Population and Growth

ECON 499: Economic Growth and Development

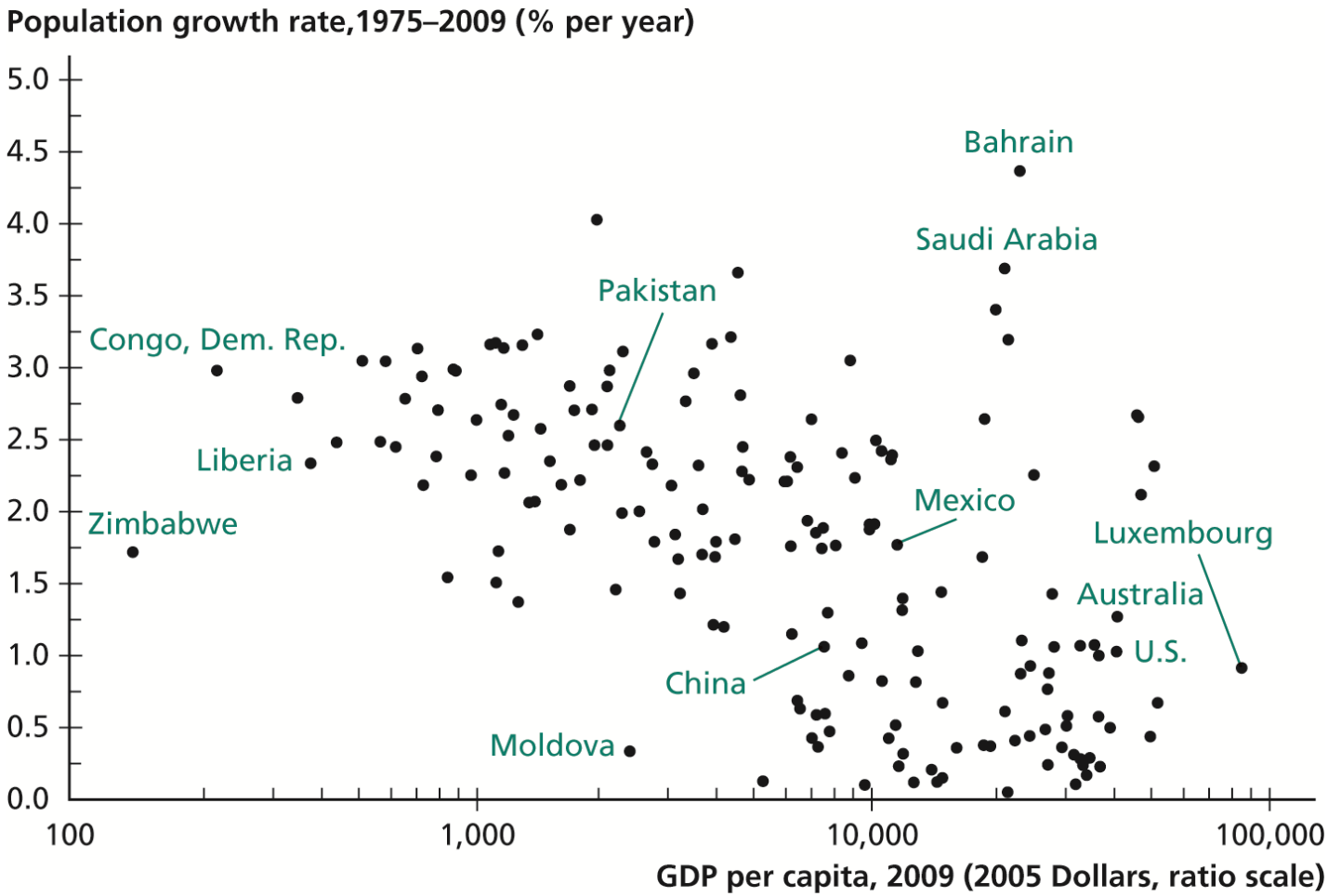
Spring 2018

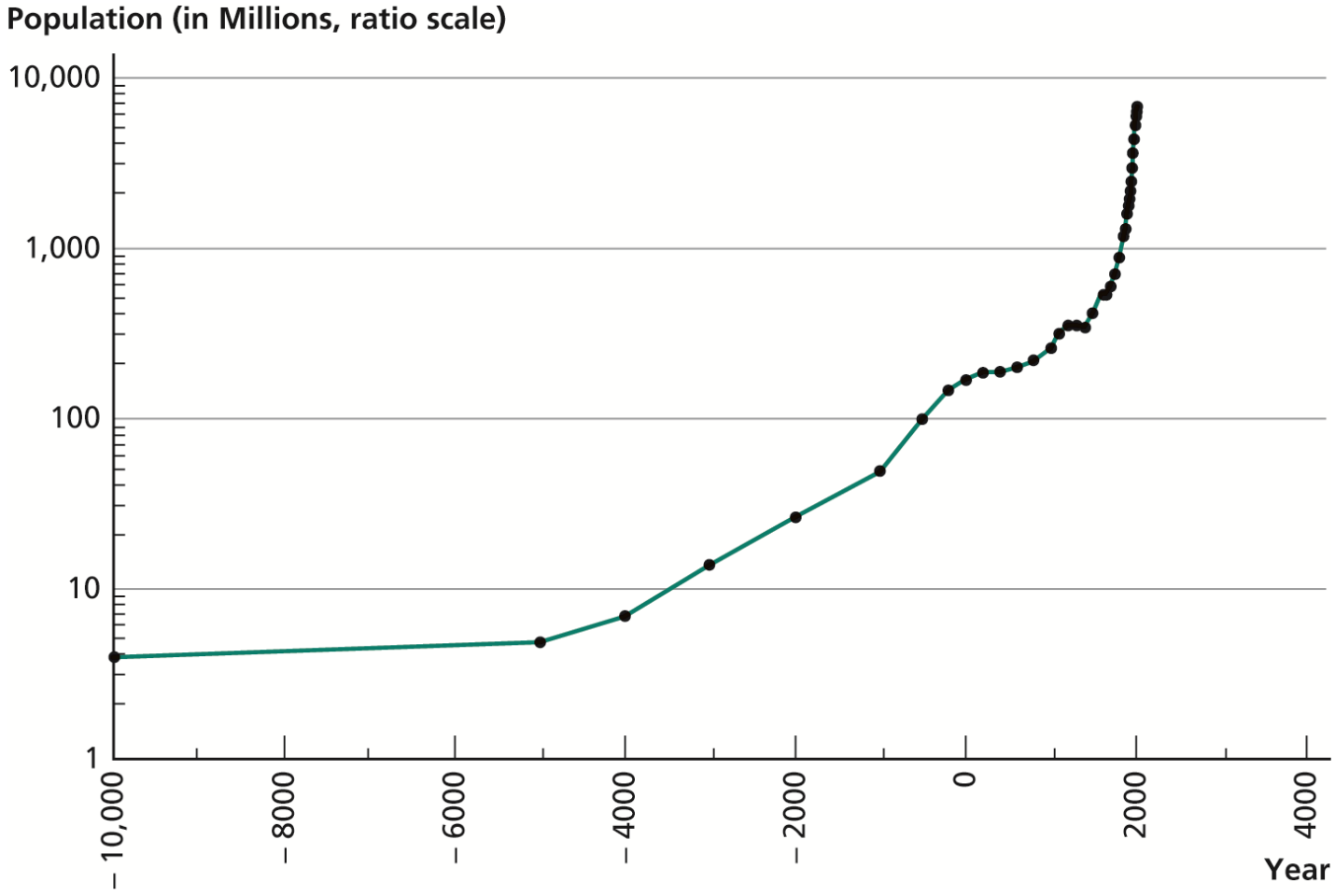
Announcements

- Reading
  - Chapters 4
- Meet here on Thursday (no lab)
- Homework due on Thursday (uploaded to Canvas)
  - Expect technological "hiccups"

Population and growth

- More people means more mouths to feed
- More people also means more workers
- How does production per capita respond to population growth?

