HUMAN CAPITAL

EE 462 Development Macroeconomics

Semester 1/2014

POPULATION

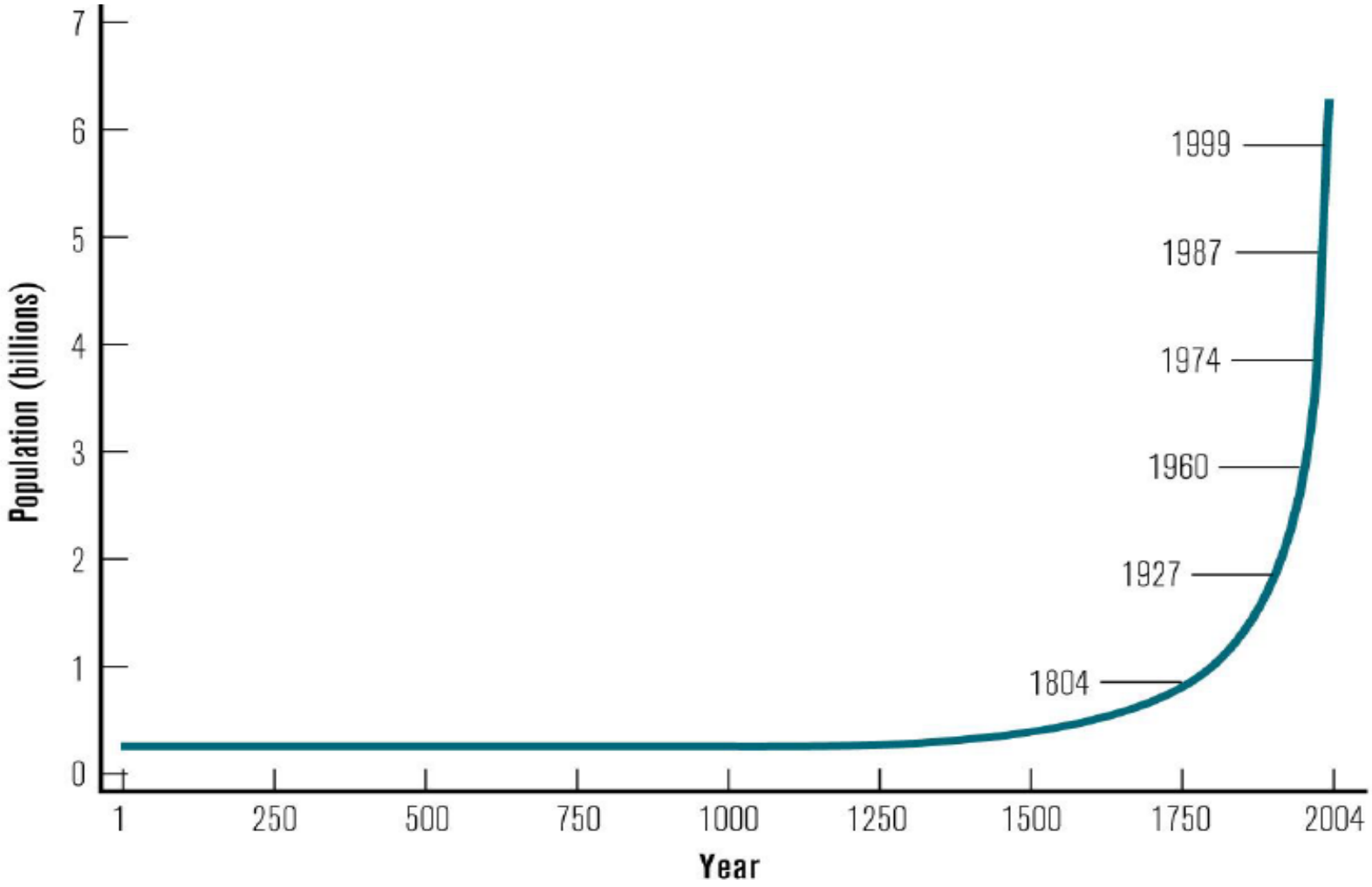
Topics

- Overview
- Demographic Transition
- Cause of Population Growth
- Population Growth and Economic Development
- Population Policy

Questions of Interests

- Do rising population numbers matter?
- Should we reduce population growth?
- Is population growth “good” or “bad” for development?
- What is the relationship between population growth and economic development?

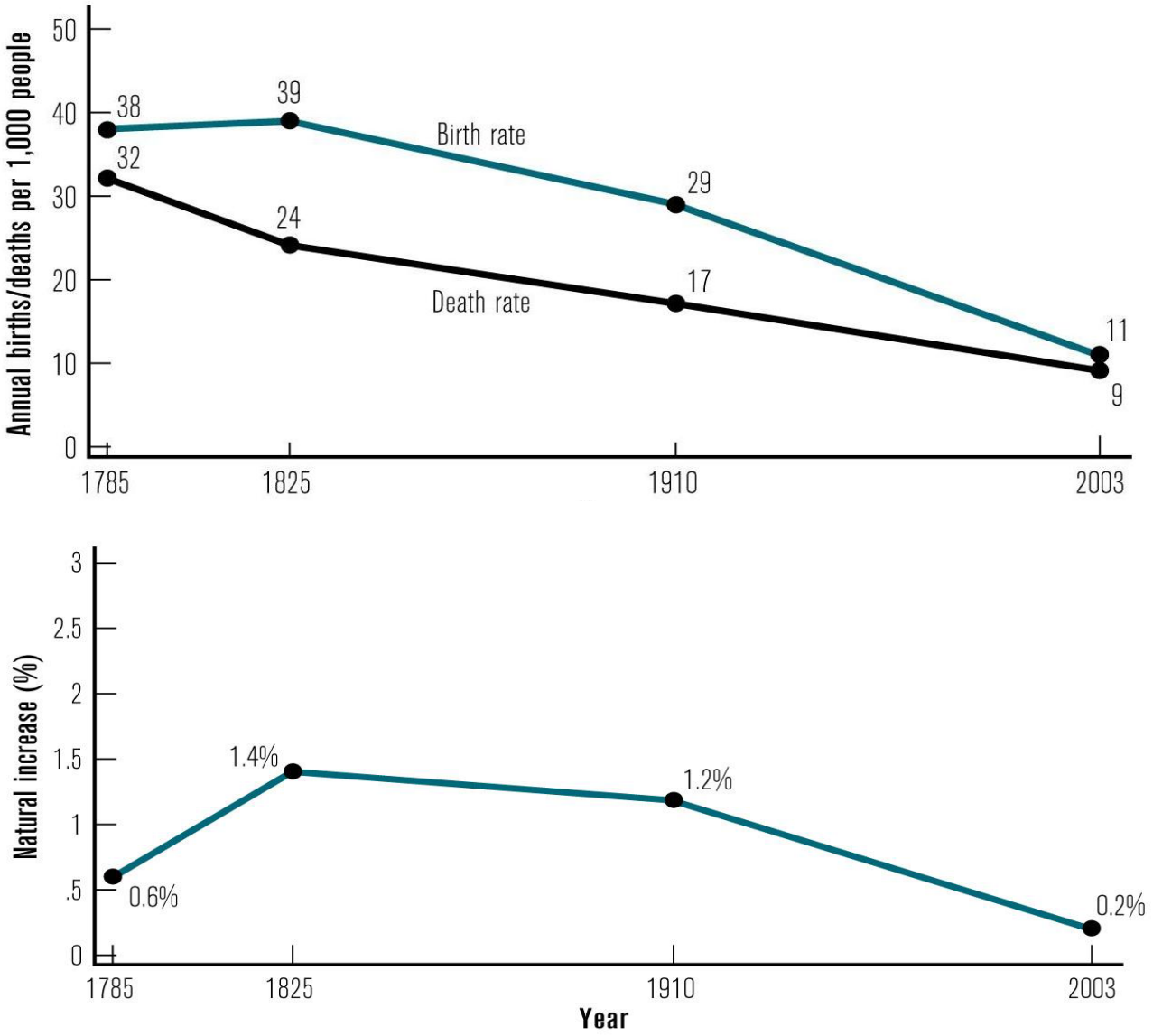
World Population Growth through History: Years Need to Add 1 Billion More People



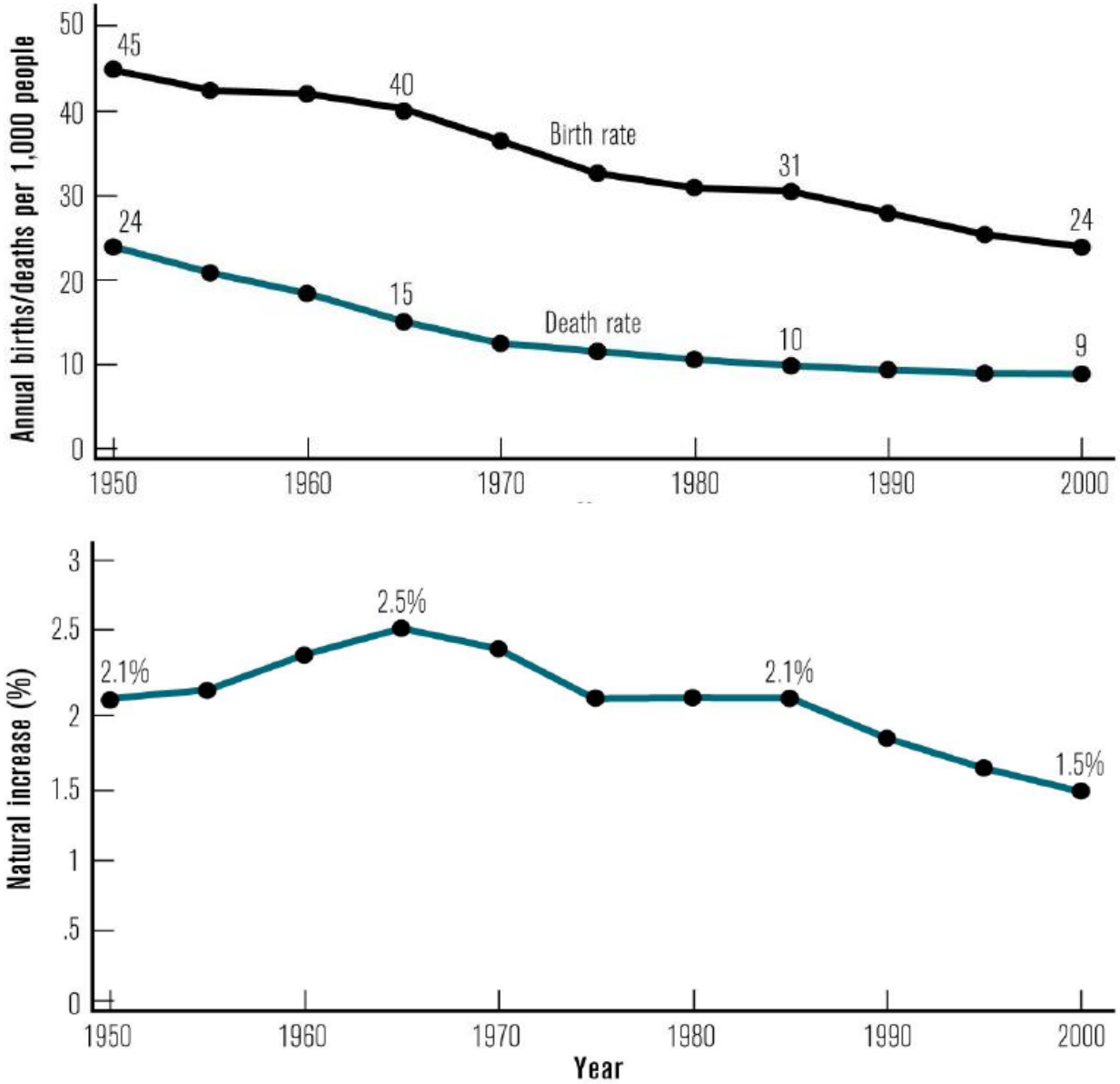
Demographic Transition

- Demographic transition occurs when population starts with low growth rates due to **high birth rates and high death rates**, moves through rapid growth stage with **high birth rates and low death rates**, and later becomes stable with low growth rates where **both birth and death rates are low**.
- Some definitions:
  - Crude birth rate = the number of live births per 1000 people (per year)
  - Crude death rate = the number of deaths per 1000 people (per year)
  - Natural increase = crude birth rate – crude death rate

Demographic Transition for Finland, 1785-2003



Demographic Transition for Less-Developed Regions, 1950-2000



Current Situation: Population Clock, 2010

		WORLD	MORE DEVELOPED COUNTRIES	LESS DEVELOPED COUNTRIES
Population		6,892,319,000	1,236,646,000	5,655,673,000
Births per	Year	140,184,169	14,215,211	125,968,959
	Day	384,066	38,946	345,120
	Minute	267	27	240
Deaths per	Year	56,907,606	12,125,055	44,782,552
	Day	155,911	33,219	122,692
	Minute	108	23	85
Natural increase (births-deaths) per	Year	83,276,563	2,090,156	81,186,407
	Day	228,155	5,726	222,429
	Minute	158	4	154
Infant deaths per	Year	6,383,531	80,133	6,303,398
	Day	17,489	220	17,270
	Minute	12	0.2	12

Source: Population Reference Bureau, *2010 World Population Data Sheet*, www.prb.org/pdf10/10wpds_eng.pdf.

