Life-Cycle Wage Growth Across Countries

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Northwestern, 18 April 2016
Life-Cycle Human Capital Accumulation Across Countries

Lessons from U.S. Immigrants

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What We Do

Document new fact: experience-wage profiles in rich countries are steeper than in poor countries

- ~ twice as steep
- wages double in rich countries, increase by 50% in poor countries
- based on representative large-sample micro data from 17 countries – better data than previous studies
Why Care?

• How life-cycle wage growth differs across countries may help us understand cross-country income differences

• Key for evaluating importance of cross-country differences in
  • human capital accumulation
    Manuelli-Seshadri, Klenow-Rodriguez-Clare, Bils-Klenow, Caselli, ...
  • labor market frictions (job ladder) Burdett, Burdett-Mortensen, Jovanovic, ...

• Hope: use profiles to discipline theories, available from my website

• Illustration of finding’s quantitative bite: development accounting
  • how much of income differences due to $K$ and $H$?
  • current consensus: $K&H$ account for $\sim 40\%$, TFP for $\sim 60\%$
  • same exercise but assuming profiles reflect “life-cycle $H$”: increases contribution of $K&H$ from $\sim 40\%$ to $\sim 60\%$
So what’s the mechanism?

- Why are profiles flatter in poor countries?
  - human capital accumulation
  - labor market frictions (job ladder)
  - ...

- Provide two pieces of (tentative) evidence:
  1. from same data: additional moments (variance profiles etc)
  2. from alternative data: wage profiles of U.S. immigrants

- These point to theories of human capital accumulation
Data
Data

- Nationally representative surveys with detailed wage and hours data:
  - Australia, Bangladesh, Brazil, Canada, Chile, France, Germany, Guatemala, India, Indonesia, Jamaica, Mexico, Peru, South Korea, United Kingdom, United States, Uruguay, Vietnam

- Focus on core set of 8 countries with repeated cross-sections spanning 15+ years

- Limitation: very poorest countries not in sample.
Sample

- Focus on full time male wage earners
  - Income of self-employed is payment to labor income and capital income (Gollin, 2002); host of other measurement issues (Deaton, 1997); potential experience harder to interpret for female and part-time workers

- Wage = \( \frac{\text{labor earnings}}{\text{hours}} \)
  - Majority of countries: earnings last month & hours last week

- Later look at females, part time, self employed
Potential Experience

• Measure lifecycle using “potential experience”

• Definition

\[
experience := \begin{cases} 
age - schooling - 6, & \text{if } schooling \geq 12 \\
age - 18, & \text{if } schooling < 12
\end{cases}
\]

• That is, years since turned 18 or finished school

• Keep individuals with \( 0 \leq experience \leq 40 \)
Lifecycle Wage Growth
Simplest Measure of Lifecycle Wage Growth

- Group workers into 5-year experience bins (0-4, 5-9, etc)
- Compute average wages by bin relative to 0-4 bin
- Report simple averages across years of data
Core Countries

Percent Wage Increase Relative to Experience <5 Years

Potential Experience

United States
Canada
Germany
United Kingdom

Chile
Mexico
Brazil
Jamaica

data available from http://www.princeton.edu/~moll/research.htm
data available from [http://www.princeton.edu/~moll/research.htm](http://www.princeton.edu/~moll/research.htm)
Challenges with Simplest Measure

- No controls for schooling
- Age-cohort-time identification problem
Mincerian Measure of Lifecycle Wage Growth

- Consider individual $i$ in cohort $c$ at time $t$
- Estimate equations of the form:
  \[ \log w_{ict} = \alpha + g(s_{ict}) + f(x_{ict}) + \gamma_t + \psi_c + \epsilon_{ict} \]
- $w_{ict}$: wages
- $s_{ict}$: schooling; $x_{ict}$: experience.
- $\gamma_t$: time effect, $\psi_c$: cohort effect
- Goal: estimate $f(\cdot)$ and assess how it varies across countries
Mincerian Measure of Lifecycle Wage Growth