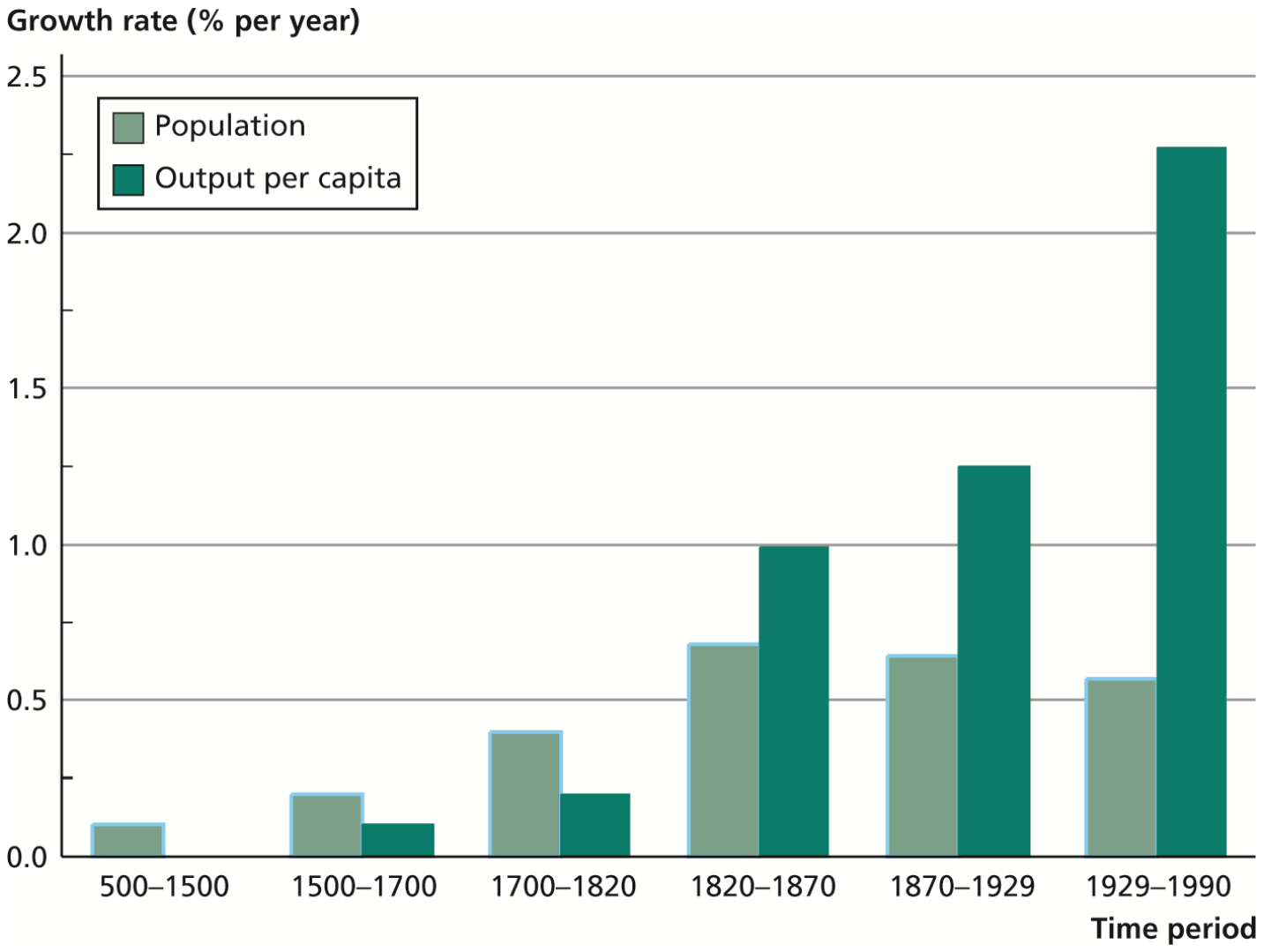

Population growth rate,1975–2009 (% per year)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Bahrain
Saudi Arabia
Pakistan
Congo, Dem. Rep.
Liberia
Zimbabwe
Mexico
Luxembourg
Australia
U.S.
China
Moldova
100
1,000
10,000
100,000
GDP per capita, 2009 (2005 Dollars, ratio scale)


Population (in Millions, ratio scale)
10,000
1,000
100
10
1
– 10,000
– 8000
– 6000
– 4000
– 2000
0
2000
4000
Year

Malthusian model

- Thomas Malthus (1766-1834)
- Productive resources are *scarce*, sometimes finite (land)
- As population increases, land per person decreases, making people worse off
- As poverty increases, people start dying and having fewer children, causing population to fall
- Population and income are self-regulating, mankind "stuck" at subsistence income level
- Malthus's solution: "Moral restraint"