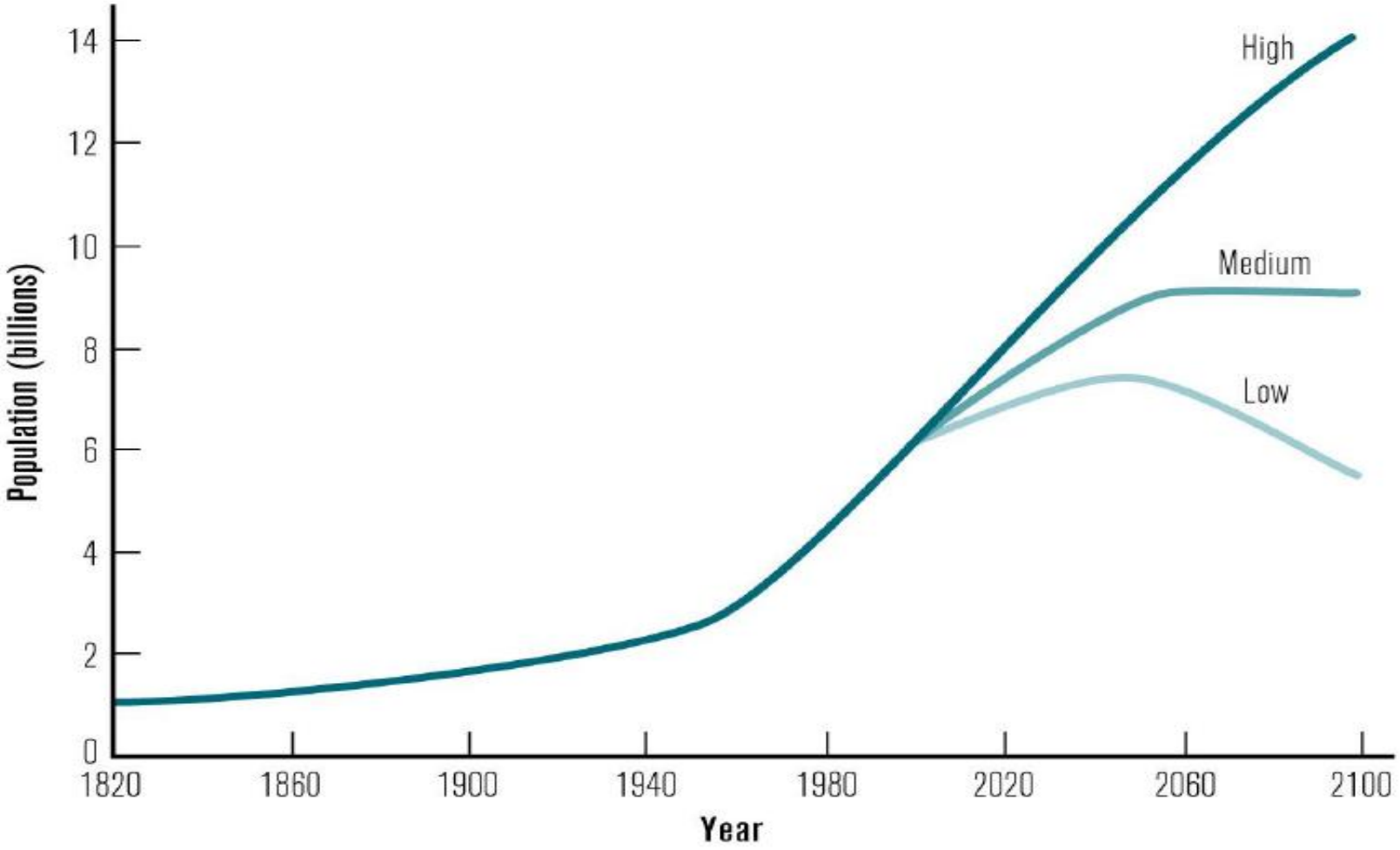
Current Situation: Countries with the Youngest and Oldest Populations, 2010

YOUNGEST	% AGES <15
Niger	50.1
Uganda	48.7
Burkina Faso	46.4
Congo, Dem. Rep.	46.4
Zambia	46.2
Malawi	45.9
Afghanistan	45.9
Chad	45.6
Somalia	44.9
Tanzania	44.7

OLDEST	% AGES 65+
Japan	22.6
Germany	20.5
Italy	20.4
Sweden	18.3
Greece	18.3
Portugal	17.9
Bulgaria	17.6
Austria	17.6
Latvia	17.4
Belgium	17.4

Source: Population Reference Bureau, *2010 World Population Data Sheet*, www.prb.org/pdf10/10wpds_eng.pdf.

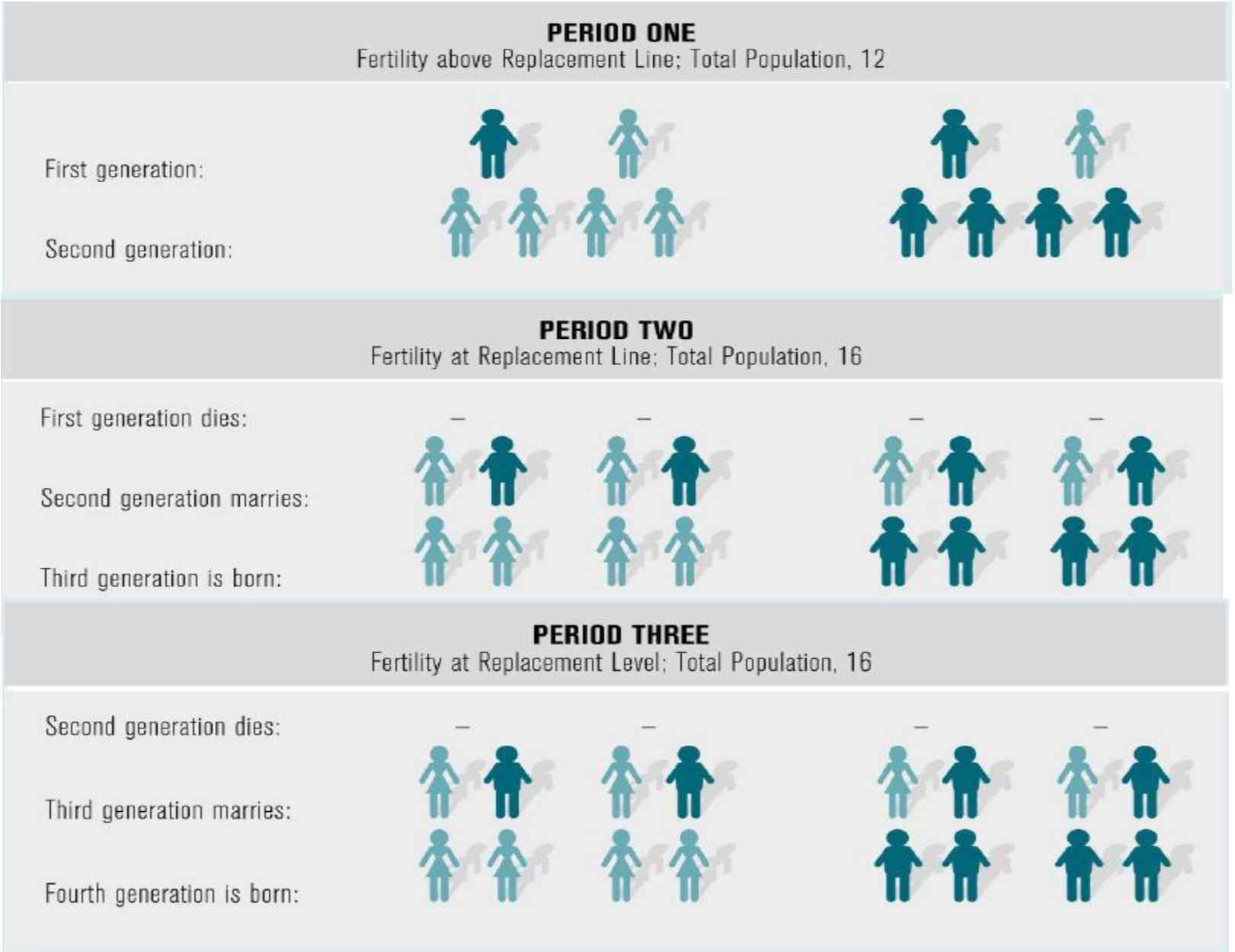
World Population Historical Trends and Projections



The Demographic Future

- For all three scenarios, world population is expected to continue to grow over the next 50 years due to:
  - A desire for large families
  - A failure to achieve the desired number of children
  - Population momentum
- Population momentum is a dynamic latent process of population growth that continues *even after the birth rates fall* due to large youthful population that widens population's parent base.
  - This implies a given population will not stabilize until 2 or 3 generations.

Population Momentum



Most Populous Countries, 2010 and 2050

2010

COUNTRY	POPULATION (MILLIONS)
China	1,338
India	1,189
United States	310
Indonesia	235
Brazil	193
Pakistan	185
Bangladesh	164
Nigeria	158
Russia	142
Japan	127

2050

COUNTRY	POPULATION (MILLIONS)
India	1,748
China	1,437
United States	423
Pakistan	335
Nigeria	326
Indonesia	309
Bangladesh	222
Brazil	215
Ethiopia	174
Congo, Dem. Rep.	166

Source: Population Reference Bureau, *2010 World Population Data Sheet*, www.prb.org/pdf10/10wpds_eng.pdf.

The Causes of Population Growth

- Thomas Malthus was population "pessimist".
- Malthus believed that "passion between the sexes" would cause population to grow as long and far as food supplies permitted.
  - He argued population grows geometrically and food production grows arithmetically at best, leading to famines and starvation.
- It can only prevented by natural *positive checks* such as epidemics, famines, plague, natural disasters, and wars.
- Malthus did not live long enough to see European population growth decline.
- *Why did Birth Rates Decline in spite of Malthus pessimism?*

Why Birth Rates Decline?

- Alternative view: Children impose costs and incur benefits.
- Economic costs of children: Explicit (cash outlays) & Implicit (opportunity costs)
- Implications of viewing children as an "economic decision":
  - Fertility should be higher when children earn income and contribute to the household
  - Reducing infant deaths should lower fertility
  - Institutionalized social security and pension will lower the need for parents to depend on their children for support in their old age.
  - Fertility should be lower if there is more opportunity for employment, especially for women.
  - Fertility may be higher with higher income because the explict costs are more easily borne.

