ also captures *flexibility* - can I adjust to $\Delta$ in comparative advantage?
Main Predictions

\[ w_i = \gamma^{-1} A_i S_i^\theta \left[ \frac{\bar{s}}{(AS)^{1-\frac{1}{\theta}}} \right] \]

1. Wages increasing in A and S, conditional on \( \theta \)
Main Predictions

\[ w_i = \gamma^{-1} A_i S_i^\theta \left[ \frac{\bar{s}}{(\bar{AS})^{1-\frac{1}{\theta}}} \right] \]

1. Wages increasing in A and S, conditional on \( \theta \)
   1.1 Returns to skill in a wage equation with occ/ind fixed effects, other controls
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\[ w_i = \gamma^{-1} A_i S_i^{\theta} \left[ \frac{\bar{s}}{(AS)^{1-\frac{1}{\theta}}} \right] \]

1. Wages increasing in $A$ and $S$, conditional on $\theta$
   
   1.1 Returns to skill in a wage equation with occ/ind fixed effects, other controls

2. $A$ and $S$ are complements
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3. Returns to \( S \) decreasing in routineness \( \theta \)
Main Predictions

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2. \( A \) and \( S \) are complements

3. Returns to \( S \) decreasing in routineness \( \theta \)
   3.1 Interact skills with O*NET task measures
Data and Empirical model

\[ \ln(w_{ijt}) = \alpha + \beta_1 AFQT_i + \beta_2 SS_i + \gamma X_{ijt} + \delta_j + \zeta_t + \epsilon_{ijt} \]
Data and Empirical model

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- NLSY79 through 2012 - AFQT, social skill summary index of self-reported sociability, participation in clubs and sports (K&W 2005)

Control for demographics, work exp, age and education FE
- Include occupation-industry-metro-division fixed effects (proxy for \( \theta \))
- SEs clustered at individual level
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Is there a labor market return to social skills?

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ln(Wages)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AFQT</td>
<td>0.162***</td>
<td>0.068***</td>
<td>0.058***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[0.005]</td>
<td>[0.005]</td>
<td>[0.06]</td>
<td></td>
</tr>
<tr>
<td>Social Skill</td>
<td>0.093***</td>
<td>0.040***</td>
<td>0.030***</td>
<td>0.021***</td>
</tr>
<tr>
<td></td>
<td>[0.004]</td>
<td>[0.004]</td>
<td>[0.004]</td>
<td>[0.004]</td>
</tr>
<tr>
<td>AFQT*Social</td>
<td>0.0073*</td>
<td>0.0077*</td>
<td>0.0089**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[0.0043]</td>
<td>[0.0041]</td>
<td>[0.0042]</td>
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<td>Non-cognitive Skills</td>
<td>X</td>
<td>X</td>
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<td>X</td>
</tr>
<tr>
<td>Education FE</td>
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<td>X</td>
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</tr>
<tr>
<td>Exclude Government Jobs</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Occ-Ind-Reg-Urb FE</td>
<td>X</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Observations</td>
<td>143,163</td>
<td>143,163</td>
<td>125,013</td>
<td>125,013</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.379</td>
<td>0.419</td>
<td>0.493</td>
<td>0.709</td>
</tr>
</tbody>
</table>
How does the return to skills vary by occupation?

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<th>(1)</th>
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<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFQT*Routine(ONET)</td>
<td>-0.0052**</td>
<td>-0.0018*</td>
<td>-0.0006</td>
</tr>
<tr>
<td></td>
<td>[0.0015]</td>
<td>[0.0019]</td>
<td>[0.0011]</td>
</tr>
<tr>
<td>Social Skill*Routine(ONET)</td>
<td>-0.0045***</td>
<td>-0.0011</td>
<td>-0.0014</td>
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<tr>
<td></td>
<td>[0.0012]</td>
<td>[0.0010]</td>
<td>[0.0011]</td>
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<tr>
<td>AFQT<em>Social</em>Routine(ONET)</td>
<td>-0.0024*</td>
<td>-0.0011</td>
<td>-0.0016</td>
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<tr>
<td></td>
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<td>[0.0009]</td>
<td>[0.0011]</td>
</tr>
<tr>
<td>Years of Completed Education</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Exclude Government Jobs</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>O*NET Task Measures</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Worker Fixed Effects</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Exclude Mgmt Occs</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Observations</td>
<td>125,013</td>
<td>125,013</td>
<td>110,351</td>
</tr>
</tbody>
</table>
A direct measure of social skill intensity

