Human Capital

ECON 499: Growth and Development

Spring 2018

Growth in the Solow model

- Output (income) is created by combining labor and capital
- Capital accumulation increases income (workers become more productive)
- As workers save (invest) more, the have more capital to utilize in the future
- Solow model assumes labor is homogeneous, same across countries
- Given the same capital, does the average worker in North Korea have the same productivity as the average worker in Germany?

Human capital

- *Human capital* is a set of individual characteristics that affect the productivity of workers
- Not an exhaustive set (innate ability is *not* considered human capital)
- Workers with high human capital are more productive
- Human capital can be changed, either through behavior or policy
- Examples: Health, education

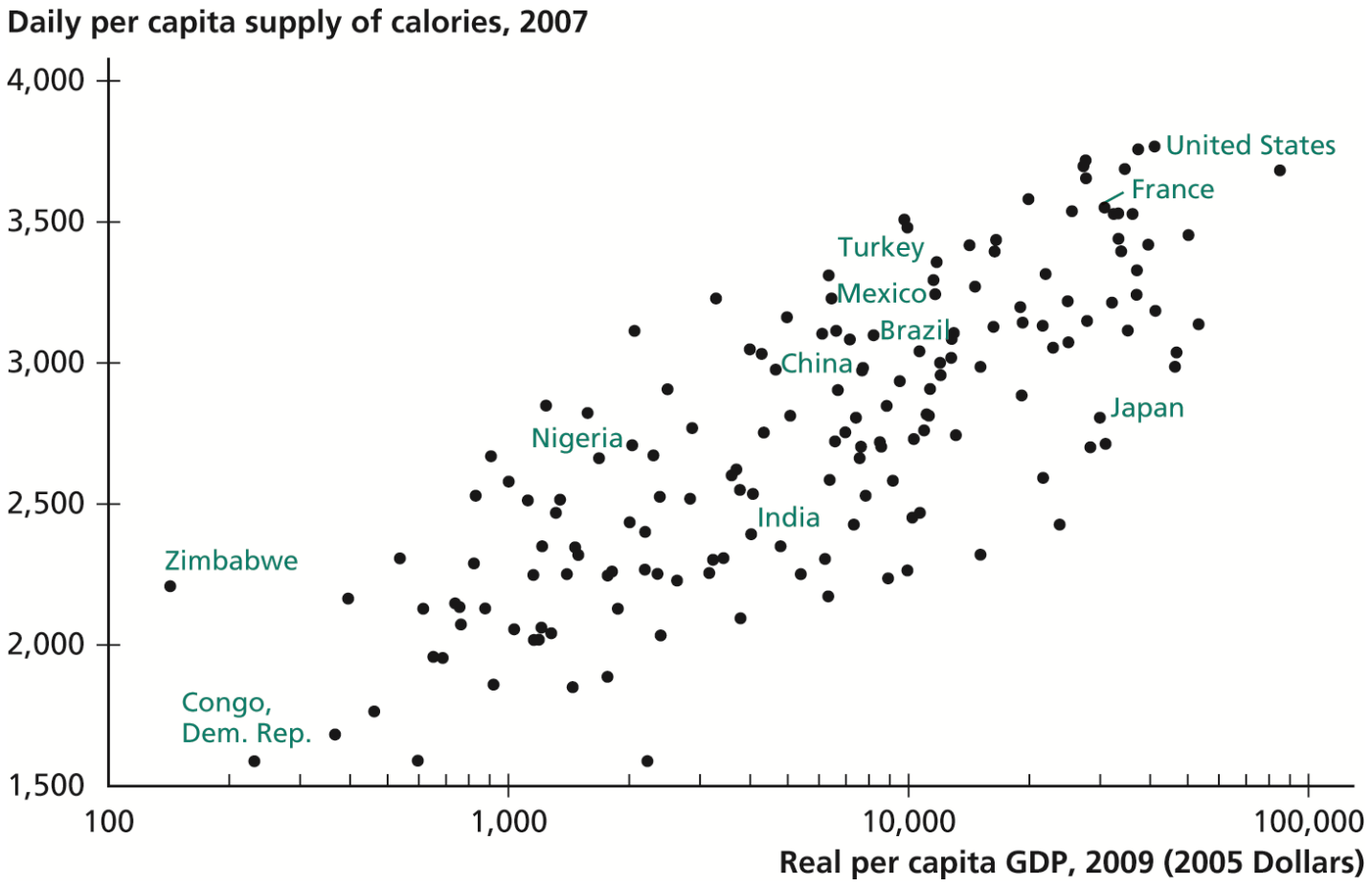
Properties of human capital

Similar to physical capital, human capital is:

