LLLight´in´Europe

LifeLong | Learning | Innovation | Growth &
Human Capital | Tracks in Europe
Income gaps grow with time

![Graph showing income gaps growth over time]
What is complex?

**Complex tasks**
- Optimization of production
- Making predictions
- Making decisions with significant financial consequences
- Teaching
- Planning and organizing work of large teams

**Simple tasks**
- Following clear and simple instructions
- Cleaning or polishing surfaces
- Serving food
- Organizing limited amount of information
- Filling out forms with known information
- Copy-pasting
Complex job holders experience a sustained growth of income
Non-complex job holders experience no income growth

![Graph showing relative earnings by age for different quintiles.](image)
The more complex the job, the faster, longer and higher the income
The same patterns are also true for USA
The returns to complexity keep on growing

**Gains in the rate of return from moving from the least to the most complex job over time**

- **Rate**
  - 40%
  - 60%
  - 80%
  - 6.5%
  - 7%
  - 7.5%

- **Year**
  - 1970
  - 1980
  - 1990
  - 2000
  - 2010
LLLight tested 1129 persons in 40 organization on their skill to solve complex problems
The Complex Problem Solving Skills increase in the same way as complexity in the job increases.
Complex Problem Solving skills by company
Complex Problem Solving skills by industry

- IT
- Entrepreneurial
- Industrial
- Professional Services
- Agricultural
- Hospitality
Complex Problem Solving skills by occupations

CPS Score

Occupation

Software Developer
Media Professional
Entrepreneur
Engineer
Manager
Consultant
Medical Professional
Agrifood Business Professional
Sales Personnel
Administrator
Technician
Mechanics
Trailer/Teacher
Agricultural Worker
Hospitality Personnel
Service Personnel
Complexity by 198 regions in Europe
With our economic model based on complexity we predict GDP per capita per region very well.
Complexity explains 89% of all wealth differences in Europe

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
<th>Model 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>17.42***</td>
<td>15.00***</td>
<td>14.83***</td>
<td>14.69***</td>
<td>14.29***</td>
<td>13.81***</td>
</tr>
<tr>
<td></td>
<td>(0.52)</td>
<td>(0.34)</td>
<td>(0.39)</td>
<td>(0.39)</td>
<td>(0.36)</td>
<td>(0.39)</td>
</tr>
<tr>
<td>Complexity</td>
<td>9.88***</td>
<td>6.39***</td>
<td>5.95***</td>
<td>5.76***</td>
<td>5.21***</td>
<td>4.66***</td>
</tr>
<tr>
<td></td>
<td>(0.71)</td>
<td>(0.46)</td>
<td>(0.54)</td>
<td>(0.54)</td>
<td>(0.51)</td>
<td>(0.54)</td>
</tr>
<tr>
<td>Ex-Socialist</td>
<td>-0.91***</td>
<td>-0.91***</td>
<td>-0.90***</td>
<td>-0.92***</td>
<td>-0.87***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.05)</td>
<td>(0.05)</td>
<td>(0.05)</td>
<td>(0.05)</td>
<td>(0.06)</td>
<td></td>
</tr>
<tr>
<td>Youth Unemployment</td>
<td>-1.02***</td>
<td>-0.99***</td>
<td>-1.19***</td>
<td>-0.88***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.28)</td>
<td>(0.27)</td>
<td>(0.26)</td>
<td>(0.34)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture &gt; 20%</td>
<td>-0.20*</td>
<td>-0.20*</td>
<td>-0.09</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.09)</td>
<td>(0.10)</td>
<td>(0.14)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital</td>
<td>0.15*</td>
<td>0.19**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td>(0.07)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Trust</td>
<td></td>
<td>0.29***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.08)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

R²: 0.59 ** 0.89 0.90 0.90 0.91 0.90
Adj. R²: 0.58 ** 0.89 0.90 0.90 0.91 0.89
Num. obs.: 198 198 198 198 198 158
df: 196 195 194 193 192 151
Mean dep. var: 9.86 9.84 9.83 9.83 9.82 9.88
BIC: 305 50 35 35 28 6
σ²: 13.04 6.77 6.46 6.39 6.21 6.29

*** p < 0.001, ** p < 0.01, * p < 0.05
Social trust is critical for complexity to function well
Finland
Adapted from Stevens and Burley (1997/2003)
Case Study: CPS within an occupation
CPS between business units
CPS by age
CPS by time required to solve a problem
CPS by degree of detail of instructions
CPS by degrees of freedom on the job
CPS and wages I

