Macroeconomic Theory II
The Long Run
Chapter 1

Facts to Explain

A quick brush at some revealing facts

INTRODUCTION

About facts

- Salient historical facts about economic growth and development in the long run will guide our analysis throughout.
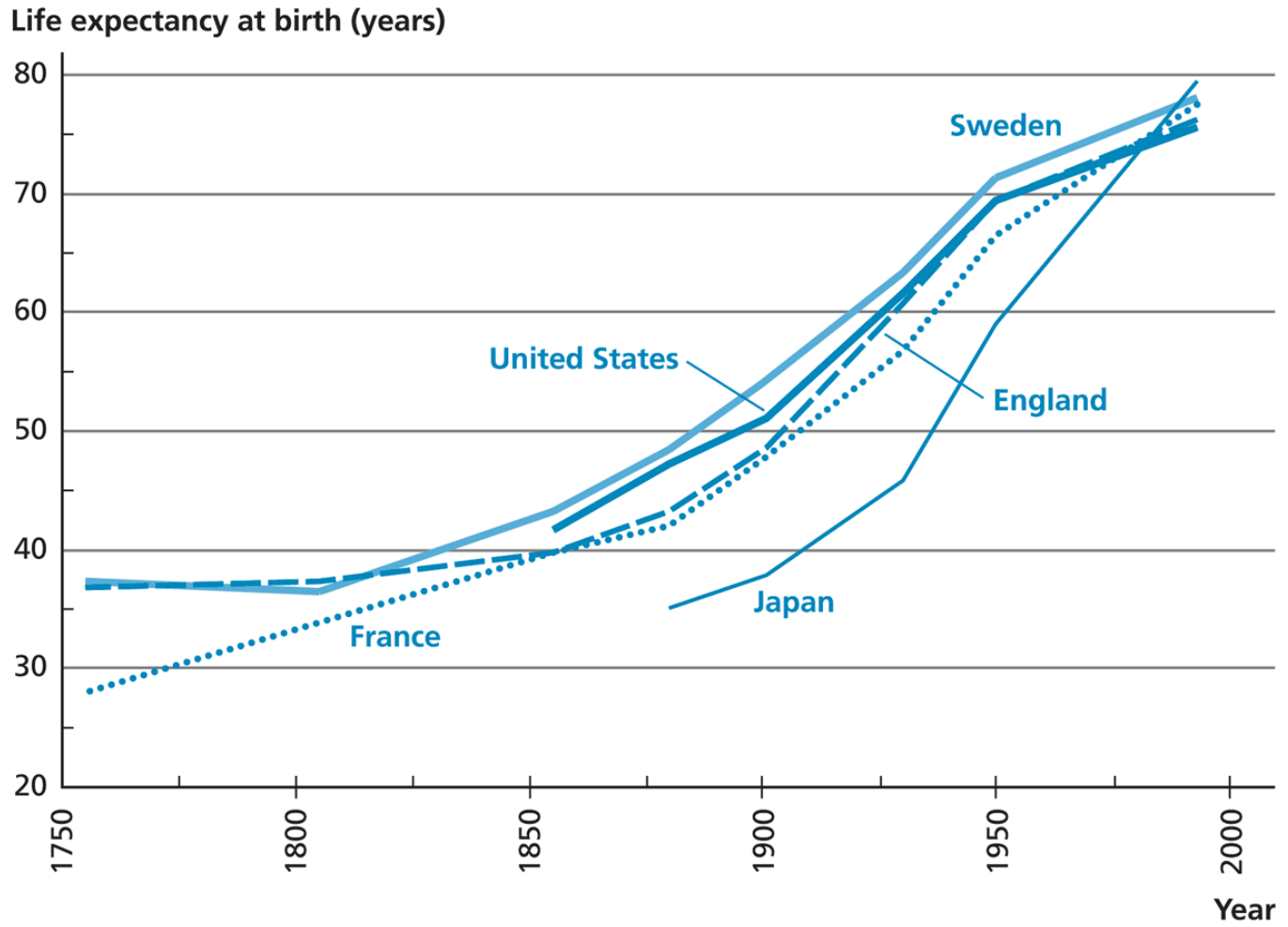
- Remark:

    The <u>scientific process</u> is an endless cycle of observation followed by a theory, followed by new observations to test the theory, followed by a new theory to fit the new observations, …

Some observations

- Evolution of life expectancy of a baby born in Japan:
    - 1880: 35 years
    - 2012: 83 years
- Average salary in the USA <u>in real terms</u>:
    - 1958: 1 refrigerator = 333 hours
    - 2004: 1 "better refrigerator" = 66 hours

FIGURE 4.8

Life Expectancy in Developed Countries

Life expectancy at birth (years)

Source: Livi-Bacci (1997).

Remarks

Generally, the terms

- Developed country
- Industrialized country (IC)
- Rich country

will be used interchangeably in this course. Also

- Developing country
- Less-developed country (LDC)
- Poor country

Additional observations

- US citizens spend three times more on leisure than 100 years ago.
- Their share of income spent on food has decreased by 2/3.
- USA 1870: 61 hours of work per week, without any real retirement.
- USA 2004: 34 hours of work per week and 10 years of true retirement.

In developing countries

- **Egypt, Indonesia, Brazil:** Life expectancy is higher now than that of British nobility at the beginning of the 20th century.
- **1981–2002:** The proportion of world population with income less than 1$/day decreases by 1/2.
- **China 1980-1998:** Population with income less than 1$/day decreases by 200 million.

FIGURE 4.9
Life Expectancy in Developing Countries

Life expectancy at birth (years)