- Assume $g(s) = \theta s$, but fully flexible $f(\cdot)$

$$
\log w_{ict} = \alpha + \theta s_{ict} + \sum_{x \in X} \phi_x D^x_{ict} + \gamma_t + \psi_c + \varepsilon_{ict}
$$

where $D^x_{ict}$ is a dummy for experience group $x \in X = \{5-9,10-14,\ldots\}$

- Pointwise identification of $f(x)$ via the $\{\phi_x\}$

- Cannot estimate as is, due to well-known collinearity problem
Mincerian Measure of Lifecycle Wage Growth

1. Time/cohort controls a la Hall (1968), Deaton (1997)
   - Focus on core countries, which have repeated cross sections spanning 15+ years
   - Assume that all growth is due either to time or cohort effects

   - Assume no wage gains due to experience in final working years
   - Consistent with models of lifecycle $H$ accumulation or search
Deaton-Hall Profiles: All Growth Due to Cohort
Limitations of Deaton-Hall Approach

- Just guessing about relative roles of cohort and time
- Same roles of cohort and time in all countries?
- Hard to imagine world without strong time effects
Heckman-Lochner-Taber (HLT) Approach

- Assume no wage gains due to experience in last working years (e.g. 35-40 or 30-40 years of potential experience)

- With this assumption, and using repeated cross sections, can identify experience effects from cohort and time

- Intuition: follow different cohorts over time; wage growth from years 1999 to 2000 identified from oldest cohort’s wage growth
Heckman-Lochner-Taber (HLT) Profiles

Percent Wage Increase Relative to Experience <5 Years

Chile
Brazil
Mexico
Jamaica
United States
Canada
Germany
United Kingdom
HLT Profiles: Robustness to Age Heaping

Germany
United States
Canada
United Kingdom

Percentage Wage Increase

Brazil
Mexico
Chile
Jamaica

Potential Experience
HLT Profiles: Robustness to Education Measurement

![Graph showing wage increase by potential experience for various countries.](image)
Selection?

- Concern:
  - in rich countries, less productive workers select out of wage employment as they age and/or...
  - ... in poor countries, less productive workers select into wage-employment as they age

- Examine using panel data from Mexico and U.S. (FLS and PSID)

(a) panel data

(b) cross section (from Fig 1)
Table 5: Robustness

Height at 20-24 Years Experience, HLT Profiles

<table>
<thead>
<tr>
<th>(1) Baseline</th>
<th>Rich</th>
<th>Poor</th>
<th>Rich - Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2) Experience at 16</td>
<td>82.1</td>
<td>45.8</td>
<td>36.2**</td>
</tr>
<tr>
<td>(3) Constructed experience</td>
<td>90</td>
<td>43.5</td>
<td>46.6**</td>
</tr>
<tr>
<td>(4) Measurement error: age</td>
<td>76.5</td>
<td>39.2</td>
<td>37.3**</td>
</tr>
<tr>
<td>(5) Measurement error: education</td>
<td>71.7</td>
<td>39.2</td>
<td>32.5**</td>
</tr>
<tr>
<td>(6) Measurement error: age and education</td>
<td>71.2</td>
<td>39.2</td>
<td>32.0**</td>
</tr>
<tr>
<td>(7) Include Self-Employed</td>
<td>80.3</td>
<td>36.6</td>
<td>43.6**</td>
</tr>
<tr>
<td>(8) Include Public-Sector Employees</td>
<td>80.4</td>
<td>42.2</td>
<td>38.2**</td>
</tr>
<tr>
<td>(9) Include women</td>
<td>70</td>
<td>29.1</td>
<td>41**</td>
</tr>
<tr>
<td>(10) Constructed experience, men and women</td>
<td>76.6</td>
<td>25.5</td>
<td>51.1**</td>
</tr>
<tr>
<td>(11) Include Part-Time (20+ hours)</td>
<td>83</td>
<td>38.2</td>
<td>44.8**</td>
</tr>
<tr>
<td>(12) Include Part-Time (&gt; 0 hours)</td>
<td>84.8</td>
<td>36.7</td>
<td>48.1**</td>
</tr>
<tr>
<td>(13) Constructed experience, incl. Part-Time</td>
<td>100</td>
<td>42</td>
<td>58.0**</td>
</tr>
</tbody>
</table>
Lifecycle Wage Growth Across Countries