- We can write the elasticities of wages as

  \[ \varepsilon_{wx} = \frac{\partial \log W}{\partial \log x} = \varepsilon_{px} + \varepsilon_{qx} + \varepsilon_{qz}\varepsilon_{zx}, \]  
  \[ (\text{complexity}) \]  

  \[ \varepsilon_{wz_0} = \frac{\partial \log W}{\partial \log z_0} = \varepsilon_{qz}\varepsilon_{zz_0}, \]  
  \[ (\text{initial skill}) \]  

  \[ \varepsilon_{wt} = \frac{\partial \log W}{\partial \log t} = \varepsilon_{qz}\varepsilon_{zt}, \]  
  \[ (\text{tenure}) \]  

- To proceed with empirical analysis, we need to impose restrictions on \( p \) and \( q \)

- We will assume that \( \varepsilon_{px}, \varepsilon_{qx}, \varepsilon_{qz} \) are constant functions of \( x \) and \( z \)
CPS and wages II

\[ \epsilon_{zx} \big|_{t=0} = 0 \]
\[ \epsilon_{zz0} \big|_{t=0} = 1 \]
\[ \epsilon_{zt} \big|_{t=0} = 0 \]  \hspace{1cm} (9)

\[ \lim_{t \to \infty} \epsilon_{zx} = \frac{x\eta}{z^*} \] \hspace{1cm} (complexity)
\[ \lim_{t \to \infty} \epsilon_{zz0} = 0 \] \hspace{1cm} (initial skill)
\[ \lim_{t \to \infty} \epsilon_{zt} = 0 \] \hspace{1cm} (tenure)  \hspace{1cm} (10)

because

\[ \epsilon_{zx} = zx \left[ \frac{\eta}{z^* 2} \left( 1 - e^{-\alpha z^* t} \right) + \alpha \eta t e^{-\alpha z^* t} \left( \frac{1}{z_0} - \frac{1}{z^*} \right) \right], \]  \hspace{1cm} (11)

\[ \epsilon_{zz0} = \frac{z}{z_0} e^{-\alpha z^* t}, \]  \hspace{1cm} (12)

\[ \epsilon_{zt} = \alpha (z^* - z) t \]  \hspace{1cm} (13)
## CPS and wages III

<table>
<thead>
<tr>
<th></th>
<th>OLS</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>0.899 (0.122)**</td>
<td>1.078 (0.173)**</td>
</tr>
<tr>
<td>poly(workexp, 2, raw = TRUE)1</td>
<td>0.044 (0.006)**</td>
<td>0.058 (0.009)**</td>
</tr>
<tr>
<td>poly(workexp, 2, raw = TRUE)2</td>
<td>-0.001 (0.000)**</td>
<td>-0.001 (0.000)**</td>
</tr>
<tr>
<td>genderMale</td>
<td>0.162 (0.042)**</td>
<td>0.055 (0.065)</td>
</tr>
<tr>
<td>isced3</td>
<td>0.186 (0.105)</td>
<td>0.136 (0.114)</td>
</tr>
<tr>
<td>isced4</td>
<td>0.253 (0.112)*</td>
<td>0.117 (0.130)</td>
</tr>
<tr>
<td>isced5B</td>
<td>0.286 (0.108)**</td>
<td>0.135 (0.132)</td>
</tr>
<tr>
<td>isced5A</td>
<td>0.504 (0.100)**</td>
<td>0.312 (0.133)*</td>
</tr>
<tr>
<td>isced6</td>
<td>0.575 (0.125)**</td>
<td>0.331 (0.166)*</td>
</tr>
<tr>
<td>cps</td>
<td>0.099 (0.025)**</td>
<td><strong>0.278 (0.083)</strong>***</td>
</tr>
</tbody>
</table>

- **R²**: 0.719 | 0.682
- Adjusted R²: 0.707 | 0.668
- Num. obs.: 442 | 442
- df: 423 | 423
- Mean dep. var: 2.295 | 2.295
- BIC: 449 | 449
- \(\sigma^2\): 0.358 | 0.381

**Significance levels:**
- *******: p < 0.001
- ****: p < 0.01
- *: p < 0.05
So what to do? – for instance adult-oriented education
“Solution and Innovation skills” Mooc was equivalent to a brain shift. It doesn’t just give knowledge; it strives to give skills to find and use the knowledge, you may not even know you need!
Making use of complexity for individual and company leadership success

Sources of Growth - How to Discover New Horizons

October 13-14 2016
at the Lorange Institute of Business Zurich
Participating Universities

- Zeppelin University, Germany
  - Peer Ederer

- University of Nottingham, United Kingdom
  - John Holford

- Danish School of Education, Denmark
  - Ulrik Brandi

- Ifo Institute, Germany
  - Ludger Woessmann

- Wageningen University, Netherlands
  - Thomas Lans

- University of Luxembourg, Luxembourg
  - Samuel Greiff

- University of Economics Bratislava, Slovakia
  - Martina Lubyova

- China Center for Human Capital, China
  - Haizheng Li

- Innovation & Growth Academy, Netherlands
  - Silvia Castellazzi
Thank you for your attention

and

please visit www.lllightineurope.com