Becker's Theory of Household Economics

- Gary Becker analyzed whether children are "normal" or "inferior" goods.
  - Couples maximize *joint total utility function* from having children which is a function of the following factors: (i) number of children, (ii) child quality (associated with health &education), (iii) goods and services, subject to constraints of time and income or cost of goods and services.
  - Fertility falls as income rises over time due to higher cost of children, especially when the opportunity cost of parents' time goes up.
  - Given the rising cost of child *quantity*, parents opt to invest in child *quality* and spend more time and money on a smaller number of children. ➔ demand for children is a "normal good".

Population Growth & Economic Development

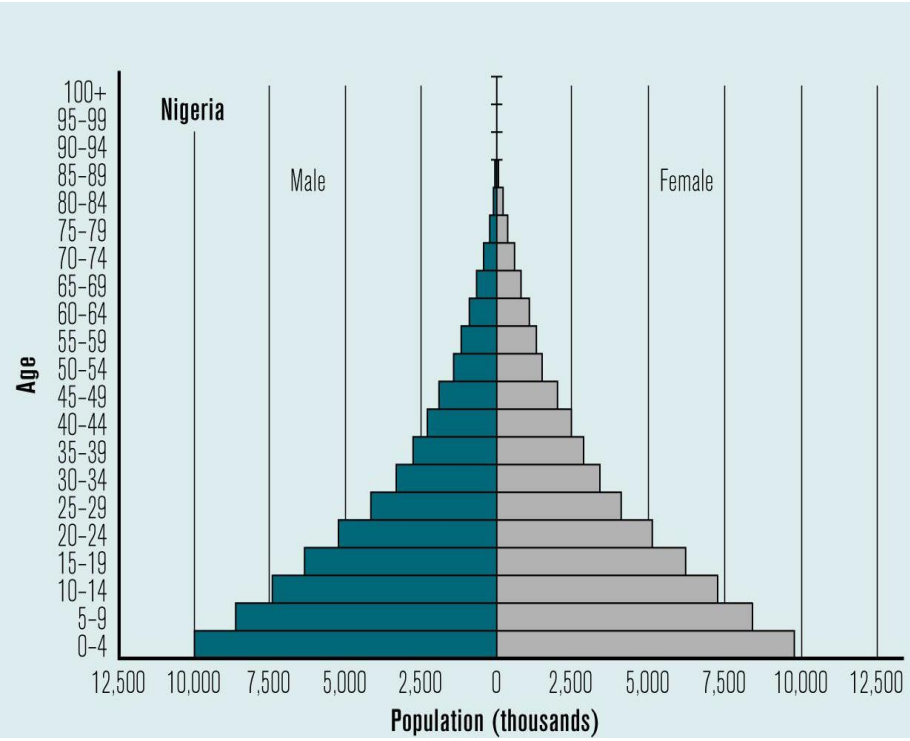
- Question: Is population an obstacle or helpful to development?
- **Population and Productivity**: Rapid population growth may retard labor productivity in the short run
- **There is no simple correlation between economic and population growth**
- Population and Market Failures

Population and Accumulation

- Population pessimists - perceived population growth as harmful to economic development.
- Coale and Hoover argue that a *reduction in birth rate could raise per capita income* in three ways:
  1. With lower fertility, capital per worker for growing number of workers (*capital widening*) would decrease and permit more investment to be used to increase capital per worker (*capital deepening*).
  2. With lower fertility, investment will be diverted away from education and health toward physical capital investment.
  3. Slow population growth would lower *dependency ratio*, which is the ratio of non-working population (0-14 & 65 and over) divided by total working population.

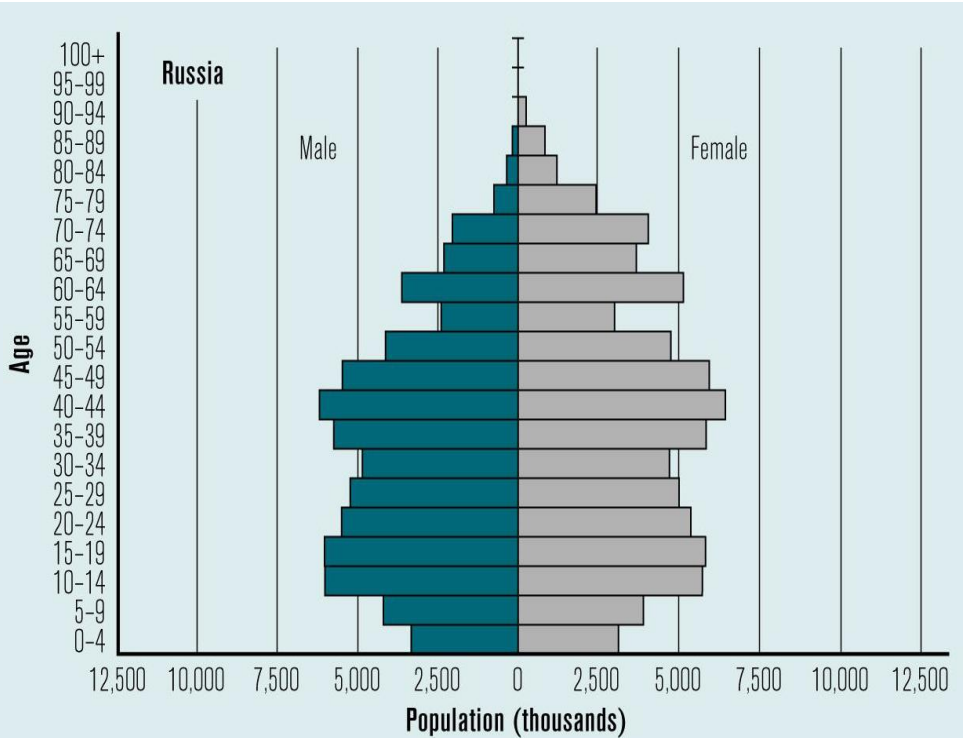
Population Growth, Age Structure, and Dependency Ratios

Nigeria



Pop growth = 2.1
TFR = 5.7
Youth dependency ratio = 0.87

Russia



Pop growth = -0.35
TFR = 1.5
Youth dependency ratio = 0.21

Population and Productivity

- Population optimists – view population growth as having the potential to increase factor productivity.
- Why?
  1. A larger population can yield economies of scale in production and consumption.
  2. There's some evidence that population pressures can induce technological change.
  3. Julian Simon - a larger population contains more entrepreneurs and other creators, who can make major contribution to solving the problems of humanity.

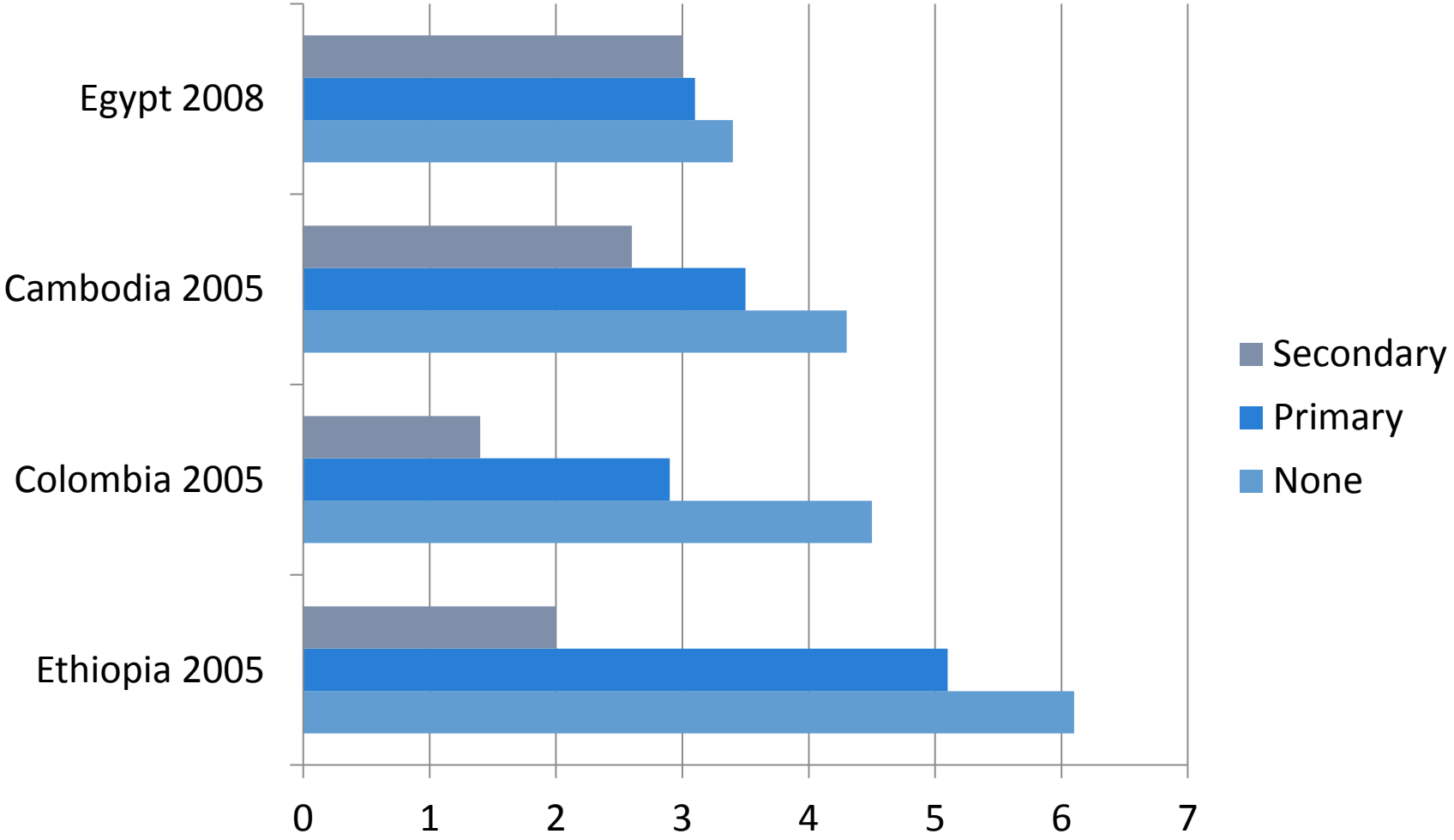
Population and Market Failures

- Population revisionists (or population neutralists) – there is no one size that fits all on population matters.
- Revisionists argue that the problem has to do with market failures where costs and benefits of households reproductive behavior are not fully borne by them.
- The fundamental problem is *not too many people*, but *the lack of well defined property rights*.
  - "The tragedy of commons" – pop growth can destroy a common resource.
  - If population grows too quickly, there can be congestion of government services.
  - Pay attention to a failure in the market for contraception
- Population revisionists also focus on other dimensions of human welfare, e.g. income distribution.