Egypt

Nigeria

Chile

India
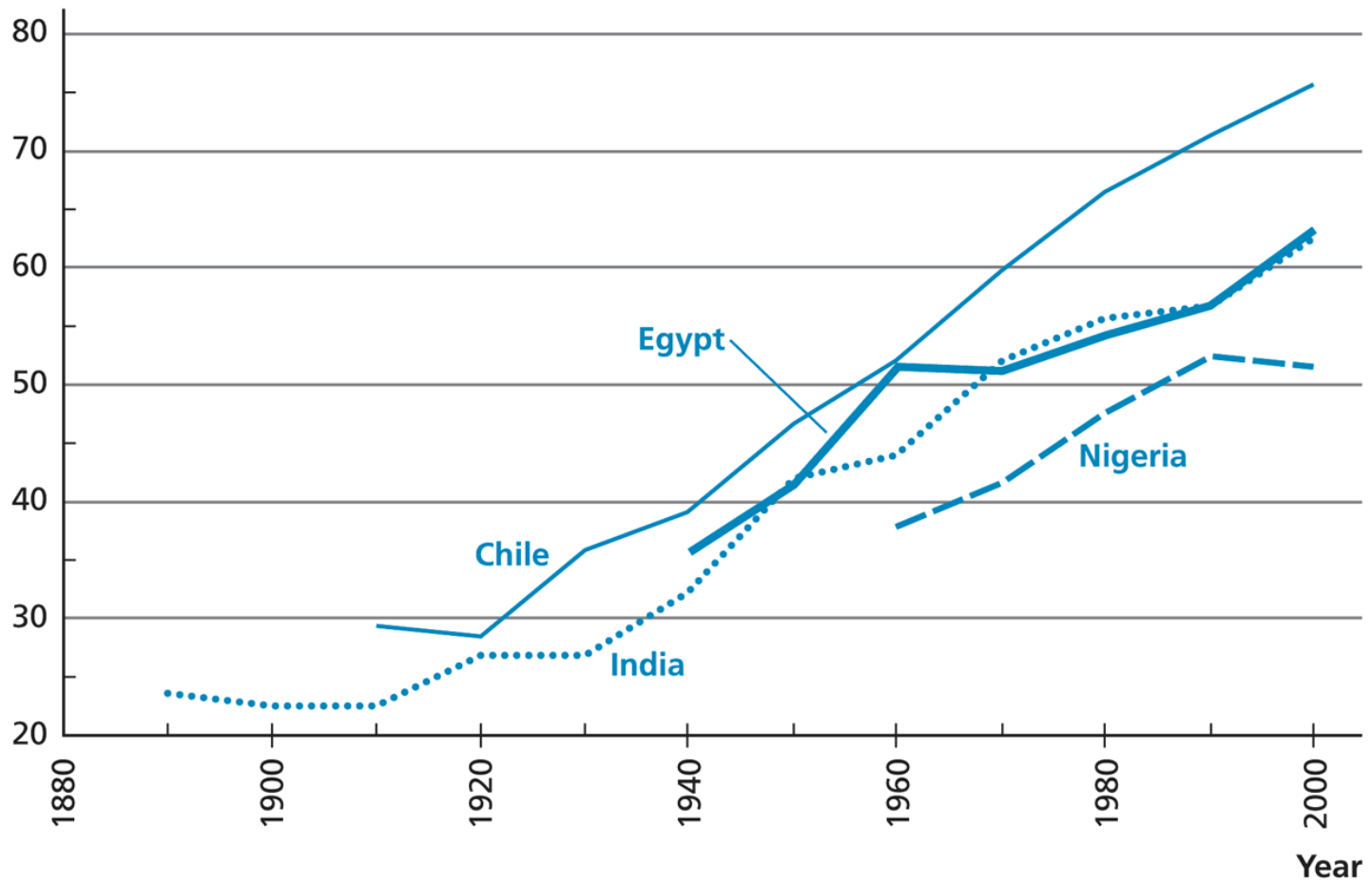
Year

In retrospect

- In the past 50 years, the standard of living has increased spectacularly for the majority of the world's population.
- In today's rich countries, this improvement has lasted for over a century.

Not bad after all.

But a diverse story

- France and Great Britain: Historically similar income levels. parallel growth
- Argentina: One of the world's richest country in early 20th century. lag behind
- Japan: Has caught up with the richest in 2-3 generations. convergence
- South Korea: Spectacular convergence within 1 generation.
- Average African household consumed 20% less in 1998 than 25 years previously. decline

Can we explain such diversity?

What about the future?

- Will rich countries keep on growing this way?
- Will our grand children consider us poor?
- Will the gaps between the rich and the poor get worse?
- What about natural resources and the environment?

In order to make predictions,
one must understand the past.

To do this week

- ☐ See course's website.

A more nuanced analysis of facts

FACTS

Two distinct, related statistics

1. Income levels (static view)
2. Income growth rates (dynamic approach)

Even though they are closely related, it is useful to consider them separately for a clearer understanding of the facts.

1) Income levels

A definition

GDP:

- □ Value of all goods and services produced within a year in the country.

- □ Sum of all incomes in the economy during a year: wages, rents, interests, profits, etc.

GDP and welfare

- GDP is <u>not</u> a perfect measure of people's welfare.
- Other measures are used to compare individual welfare between countries.
- Most popular:

Human Development Index (HDI)

Human Development Index (HDI)

Weighted sum of

- longevity: life expectancy at birth
- knowledge: adult literacy and years of schooling
- standard of living:
  - per capita income (PPP adjusted)
  - diminishing marginal utility of income

TABLE 2.10 Human Development Index Variations for Similar Incomes, 2002

| Country	GDP Per Capita (U.S. $ PPP)	HDI	HDI Rank	Life Expectancy (years)	Adult Literacy (%)
GDP per capita around PPP $1,000					
Tajikistan	980	0.671	116	68.6	99.5
Kenya	1,020	0.488	148	45.2	84.3
Central African Republic	1,170	0.361	169	39.8	48.6
Burkina Faso	1,100	0.302	175	45.8	12.8
GDP per capita around PPP $2,000					
Vietnam	2,300	0.691	112	69.0	90.3
Pakistan	1,940	0.497	142	60.8	41.5
Guinea	2,100	0.425	160	48.9	41.0
Angola	2,130	0.381	166	40.1	42.0
GDP per capita around PPP $3,500					
Jamaica	3,980	0.764	79	75.6	87.6
Sri Lanka	3,570	0.740	96	72.5	92.1
Indonesia	3,230	0.692	111	66.6	87.9
Morocco	3,810	0.620	125	68.5	50.7

TABLE 2.9   Human Development Index for Twenty-Two Selected Countries, 2002

Country	Relative Ranking (lowest to highest)	Human Development Index (HDI)	Real 2002 GDP Per Capital (PPP$)	GDP Rank minus HDI Rank[a]
Low human development				
Sierra Leone	177	0.273	520	−1
Ethiopia	170	0.359	780	−1
Angola	166	0.381	2,130	−38
Malawi	165	0.388	580	+9
Tanzania	162	0.407	580	+12
Guinea	160	0.425	2,100	−30
Medium human development				
Bangladesh	138	0.509	1,700	+1
India	127	0.595	2,670	−10
South Africa	119	0.666	10,070	−66
Nicaragua	118	0.667	2,470	+1
China	94	0.745	4,580	+5
Turkey	88	0.751	6,390	−12
Peru	85	0.752	5,010	+7
Thailand	76	0.768	7,010	−9
Oman	74	0.770	13,340	−32
Malaysia	59	0.793	9,120	−2
High human development				
Costa Rica	45	0.834	8,840	+14
Kuwait	44	0.838	16,240	−6
United Kingdom	12	0.936	26,150	+8
United States	8	0.939	35,750	−4
Canada	4	0.943	29,480	+5
Norway	1	0.956	36,600	+1

Source: United Nations Development Program, *Human Development Report, 2004* (New York: Oxford University Press, 2004), annex tab. 1. Reprinted with permission.

[a]A positive figure indicates that the HDI rank is better than the real GDP per capita (PPP$) rank; a negative indicates the opposite.

On happiness
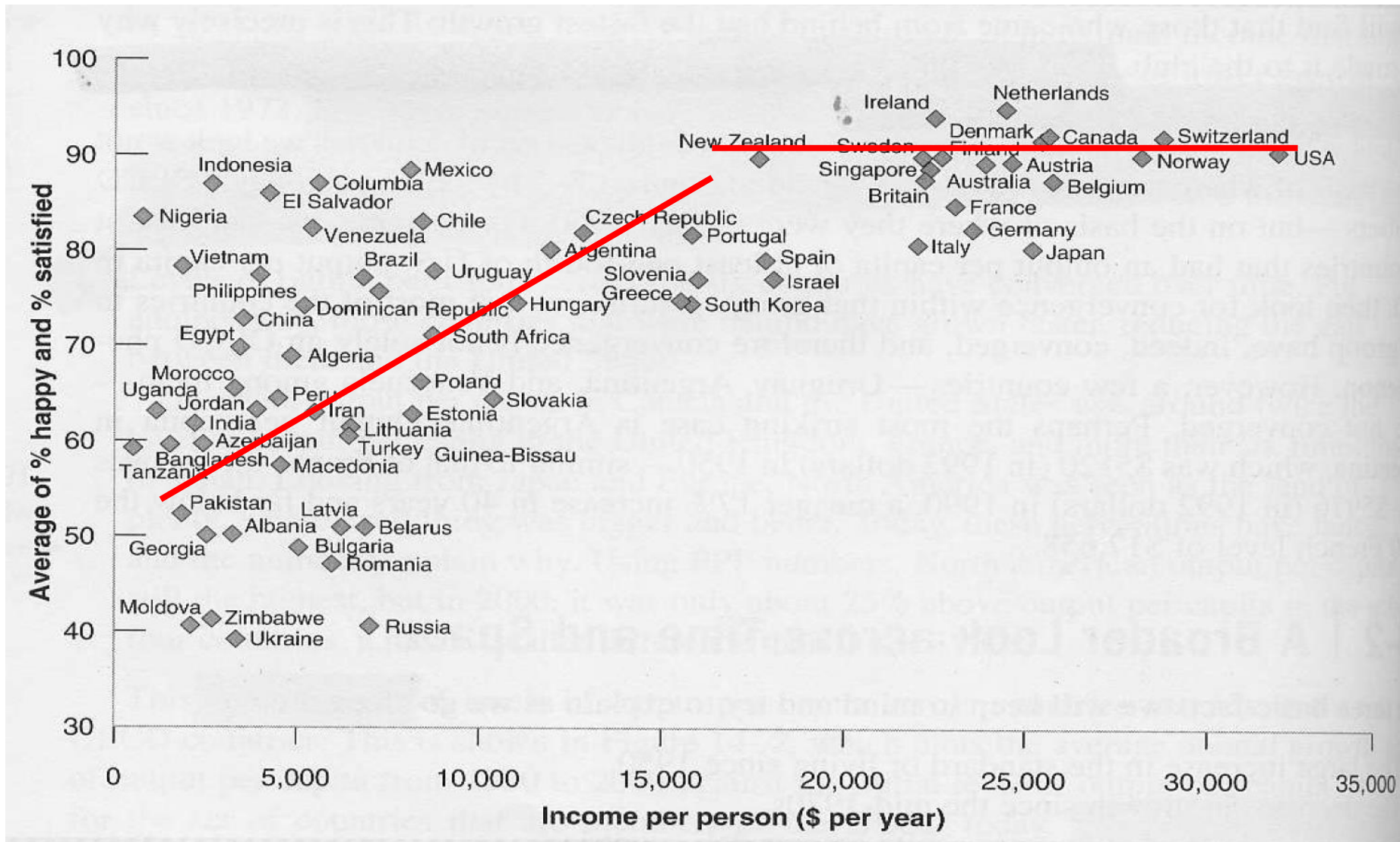
GDP per capita and happiness

- In poor countries, there seems to be a solid positive relation between <u>absolute</u> levels of GDP per capita and happiness.