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
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<tbody>
<tr>
<td>Ln(Wages)</td>
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<tr>
<td>AFQT*SS(ONET)</td>
<td>0.0088**</td>
<td>0.0059***</td>
<td>0.0063***</td>
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<td></td>
<td>[0.0016]</td>
<td>[0.0011]</td>
<td>[0.0014]</td>
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<tr>
<td>Social Skill*SS(ONET)</td>
<td>0.0041***</td>
<td>0.0026**</td>
<td>0.0041***</td>
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<td>[0.0015]</td>
<td>[0.0011]</td>
<td>[0.0014]</td>
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<tr>
<td>AFQT<em>Social</em>SS(ONET)</td>
<td>0.0012</td>
<td>0.0024**</td>
<td>0.0038***</td>
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<td></td>
<td>[0.0015]</td>
<td>[0.0011]</td>
<td>[0.0014]</td>
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<tr>
<td>Years of Completed Education</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Exclude Government Jobs</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>O*NET Task Measures</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Worker Fixed Effects</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Exclude Mgmt Occs</td>
<td></td>
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<tr>
<td>Observations</td>
<td>125,013</td>
<td>125,013</td>
<td>110,351</td>
</tr>
</tbody>
</table>
Other Predictions

- Occupational sorting (Table 2)
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- Firm size and nonroutine task intensity (Table A1)
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- Occupational sorting (Table 2)
- Firm size and nonroutine task intensity (Table A1)
- Routine work = more “crowd out” by higher-skilled factors
  - Could be capital - test (Table 5) with computer use intensity by industry/year (Autor et al 1998)
• If computers “crowd out” workers more completely in routine tasks, shift workers to non-routine tasks

ICT and Skill Complementarity
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ICT and Skill Complementarity

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  • ICT and move from “Taylorist” to flexible, self-managed teams, job rotation (e.g. Lindbeck and Snower 2000)

• Implies link between ICT and skill complementarity, not just cognitive skill

• Consistent with case study evidence (Autor et al 2002, Bresnahan et al 2002, Bartel et al 2007)
Social Skills and Gender

- Narrowing/reversal of gender gaps in education and labor market outcomes (Welch 2000, Goldin et al. 2006, Autor and Wasserman 2013)
Social Skills and Gender


- SBTC favors women - brains relative to brawn (Black and Spitz-Oener 2010, Beaudry and Lewis 2014)
Social Skills and Gender


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- Females consistently score higher on tests of emotional and social intelligence (Hall 1978, Woolley et al 2010, Kirkland et al 2013)
Worker Tasks in the U.S. Economy, 1980-2012

Males - Update of ALM (2003), Figure 1

Occupational Task Intensity based on 1998 O*NET

Worker Tasks in the U.S. Economy, 1980-2012
Females - Update of ALM (2003), Figure 1

Occupational Task Intensity based on 1998 O*NET
Change in Female Employment Share by Social Skill Task Intensity
1980-2012

Social Skills Task Intensity based on 1998 O*NET

Sources: 1980 Census, 2011-2013 ACS
Measuring social skills

Are social skills conceptually distinct? Can they be measured?
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• “Non-cognitive” skills - *intrapersonal* vs. *interpersonal*
despondent

relieved

shy

excited
## Perry Preschool (Heckman et al 2013)

### Figure 6. Decompositions of Treatment Effects on Outcomes, Males

<table>
<thead>
<tr>
<th>Outcome Description</th>
<th>Treatment Effect</th>
<th>Cognitive Factor</th>
<th>Externalizing Behavior</th>
<th>Academic Motivation</th>
<th>Other Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAT total at age 14, end of grade 8 (0.566*)</td>
<td>0.161</td>
<td>0.071</td>
<td>0.071</td>
<td>0.013</td>
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<tr>
<td>Number of misdemeanor arrests, age 27 (-1.21**)</td>
<td>0.071</td>
<td>0.557</td>
<td>0.014</td>
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</tr>
<tr>
<td>Number of felony arrests, age 27 (-1.12)</td>
<td>0.071</td>
<td>0.246</td>
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<td></td>
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<tr>
<td>Number of adult arrests (misd. + fel.), age 27 (-2.33**)</td>
<td>0.062</td>
<td>0.144</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monthly income, age 27 (0.876**)</td>
<td>0.089</td>
<td>0.027</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Use tobacco, age 27 (-0.119*)</td>
<td>0.046</td>
<td>0.141</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Number of misdemeanor arrests, age 40 (-3.13**)</td>
<td>0.136</td>
<td>0.088</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Number of felony arrests, age 40 (-1.14*)</td>
<td>0.056</td>
<td>0.403</td>
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<tr>
<td>Number of adult arrests (misd. + fel.), age 40 (-4.26**)</td>
<td>0.086</td>
<td>0.149</td>
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<tr>
<td>Number of lifetime arrests, age 40 (-4.20*)</td>
<td>0.077</td>
<td>0.204</td>
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<tr>
<td>Employed, age 40 (0.200**)</td>
<td>0.085</td>
<td>0.018</td>
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</tbody>
</table>
Summing up

1. Growth in social skill-intensive jobs throughout the wage distribution, cognitive-social skill complementarity
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2. Model of team production - social skills reduce *worker-specific* coordination costs
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4. Future work - direct measures of teamwork and social skills; more on gender differences

5. Potentially important implications for education and skill development
Thanks!

This is work in progress, and I appreciate your thoughts, suggestions and criticisms.

david_deming@gse.harvard.edu