Life-cycle Human Capital Accumulation Across Countries: Lessons From U.S. Immigrants

David Lagakos, UCSD and NBER
Benjamin Moll, Princeton and NBER
Tommaso Porzio, Yale
Nancy Qian, Yale and NBER
Todd Schoellman, ASU

October, 2015
Motivating question: how important is human capital in accounting for cross-country income differences?

2005 conventional wisdom: not very. Logic:

- Human capital = years of schooling
- Value of schooling = Mincer return
- $\Rightarrow$ small cross-country variation
- Hall and Jones (1999); Bils and Klenow (2000); Caselli (2005)
Recent Literature

Expand scope of human capital measurement
- Education quality, health, early childhood human capital.
- Generally, larger role for human capital

Current research: life-cycle human capital accumulation
- Manuelli and Seshadri (2014): calibrated Ben-Porath model
- Companion paper: document cross-country facts
  - Profiles are steeper in richer countries
  - Multiple interpretations possible
This Paper: Returns to Experience of U.S. Immigrants

We measure returns to experience among U.S. immigrants
  • Steeper returns to rich country experience

Use data on migrants, non-migrants to provide interpretation
  • Returns to experience similar among migrants, non-migrants
  • Other comparisons do not support skill transfer or selection

Conclude that life-cycle wages reflect human capital
  • Update development accounting results
  • Provide suggestive evidence on mechanisms
Outline of Talk

1. Returns to Experience, Simplified Sample
2. Returns to Experience, Full Sample
3. Interpretation
4. Development Accounting
5. Conclusion
Data


- Immigrant: born outside the fifty states
- Restrictions: employed, full-time, wage worker, men, private sector, age 16+, 0–40 years of experience
- Positive income, valid responses to other key variables

**Nice feature: Extremely large sample**

- 770k immigrants from 120 countries
- 73 countries with 1,000+; 15 with 10,000+
- Wide variety of controls
Begin with a simple exercise

- Consider immigrants with only foreign experience
  - Immigrated the year prior to the Census
- Focus on four countries: UK, Canada, Mexico, Guatemala

Estimate:

$$\log(w_{it}) = \alpha + \theta s_{it} + \sum_{x \in X} \phi_x D_{it}^x + \mu_t + \varepsilon_{it}$$

- Minimal controls
- Potential experience dummies $x \in X = \{5 - 9, 10 - 14, \ldots\}$
Returns to Foreign Experience Lower for Poor Countries
Next Step: Standard Immigration Estimation

Add more countries, pool regressions:
- Include all countries with 500+ immigrants
- Intercept, return to school & experience vary by country
- Include cohort of immigration controls (decade x country)
- Include natives (for identification)

Add controls:
- State of residence, English language

Retain focus on immigrants with only foreign experience
Returns to Foreign Experience Lower for Poor Countries

The graph shows the percent wage increase relative to 0–4 years of foreign experience for different countries. The data is presented for the United Kingdom, Canada, Mexico, and Guatemala.

- The United Kingdom line shows a steady increase in wage increase over years of foreign experience.
- The Canada line initially increases rapidly but then plateaus.
- The Mexico line is relatively flat, indicating minimal changes in wage increase over foreign experience.
- The Guatemala line shows a moderate increase initially but then plateaus.

The graph highlights that returns to foreign experience are generally lower in poor countries compared to wealthier nations.
Returns to Foreign Experience Lower for Poor Countries

![Graph showing wages at 20-24 relative to 0-4 years foreign experience vs. PPP GDP p.c., 2010. Points for countries such as CAN, CHN, GBR, GTM, IN, IND, JPN, KOR, MEX, PHL, PRI, SLV, and MEX are plotted.]
Outline of Talk

1. Returns to Foreign Experience, Simplified Sample
2. **Returns to All Experience, Full Sample**
3. Interpretation
4. Development Accounting
5. Conclusion
Estimating Experience Profiles for All Immigrants

For all immigrants, we estimate:

$$\log(w_{it}) = \alpha + \beta z_{it} + \sum_{x \in X} \phi_{f,x} D_{it}^{f,x} + \sum_{x \in X} \phi_{u,x} D_{it}^{u,x} + g(x_f, x_u) + \varepsilon_{it}$$

- $z_{it}$: vector of controls
- $x_f$: years of foreign experience
- $x_u$: years of U.S. experience