- In rich countries, the relation appears to break down.

- Further evidence indicates that <u>within</u> rich countries, rich people seem to be happier than poor.

- This suggests than beyond a certain per capita income level - about $15 000 - <u>relative income</u> may be a more important determinant of happiness.

Economics, GDP measures, and welfare

- If economic analyses often concentrate on GDP per capita for comparisons, it is not due to "more materialistic motives".

- GDP per capita is highly correlated with other, global measures of Human Development.

- GDP per capita remains one of the best and easiest measure to use for comparisons; it is a good, first approximation.

- But it can also be "abused" by some as an end in itself.

Income levels: A snapshot of the world

GDP per capita, 2009
(2005 Dollars)

World Average
$9,909

Percentage of the World population that has passed by
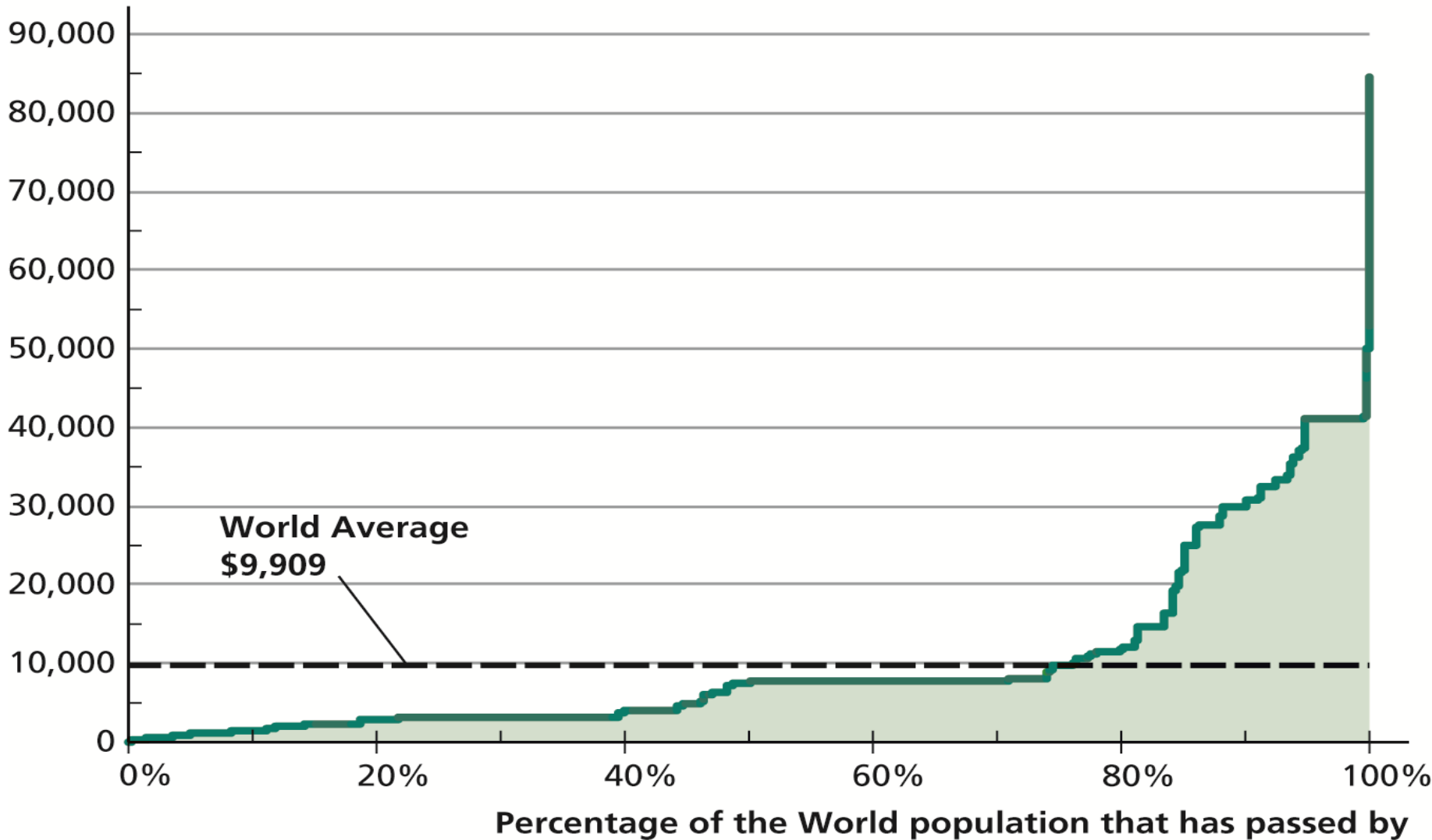
Income levels: The first 50%
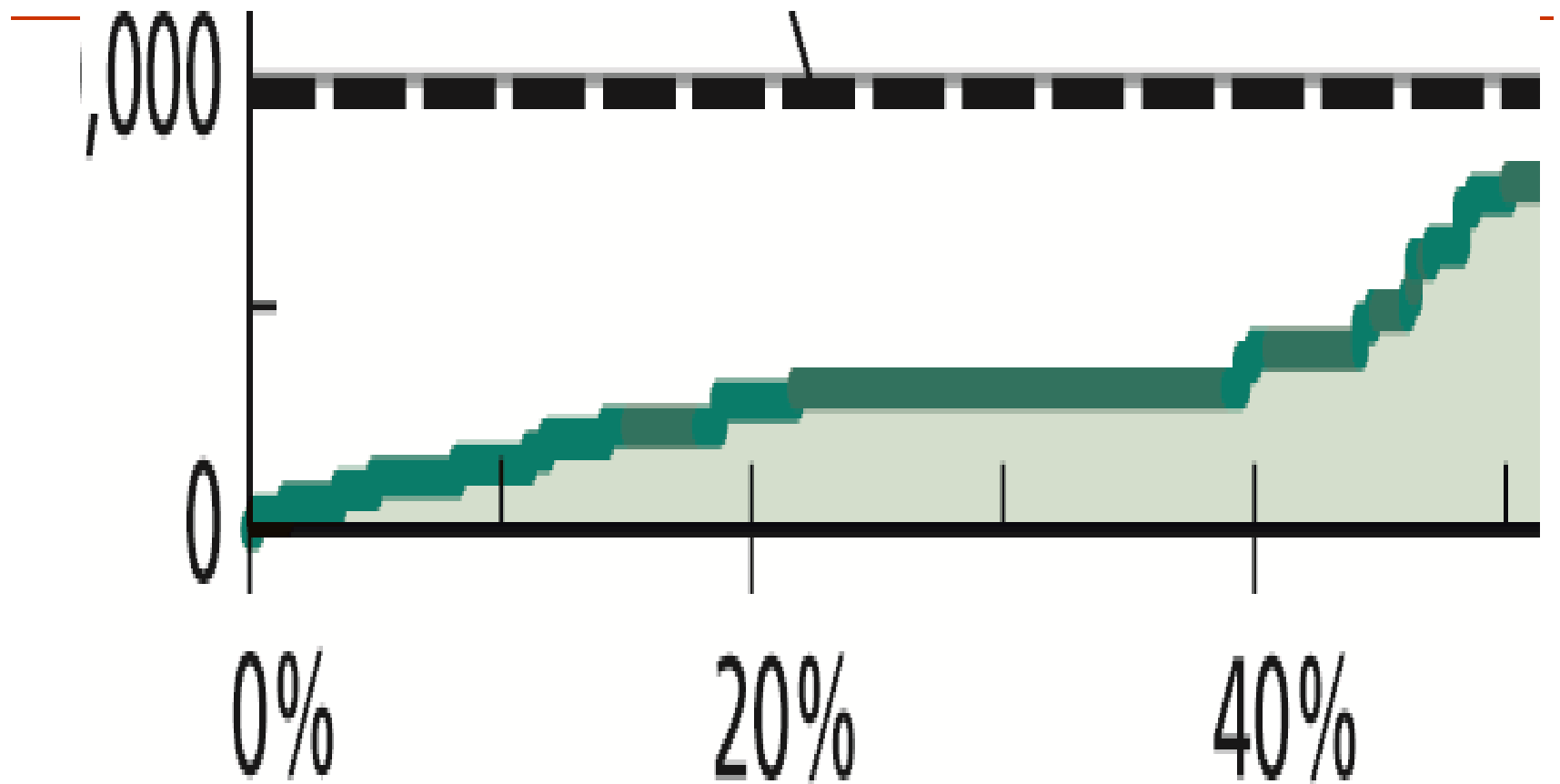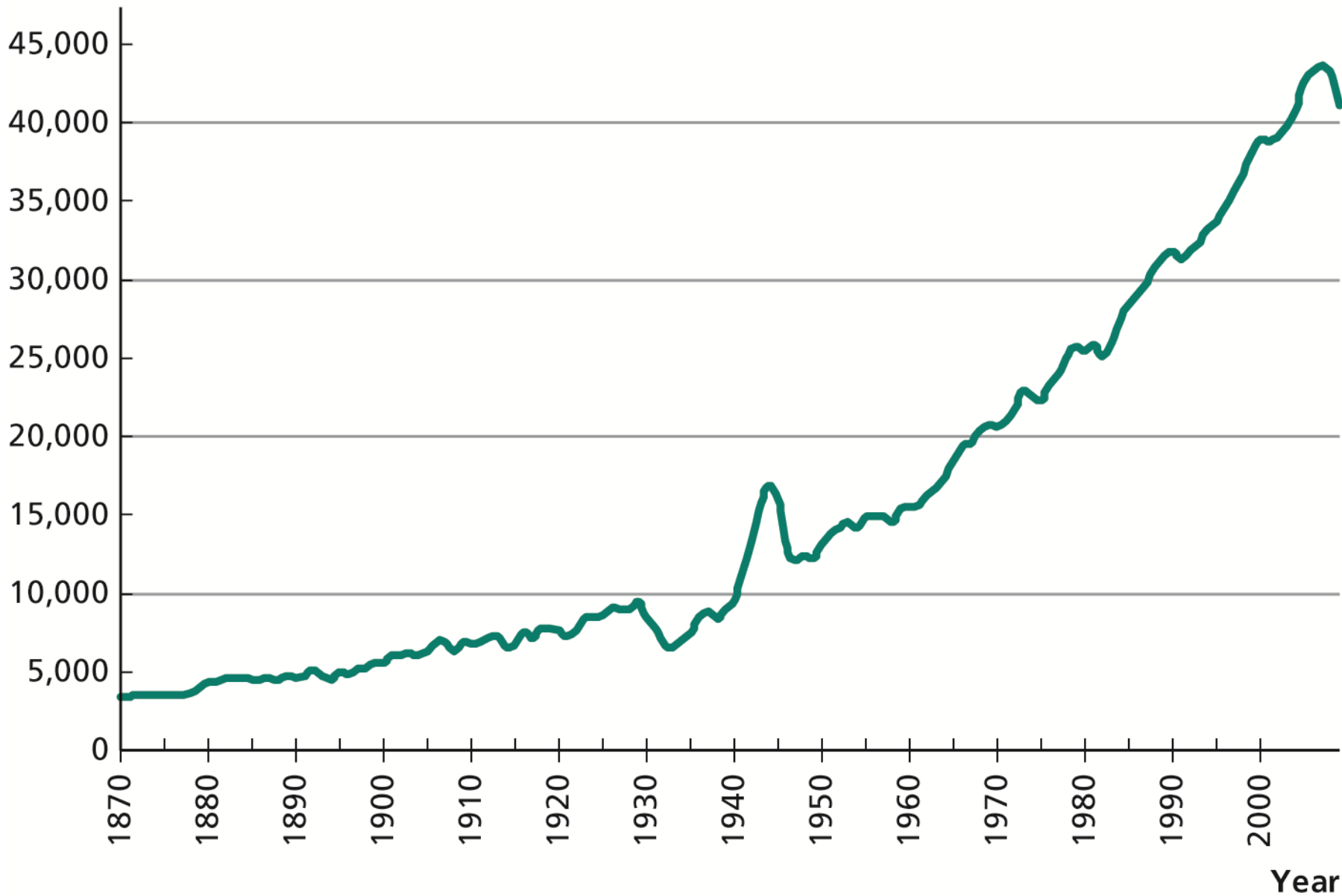
2) Income growth rates

