Education and Skills Mismatch in Developing Countries: Magnitudes, Explanations, and Impacts

Results from the World Bank STEP Surveys

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Rationale for mismatch research

Persistent concerns in OECD countries (over decades)
  • Job skill requirements high and rising (accelerating?)
  • Education quality too low, rising too slowly, or falling
  • Worker skills are struggling to keep pace with job changes

But research literature finds overeducation more common
More shortage of skilled jobs than skilled workers

Research on developing countries is sparse, generality of results and influence of distinctive contexts unknown
STEP samples

- **Urban households** (mostly)
- **Random sample, working age** (age 15-64)
- **Background survey + reading assessment** (some countries, based on PIAAC)
- **Separate employer survey** (some countries)

12 countries, almost all major regions (2012-2013)

1. Ghana (n=2,070)  
2. Kenya (n=1,956)  
3. China—Yunnan (n=1,268)  
4. Lao (n=1,283)  
5. Sri Lanka (n=579)  
6. Vietnam (n=2,183)  
7. Bolivia (n=1,206)  
8. Colombia  
9. Armenia (n=972)  
10. Georgia (n=906)  
11. Macedonia (n=1,751)  
12. Ukraine (n=941)

*Serbia, Kosovo, and Philippines are in process*
Distinctive issues in developing country contexts

- Very high rates of informality, self-employment, micro-firms (55%-80%)

- Very low employment rates among working age population (Europe/Central Asian countries, S. Asia) (33%-55%)
  - creates selection issues
  - unemployment/inactivity a form of mismatch

- Both reflect very weak job market, low job generation (or gender dynamics)
Persistent methodological issue

How to measure mismatch?

• education level (various methods)
• skill level (various methods)

Many ways to compare workers and jobs $\rightarrow$ different results
Measure person and job characteristics on same scale to permit direct person-job comparisons (not always possible, e.g. test scores)

Focus will be on education mismatch
Personal attainment vs. Reported job educ. requirements

Source: Michael J. Handel, Alexandria Valerio, and Maria Laura Sanchez Puerta, Accounting for Mismatch in Low- and Middle-Income Countries: Measurement, Magnitudes, and Explanations. (2016, World Bank)
Examples of STEP job task measures

Reading, Writing

Level
1. Anything
2. Length of longest document read normally (<1 page, 2-5, 6-10, 11-25, >25)

Kind
• Forms, bills
• Manuals, reports
• Newspapers, magazines, books

Math

Level
1. Anything
2. Measure sizes, weights, distances, calculate prices/costs
3. Use/calculate fractions, decimals, percentages
4. Other multiplication, division
5. Advanced math (e.g., algebra, geometry, trigonometry)

General cognitive

Problem-solving: How often perform tasks requiring 30 minutes thinking to figure out what to do (e.g., mechanic fixing a car) (never-every day)
Non-objective measures?

Best to avoid

- ‘Does your main job involve complex tasks’ (yes/no)
  - European Working Conditions Survey (EU) (1990-present, every 5 years)

- ‘My job is complex and difficult’ (strongly agree-strongly disagree)
  - Household, Income and Labour Dynamics (HILDA) (Australia’s panel survey)

Items apply to everyone, but not very explicit—too general, subjective
Low information content—not clear what answers mean

Focus

1. Incidence of mismatch in developing countries

2. Explanations
   A. Small when measured correctly (frictions, transitory, “preferences”)
   B. School failure (low achievement, “wrong” fields of study)
   C. Job market failure (low employment rates, low investment → informality)

3. Consequences of mismatch
Education of employed persons, STEP countries
Education required by job across STEP countries

Figure 5.3 Distribution of Jobs by Job-Required Education Levels, by STEP Country