1. Productive
2. Produced
3. Earns a return (higher wages)
4. Depreciating

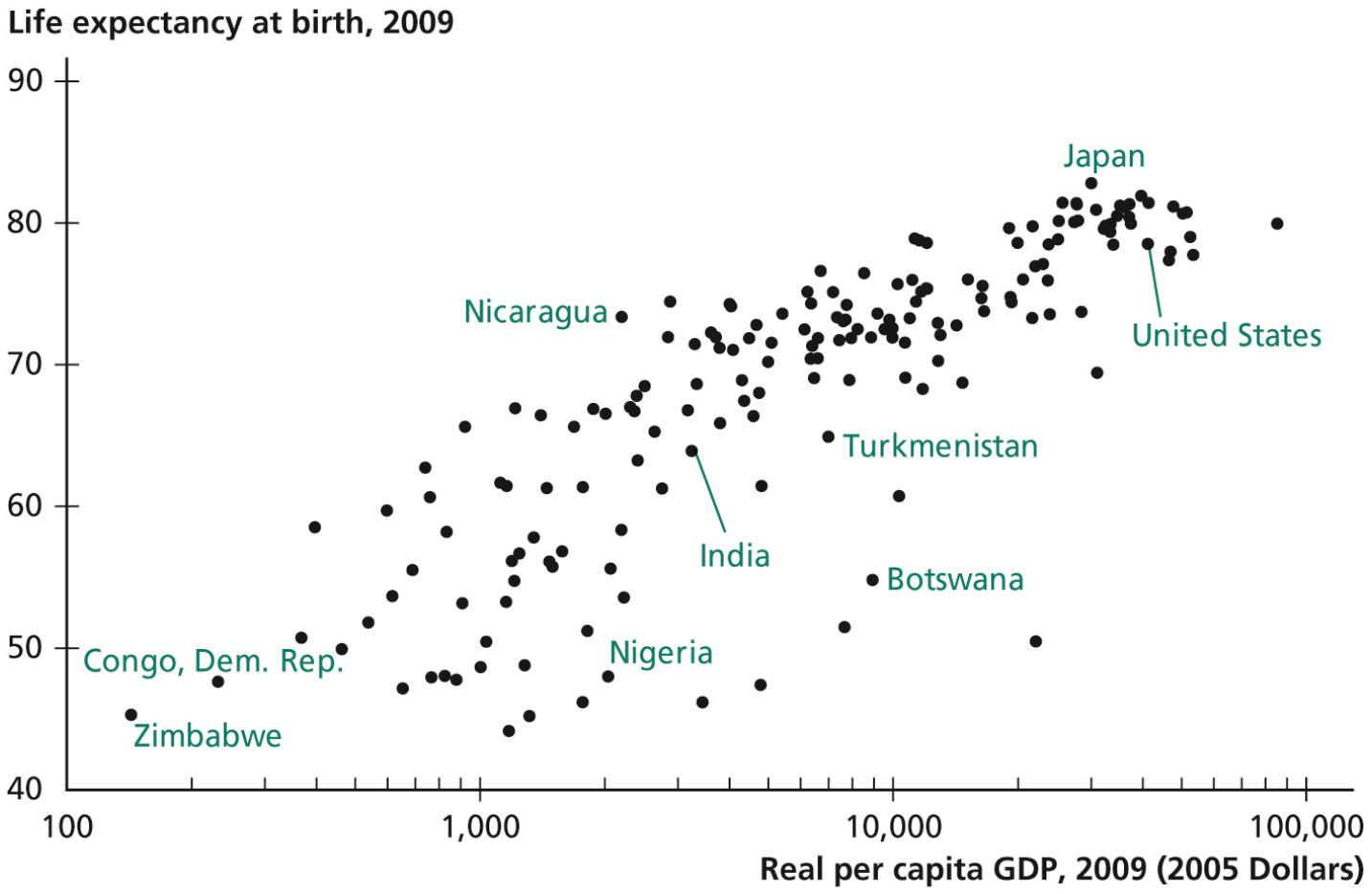
Health

- Healthy people can work longer, harder than unhealthy people
- Health human capital can be difficult to measure, must rely on "proxy" variables
- Height and available calories are commonly used proxies
- In 1855, 2/3 of Dutch men were shorter than 5'6", less than 2% today


Daily per capita supply of calories, 2007
4,000
3,500
3,000
2,500
2,000
1,500
United States
France
Turkey
Mexico
Brazil
China
Japan
Nigeria
India
Zimbabwe
Congo,
Dem. Rep.
100
1,000
10,000
100,000
Real per capita GDP, 2009 (2005 Dollars)