USA 1900-1920

USA 1930-1950

GDP per capita (2005 Dollars)

- Americans are much richer today than 4-5 generations ago. (12 times)
- Canadian experience is similar (next slide).
- Force of compounded growth:
  - US: 1.8%/year for 139 years.
  - Canada: 1.8%(?) over the same period.
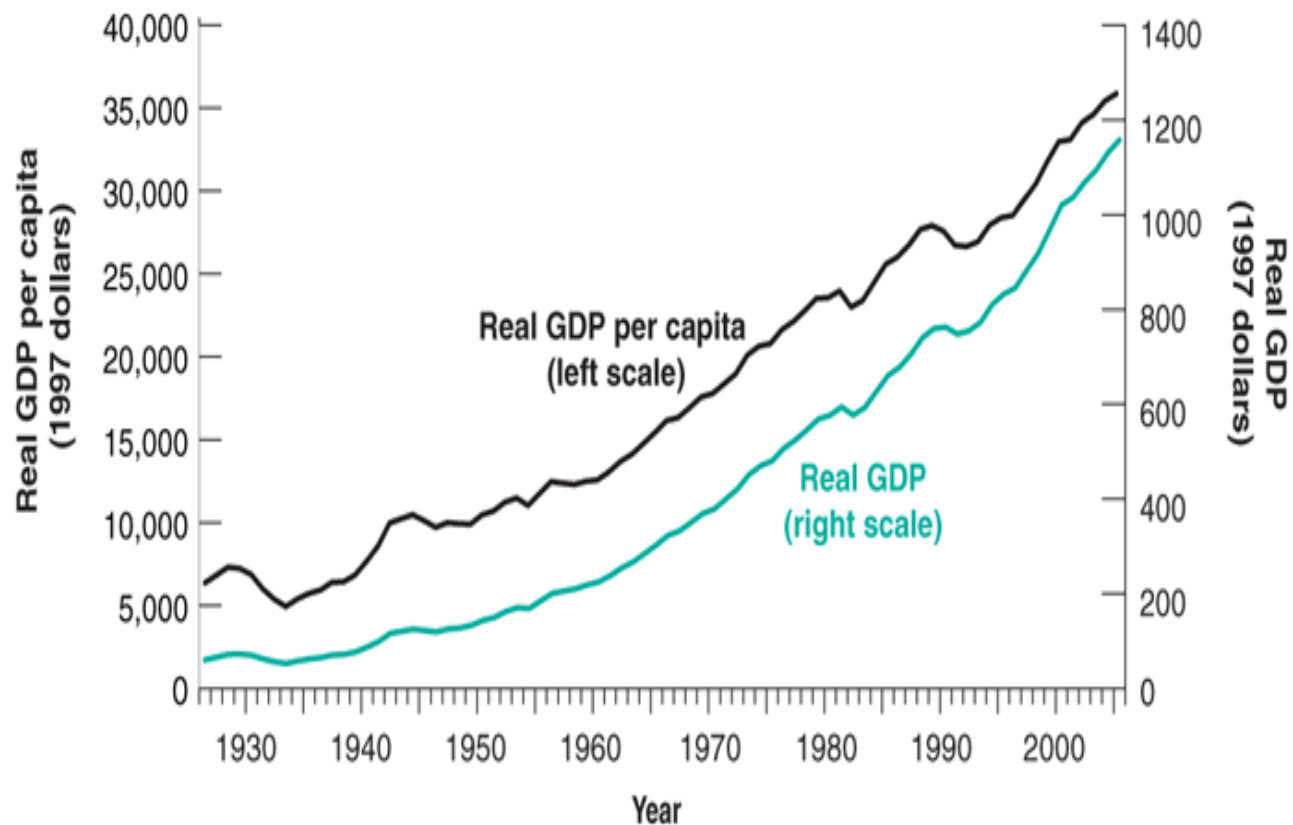 - Little difference between two consecutive years but large over many years.

