China’s Rural Human Capital Gap and the Middle Income Trap

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&

REAP Partners
http://reap.stanford.edu
Seven facts (from the conference so far)

1. Wage rates are rising … towards US$10/hour by 2025 to 2030 …
2. Even with slower growth, wages will rise fast …
3. Low-wage, labor-intensive jobs will begin to move outside of China over the next decade or so …
4. China would like to become a high income / productivity/innovation-based economy …
5. In a high wage economy, for a firm owner / corporate manager to be able to hire a worker, the worker needs the skills to be able to be “worth” …
6. In a high wage economy, human capital is an important determinant of income (poverty) …
7. China’s income is now quite unequally distributed … the poor are in rural areas / and in western provinces …
What is the state of China’s human capital … in the areas where the *poor* live?

- ≈ 35% of school-aged children in poor rural areas

(> 50 million children, ages 6 to 15)

*Remember: today’s children are tomorrow’s workers and...*
China’s Human Capital Challenges

- Going to college … only 2% of students from poor rural areas go to college

- Going to high school … only 25-30% of junior high grads in poor rural areas go to academic high school..

- Why?
  - High tuition in college / high school
  - Poor quality of education in grades 1-9
    - Poor facilities …
    - Poor nutrition …
    - Poor preparation (no ECCE)
The greatest “gap” in China (much more serious than the urban-rural income gap—about 3:1): 

**The Higher Education Gap**

<table>
<thead>
<tr>
<th>Percent of students that go to college</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large cities in China</td>
<td>70</td>
</tr>
<tr>
<td>Poor rural areas</td>
<td>2</td>
</tr>
</tbody>
</table>

35:1 gap in access to tertiary education …
While all kids do not need to go to college, they should be going to high school … to get basic skills for workforce 20 years from now!!

• Going to college … only 2% of students from poor rural areas go to college

• Going to high school … only 40% of junior high grads in poor rural areas go to academic high school ..

• Why?
  – High tuition in college / high school
  – Poor quality of education in grades 1-9
    • Poor facilities …
    • Poor nutrition …
    • Poor preparation (no ECCE)
Perhaps even more serious

The High School Gap

Percent of students that go to secondary school

Large cities in China
Poor rural areas
There are literally tens of millions of children in China today that are not learning the skills that they are going to need for tomorrow.

**China in the 2005**

- Large cities in China: 80%
- Poor rural areas: 40%

**Mexico in the 1980s!**

- Large cities in Mexico: 80%
- Rural and Poor Urban: 40%
Is China planting the seeds for a Mexico-like crisis in the future?

Foreign Direct Investment in Mexico

Cartels & gangs

Violence

Break down of law and order

Except in China it could involve 100s of millions of individuals in gangs and triads and organized crime
High School Tuition Levels around the world (in US dollars – public rural high schools)

China
High School Tuition Levels around the world (in US dollars – public rural high schools)

People in China are amazed when they see this graph … then they say: this is not the reason for low matriculation to high school.
Is high tuition a constraint to upper secondary education?

• Recent study:
  “Contracting for Dreams”

• Main Goal: answer the question ➔ “Will eliminating high school tuition lead to students working harder in Lower Secondary School and higher enrollment in Upper Secondary?”

Actually this is collaborating with the local governments ... they are paying the tuition (or granting tuition waivers)
The sampling frame (Contracting for Dreams)

• 3 counties / more than 100 rural jr. high schools:

• More than 1000 students in the treatment schools and 2000 students in the control schools

The intervention:

• In one set of jr. hi. schools: offer a “contract” [if you get into high school, we, the county government, will pay the tuition and fees]

• In the control schools, no support (like the rest of China)
Difference between Year One and Year Two Outcomes

Changes in Standard Deviations between Year 1 and Year 2

P-value = 0.03

Changes in Share of Students between Year 1 and Year 2

P-value = 0.07

Test Scores (TIMMS Math Test)  Plans to Go On to High School

Forthcoming REAP paper!
Another study: supported by Caterpillar Corp.