$g(x_f, x_u)$: controls for interaction effects

- Necessary since experience profiles are concave
- Quadratic interactions, but results are robust
Returns to Experience with Entire Sample

- Wages at 20–24 Relative to 0–4 Years Experience

- Real GDP p.c., 2010

- Foreign Experience
- U.S. Experience
## Robustness

<table>
<thead>
<tr>
<th>Experience:</th>
<th>Foreign</th>
<th>U.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>20.0***</td>
<td>5.61*</td>
</tr>
<tr>
<td>35–39 Years Experience</td>
<td>23.3**</td>
<td>7.2</td>
</tr>
<tr>
<td>Discounted Average Height of Profile</td>
<td>8.4***</td>
<td>2.7**</td>
</tr>
<tr>
<td>Include Women</td>
<td>20.1***</td>
<td>3.6</td>
</tr>
<tr>
<td>Include All Part-Time</td>
<td>23.8***</td>
<td>7.8***</td>
</tr>
<tr>
<td>Include Public Sector</td>
<td>21.5***</td>
<td>6.3**</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>15.7***</td>
<td>5.4</td>
</tr>
<tr>
<td>Service Industry</td>
<td>23.2***</td>
<td>11.6***</td>
</tr>
<tr>
<td>Excellent English</td>
<td>26.4***</td>
<td>6.7*</td>
</tr>
<tr>
<td>Year 2000+</td>
<td>21.9***</td>
<td>6.4**</td>
</tr>
</tbody>
</table>
Outline of Talk

1. Returns to Foreign Experience, Simplified Sample
2. Returns to All Experience, Full Sample
3. Interpretation
4. Development Accounting
5. Conclusion
Related facts are known in literature since Chiswick (1978)

- Early focus: immigrants vs. natives, immigrants by region
- Coulombe, Grenier, Nadeau (2014): by birth country income

Interpretation is debated. Three hypotheses:

1. Differences in human capital accumulation
2. Differences in skill transferability
3. Differences in selection
Learning-By-Doing Model

Human capital accumulation in birth country and US given by:

\[ \dot{h}_{ic}(t) = z_{ic} \phi_{c} x_{ic}(t) h_{ic}(t) \]

\[ h^{*}_{ic} = \gamma_{c} h^{\theta_{c}}_{ic} \]

\[ \dot{h}^{*}_{ic}(t) = z_{ic} \phi^{*}_{c} x^{*}_{ic}(t) h^{*}_{ic}(t) \]

- \( x_{ic} \) is experience
- \( z_{ic} \) is ability to learn
- * denotes U.S.
Possible Sources of Differences

Three possible sources of differences in experience profiles:

1. **Human capital**: $\phi_c$ increasing in GDP per capita
2. **Skill loss**: $\theta_c$ increasing in GDP per capita
3. **Selection**: $z_{ic}$ increasing in GDP per capita for immigrants
   - Distribution of $z_{ic}$ increasing in GDP p.c. (FOSD)

Ben-Porath Model
We compare immigrants, non-migrants along several dimensions:

1. Returns to foreign experience
2. Education utilization
3. Schooling, income

We use these as tests of the three hypotheses
Comparison 1: Returns to Experience

Height at 20-24 Years of Experience vs. PPP GDP p.c., 2010

- Non-Migrants
- Immigrants

Countries included: AUS, BGD, BRA, CAN, CHL, FRA, GBR, GER, GTM, IDN, JAM, KOR, MEX, PER, VNM
Comparison 1: Returns to Experience

The graph shows a comparison of the number of immigrants and non-migrants across different countries. Each country is represented by a point on the graph, with the x-axis representing non-migrants and the y-axis representing immigrants. The countries mentioned include AUS, BGD, BRA, CAN, CHL, FRA, GER, GTM, IDN, JAM, KOR, MEX, PER, and VNM. The data points are scattered along a diagonal line, indicating a positive correlation between the number of immigrants and non-migrants for each country.
Fact 1: Returns to Experience Similar

Simplest explanation:

- Less experience human capital in poor countries.
- Consistent with additional evidence from existing literature:
  - Mexican return migrants: Reinhold and Thom (2012)

Alternative explanation:

- Non-migrant returns reflect some other force
  - Labor market frictions, implicit contracts, measurement error
- Immigrant returns reflect some other force
  - Skill transferability, selection
- These biases line up in magnitude
Comparison 2: Education Utilization
Comparison 2: Education Utilization