### Table 5.2 Individual-Level (Actual) Match Rates, by STEP Country

<table>
<thead>
<tr>
<th>Country</th>
<th>Well-matched</th>
<th>Over-educated</th>
<th>Under-educated</th>
<th>Actual mismatch</th>
<th>Aggregate mismatch</th>
<th>Difference (column 4 minus column 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lao PDR</td>
<td>45.1</td>
<td>41.1</td>
<td>13.7</td>
<td>54.9</td>
<td>27.0</td>
<td>27.9</td>
</tr>
<tr>
<td>Ghana</td>
<td>47.7</td>
<td>39.5</td>
<td>12.8</td>
<td>52.3</td>
<td>22.3</td>
<td>30.0</td>
</tr>
<tr>
<td>Kenya</td>
<td>34.5</td>
<td>24.9</td>
<td>40.4</td>
<td>65.5</td>
<td>29.9</td>
<td>35.6</td>
</tr>
<tr>
<td>Bolivia</td>
<td>40.1</td>
<td>34.6</td>
<td>25.2</td>
<td>59.9</td>
<td>19.8</td>
<td>40.1</td>
</tr>
<tr>
<td>Vietnam</td>
<td>26.0</td>
<td>70.0</td>
<td>4.0</td>
<td>74.0</td>
<td>33.7</td>
<td>40.3</td>
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<tr>
<td>Sri Lanka</td>
<td>43.5</td>
<td>46.1</td>
<td>10.4</td>
<td>56.5</td>
<td>33.8</td>
<td>22.7</td>
</tr>
<tr>
<td>Yunnan Province</td>
<td>56.6</td>
<td>32.6</td>
<td>10.7</td>
<td>43.4</td>
<td>11.9</td>
<td>31.5</td>
</tr>
<tr>
<td>Macedonia, FYR</td>
<td>72.6</td>
<td>22.3</td>
<td>5.1</td>
<td>27.4</td>
<td>11.2</td>
<td>16.2</td>
</tr>
<tr>
<td>Armenia</td>
<td>66.2</td>
<td>28.0</td>
<td>5.8</td>
<td>33.8</td>
<td>16.0</td>
<td>17.8</td>
</tr>
<tr>
<td>Georgia</td>
<td>66.4</td>
<td>29.4</td>
<td>4.0</td>
<td>33.4</td>
<td>21.2</td>
<td>12.2</td>
</tr>
<tr>
<td>Ukraine</td>
<td>72.1</td>
<td>24.0</td>
<td>3.8</td>
<td>27.9</td>
<td>13.1</td>
<td>14.8</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td><strong>51.9</strong></td>
<td><strong>34.2</strong></td>
<td><strong>12.4</strong></td>
<td><strong>48.1</strong></td>
<td><strong>21.8</strong></td>
<td><strong>26.3</strong></td>
</tr>
</tbody>
</table>

One point calling for more explanation...

Over-education more common than under-education in low- and middle-income countries, as well as OECD

Lower prevalence of under-education may be explicable—overqualified more likely to be hired than underqualified

But why so much over-education in low-education countries, when policy advice emphasizes raising education levels?

Same issue in OECD countries—how to reconcile rising university premium with persistent underutilization of university graduates?

If there is shortage of tertiary grads, why are so many not absorbed?
Match and Mismatch rates, STEP countries
Different forms of possible match and mismatch

<table>
<thead>
<tr>
<th>Worker skills</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Medium</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>High</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
</tbody>
</table>

(1) Low-skill match (worst)  (2,3,6) Job skill requirements > worker skills
(5) Medium-skill match       Firms lower hiring standards (under-education)
(9) High-skill match (best)  (4,7,8) Jobs requirements < worker skills
                             Workers lower job expectations (over-education)

Matches on diagonal—but not all are desirable: (1) is worst-case, (9) is best case

Ranking of under-education and over-education more ambiguous (but not optimal)

This model of match and mismatch is starting point and focus here,
Skills = Education
Worker education vs. job required education

**Worker education (rows) by Education required for job (columns)**
(figures sum to ~100)

**Matches:** Diagonal cells
**Overeduc:** Left of diagonal
**Undereduc:** Right of diagonal
Joint Distribution of Worker Education by Job Education (cell percentages sum to ~100)

Laos

Lao: large share of well-matched workers with < primary education, large groups of more-educated workers also in jobs requiring < primary education (over-educated).

Ghana: similar pattern, somewhat less pronounced

Significant underutilization of current workers’ education before controlling for covariates
### Bolivia

<table>
<thead>
<tr>
<th>Education Level</th>
<th>No Primary</th>
<th>Primary</th>
<th>Low Second</th>
<th>Secondary</th>
<th>Tertiary</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Primary</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Primary</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Low Second</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Secondary</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Tertiary</td>
<td>11</td>
<td>11</td>
<td>2</td>
<td>11</td>
<td>21</td>
</tr>
</tbody>
</table>

**Job Required Education**

- No Primary
- Primary
- Low Second
- Secondary
- Tertiary

**Bolivia: large share with < primary education in jobs requiring more education (under-educated). Over half of workers with secondary education are evenly distributed across jobs requiring less (over-educated). 42% of tertiary grads have jobs requiring ≤ secondary education (over-educated)**

### Vietnam

<table>
<thead>
<tr>
<th>Education Level</th>
<th>No Primary</th>
<th>Primary</th>
<th>Low Second</th>
<th>Secondary</th>
<th>Tertiary</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Primary</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary</td>
<td>12</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Second</td>
<td>11</td>
<td>8</td>
<td>9</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>Secondary</td>
<td>8</td>
<td>6</td>
<td>11</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>Tertiary</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>6</td>
<td>13</td>
</tr>
</tbody>
</table>

**Job Required Education**

- No Primary
- Primary
- Low Second
- Secondary
- Tertiary

**Vietnam: surprisingly few on diagonal, many report jobs require less education than they have; very high share overeducated**
Macedonia: workers with secondary and tertiary educations in jobs requiring less education (under-educated) but workforce otherwise well-matched at relatively high skill level.