FIGURE 14-1

Real GDP and Real GDP per Capita in Canada, 1926–2005

Aggregate real output has increased by a factor of 19 in Canada since 1926. Per capita real output has increased by a factor of 5.5 times. The latter shows that the average Canadian was much better off in 2005than in 1926.

Source: Real GDP using CANSIM I variable D14442 and CANSIM II variable V3862685; population using CANSIM II variables.
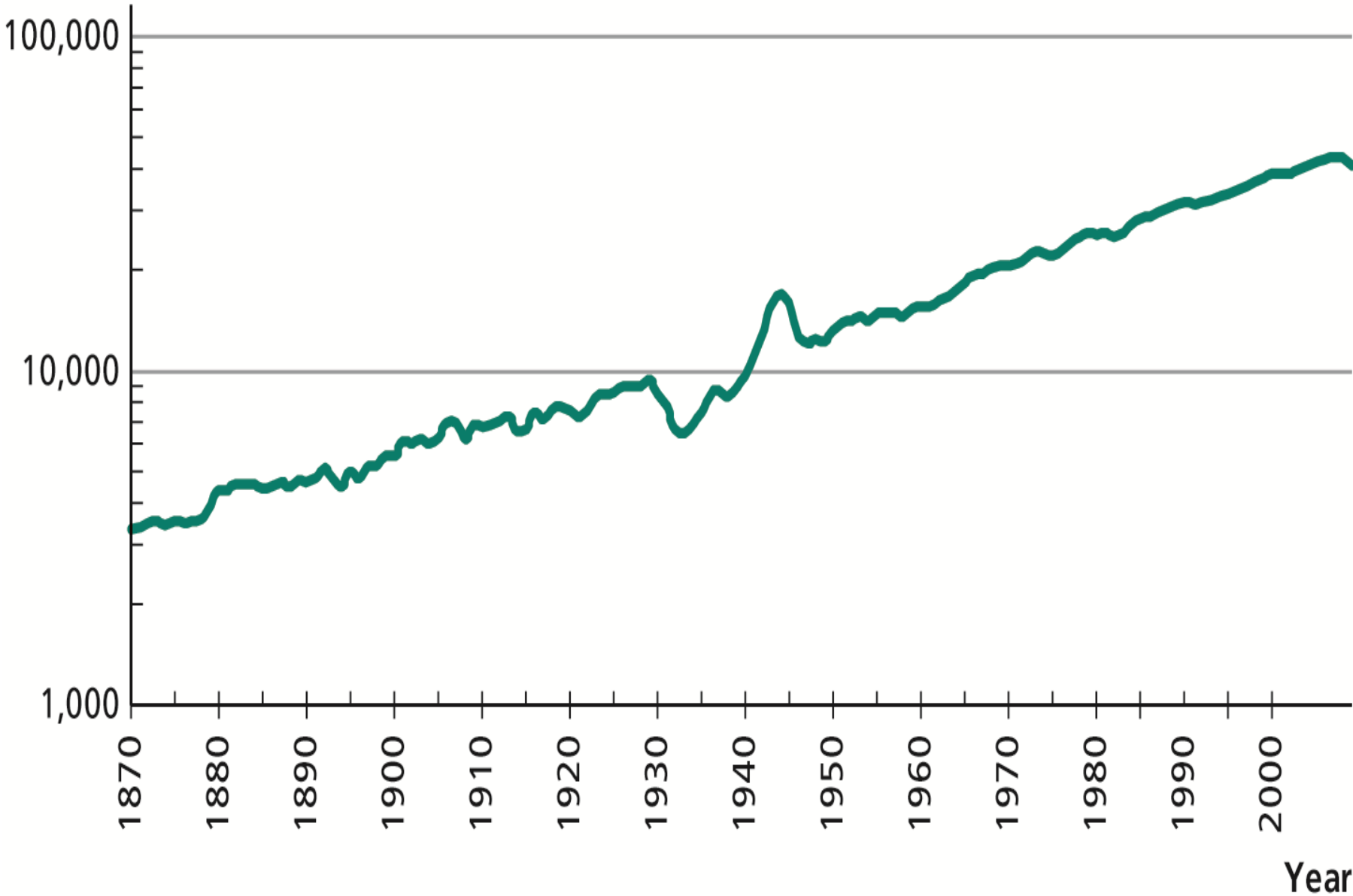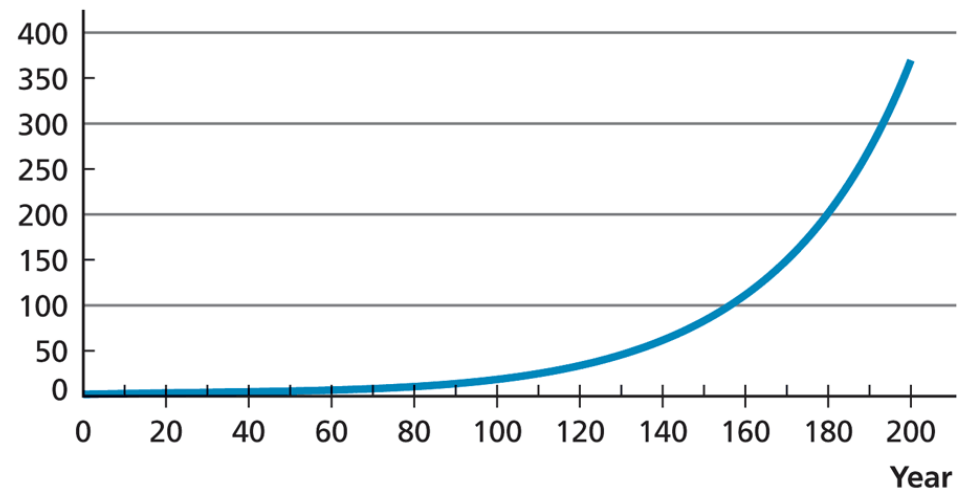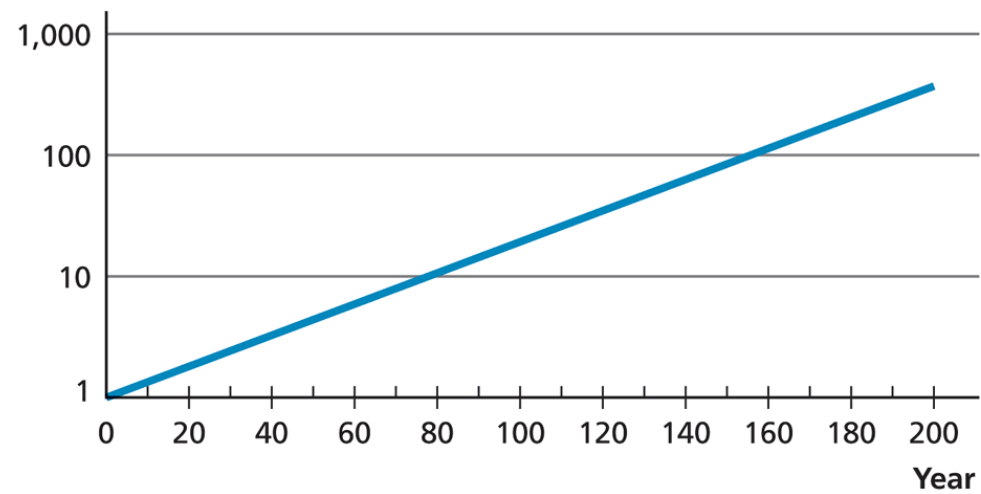
GDP per capita (2005 Dollars, ratio scale)