• **Punchline**: less lifecycle wage growth in poor countries

• Results present multiple assumptions about role of cohort and time, numerous alternative sample restrictions

• Some modest role for interactions between schooling and experience
Interactions Between Schooling and Experience
Experience-Wage Profiles by Education Level

- United States
- Germany
- Canada
- United Kingdom
- Chile
- Brazil
- Mexico
- Jamaica

Percent Wage Increase Relative to Experience <5 Years

Legend:
- College
- High School
- Less than H.S.
Accounting for Aggregate Experience-Wage Profiles

![Graph showing the relationship between counterfactual and actual average returns for different countries.](graph.png)
Distinguishing Between Mechanisms (new!)
Potential Mechanisms

1. human capital accumulation

2. search and matching/job ladder

3. long-term contracts with $w \neq MPL$

4. what else?

Large literature studies rel. importance of 1 to 3 in U.S./rich countries
Topel-Ward, Rubinstein-Weiss, Altonji-Smith-Vidangos, Bagger-Fontaine-PostelVinay-Robin, ...
Moments we would like to look at

• search and matching/job ladder
  • data on job-to-job transitions

• long-term contracts
  • tenure profiles

• problem: both require panel data (or matched employer-employee data) which we don’t have
Moments we can look at

- profiles for particular groups of workers
  - workers with short-term contracts $\Rightarrow$ long-term contracts?
  - ...
- hours and earnings profiles
  - human capital, long-term contracts
- variance profiles
  - human capital
Workers with Short-Term Contracts

• Long-term contracts ⇒ flatter profiles in poor countries if
  • \( w \neq MPL \) and wages front-loaded in poor countries
  • \( w \neq MPL \) and wages back-loaded in rich countries

• a priori reason to be skeptical: median tenure in U.S. = 4.6 years (BLS)

• Nevertheless went through survey codebooks to identify workers for which long-term contracts, tenure concerns seem unlikely
Workers with Short-Term Contracts

(a) India
(b) Mexico
(c) United States
Hours, Earnings and Variance Profiles

Two predictions of simple human capital theories (Ben-Porath,...):

1. time investment into $H$ declines over life-cycle
   - if hours worked reflect time not investing
     - steep hours profiles in rich countries
     - flat hours profiles in poor countries

2. $Var(\log \text{earnings})$ are \textit{U-shaped} Mincer, Polachek, Rubinstein-Weiss
   - individuals differ in “learning ability”
   - steep profiles start below flat ones and cross (“overtaking age”)
Lifecyle Hours Profiles

[Graph showing lifecycle hours profiles for various countries, including France, United States, Germany, Canada, Australia, United Kingdom, Uruguay, S. Korea, Chile, Indonesia, Mexico, Brazil, Peru, United Kingdom, Uruguay, S. Korea, Chile, India, Jamaica, Vietnam, Bangladesh, Guatemala.]

Potential Experience

Mexico Indonesia Brazil Peru

United States Germany France

Percent Hours Increase

Potential Experience

0 5 10 15 20 25 30 35 40

0 25 50 75 100

Potential Experience

United States Germany France

Percent Hours Increase

Potential Experience

0 5 10 15 20 25 30 35 40

0 25 50 75 100

Potential Experience

United States Germany France

Percent Hours Increase

Potential Experience

0 5 10 15 20 25 30 35 40

0 25 50 75 100

Potential Experience

United States Germany France

Percent Hours Increase

Potential Experience

0 5 10 15 20 25 30 35 40

0 25 50 75 100
Lifecyle Earnings Profiles

- Germany
- United States
- Australia
- Canada
- France
- United Kingdom
- Chile
- S. Korea
- Mexico
- Brazil
- Indonesia
- Peru
- Vietnam
- Bangladesh
- Guatemala
- Jamaica
- India
- Chile
- S. Korea
Lifecyle Variance Profiles (within education groups)
Summary

Additional moments from our data

• **not supportive** of long-term contracts

• **consistent** with human capital theories, not definitive

• **inconclusive** about search and matching/job ladder

Next: bring another dataset to the table
Lessons from U.S. Immigrants
Returns to Experience for Immigrants

Study returns to experience for immigrants in the U.S.