Breakdown of the Malthusian Model

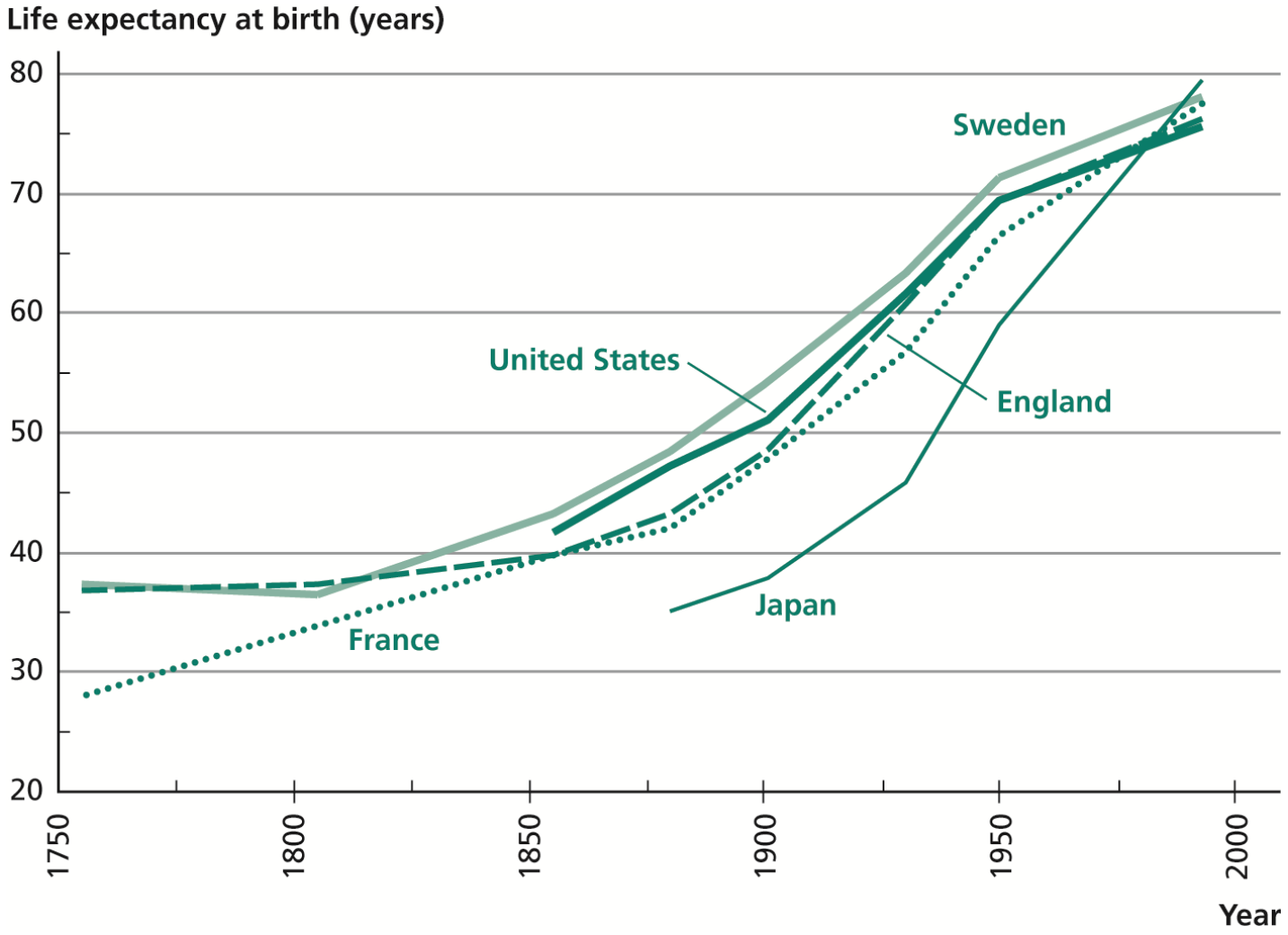


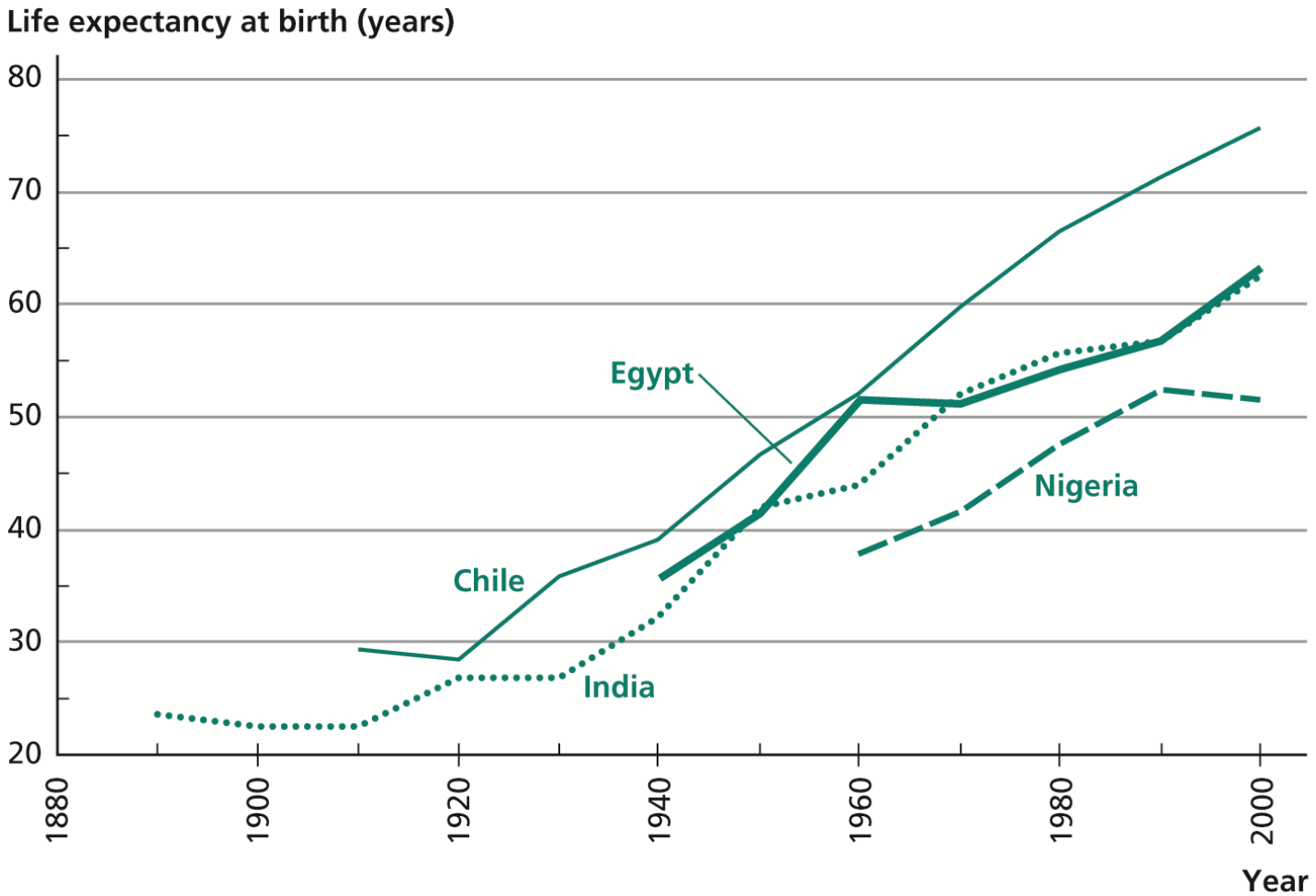
Explaining population growth

- Solow model predicts that increased population growth can decrease income through capital dilution
- Population growth in Solow model is *exogenous*, determined outside the model
- Population growth usually modeled as *demographic transition*
- Developing countries go through mortality and fertility transitions as they develop

Mortality transition

- Life expectancy at birth: number of years a newborn baby in a given year will live on average
- Most countries have seen life expectancy increase over last few centuries, beginning with developed countries
- Three factors:
  1. More plentiful, nutritious food
  2. Public health: sanitation, clean water, etc
  3. Medical technology


Life expectancy at birth (years)
80
70
60
50
40
30
20
1750
1800
1850
1900
1950
2000
Year
Sweden
United States
England
Japan
France


Life expectancy at birth (years)
80
70
60
50
40
30
20
1880
1900
1920
1940
1960
1980
2000
Year
Egypt
Chile
India
Nigeria

Fertility transition

- Total fertility rate: number of children the each woman would have if she lived through child-bearing age
- Fertility rates decreased rapidly in developed world
- Decreasing in developing world, but still higher than developed world
- Possible explanations:
  1. Contraception
  2. Declining mortality
  3. Income and substitution effects
  4. Quantity/quality tradeoff