Year

FIGURE 1.3

The Effect of Using a Ratio Scale

X (Linear scale)

X (Ratio scale)

GDP per capita (2005 Dollars, ratio scale)
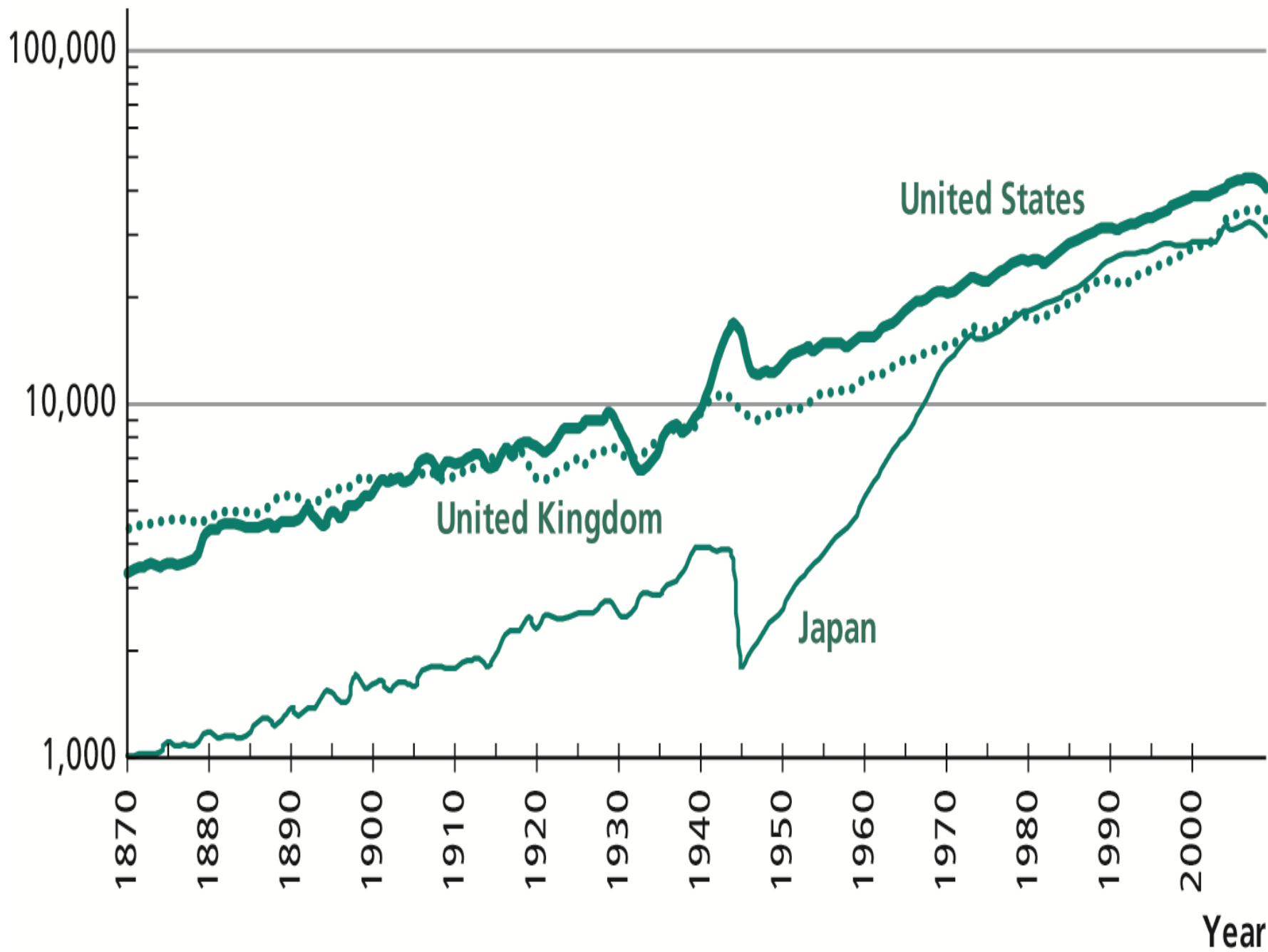
100,000
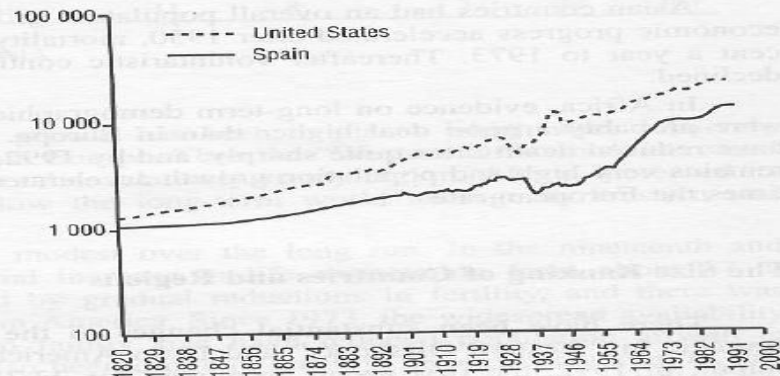
United States

10,000

United Kingdom

Japan

1,000

1870 1880 1890 1900 1910 1920 1930 1940 1950 1960 1970 1980 1990 2000

Year

Figure 1.2. Binary confrontation of per capita GDP levels since 1820
(1990 Geary-Khamis dollars)
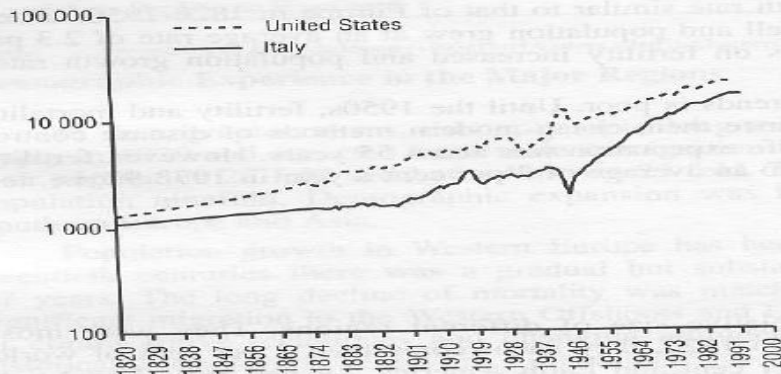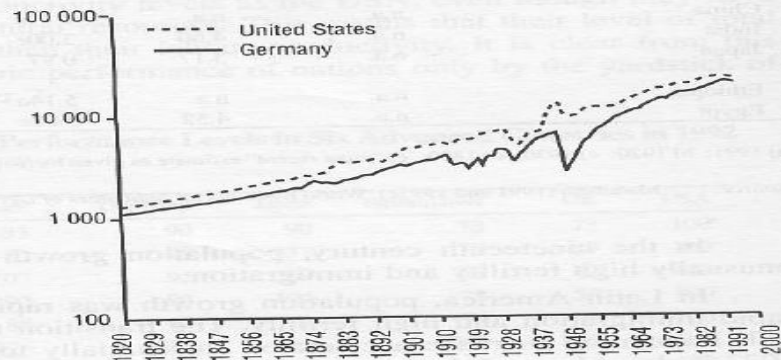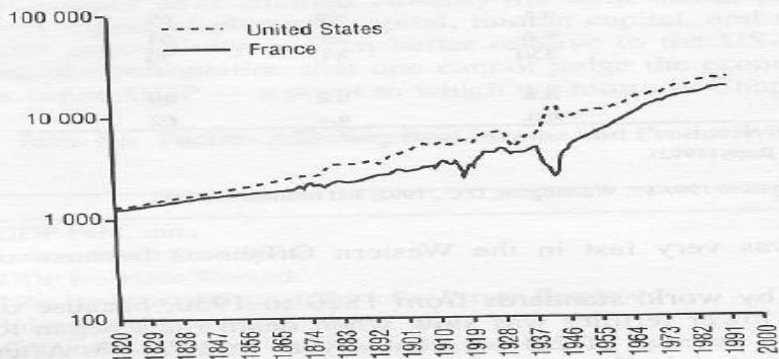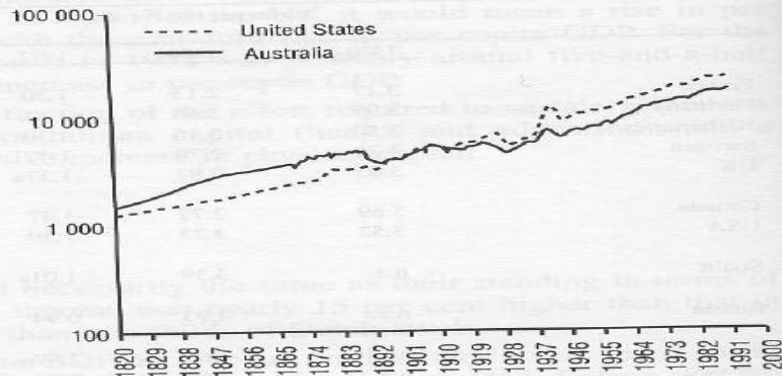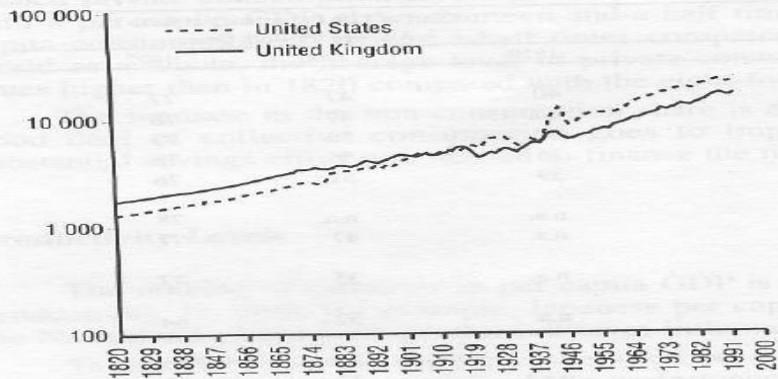
Source: Appendix D.