Population Policy

- Reducing birth rates is one solution to lower population growth. But How?
- Family planning or broad-based socioeconomic development
  - *Educating girls*
  - All policies that *promote economic development* → more education, better health, higher per capita income → lower fertility
  - Family Planning Programs: Use of persuasion and education to influence couples to have less children, or reduce *unwanted births*
- Authoritarian approaches
  - Chinese one child policy campaign in 1979
    - Dramatic decline in fertility
    - Rapidly ageing population in the next decades
    - Growing imbalance between the number of males and females

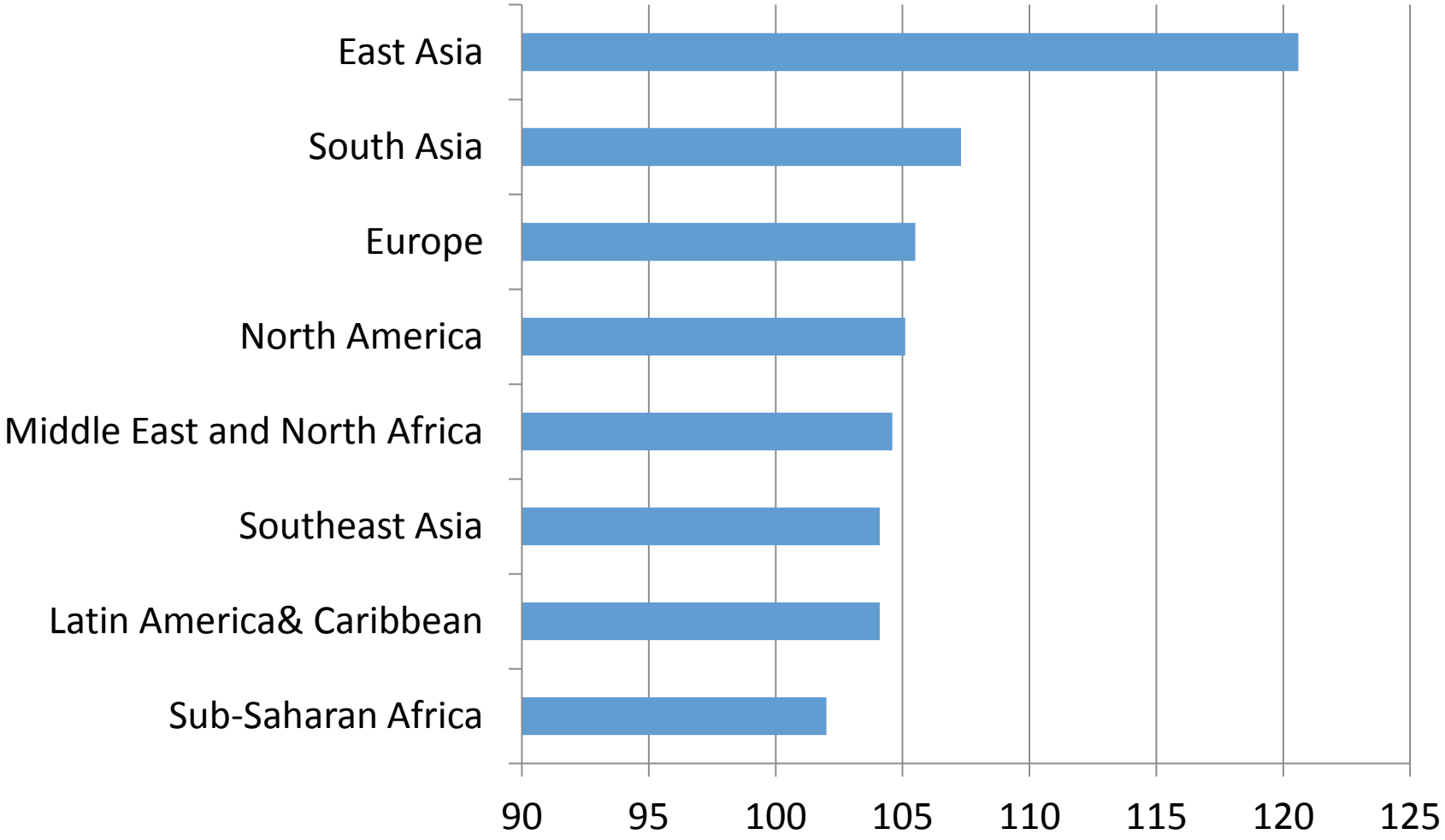
Total Fertility Rates by Mother's Education



Missing Women & Girls

- In most countries male: female ratio is not equal or 50: 50. It is more like 105:100.
  - In Africa, it is 102:100.
  - In East Asia, it is 121:100.
- This is due to cultural male preference by couples in traditional societies for various reasons.
- Other factors such as sex selection abortion, abandonment of female infants, including murder of female children in the Chinese case.
- In 2000,China reported male: female ratio of 105:100 for first births, but 152:100 for second births. This due to high “one child” population policy.

Male/Female Ratio of Children 0-4 Years Old (2005)



Source: http://www.un.org/esa/population/publications/wpp2008/wpp2008_highlights.pdf

EDUCATION

Topics

- Trends and Pattern
- Education As An Investment

Trends and Patterns

Some concepts:

- ***Gross enrollment rates***: the total number of children enrolled in a given school category divided by the number of children of the age group for that level of schooling (e.g. relevant age group for primary school is 6-11 years)
- ***Net enrollment rates***: enrollments of only those of the relevant age group
- *Grade survival rates*: how many children actually complete a certain grade level
- *Education attainment*: the highest level (or degree) of education that an individual has completed.

Changes in Schooling, Gross Enrollment Rates by Regions, 1970-2000

REGION	PRIMARY		SECONDARY		TERTIARY	
	1970	2000	1970	2000	1970	2000
East Asia and Pacific	89.4	111.4	23.8	66.4	1.1	14.4
Europe and Central Asia	99.3[a]	99.5	86.2[a]	85.6	30.9[a]	46.0
Latin America and Caribbean	107.2	124.7	27.6	84.8	6.2	22.6
Middle East and North Africa	70.1	95.6	23.5	70.3	4.4	20.7[b]
South Asia	70.6	94.8	23.0	48.0	4.2	10.0
Sub-Saharan Africa	51.0	81.7	6.3	25.7[b]	0.8	3.6[b]
High income	100.0	101.9	75.0	106.0	26.2	61.1

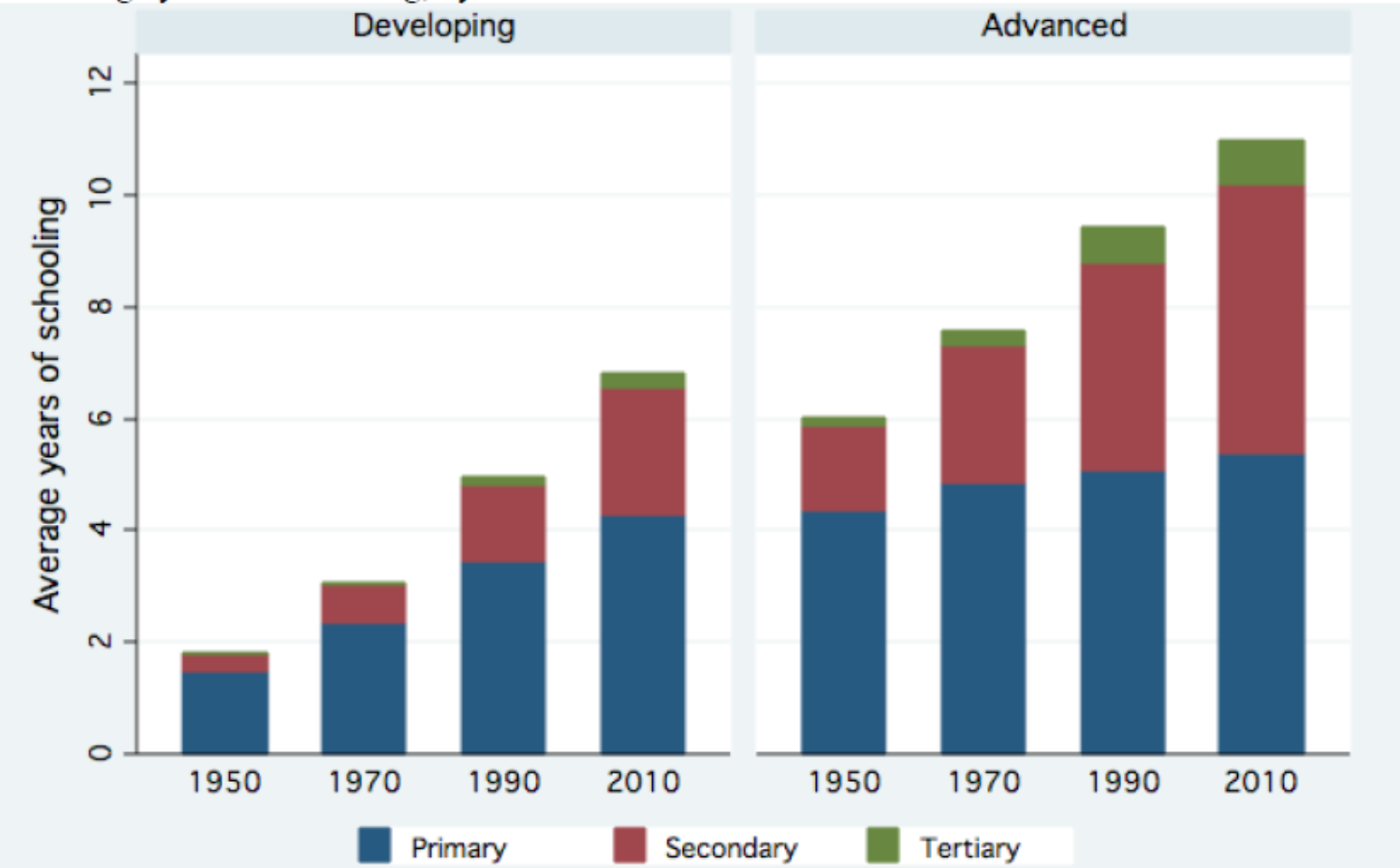
[a]Due to insufficient data for 1970, the values for Europe and Central Asia refer to 1980.

[b]Values refer to the late 1990s.

Source: World Bank, *World Development Indicators Online.*

Education Attainment of Population Age over 15

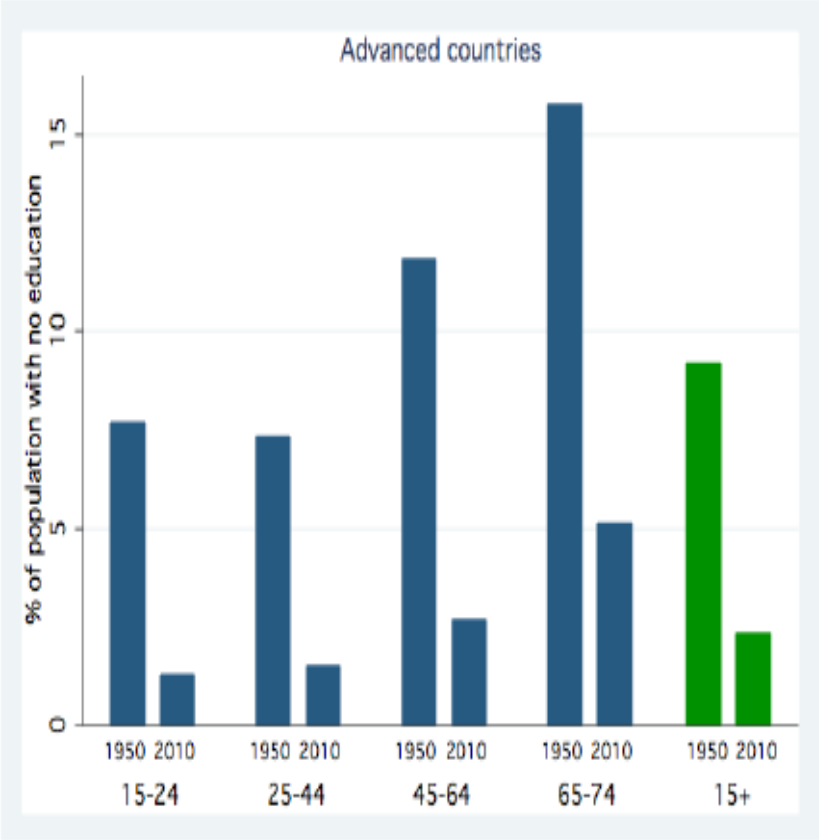
a. Average years of schooling, by educational level