- Went to 250 junior high school grade 3 classes in Southern Shaanxi in Jan. 2011
- Identified 2 poorest students in each class
- Offered 1 (randomly selected) 1500 to 2000 to 2500 yuan per year, if the student matriculated into high school

<table>
<thead>
<tr>
<th>Share of students continuing on to upper secondary school</th>
<th>Treated</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>51%</td>
<td>38%</td>
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</tbody>
</table>

Difference is statistically significant at 5% level
Financial aid matters:

- For effort
- For plans to go to high school
- For actual matriculation

- Good news: in 2009 MoFinance allocated funds to give poorest 20% of students in poor counties financial aid for high school …
- Bad news: in November 2011, we surveyed about 30 schools / 3000 students in grade 1 of high school ➔ < 1% had any financial aid
New research, however, shows “source” of problem begins before high school

• Going to college … only 2% of students from poor rural areas go to college

• Going to high school … only ≈30-40% of junior high grads go to high school ..

• Why so low?
  – High tuition in college / high school + Other Costs!!
  – Poor quality of education in grades 1-9 and before
    • Poor facilities … teachers … curriculum …
    • Poor nutrition …
A Large Cost of Going to High School is Attending Jr. High

• But isn’t Jr. High Free?
  – Yes: no tuition / no fees

• High “Opportunity Cost”
  – Labor contractors offering junior high students:
    • 1500 yuan / month
    • Free room + board + transportation
    [ … plus a “junior high diploma” 😊 ]

China is sort of a victim of its own success!
Even worse news:
Disturbing new study shows students are not even getting through junior high school

- Results from 2009/2010 REAP survey

<table>
<thead>
<tr>
<th>Grade</th>
<th>Drop out rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 7</td>
<td>14%</td>
</tr>
<tr>
<td>Grade 8</td>
<td>15%</td>
</tr>
<tr>
<td>Grade 9</td>
<td>9%</td>
</tr>
</tbody>
</table>

Nearly 40 percent of students from poor rural areas are dropping out of JUNIOR HIGH SCHOOL!
How do you solve this problem?
“pay parents to keep kids in school”

• For 600 poorest chuyi students (sept. 2009):
  – 300 gave a CCT (conditional cash transfer)
    • “if you keep your student in school, in June we will give you student / parents a 1500 cash transfer”
  – 300 gave ZERO

***************

• Results in Sept. 2010:

<table>
<thead>
<tr>
<th>Drop out rate</th>
<th>No CCT</th>
<th>CCT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13.7%</td>
<td>5.1%</td>
</tr>
</tbody>
</table>
Why?
3 reasons

• Too poor [not the main problem]

• Opportunity cost is too high
  – Especially boys … and older students (who can command a higher wage in off farm employment markets)

• Value of education is low
  – Many dropout are poor students (low grades)
  – In China’s competitive high school system, even if they stay in junior high they may not be able to go to high school …
Maybe the “REAL source” of problem begins before junior high school

• Going to college … only 2-3% of students from poor rural areas go to college

• Going to high school … only 30-40% of students go to high school

• Why? One reason: Drop outs from junior high … up to 40%

• Why?
  – Poor quality of education in grades 1-9 and before
    • Poor facilities … teachers … curriculum …
    • Poor nutrition …
In fact, students in poor rural areas are poor students!!

Standardized TIMMS test (4th grade, 2005 ... World Bank
Why?

- Too expensive … not any more …
  - Grades 1 to 9 ➔ zero tuition and fees
  - Grades 10 and above ➔ Plenty of financial aid

- Rural students can’t compete …
  - Poor facilities / poor teachers
    - Yes … but, large investments in recent years …
      China spending 3.5% of GDP on education
      (although MOST into colleges and urban education
      … but, also, a lot into rural education)
  - Some other reason?
Poor Health / Poor Nutrition

No matter how much investment into facilities / teacher salaries & training / curriculum … if students are sick or malnourished, may not be able to learn …
Results of study of 4000 students in rural Shaanxi Province

- Found that 39% of students had anemia
  - In some schools, ≈70% of students had anemia!
Report to Center for Disease Control:

“There are Still High Rates of Anemia”

Response:

“It must be those guys from Shaanxi … they have never had good diets …”
We went on to test nearly 14,000 additional children across China....
In fact, anemia is all over China