Figure 1.2 cont'd. **Binary confrontation of per capita GDP levels since 1820**
(1990 Geary-Khamis dollars)
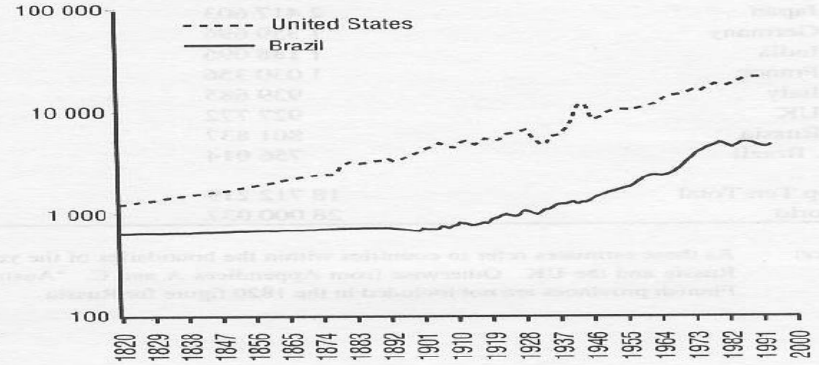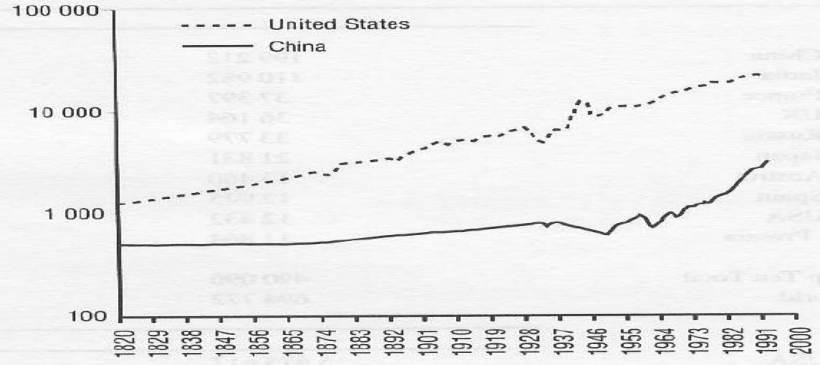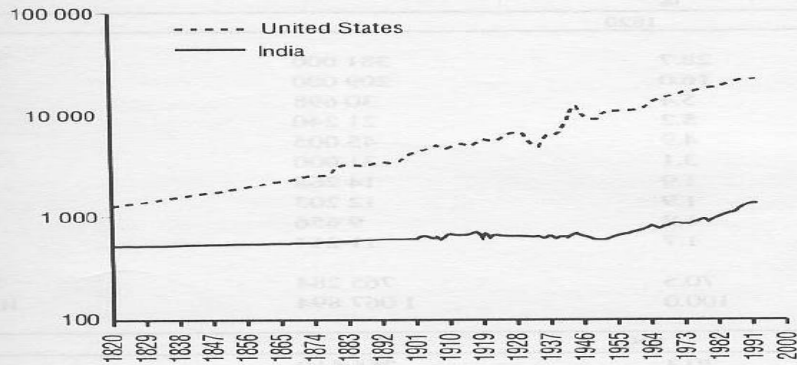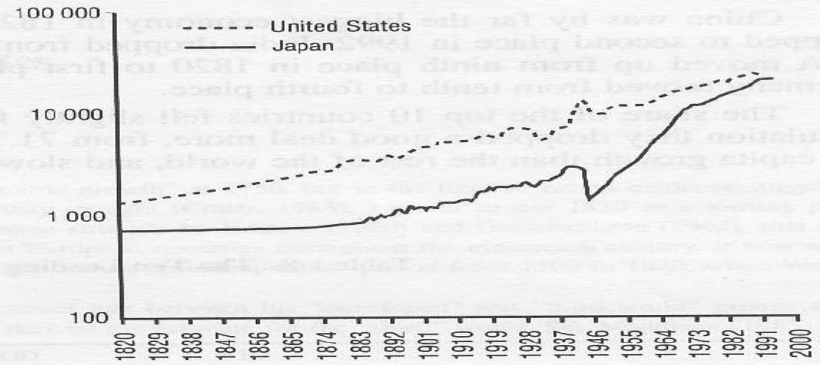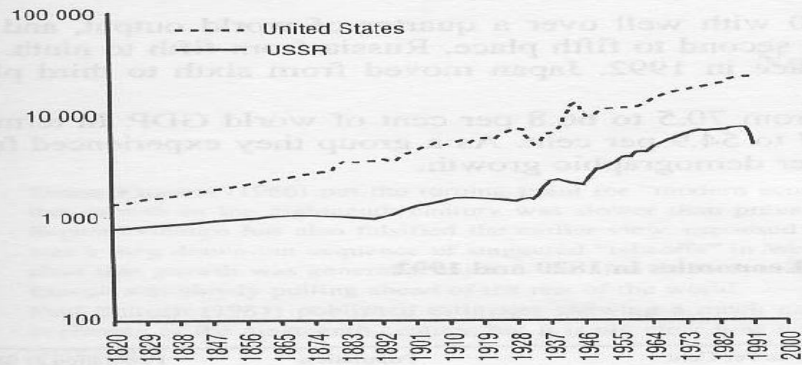
Source: Appendix D.

Convergence OECD

FIGURE 14-2

Growth Rate of GDP per Capita since 1950 versus GDP per Capita in 1950; OECD Countries

Countries with lower levels of output per capita in 1950 have typically grown faster. *Source: See Table 14-1. South Korea, the Czech Republic, Hungary, and Poland are not included because of missing data.*

Convergence across the world?

FIGURE 14–3

Growth Rate of GDP per Capita 1960–2000, versus GDP per Capita in 1960 (1996 dollars); 99 Countries

There is no clear relation between the growth rate of output since 1960 and the level of output per capita in 1960.