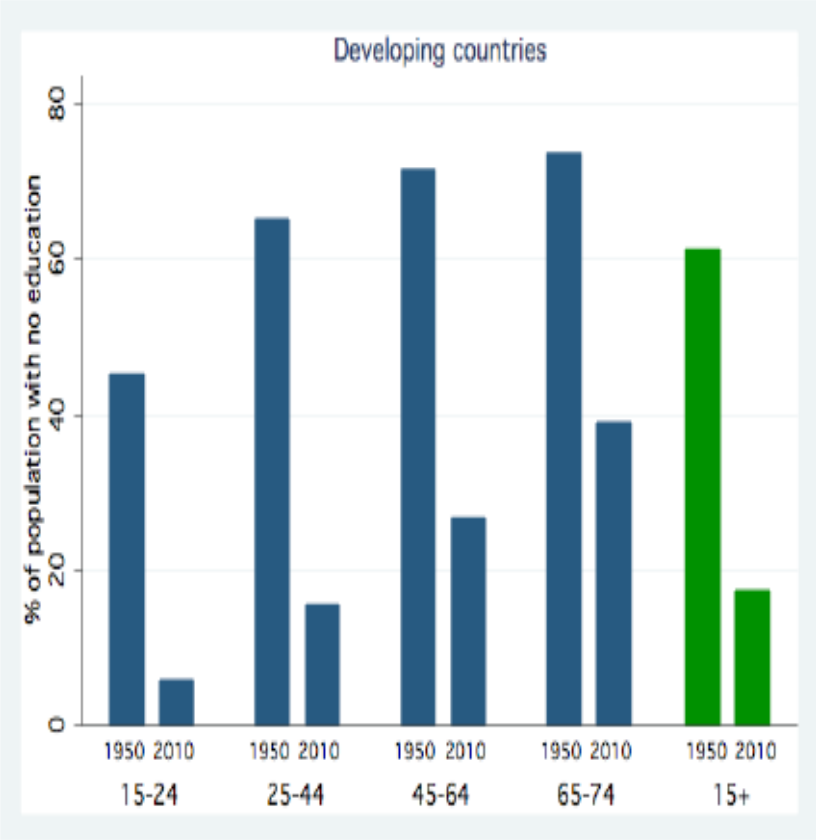


Note: Advanced countries = Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, USA, United Kingdom.

Source: http://www.nber.org/papers/w15902

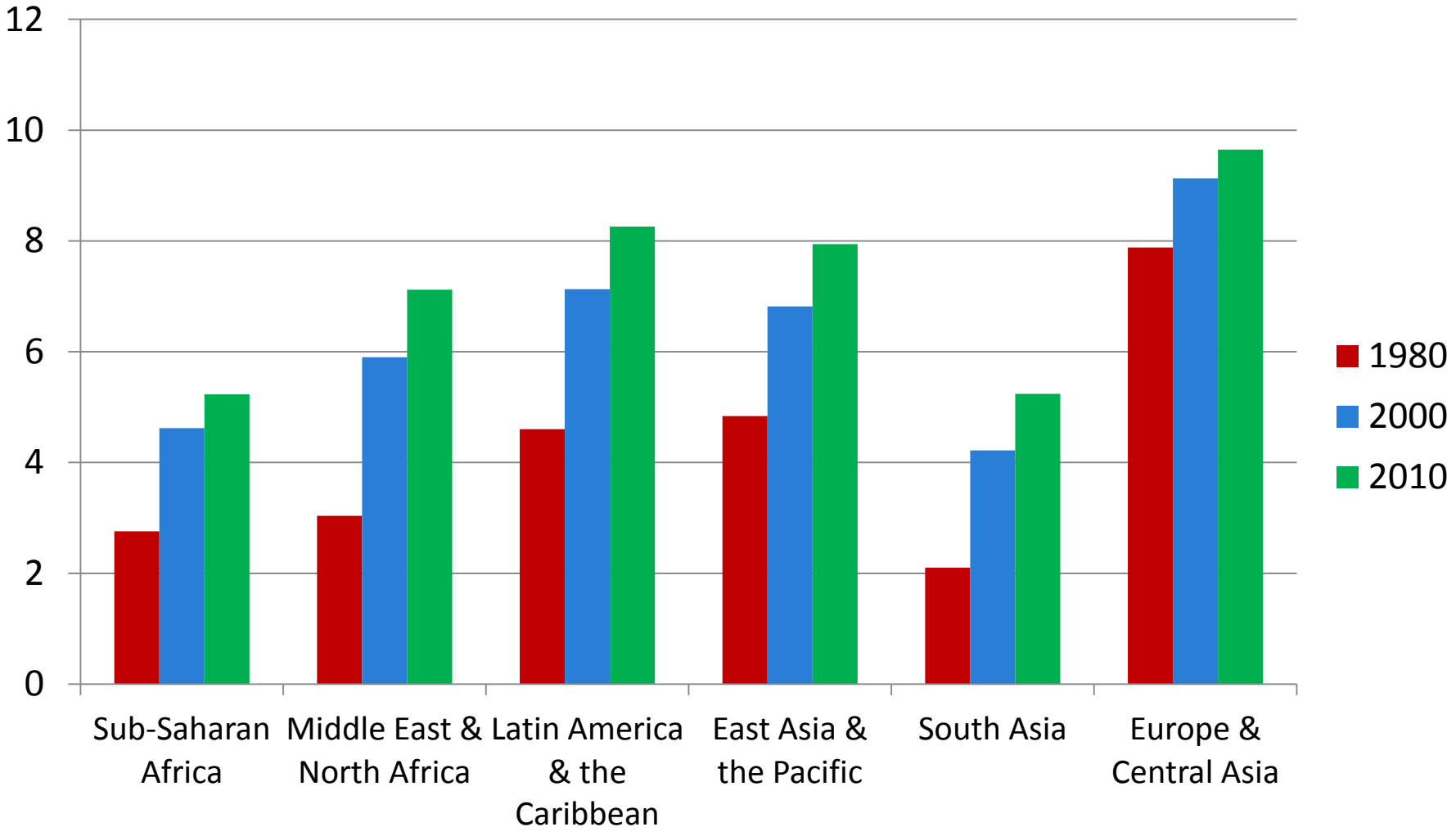
Proportion of Population Age 15+ with *No Schooling*, by age group





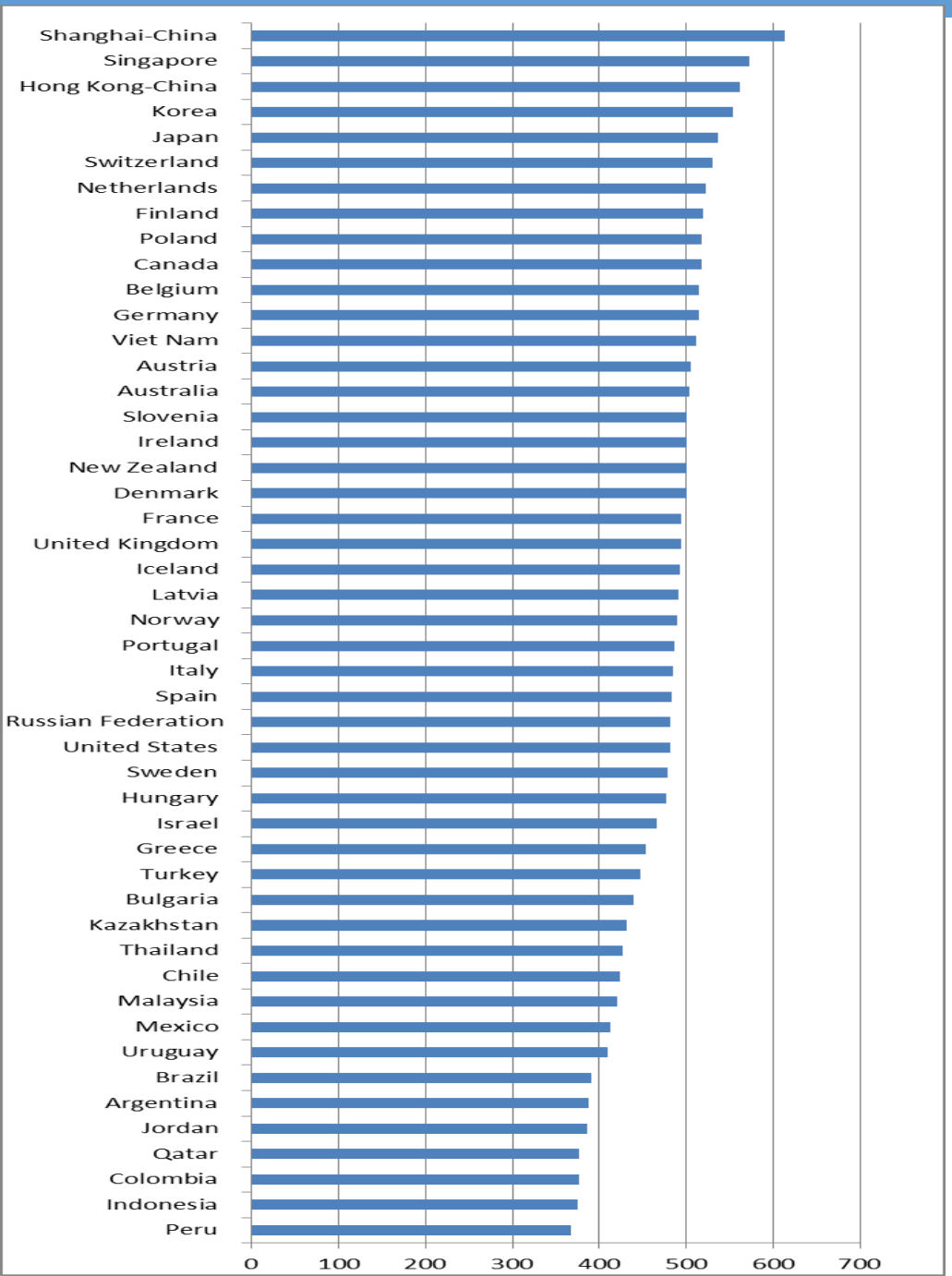
Source: http://www.nber.org/papers/w15902

Average Years of Total Schooling for Adults Age 15+



Schooling versus Education

- *Schooling is only a means to an end, but the real goal is education.* – skills individuals acquire from time spent studying and learning.
- One source of information on learning outcomes is the Programme for International Student Assessment (**PISA**).
- There is a gap between rich and poor nations in educational quality.
- Problems in developing countries may have more to do with quality (which could result from expanding quantity)
  - Too many unqualified teachers, absenteeism among students and teachers, insufficient teaching resources