Malnourishment divide

- Very few people are malnourished in the developed world
- Fogel (1997): 20% of adults in 1780 Britain did not have enough calories to provide energy to work 1 hour per day, contributed to 0.33% additional growth per year
- Malnourishment still a chronic problem in developing world
- In addition to calories, many lack essential vitamins and minerals, affects wages and ability to work, health outcomes


Life expectancy at birth, 2009
90
80
70
60
50
40
100
1,000
10,000
100,000
Real per capita GDP, 2009 (2005 Dollars)
Japan
United States
Nicaragua
Turkmenistan
India
Botswana
Nigeria
Congo, Dem. Rep.
Zimbabwe

Simultaneity of health and income

Health and income are *simultaneously determined*

- Health can affect ability to earn income
- Income allows people to buy more food, health care, etc
- Creates multiplier effects, feedback between health and income
- Creates difficulty in measuring relative importance of health vs income

Example: Malaria debate

Jeffrey Sachs:

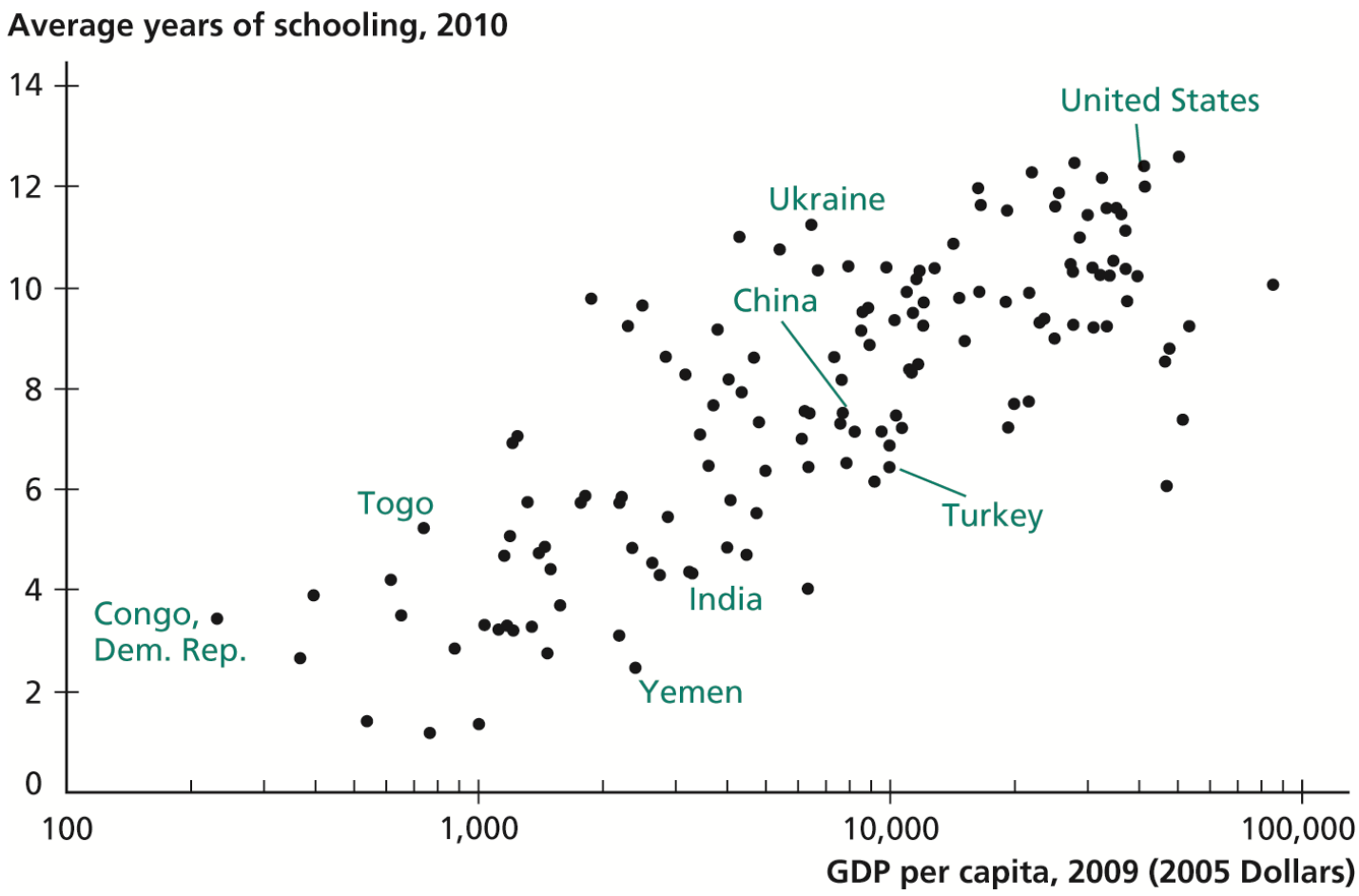
- Countries that have eliminated malaria have grown much more rapidly than countries that have high malaria rates
- Malaria alone is responsible for a substantial portion of cross-country differences in growth and income
- Micro evidence suggests that eliminating malaria can have large effects on human capital acquisition, productivity