Armenia: greater mass of workers at tertiary level → larger group of workers with tertiary education who are over-educated. The profiles for Georgia and Ukraine are very similar.
Job required education of tertiary graduates, all countries (rows sum to 100)

Distribution of Job Required Education for Workers with Tertiary Education

<table>
<thead>
<tr>
<th>Country</th>
<th>&lt; Primary</th>
<th>Primary</th>
<th>Low Secondary</th>
<th>Secondary</th>
<th>Tertiary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lao</td>
<td>9</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Ghana</td>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bolivia</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kenya</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vietnam</td>
<td></td>
<td></td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sri Lanka</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yunnan</td>
<td></td>
<td></td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Macedonia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Armenia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Georgia</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Ukraine</td>
<td></td>
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</tr>
</tbody>
</table>

Job Required Education

- Lao: 80%
- Ghana: 60%
- Bolivia: 60%
- Kenya: 72%
- Vietnam: 49%
- Sri Lanka: 63%
- Yunnan: 53%
- Macedonia: 77%
- Armenia: 72%
- Georgia: 69%
- Ukraine: 73%

Rows sum to 100%
Job required education of secondary grads, all countries (rows sum to 100)
Looking at both workers and jobs

Skills problem? (amount, kind, generality)

- Not enough post-primary
  - Only older cohorts? (not much to be done)
- Not enough tertiary
- Low functioning despite educ. level
  - Test scores within educ group (foundation skills)
- Wrong type of education (field, genrl vs. specific)
  - Too few valuable high skills (STEM, health, mgt)
  - Too few middle skills (clerical, skilled BC, IT)
  - Too much general educ vs. voc ed?
  - Not enough occupation-specific skills?
    - Diseconomies of scale a problem
  - Not enough transferable skills?
    - Flexibility vs. specialization
    - Voc ed limit or reinforce foundation skills?

But what about the employment side?

Jobs problem? (quantity and quality)

- Absolute job scarcity (quantity)
  - inactive, un(der-)employed, informal
  - weak macro, crises/shocks (fin, oil, trade), TNC/local investment, infra, policies, institutional capacity, governance, conflict
- Education level required by job
  - ISCED 0, 1, 2, 3, 5+
- Actual level of task demands
  - foundation skills, IT, other technology
- Types of knowledge demand (ISCO)
  - High: STEM, health, other prof./mgt.
  - Middle: clerical, skilled BC
  - Vocational education needed (ISCED 4)
- General/specific (low levels of firm training?)
- Employer strategy, industry, resources
  - manufacturing, value-chain rank, HR, tech

Educational effectiveness

Job quantity and quality

The eternal question...
Drivers

Some mismatch may be due to

• **frictions** (imperfect information—the “right” workers/firms can’t find each other)
• **transitory business cycle** (unemployed take any job)
• **life cycle stage** (youth, age)
• **work/family preferences** (women, mothers w/young children)
• **social exclusion** (SES, minorities, immigrants)

…but might also reflect problems with

• **education** (education level, achievement, field of study)
• **job market** (low employment rates, low investment → informality, low-quality jobs, low-skill equilibrium)
Logistic regression models of under- and over-education

Predictors

• **Education**
  - level of education, years of tertiary
  - field of study
  - literacy test score (available countries)

• **Job market**
  - public vs. private sector
  - formal vs. informal employee, informal self-employed

• **Life cycle stage**
  - middle age vs. young, older workers

• **Work/Family preferences**
  - voluntary part-time
  - men vs. women with and without young children
  - limiting health issues
Logistic regression models predicting over-education

Predictors

• **Education**
  - level of education, years of tertiary *Strong effects* ✓
  - field of study *Weak effects*
  - literacy test score (available countries) *Moderate effects*

• **Job market**
  - public vs. private sector *Strong effects* ✓
  - formal vs. informal employee, informal self-employed *Strong effects* ✓