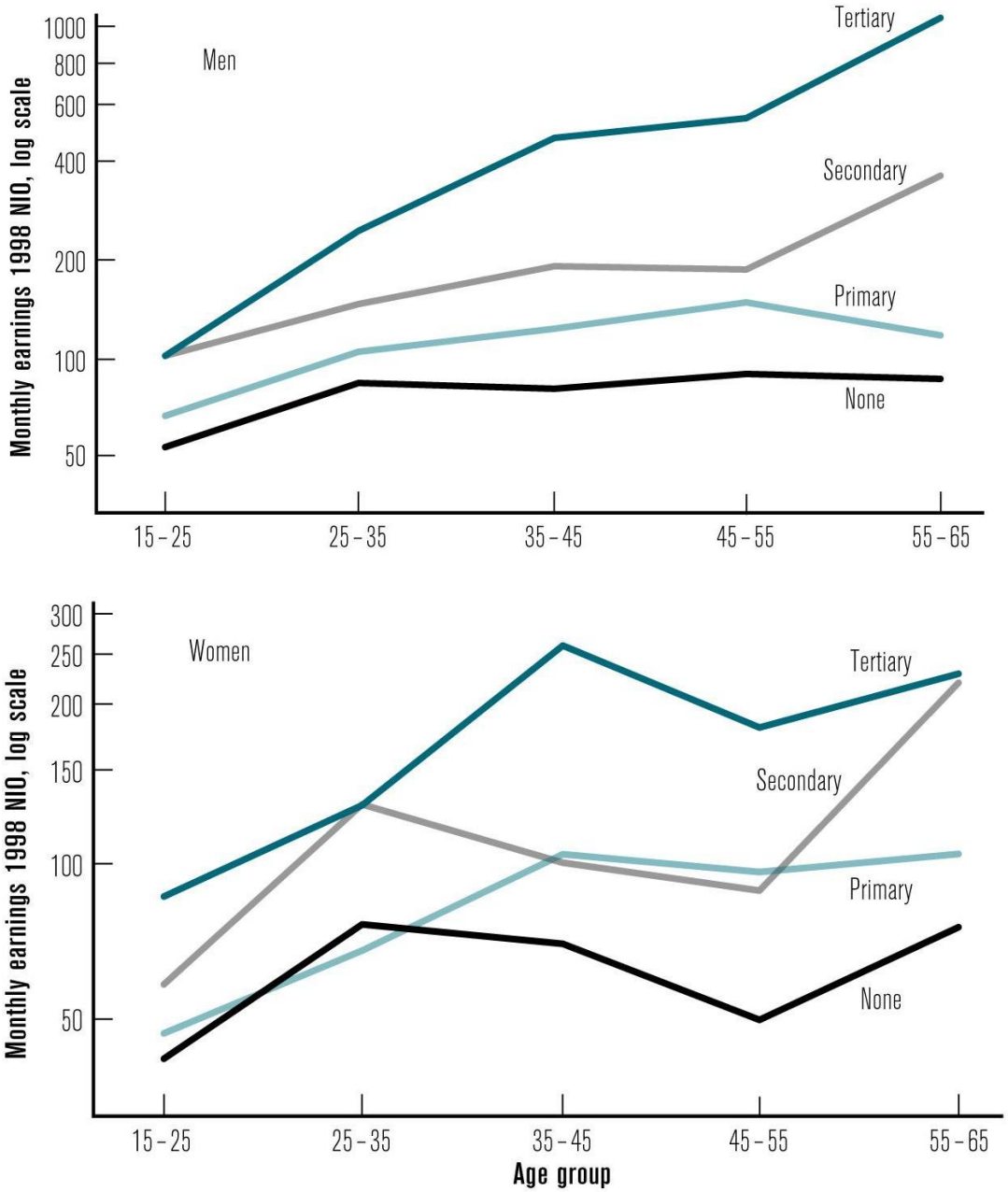
Learning Outcomes: 2012 PISA Math Score of Students age 15 years

Sample question:
"Three-fifths of the students in a class are girls. If 5 girls and 5 boys are added, which statement is true?"

a. There are more girls than boys.
b. There are the same number of girls as boys.
c. There are more boys than girls.
d. You cannot tell whether there are more boys or girls from the information provided.

Education As An Investment

- Education is an investment.
- Schooling produces human capital.
- It is expected that investments in human capital will yield a positive return *(i.e. more educated are more productive and better compensated).*
- General tendency:
  - Earning rises with educational levels; those with more education tend to have *higher age-earnings* profiles.
  - At every education level, women tend to earn less than men. Why?



Age Earnings Profiles

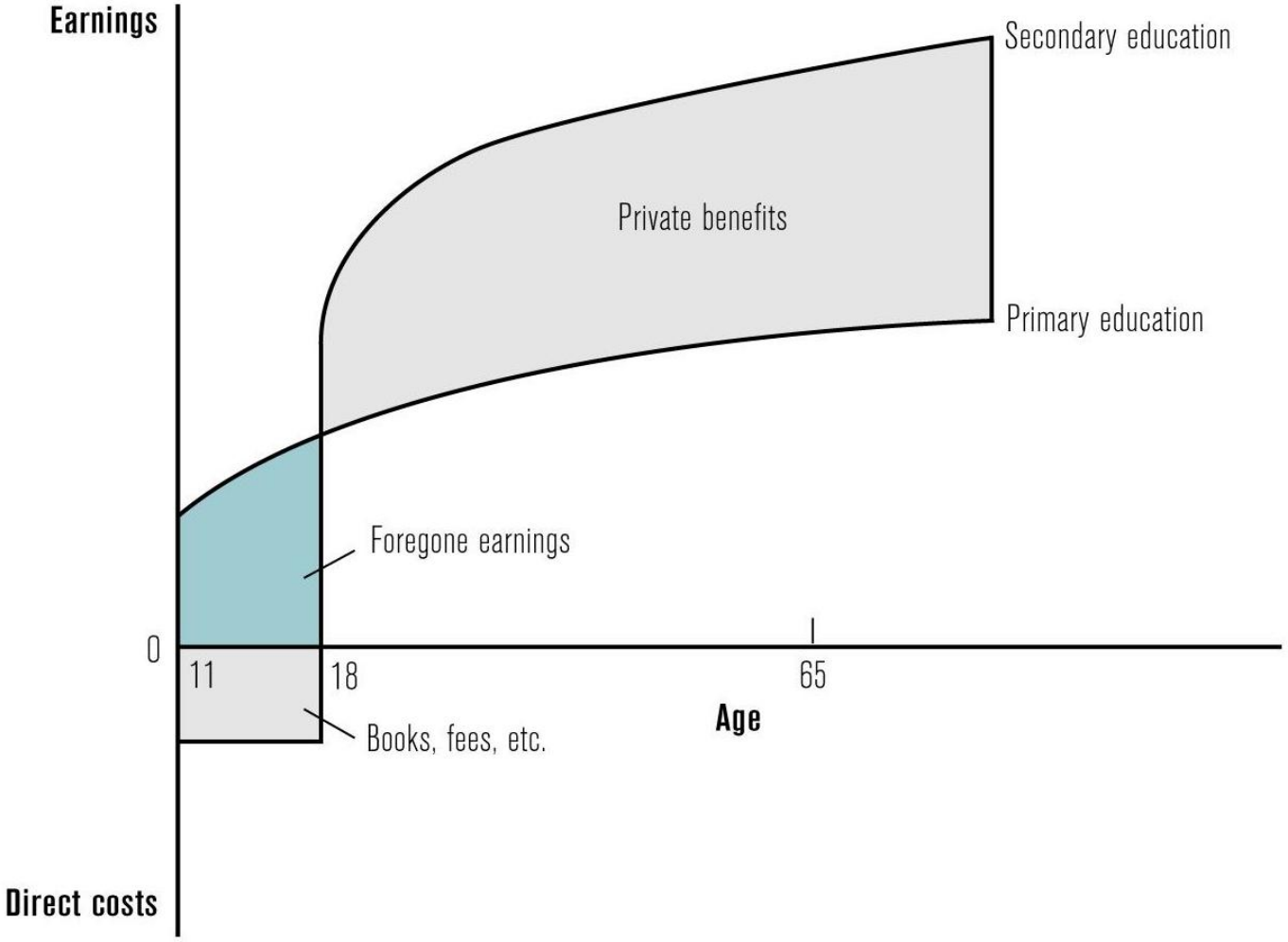
by Age, Education, and Gender in Nicaragua, 1998

Benefits and Costs of Education

- *Private pecuniary benefits* of education are the earnings the individual expects to receive beyond what they would have earned without that level of education.
  - Sum of present Value of all future private benefits:
    $PV_B = \sum_{t=1}^{n} B_t/(1+i)^t$
- *Costs* of education include direct costs (e.g. tuition) and indirect costs (or opportunity costs).
  - Sum of present value of all anticipated private costs:
    $PV_C = \sum_{t=1}^{n} C_t/(1+i)^t$
- **Internal rate of return** is the rate (r) that which equates PV_B to PV_C. That is,

$$\sum_{t=1}^{n} (B_t - C_t)/(1+r)^t = 0$$

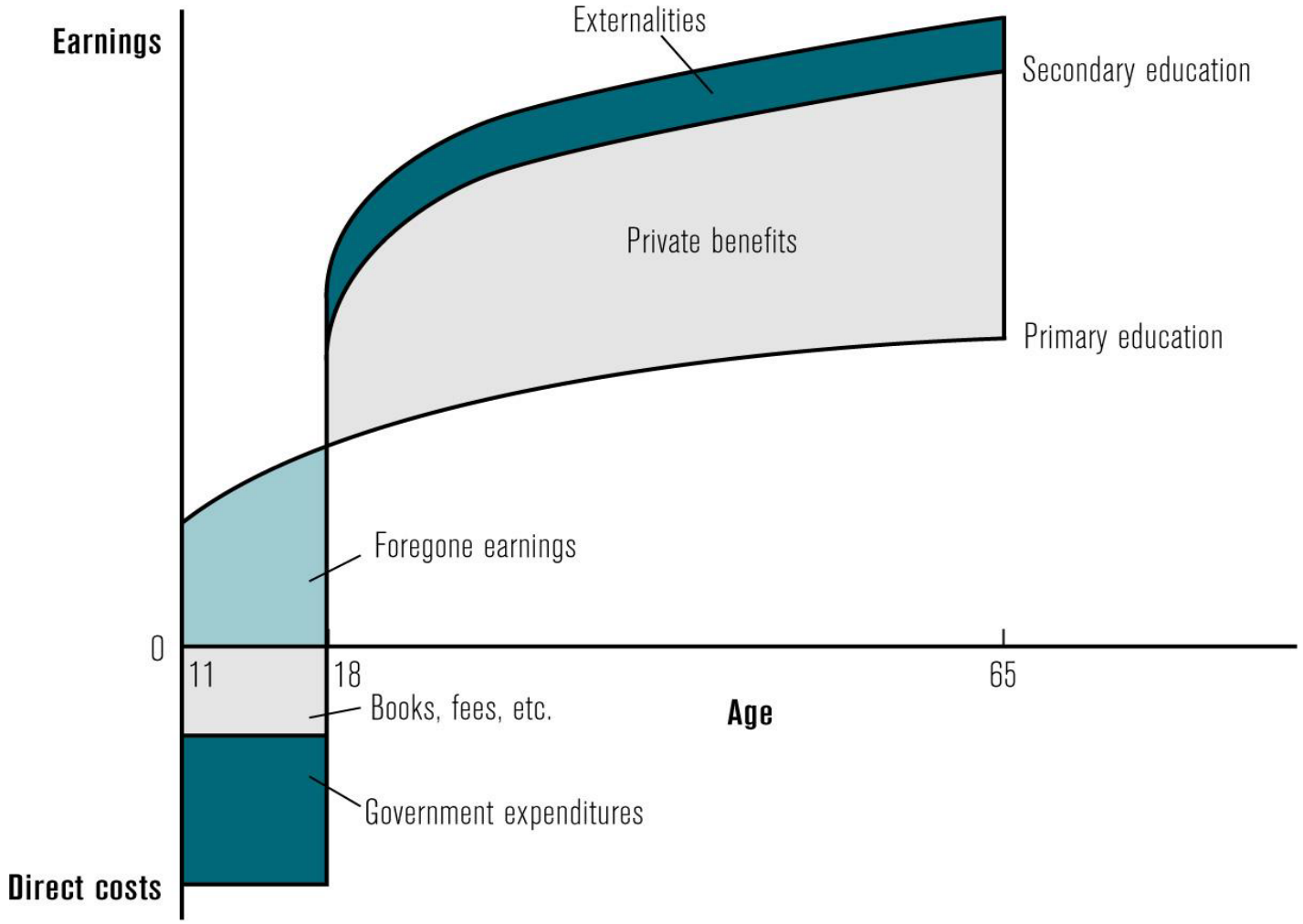
Determinants of Private Returns to Schooling



External Benefits of Education

- Education is also a social investment. So, there's a social return to schooling.
  - *Costs*: other costs borne by the society (e.g. payment for free primary school, construction of schools, etc.)
  - *Benefits*: schooling produces ***positive externalities*** – benefits that accrue to members of society above and beyond the benefits to the individual who receives the education
    - What are examples these positive externalities? Could they contribute to development?
- The privates sector or markets will under produce education if left to themselves.
- The fact that education has positive externalities justifies public provision or subsidy of education.