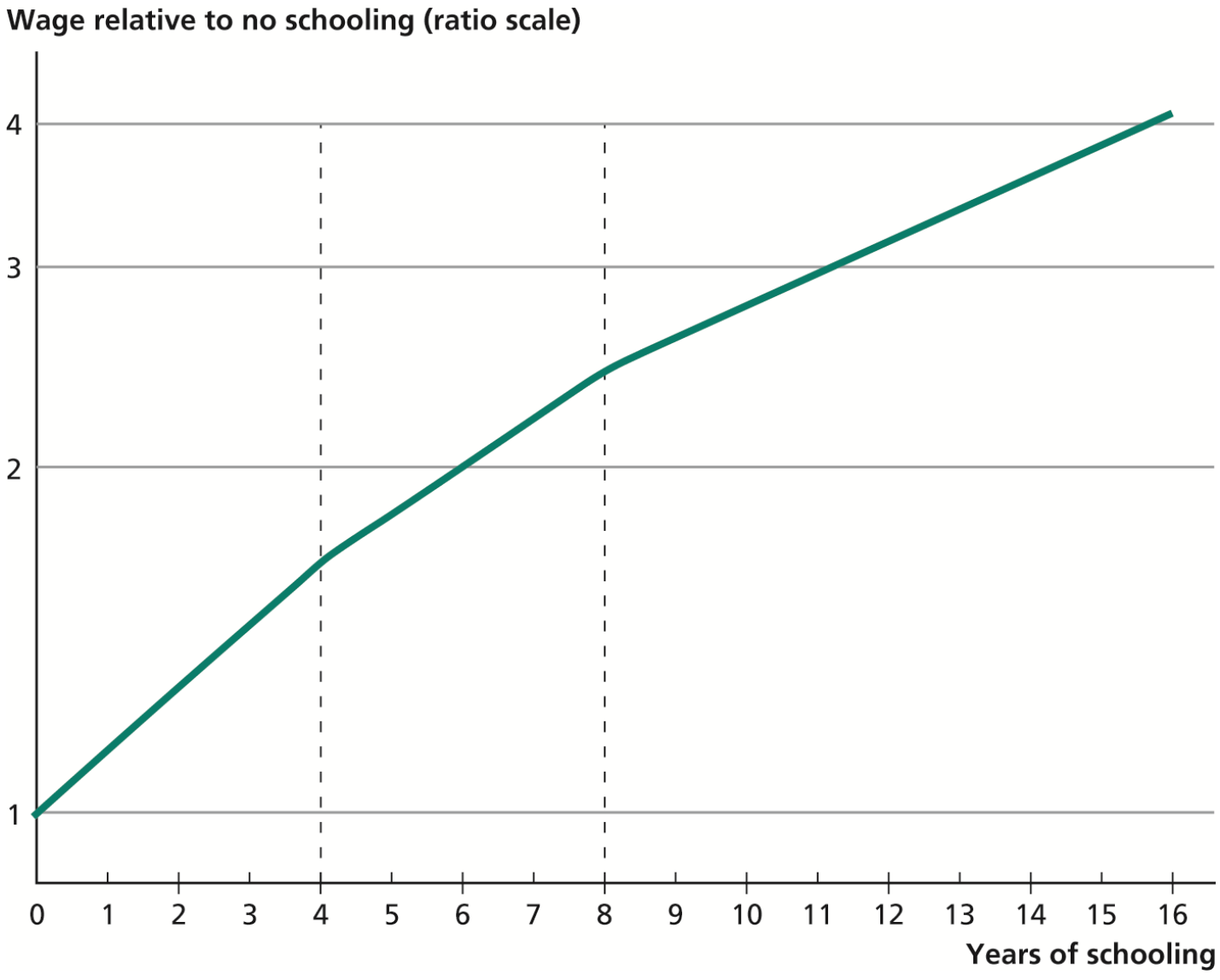
Acemoglu, Johnson, Robinson:

- Countries differ in their *ability* to combat malaria
- Countries that are able to eliminate malaria have strong institutions, care about public health
- Good institutions are responsible for growth and income, malaria reductions are a side effect

Education

- Obvious relationship between education and productivity, wages
- *Return to schooling*: income derived from an additional year of school
- Return is higher for early schooling (reading and writing marginally more valuable than learning how to solve the Solow model)
- Omitted variable bias?