• **Life cycle stage**
  - middle age vs. young, older workers

• **Work/Family preferences**
  - voluntary part-time *Weak effects*
  - men vs. women with and without young children *Moderate effects*
  - limiting health issues *Weak effects*
<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Literacy scores</th>
<th>No literacy</th>
<th>All</th>
<th>Baseline</th>
<th>Literacy scores</th>
<th>No literacy</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Over-education Experience</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>10–29 years</td>
<td>0.852</td>
<td>0.832</td>
<td>(-0.996)</td>
<td>(-1.141)</td>
<td></td>
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<tr>
<td>30+ years</td>
<td>0.746</td>
<td>0.717</td>
<td>(-1.427)</td>
<td>(-1.612)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female, no young kids</td>
<td>1.631***</td>
<td>1.633***</td>
<td>(3.531)</td>
<td>(3.534)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female, young kids</td>
<td>1.305</td>
<td>1.304</td>
<td>(1.611)</td>
<td>(1.603)</td>
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<td></td>
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<tr>
<td>Voluntary part-time</td>
<td>1.304</td>
<td>1.296</td>
<td>(1.193)</td>
<td>(1.171)</td>
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<tr>
<td>Health problem</td>
<td>1.138</td>
<td>1.133</td>
<td>(0.802)</td>
<td>(0.777)</td>
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<tr>
<td>Public sector</td>
<td>0.643***</td>
<td>0.637***</td>
<td>(-2.836)</td>
<td>(-2.889)</td>
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<tr>
<td>Informal employee</td>
<td>1.684***</td>
<td>1.651***</td>
<td>(2.694)</td>
<td>(2.587)</td>
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</tr>
<tr>
<td>Informal self-employed</td>
<td>1.870***</td>
<td>1.824***</td>
<td>(3.324)</td>
<td>(3.182)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Informal family</td>
<td>1.910**</td>
<td>1.842*</td>
<td>(1.996)</td>
<td>(1.876)</td>
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</tr>
<tr>
<td>Primary (ISCED = 1)</td>
<td>0.967</td>
<td>0.765</td>
<td>(-0.166)</td>
<td>(-1.241)</td>
<td></td>
<td></td>
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<tr>
<td>Low secondary (2)</td>
<td>1.089</td>
<td>0.988</td>
<td>(0.459)</td>
<td>(-0.0646)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Tertiary &lt;16 years (5)</td>
<td>1.692</td>
<td>1.741*</td>
<td>(1.567)</td>
<td>(1.649)</td>
<td></td>
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<tr>
<td>Tertiary 16 years (5)</td>
<td>0.154***</td>
<td>0.160***</td>
<td>(-10.96)</td>
<td>(-10.62)</td>
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<td></td>
</tr>
<tr>
<td>Tertiary &gt;16 years (5)</td>
<td>0.0349***</td>
<td>0.0371***</td>
<td>(-8.620)</td>
<td>(-8.443)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Tertiary, all (5)</td>
<td>0.149***</td>
<td>0.162***</td>
<td>(-13.27)</td>
<td>(-12.47)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Literacy (1 = 25 pts.)</td>
<td>0.909***</td>
<td>0.939*</td>
<td>(-2.946)</td>
<td>(-1.818)</td>
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</tr>
<tr>
<td>N</td>
<td>2,183</td>
<td>2,183</td>
<td>2,130</td>
<td>2,130</td>
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<td></td>
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<tr>
<td>Pseudo R²</td>
<td>0.203</td>
<td>0.209</td>
<td>0.265</td>
<td>0.269</td>
<td></td>
<td></td>
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<tr>
<td>Log likelihood</td>
<td>-1,285</td>
<td>-1,277</td>
<td>-1,143</td>
<td>-1,138</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Other predictors to be added

• **Frictions**
  o search methods (networks, internet)
  o firm/establishment size

• **Business cycle**
  o local unemployment rate
  o recently unemployed

• **Social exclusion**
  o socio-economic background
  o minority language
  o immigrant status
Is mismatch genuine?
Is the “subjective” measurement method valid?
Do over-educated workers really perform mostly lower-skill tasks?
Does task complexity of mismatched tertiary grads reflect mostly their personal education or their jobs?

Task measures show jobs of mismatched tertiary much more similar to upper secondary than to well-matched tertiary.
Is mismatch genuine?
Does task complexity of mismatched tertiary grads reflect mostly their personal education or their jobs?

### Groups:
- Matched upper secondary (3,3)
- Mismatched tertiary (5,3)
- Matched tertiary (5,5)

### Gap ratio:
\[
\frac{(5,5) - (5,3)}{(5,5) - (3,3)}
\]

Example (35-75)/(35-86) = 0.78

### Task measures show jobs of mismatched tertiary much more similar to upper secondary than to well-matched tertiary.