Determinants of Social Returns to Schooling



Returns to Schooling by Level and Country Income Group

INCOME CATEGORY	PRIVATE RATE OF RETURN			"SOCIAL" RATE OF RETURN		
	PRIMARY	SECONDARY	TERTIARY	PRIMARY	SECONDARY	TERTIARY
Low income	25.8	19.9	26.0	21.3	15.7	11.2
Middle income	27.4	18.0	19.3	18.8	12.9	11.3
High income	N.A.	12.2	12.4	N.A.	10.3	9.5

Notes: These estimates of "social" rates of return account for only government expenditures on schooling and do not include estimates of any positive externalities resulting from schooling.

Given the small number of workers in high-income nations with only primary educations, most studies of high-income nations do not provide estimated rates of return to primary education.

Source: G. Psacharopoulus and H. Patrinos, "Returns to Investment in Education: A Further Update," *Education Economics* 12, no. 2 (August 2004).

Q1. why are "social" rate of return smaller than private rate of return?

Q2. why the rate of return on primary education greater than that of secondary education?

PUZZLES

- Microeconomic puzzle: schooling in many developing countries often produces in the way of learning.
  - Could be due to quality problem
- Macroeconomic puzzle: there has been a rapid growth in schooling throughout the world (and convergence in schooling), but there has been a divergence in per capita income.
  - Schooling is not the only factor that affects economic growth.
  - In bad environment, those with more education may engage in rent seeking and other activities that are “socially dysfunctional”.
  - Other explanations?

Problems with the Supply of Education

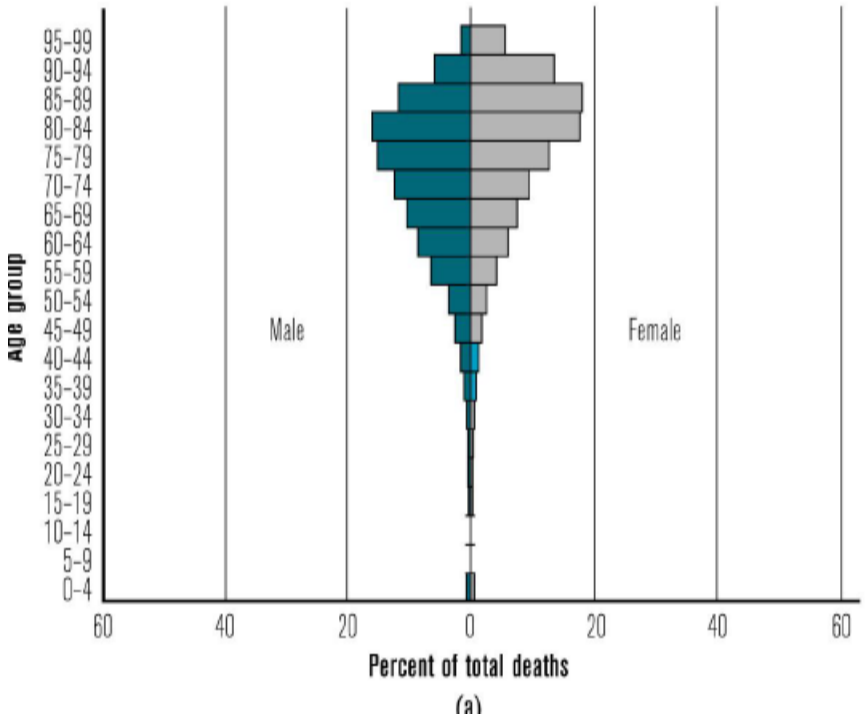
- Underinvestment
  - Public spending on education is likely to be cut first if there is fiscal crisis.
- Misallocation
  - Spending on tertiary schooling tends to be higher than spending on primary or secondary education levels
- Inefficient use of resources
  - Should we spend on building new schools or on recurrent expenditures?
  - Examples: “deworming” in Kenya, provision of textbooks (RCT)
- Absent teachers
  - Example: Use of cameras to monitor teacher absence in India

HEALTH

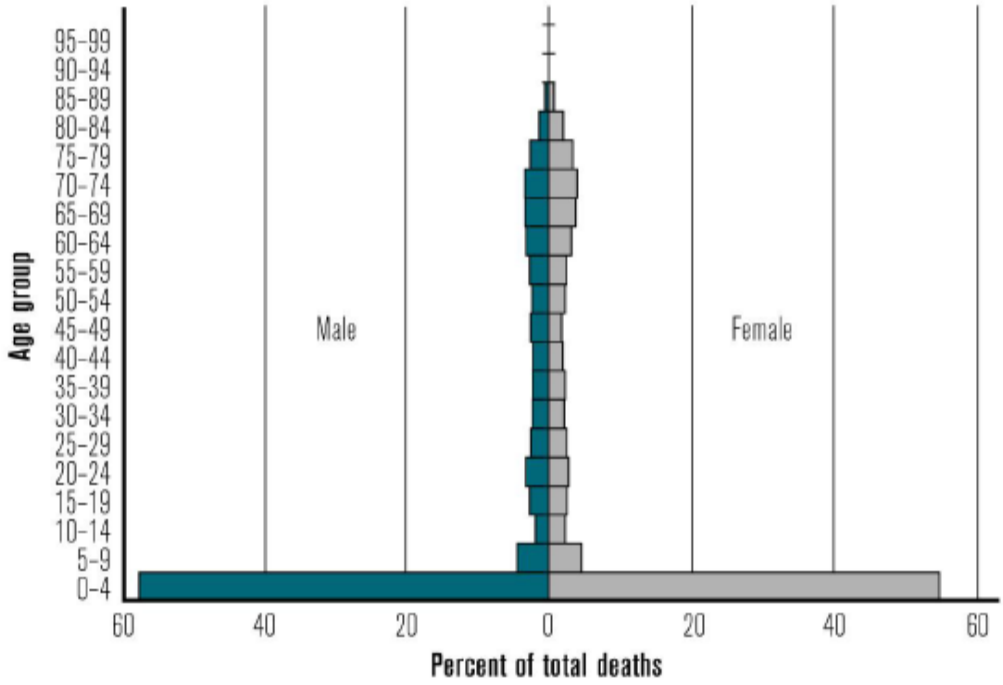
Topics

- Health Measures
- Transitions in Global Health
- Health, Income, and Growth
- Three Critical Disease

Distribution of Age and Deaths, 2005



Denmark



Sierra Leone

Poor health outcomes are correlated with income levels, but which causes which?

Health Measures

- **Mortality** measures deaths in a population
  - Ex: Under-five mortality rate is the probability (in terms of 'per 1000 live births') that a child born dies before reaching age five
- **Morbidity** measures rates of disease and illness.
  - Ex: Prevalence of HIV-infected cases
- **Life expectancy** is the average number of years that the person is expected to live.
- **Health-adjusted life expectancy (HALE)** is a measure of life expectancy that takes into account disability-impaired living.

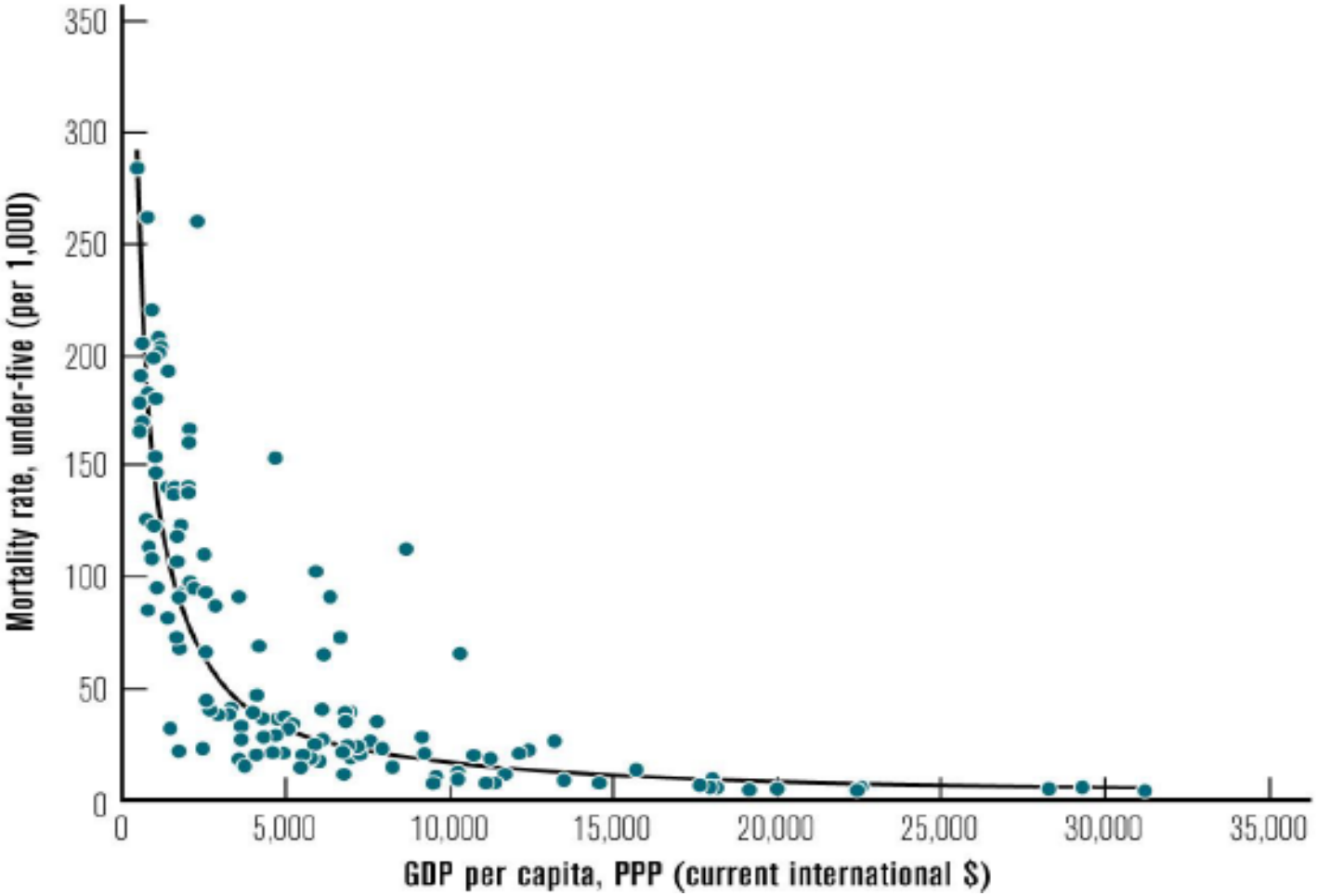
Transition in Global Health

- All regions of the world experienced gains in life expectancy since 1960, but some countries in Sub-Saharan Africa saw declines since the 1990s due to HIV/AIDS.
- In many developing countries, life expectancy has risen and fertility has fallen.
  - Lower youth dependency ratio, but higher elderly dependency ratio
- "Epidemio-logical transition": (i) age of pestilence and famine, (ii) the age of receding pandemics, (iii) the age of degenerative and human-made diseases
- In the 20th century, there has been a major shift in causes of death and disability from infectious disease to non-communicable disease.