Average years of schooling, 2010
14
12
10
8
6
4
2
0
United States
Ukraine
China
Turkey
Togo
India
Congo,
Dem. Rep.
Yemen
100
1,000
10,000
100,000
GDP per capita, 2009 (2005 Dollars)


Wage relative to no schooling (ratio scale)
4
3
2
1
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Years of schooling

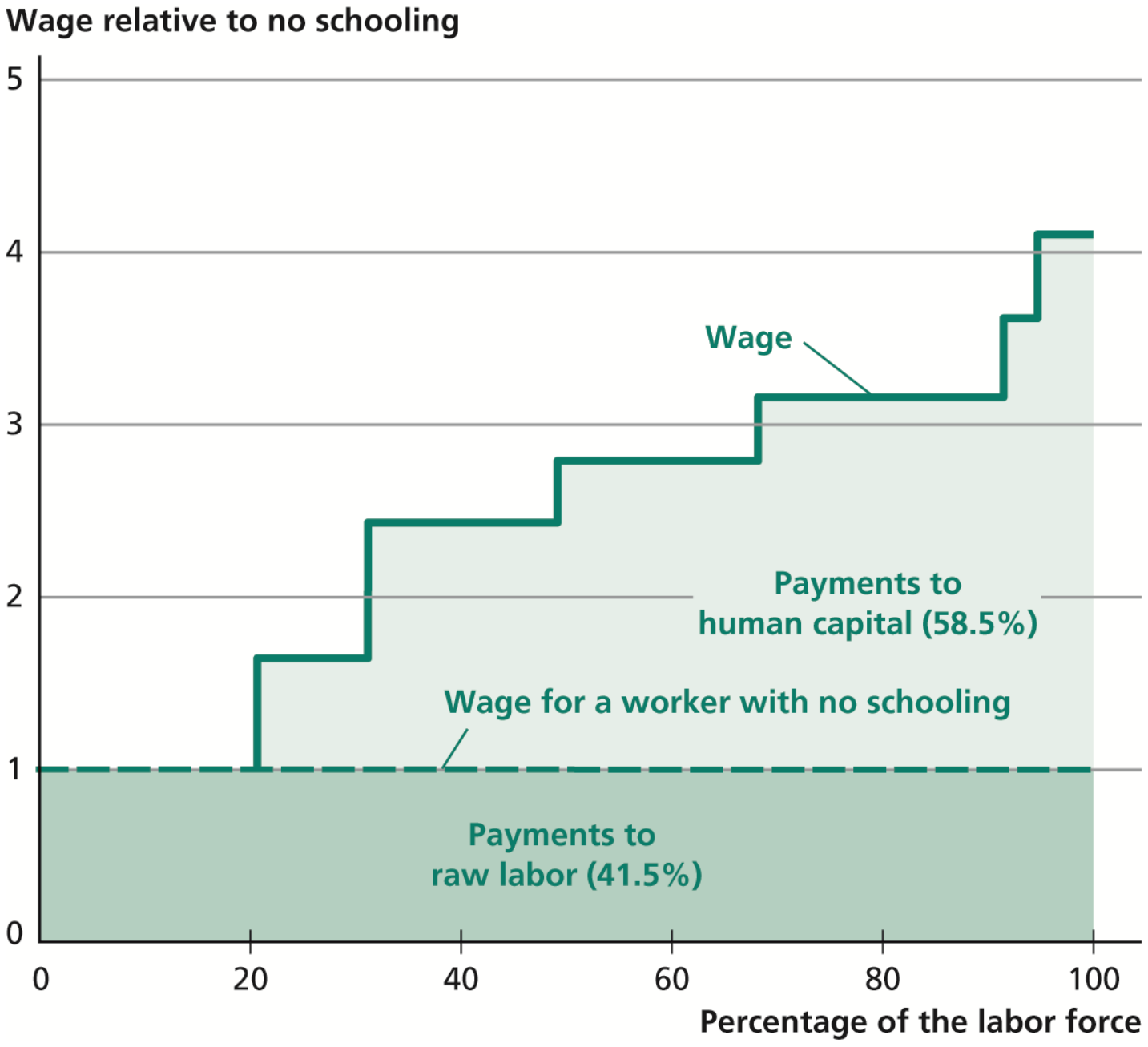
Human capital share of wages

- How much of national income rewards human capital?
- Alternatively, how large are the returns to education? How much cross-country difference can it explain?
- Using returns to wages and national education levels, we can divide amount of income going to "raw labor" and amount going to human capital