Total fertility rate
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
1860
1870
1880
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
Year

Contraception

- Fertility rates began declining in developed world long before contraception was widely available
- Fertility in developing world decreasing contemporaneously with contraception
- Micro studies:
  - Making contraception available decreases number of offspring
  - Decreases unwanted pregnancies
  - Increases female "bargaining power", agency

Mortality reduction

- Perhaps parents don't care about the number of children, but rather the number that survive to adulthood
- If mortality rates are high, parents will want more children to ensure more adult children
- Declining mortality rates will mean fewer children, effects likely delayed

Income and substitution effects

- Rising income means people can afford more of everything, including children (income effect)
- Rising income means the opportunity cost of children is higher (substitution effect)
- If substitution effect dominates, people want fewer children as income rises
- In developing countries, female wages generally rise faster than male, substitution effect higher for women

Quantity/quality

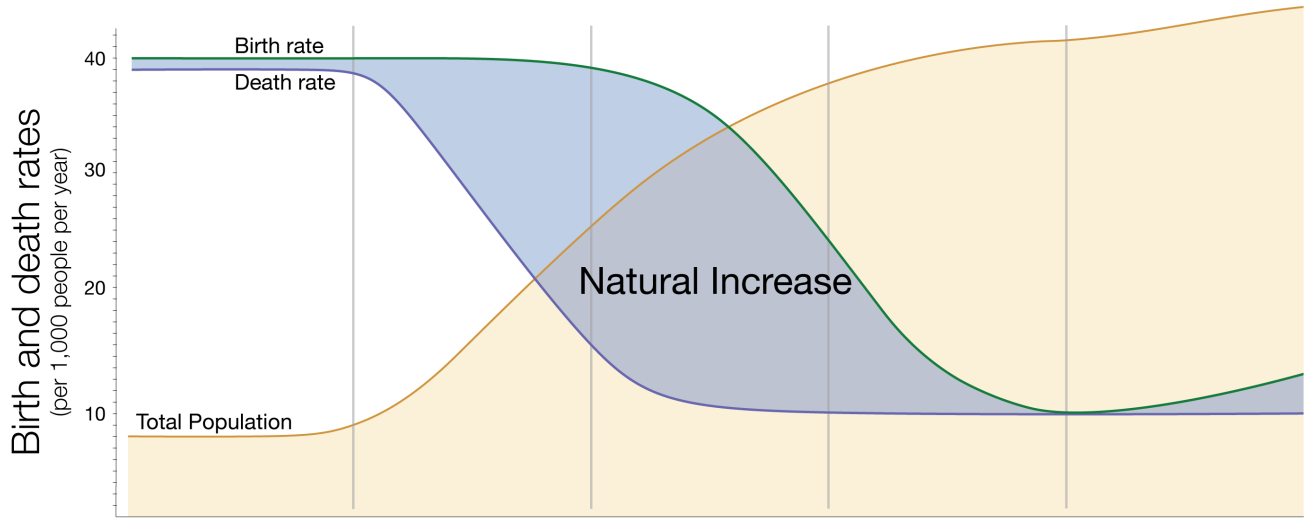
- Development increases opportunities for children
- Parents may invest more in children's education, knowing payoffs are higher
- This leaves less resources for other children
- Parents choose having fewer, higher quality children