<table>
<thead>
<tr>
<th>Region</th>
<th>Year</th>
<th>Dataset</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>33.7</td>
</tr>
<tr>
<td>Shaanxi</td>
<td>2008</td>
<td>Dataset 1</td>
<td>37.5</td>
</tr>
<tr>
<td>Shaanxi</td>
<td>2009a</td>
<td>Dataset 2</td>
<td>31.6</td>
</tr>
<tr>
<td>Gansu</td>
<td>2010</td>
<td>Dataset 3</td>
<td>31.2</td>
</tr>
<tr>
<td>Qinghai</td>
<td>2009</td>
<td>Dataset 4</td>
<td>51.1</td>
</tr>
<tr>
<td>Ningxia</td>
<td>2009</td>
<td>Dataset 5</td>
<td>25.4</td>
</tr>
<tr>
<td>Sichuan</td>
<td>2010</td>
<td>Dataset 6</td>
<td>24.8</td>
</tr>
<tr>
<td>Guizhou</td>
<td>2010</td>
<td>Dataset 7</td>
<td>33.1</td>
</tr>
</tbody>
</table>

Poor areas of China

Children with anemia (≈ 33%)

≈ 20 million school aged children are estimated to have anemia …
Tested 18,915 children in Gansu Province

2069 (10.9%) were myopic (or nearsighted).
Tested 18,915 children in Gansu Province

2069 (10.9%) were myopic (or nearsighted).

Only 109 had eyeglasses (about 0.5%)
What happens when students cannot see …

• The chalk board?
• Teachers’ illustrations?
• The work of fellow students?
THE SCOURGE WITHIN: INTESTINAL WORMS IN RURAL CHINA

Chinese Academy of Sciences
Center for Disease Control, Shanghai
Stanford University (with support of Asia Health Care Initiative funding)
Total 1701 children

- 8 students/village (8-10 years old/grades 3-4)
- 8 children/village (3-5 years old, pre-school)
# Intestinal Worm Prevalence in China

## Infection Rate of Four Kinds of Worms

<table>
<thead>
<tr>
<th></th>
<th>3-5 years old</th>
<th>8-10 years old</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Guizhou</td>
</tr>
<tr>
<td>Any of three kinds of worms (%)</td>
<td>21.2</td>
<td><strong>33.9</strong></td>
</tr>
<tr>
<td>Roundworm (%)</td>
<td>16.5</td>
<td>29.5</td>
</tr>
<tr>
<td>Hookworm (%)</td>
<td>2.9</td>
<td>1.6</td>
</tr>
<tr>
<td>Whipworm (%)</td>
<td>4.8</td>
<td>6.7</td>
</tr>
<tr>
<td>Pinworm (%)</td>
<td>4.7</td>
<td>1.3</td>
</tr>
</tbody>
</table>
It is not just health/nutrition:
Large Urban / Poor Rural
Digital Divide

Computer Ownership

Internet Access

Urban | Rural
--- | ---
62% | 8%
91% | 2%
Response by Ministries

• Mostly: silence
• Why?
  – MOE: “What does health and nutrition have to do with education?”
  – MOH: “We know this / tell us what to do about it …”
The need for “Action Research” or Social Experimentation

• Seeing is believing …

• Show the effect of treatment on China …

• Experiment with different ways of treating … compare efficacy / cost …

➡ To gain policy traction …
The FIRST anti-anemia intervention:
October, 2008 - June, 2009
What can be done?
Will iron supplements \( \rightarrow \) less anemia?

Lower anemia \( \rightarrow \) Better school performance?

Baseline Survey (Oct. 2008):
-- Anemia (Hb) Test
-- Standardized Math Test

Stage 1

POLICY EXPERIMENT
RCT’s

Baseline survey

Evaluation survey

treated
control
The sampling frame:

- 8 counties
- 143 centralized rural elementary schools:
  - Randomly selected 60 schools

_Shaanxi Province_
Locations of 60 sample schools in Shaanxi Province
Using Hemocue 201+ technology gives Hb levels in 45 seconds (Oct. 2008)
Baseline TIMMS test (October 2008)
All fourth grade students
Locations of sample schools in Shaanxi Province

(●) Treatment Schools
(○) Control Schools
Pre-balanced at the baseline between 30 Treatment (T) Schools and 30 Control (C) Schools

![Bar chart showing Hb levels, Anemia Rates, and Test Scores for Treatment (T) and Control (C) Schools.]