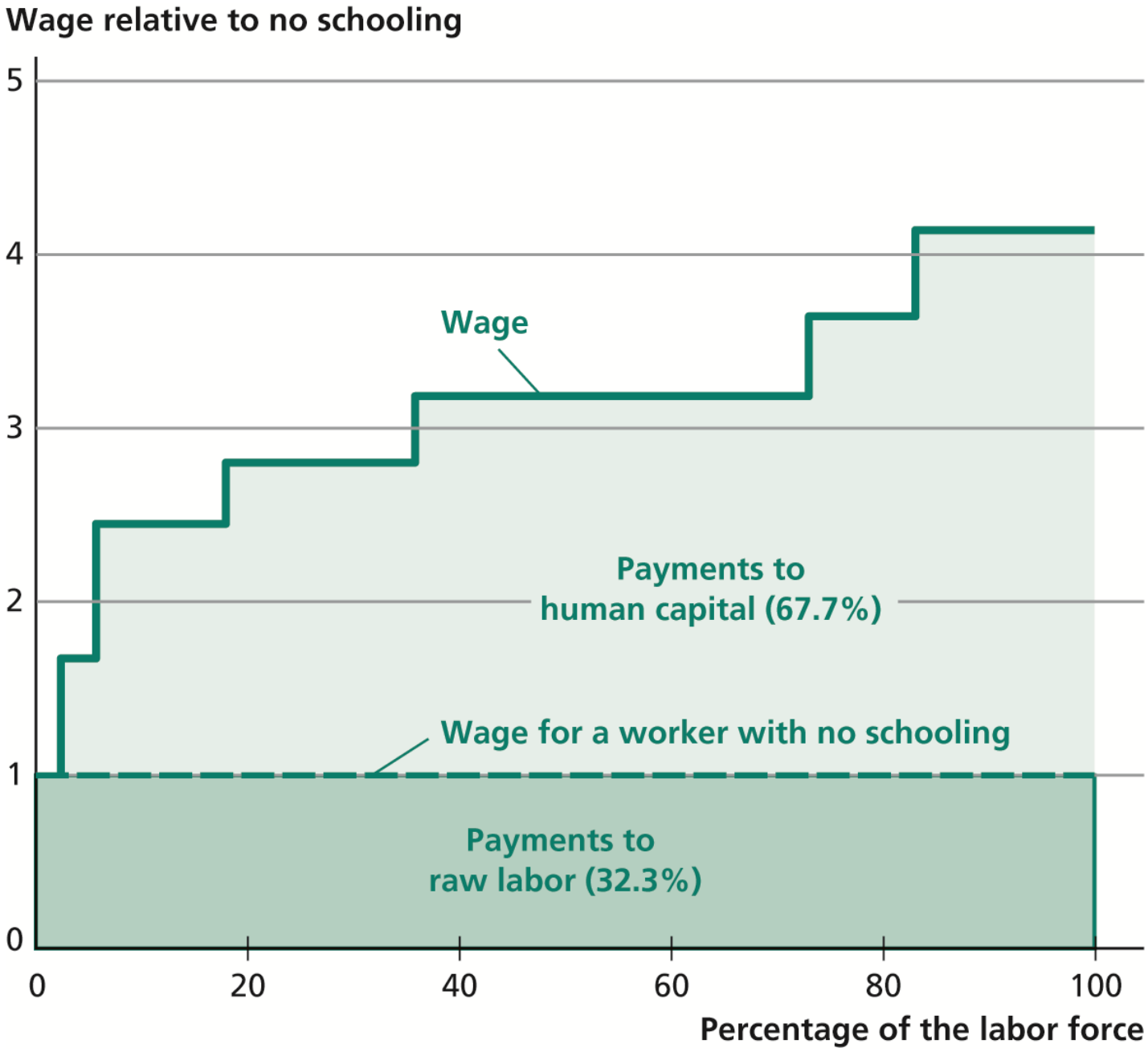
Highest Level of Education	Years of schooling	Wage Relative to No Schooling	Percentage of the Population	
			Developing Countries	Advanced Countries
No Schooling	0	1.00	20.8	2.5
Incomplete Primary	4	1.65	10.4	3.4
Complete Primary	8	2.43	18.0	12.3
Incomplete Secondary	10	2.77	19.3	17.8
Complete Secondary	12	3.16	23.2	37.4
Incomplete Higher	14	3.61	2.9	9.9
Complete Higher	16	4.11	5.3	16.6