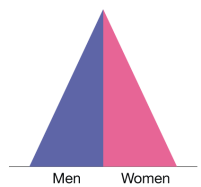
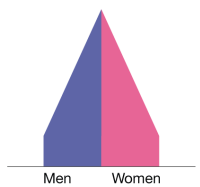
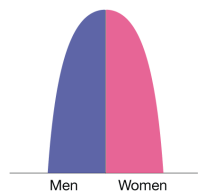
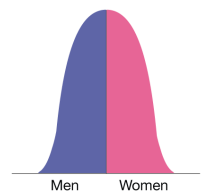
Demographic transition

- In general, mortality rates decline before fertility rates
- We can model population growth as a **demographic transition**
- Falling mortality rates give rise to increasing population until fertility declines as well

The demographic transition in 5 stages

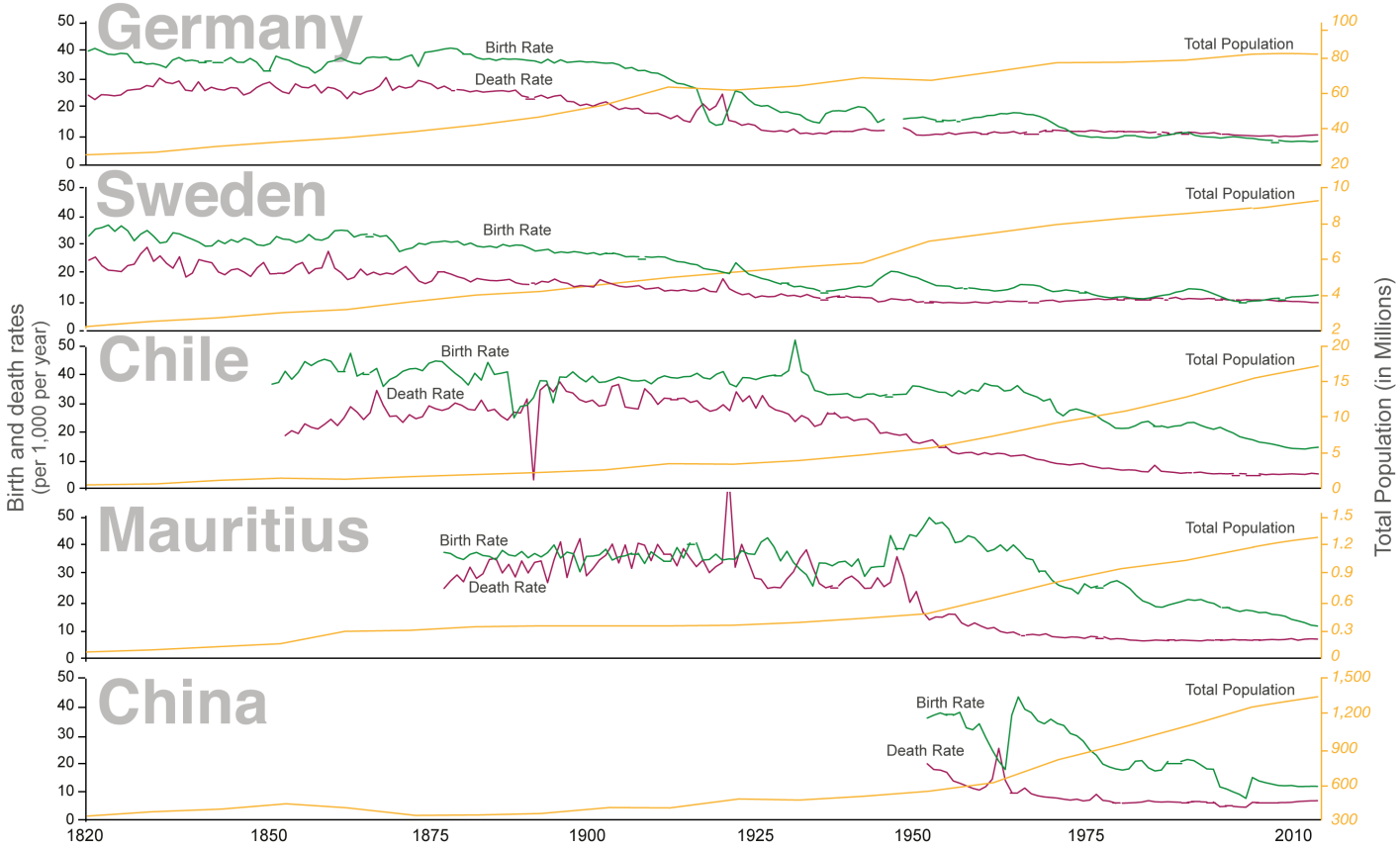
Our World in Data



	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Birth rate	High	High	Falling	Low	Rising again
Death rate	High	Falls rapidly	Falls more slowly	Low	Low
Natural increase	Stable or slow increase	Very rapid increase	Increase slows down	Falling and then stable	Stable or slow increase
Population Pyramid					

The Demographic Transition in 5 Countries

The Demographic Transition refers to the transition from high birth & death rates to low birth & death rates.
It is shown here for five countries that achieved the transition one after the other.