<table>
<thead>
<tr>
<th></th>
<th>T</th>
<th>C</th>
<th>T</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hb levels</td>
<td>122.4</td>
<td>122.2</td>
<td>38.7</td>
<td>39.8</td>
</tr>
<tr>
<td>Anemia Rates</td>
<td>73.1</td>
<td>72.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Prebalancing ensures that schools in treatment groups and schools in control groups are statistically identical prior to the intervention (like identical twins).

Therefore, after the intervention, we can interpret any differences to the outcome variables (Hb levels, anemia, test scores) to be due to the intervention.
Stage 2 ➔ The Intervention
Will iron supplements ➔ less anemia?

Lower anemia ➔ Better school performance?

Stage 2

Baseline survey ➔ POLICY EXPERIMENT RCT’s ➔ Evaluation survey

POLICY EXPERIMENT

control

treated
The Intervention

School Type A
(30 schools)

“Centrum / Day”

Give students one multi-vitamin with iron per day (5 mg of iron) … from November 2008 to May 2009

(≈4 US cents/day)
30 control schools

Zero: no vitamins
Evaluation Survey (stage 3)
Will iron supplements $\Rightarrow$ less anemia?

Lower anemia $\Rightarrow$ Better school performance?

Baseline survey

POLICY
EXPERIMENT
RCT’s

Stage 3

Evaluation survey
Evaluation survey (June 2009)

Re-taking the standardized academic tests …

… after 5 months of vitamins
Re-taking the Hb Test (June 2009)
Still anemic or not?
Results
Impact of vitamin on students:

Hemoglobin Points

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Treatment (Vitamin/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
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<tr>
<td>1</td>
<td></td>
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<tr>
<td>0</td>
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</table>

Anemia Rates (%)

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Treatment (Vitamin/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-10</td>
<td></td>
<td></td>
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<tr>
<td>-15</td>
<td></td>
<td></td>
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<tr>
<td>-20</td>
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<td></td>
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<td>-25</td>
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Math Test Scores (std. dev.)

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<tr>
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<th>Control</th>
<th>Treatment (Vitamin/day)</th>
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<tbody>
<tr>
<td>0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.4</td>
<td></td>
<td></td>
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<tr>
<td>0.3</td>
<td></td>
<td></td>
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<tr>
<td>0.2</td>
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<tr>
<td>0.1</td>
<td></td>
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<tr>
<td>0</td>
<td></td>
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</tbody>
</table>
Other interventions

Intervention One: 1 egg/day + vitamin
Intervention Two

Vita Meal (vitamin-fortified porridge)

Supported by Nu-skin Cosmetic Company’s CSR group
Intervention Three
Chewable Vitamin per Day
Impact of vitamin supplementation on students

Hemoglobin Points

<table>
<thead>
<tr>
<th>Control</th>
<th>Intervention 1</th>
<th>Intervention 2</th>
<th>Intervention 3</th>
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Anemia Rates (%)

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Math Test Scores (std. dev.)

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</table>
There are many solutions

- Vitamin / day $\Rightarrow$ 0.2 yuan per day
- Deworming $\Rightarrow$ 1 yuan per year
- Eyeglasses $\Rightarrow$ 80 yuan per year
  \(< 0.10$ yuan per day\)

- Early Childhood Education
- Computer room + Software + Teacher training
- Conditional Cash Transfers for Jr. Hi. students
The optimistic view

• China can overcome it …
• Aggressively invest (declare “war on rural education”) … it is late … but, not too late … there is exactly enough time starting now …

• Plenty of fiscal resources … growth is top priority … we must convince decision makers that a War on Rural Poverty is in their own interest … the future of China depends on it …
What if China can not overcome the [BIG] human capital challenge?

• If human capital does not rise, will China stop growing?

• What happens if there are two distinct classes … haves and have nots … and China’s growth slows?

• What happens if there are:
  100 million unemployed?
  70 million unmarried?

There will only be two choices for the unemployed in China (they will NOT be able to cross the border into a neighboring rich country) ... they will either seek employment in the informal economy OR seek refuge in organized crime [this is NOT new in Chinese history]
Can China solve these problems? Can it overcome its human capital gap today ... so it won’t have a DANGEROUS human capital gap tomorrow ...

Will China follow the road of Mexico? ...

What is the consequences of instability in China ➔

• for China

• its people

• for the world?

Is it too late to follow the road of South Korea or Taiwan?
Thank you

http://reap.stanford.edu