Ratio of Immigrants to Non-Migrants vs. Real GDP p.c., 2010.
Comparison 3: Education Selection
Summary so Far

Lower returns to poor country experience

- Equally true for immigrants, non-migrants
- Simplest explanation: human capital

Little support for alternative explanations

- Skills transfer equally well from poor, rich countries.
- Poor country immigrants more selected on education
Recent literature: education-experience complementarity

- Heckman, Lochner, and Todd (2006); Lemieux (2006); LMPQS (2015)
- Different from Mincer (1974)

Unique opportunity to explore two dimensions of education

- Quantity (college vs. high school)
- Location/quality (where it was received)
Returns to Experience by Education Quantity

Wages at 20−24 Relative to 0−4 Years Experience

Real GDP p.c., 2010

High School or Less
College or More
Returns to Experience by Education Location

Wages at 20–24 Relative to 0–4 Years Experience

Real GDP p.c., 2010

U.S. Experience and:  
- Foreign School
- U.S. School
Outline of Talk

1. Returns to Foreign Experience, Simplified Sample
2. Returns to All Experience, Full Sample
3. Interpretation
4. Development Accounting
5. Conclusion
Extend Caselli (2005). Construct output, human capital:

\[ Y_c = K_c^{1/3} (A_c H_c)^{2/3} \]
\[ H_c = f(s_c) g(x_c) \]

Measure contribution of inputs as:

\[ Y_{KH,c} = K_c^{1/3} H_c^{2/3} \]

\[ success_1 = \frac{\text{var}(\ln Y_{KH,c})}{\text{var}(\ln Y_c)} \]
**Two views on experience:**

1. Learning-by-doing: it comes for free.
   - Experience human capital = integral of life-cycle wage profile
   - Upper bound on role of human capital.

2. Ben-Porath: result of active investment
   - Experience human capital < integral of age-earnings profile
   - Paper: provide a lower bound on role of human capital.
### Development Accounting

<table>
<thead>
<tr>
<th>Human Capital Measure</th>
<th>$\text{Success}_1$ (1)</th>
<th>$\text{Slope}(\log(Y_{KH}), \log(\text{GDP}))$ (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(a) Upper Bound</td>
<td></td>
</tr>
<tr>
<td>Schooling</td>
<td>0.44</td>
<td>0.64</td>
</tr>
<tr>
<td>Experience</td>
<td>0.53</td>
<td>0.68</td>
</tr>
<tr>
<td>Schooling + Experience</td>
<td>0.81</td>
<td>0.84</td>
</tr>
<tr>
<td></td>
<td>(b) Lower Bound</td>
<td></td>
</tr>
<tr>
<td>Schooling</td>
<td>0.44</td>
<td>0.64</td>
</tr>
<tr>
<td>Experience</td>
<td>0.41</td>
<td>0.61</td>
</tr>
<tr>
<td>Schooling + Experience</td>
<td>0.65</td>
<td>0.77</td>
</tr>
</tbody>
</table>
Conclusion

Less experience human capital in poor countries.
- Wages rise little with poor country experience
- Equally true for migrants, non-migrants
- Little support for alternative theories.
- Development accounting: larger role for human capital

Some possible mechanisms
- Much of effect explained by country of work
- Some due to quantity, country of education
EXTRA SLIDES
• Individual born in U.S. solves

$$\max_{\{\ell_c(t)\}} \int_0^T e^{-rt} w_c(t) dt \quad \text{s.t.}$$

$$w_c(t) = \omega (1 - \ell_c(t)) h_c(t)$$

$$\dot{h}_c(t) = B_c \phi(\ell_c(t)) h_c(t) - \delta h_c(t)$$

$$0 \leq \ell_c(t) \leq 1$$

• Workers abroad solve analogous problem (with *’s)...

• ... migrate at some experience level $x^*$
Possible Sources of Differences

Three possible sources of differences in experience profiles:

1. $B_c$ increasing in GDP per capita
2. $\theta_c$ increasing in GDP per capita
3. $z_{ic}$ for immigrants is increasing in GDP per capita
   - Distribution of $z_{ic}$ increasing in GDP per capita (FOSD)
Development Accounting

![Graph showing the relationship between Real GDP per worker and Log of Human Capital Stocks.](image-url)