Data source: The data on birth rates, death rates and the total population are taken from the International Historical Statistics, edited by Palgrave Macmillan (April 2013).
The interactive data visualisation is available at OurWorldinData.org. There you find the raw data and more visualisations on this topic.

https://ourworldindata.org/grapher/
child-mortality-vs-population-growth?time=1970..2015

Fertility in the developed world

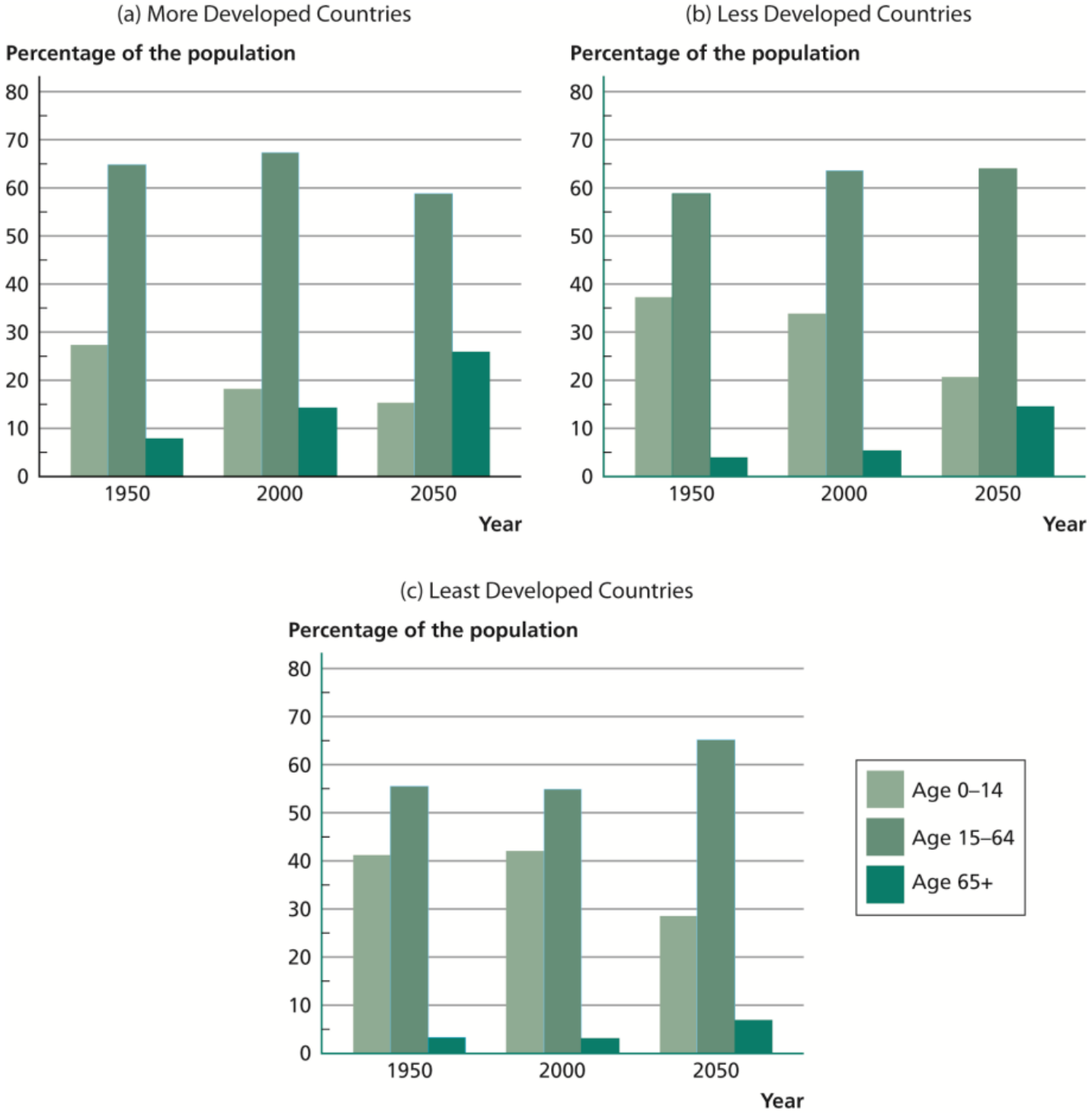
- Fertility rates in many developed countries are well below "replacement level"
- Should expect declining populations (Japan projected to lose 29% of population by 2055)
- Tempo effect: women delaying children can "artificially" reduce fertility rates but maintain constant population
- Increasing wages and political freedom for women can increase tempo effects