- foreign experience, but also U.S.-acquired experience

Advantages:

- common labor market, institutions, data set

Challenges:

- immigrants may be selected, suffer skill loss
Three Main Findings

1. Return to foreign experience is much lower for poor country immigrants, similar to that for non-migrants

2. Return to U.S. experience is modestly lower

3. Return to U.S. experience for U.S.-educated immigrants is independent of birth country
Interpretation of Findings

Evidence leads us to a human capital interpretation:

• Less human capital formation through experience in poor countries

• Part of this effect is explained by the work environment

• Part of this effect stems from school type/quality
Data


- Immigrant: born outside the fifty states
- Restrictions: employed wage worker, 0–45 years experience
- Positive income, valid responses to other key variables

**Nice feature: extremely large sample**

- 1.6 million immigrants, 120 birth countries
- 102 countries with 1000+; 29 with 10,000+
- Wide variety of controls
Fact 1: Returns Similar for Immigrants, Non-Migrants
Fact 1: Returns Similar for Immigrants, Non-Migrants
Implication of Fact 1

Simplest explanation:

- Less lifecycle human capital accumulated in poor countries.

Alternative explanation:

- Non-migrant returns are biased
  - Labor market frictions, implicit contracts, measurement error
- Returns for immigrants biased
  - Selection, skill transferability
- These biases affect only poor countries, negatively, by same magnitude
Fact 2: No Relation Between Income, “Skill Transfer”
Fact 2: No Relation Between Income, “Skill Transfer”

Percent of Workers in High-Skill Occupations
Ratio of Immigrants to Non-Migrants, College Grads Only

Ratio of Immigrants to Non-Migrants vs. Ln(GDP per Capita)
Fact 3: Schooling Selection Declines in Income
Development Accounting
Development Accounting

• So far, new fact: experience-wage profiles flatter in poor countries than rich countries

• Now: development accounting exercise
  • same as previous literature ...
  • except returns to experience vary across countries

• Conclusion: Importance of $H$ now 60%, rather than 40%
Development Accounting

- Use same accounting method as Caselli (2005).
- Real GDP in a country

\[ Y = K^\alpha \cdot (AH)^{1-\alpha} \]

- Assume \( \alpha = 1/3 \).
- Re-construct Caselli’s \( success_1 \) measure:

\[ Y_{KH} = K^\alpha \cdot H^{1-\alpha} \]

\[ success_1 = \frac{\text{var}(\ln Y_{KH})}{\text{var}(\ln Y)} \]
## Development Accounting

<table>
<thead>
<tr>
<th>Human Capital Measure</th>
<th>Success$_1$</th>
<th>Slope($\log(Y_{KH}), \log(GDP)$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schooling</td>
<td>0.40</td>
<td>0.53</td>
</tr>
<tr>
<td>Experience</td>
<td>0.40</td>
<td>0.56</td>
</tr>
<tr>
<td>Schooling + Experience</td>
<td>0.63</td>
<td>0.65</td>
</tr>
</tbody>
</table>
Conclusion

- Less lifecycle wage growth in poor countries

- Some evidence in favor of human capital explanation

- Through lens of development accounting framework: H and K account for ~ 60% of income differences, not ~ 40%

- Priority for future work: panel data for poor countries
FIGURE 1.—Decomposing the experience profile of wages. Baseline model, full SRC sample. The figure displays the model’s decomposition of wage growth over a career (or the experience profile of log wages) into the contributions of job shopping (the mean value of the job-specific wage component $\nu$), the accumulation of tenure (the contribution of the mean value of tenure on the wage experience profile), and the accumulation of general human capital.