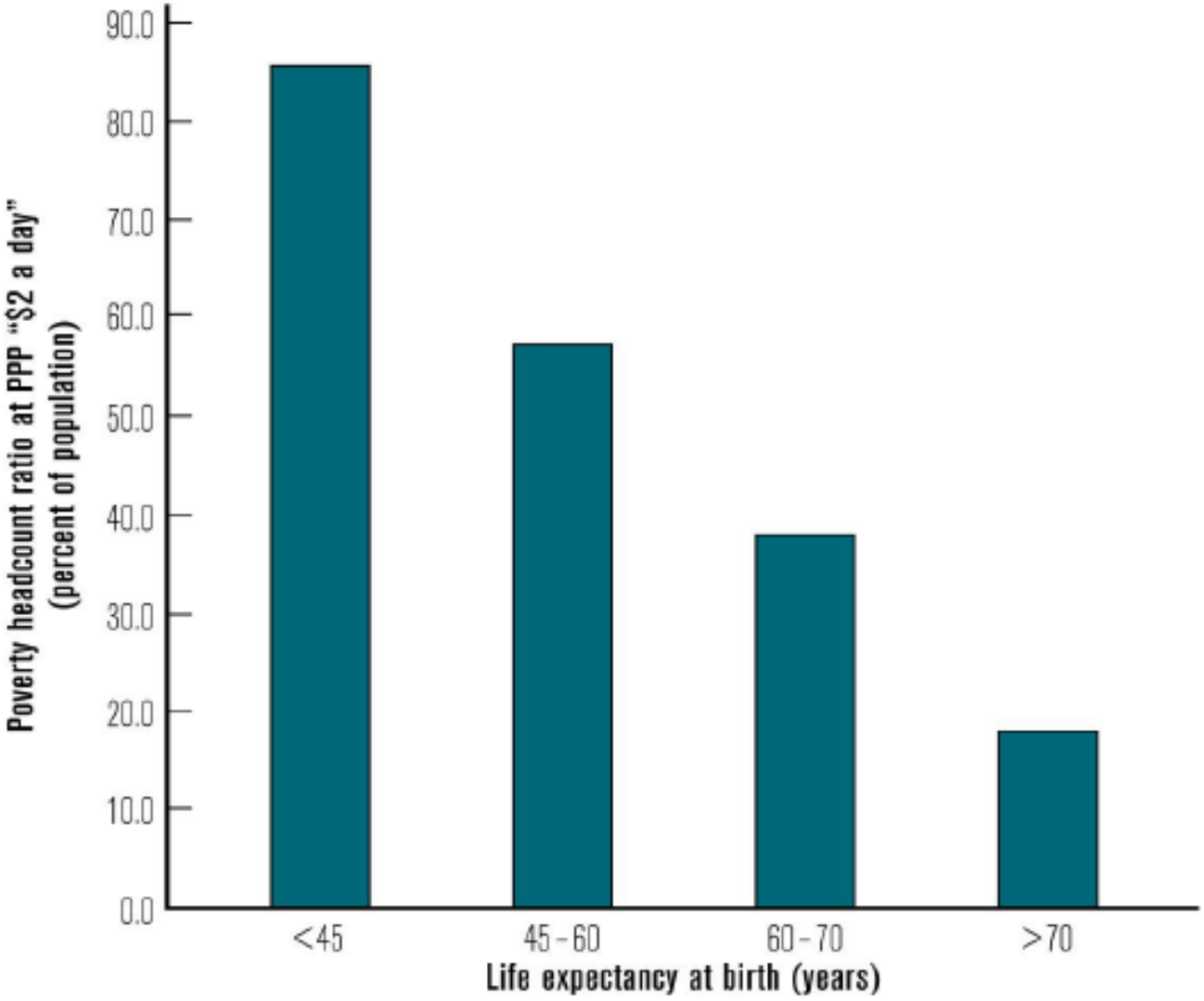
Health, Income, and Growth

- The relationship between health and income growth is bidirectional.
  - Higher income and growth means more resources available in the economy, so individuals can spend more on goods and services that directly or indirectly improve health.
  - Improved health leads to faster economic growth, higher incomes, and reduced poverty.

Child Mortality and Income



Poverty and Life Expectancy, 1998-2003



Income and Health

- As income rises, there is greater ability to build public health clinics and hospitals, trains more doctors and nurses, and pay for public health services (e.g. immunization campaign).
- Prichett & Lawrence's article "Wealthier Is Healthier" suggests that improvements in income, holding other factors constant, lower child mortality and increase life expectancy.
- Caution: there's no evidence that economic growth will improve health *without deliberate public action*.
  - So, the problem might be "lack of information" or "weak belief" (Banerjee & Duflo).
  - Examples: Use of ORT and bed nets

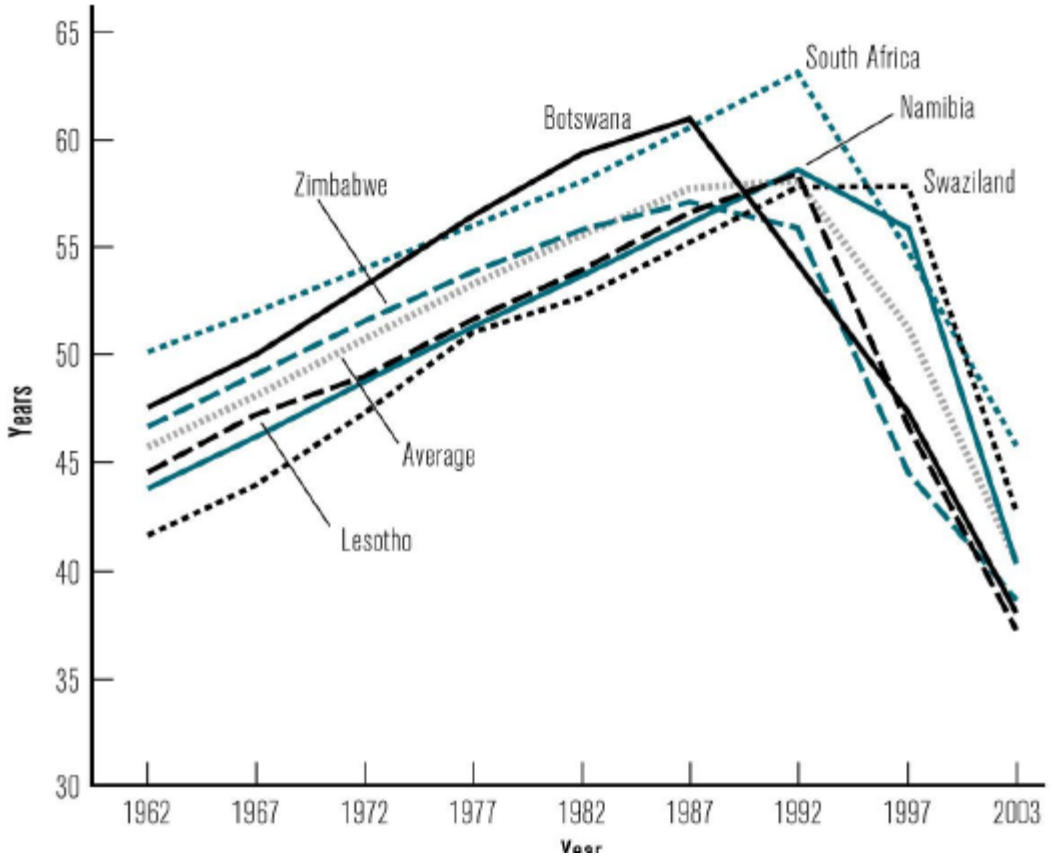
Health and Productivity

- Q: How does better health lead to economic growth?
  - Productivity gains and increased investment
  - Healthier workers are not only more productive, but also loses fewer workdays due to illness.
  - Better health means less opportunity costs for care-takers in the household
- A family member's health can affect children's education.
  - No need to rely on child labor
  - Child's health has a direct effect on his/her own schooling.
  - There's evidence that childhood health can affect labor productivity later in life.

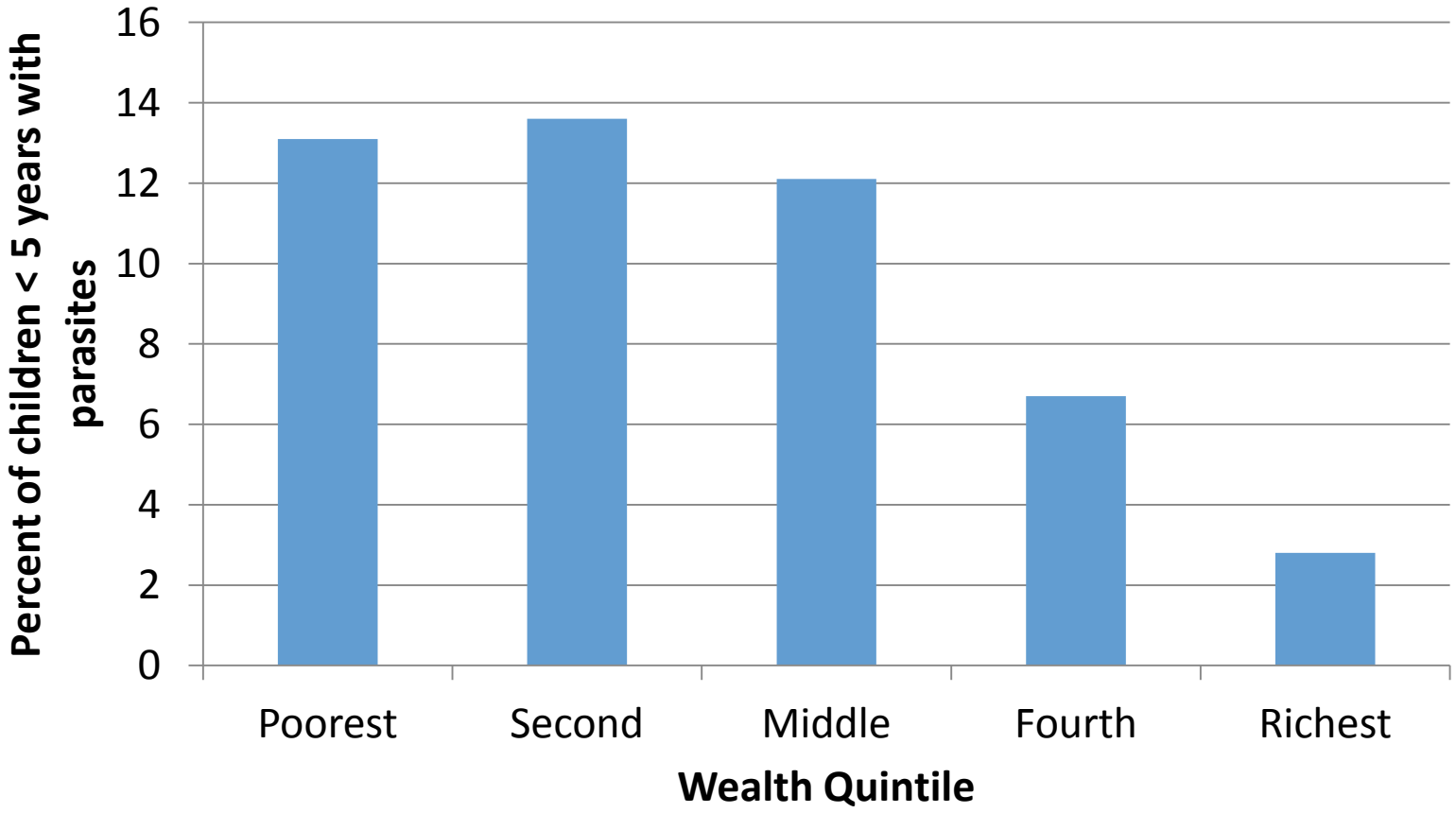
Three Critical Diseases

- HIV/AIDS
  - First leading causes of deaths in Sub-Saharan Africa
  - Combating HIV/AIDS requires strong national & international commitment with both political and economic initiatives.
- Malaria
  - Malaria can have substantial economic costs, but malaria intervention programs are very cost-effective.
- Tuberculosis (TB)
  - TB is airborne disease and can be more prevalent among the poor who live in overcrowded condition.
  - The economic costs of TB can be substantial due to lost work for the patient and caregivers, treatment costs, etc.

Life Expectancy at Birth in Selected Most-HIV Affected Countries (1962-2003)



Malaria Parasite Prevalence in Children in Zambia (2008)



Source: http://www.nmcc.org.zm/files/ZambiaMIS2008Final.pdf