HIV/AIDS

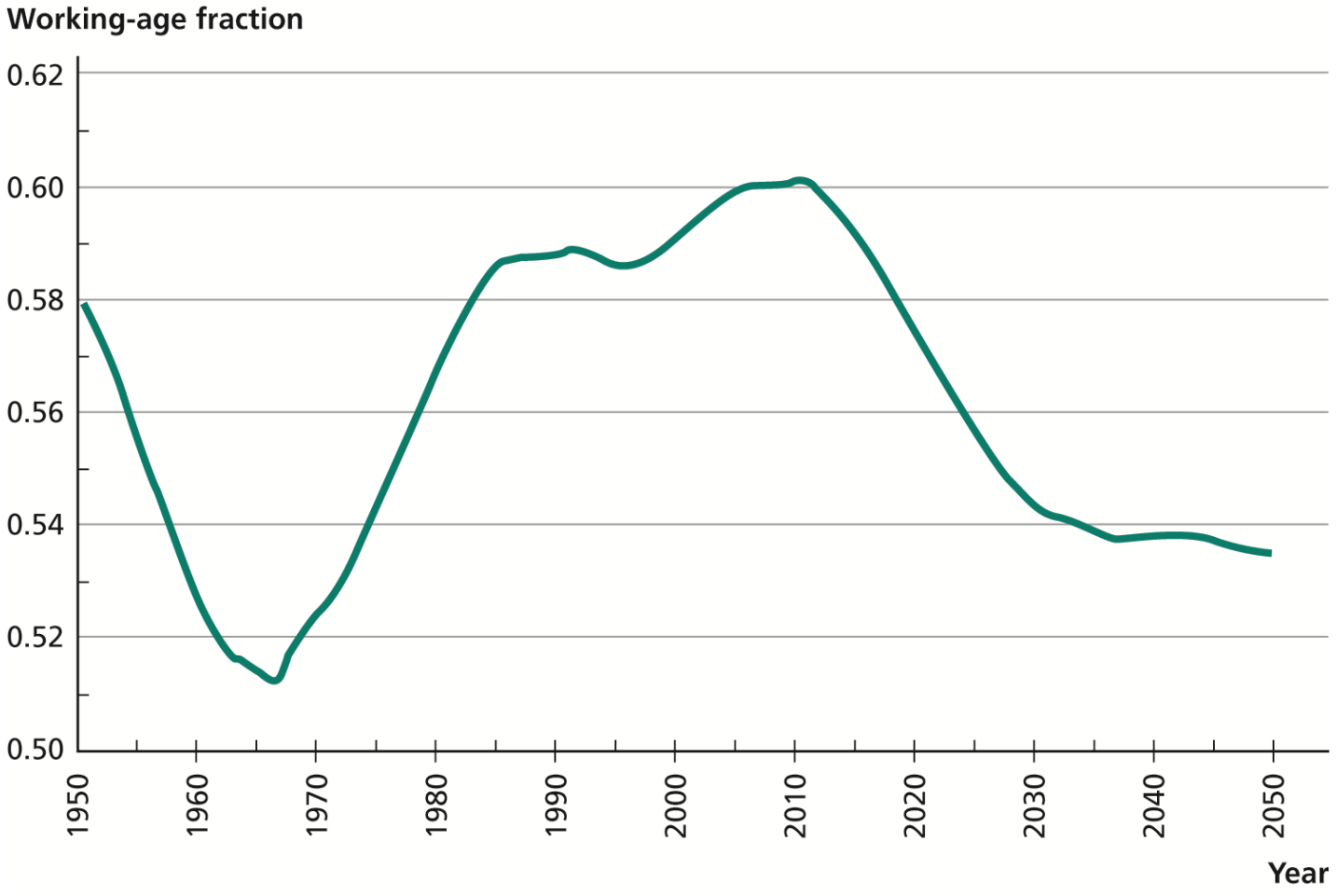
- 90% of infected people live in developing countries
- 5% of SSA infected (25% in Botswana)
- Reverses many of the mortality gains experienced elsewhere
- Life expectancy **decreased** 15 years in SSA

Aging

- Declining mortality rates mean more people live into old age
- Declining fertility rates mean there are fewer children
- Median global age will increase 10 years by 2050
- Only workers create output, retired people don't work


(a) More Developed Countries
Percentage of the population
80
70
60
50
40
30
20
10
0
1950
2000
2050
Year
(b) Less Developed Countries
Percentage of the population
80
70
60
50
40
30
20
10
0
1950
2000
2050
Year
(c) Least Developed Countries
Percentage of the population
80
70
60
50
40
30
20
10
0
1950
2000
2050
Year
Age 0–14
Age 15–64
Age 65+

Working-age fraction of US population



GDP per capita and aging

- GDP per worker = GDP/(# of workers)
- GDP per capita = GDP/(total population)

$$\text{GDP per capita} = \frac{\text{GDP}}{\text{workers}} \times \frac{\text{workers}}{\text{population}}$$

$$\text{GDP per capita} = \text{GDP per worker} \times \frac{\text{workers}}{\text{population}}$$

- GDP per capita can decrease even as GDP per worker increases