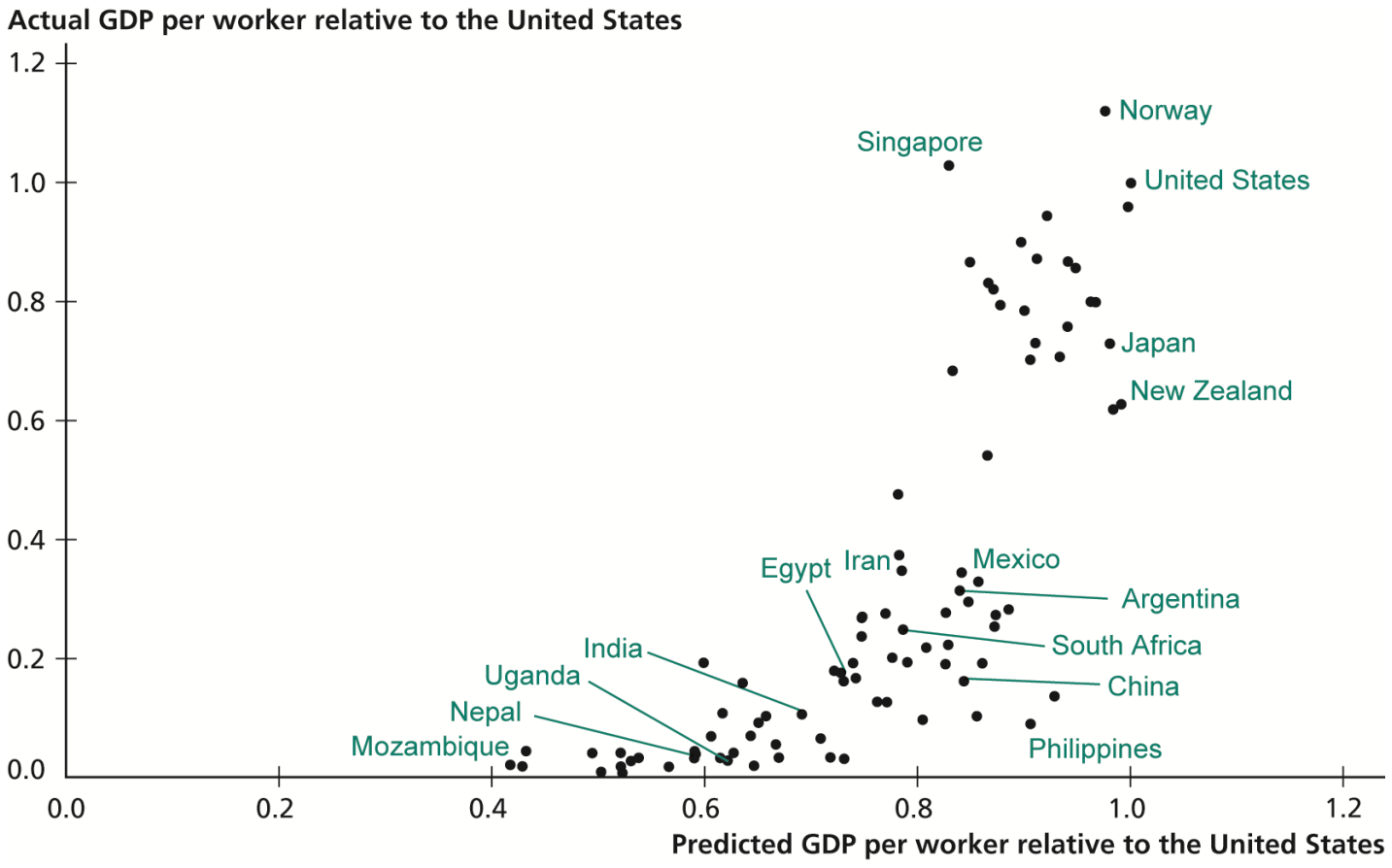
Source: Barro and Lee (2010).

Share of Human Capital in Wages in Developing Countries



Share of Human Capital in Wages in Advanced Countries



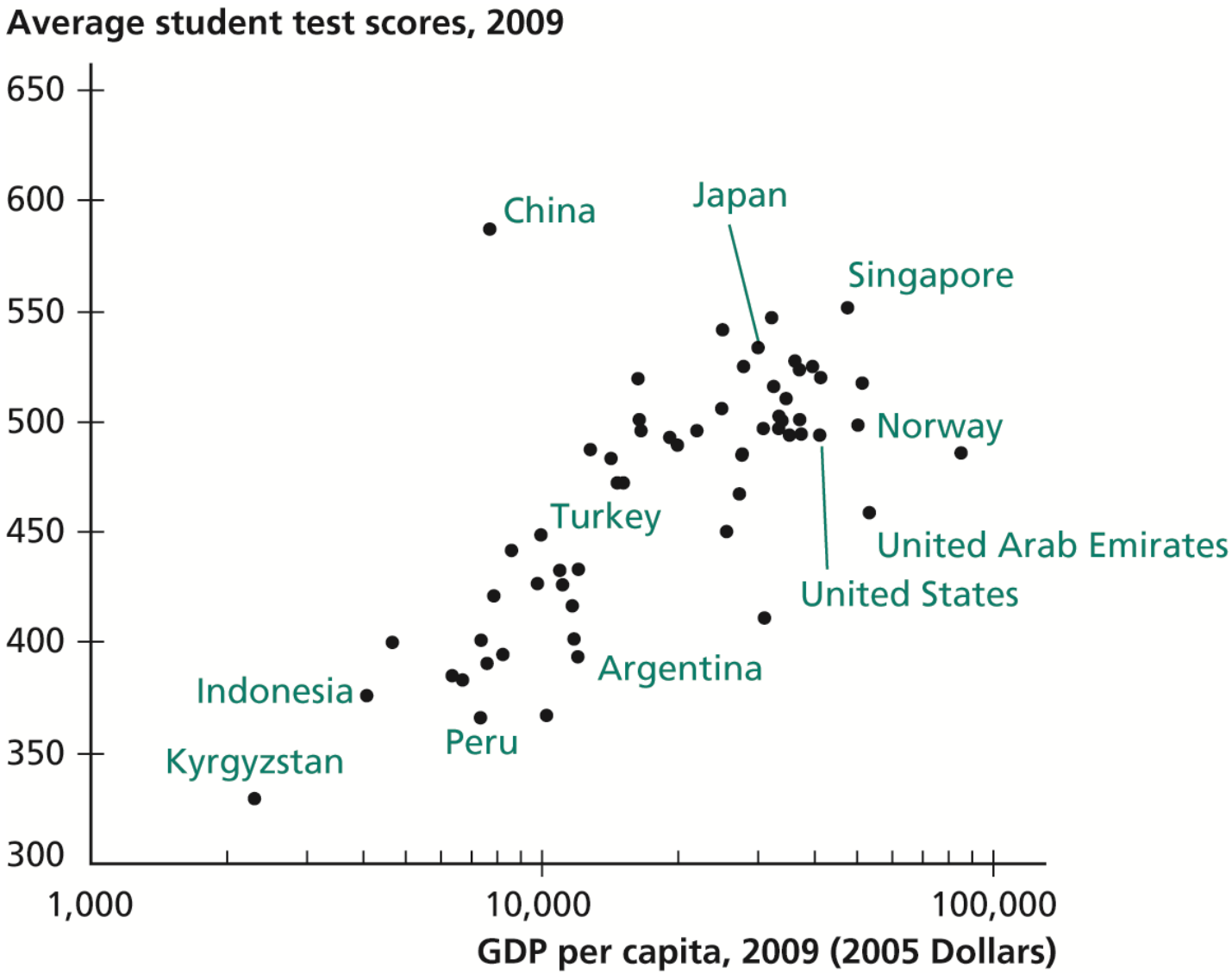

Actual GDP per worker relative to the United States
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.2
0.4
0.6
0.8
1.0
1.2
Predicted GDP per worker relative to the United States
Norway
Singapore
United States
Japan
New Zealand
Egypt
Iran
Mexico
Argentina
South Africa
India
Uganda
China
Nepal
Mozambique
Philippines

Education in the Solow model

- Cross-country differences in education explain much (but not all) of the difference in income
- Model performs better for developed countries than developing countries
- Developing countries are poorer than they "should" be given educational differences

Quantity vs quality

- Years of schooling might be a bad measure of human capital attainment
- 12 years in Sweden is different than 12 years in Mozambique
- Teachers in developing world often have less training, fewer textbooks and other resources, worse attendance (students and teachers)


Average student test scores, 2009
650
600
550
500
450
400
350
300
China
Japan
Singapore
Norway
Turkey
United Arab Emirates
United States
Argentina
Indonesia
Peru
Kyrgyzstan
1,000
10,000
100,000
GDP per capita, 2009 (2005 Dollars)

Externalities

- People invest in human capital and get a return in the form of higher wages
- Investing in human capital may impact **other** people as well (externality)
- Educated workers more likely to adopt technology, other workers can then use that technology
- Higher educated teachers can improve education of next generation
- Educated workers may innovate, accumulate capital
- Socially optimal education levels may be higher than levels chosen by fully rational people