Source: See Table 14–1.
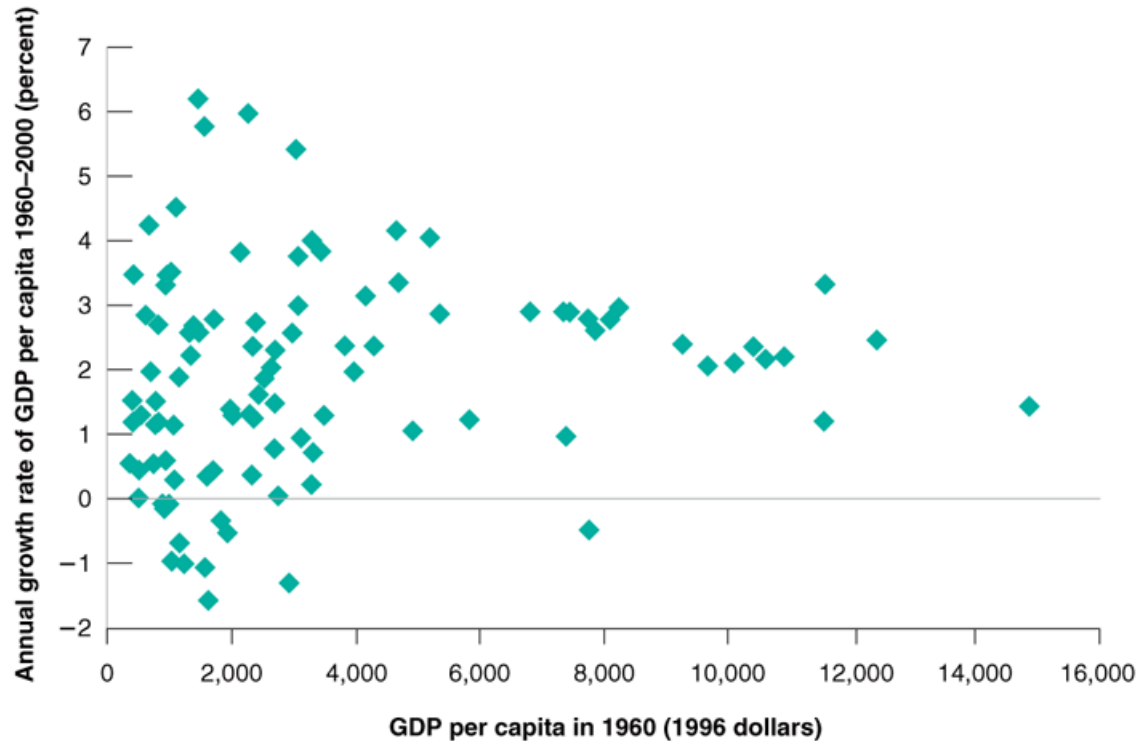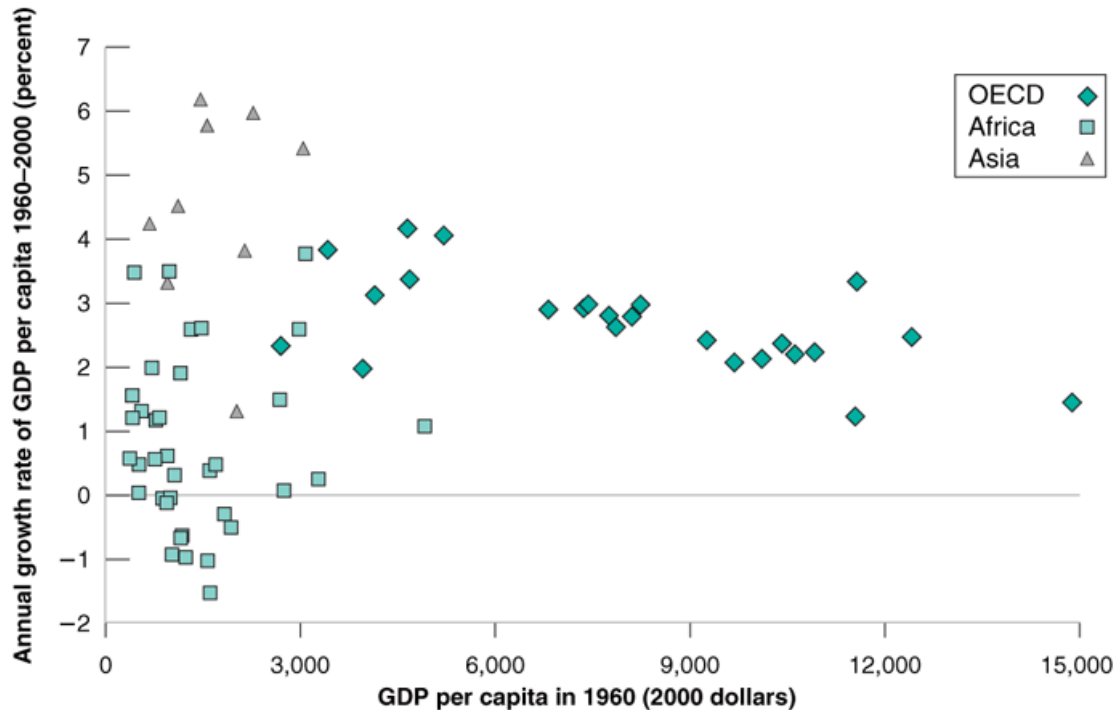
Convergence?

FIGURE 14-4

Growth Rate of GDP per Capita, 1960–2000, versus GDP per Capita in 1960: OECD, Africa, and Asia

Asian countries are converging to OECD levels. There is no evidence of convergence for African countries.

Source: See Table 14–1.

Convergence

- **OECD countries are converging**
- **Asian countries are converging**
- **African countries are not converging**

Distribution of growth rates 75-09

Average annual growth rate

Growth rate	Countries
8.5%–9.0%	Equatorial Guinea
8.0%–8.5%	
7.5%–8.0%	China
7.0%–7.5%	
6.5%–7.0%	
6.0%–6.5%	
5.5%–6.0%	Maldives
5.0%–5.5%	Taiwan, South Korea
4.5%–5.0%	Singapore, Vietnam
4.0%–4.5%	Botswana, Thailand
3.5%–4.0%	India, Indonesia, Egypt, Malaysia
3.0%–3.5%	Bulgaria, Chile, Ireland
2.5%–3.0%	Albania, Cambodia, Dominican Republic
2.0%–2.5%	Poland, Portugal, Norway, Tunisia, Uruguay
1.5%–2.0%	Angola, Canada, Japan, Spain, Tanzania, United States
1.0%–1.5%	Argentina, Ethiopia, New Zealand, Mexico, Switzerland, Syria
0.5%–1.0%	Afghanistan, Guatemala, Senegal, Peru, South Africa
0.0%–0.5%	Bolivia, Jamaica, Kenya, Nigeria
−0.5%–0.0%	Bahrain, Iran, Sierra Leone, Venezuela
−1.0%–−0.5%	Haiti, Zambia
−1.5%–−1.0%	Brunei, Central African Republic, Iraq
−2.0%–−1.5%	Nicaragua
−2.5%–−2.0%	Somalia
−3.0%–−2.5%	Djibouti
−3.5%–−3.0%	Zimbabwe
−4.0%–−3.5%	
−4.5%–−4.0%	Liberia

Number of countries

Convergence and Divergence

- Recent growth rates for 128 countries 1975-2009
- Economic miracles: sustained growth above 4%/y.
- Tragedies at bottom of graph: negative growth
- Growth of 1.8% in USA for the last 139 years is not so extraordinary when compared to the past 35 years.
- The force of compounded growth:
  - 1960: South Korea and Philippines had similar income per capita: 1782 and 1314 resp.
  - South Korea growth: 5.5%/y.
  - Philippines growth: 1.6%/y (historically good, but much lower than SK)
  - Outcome: Income per cap 2009:
    - SK $25,034
    - Philippines $2,838
  - In 1960, many economists believed than the Philippines had a brighter future than SK…

Latest news (The Economist 6 Jan 2011)

Go south, young man

World's ten fastest-growing economies*
Annual average GDP growth, %

2001-2010†		2011-2015‡	
Angola	11.1	China	9.5
China	10.5	India	8.2
Myanmar	10.3	Ethiopia	8.1
Nigeria	8.9	Mozambique	7.7
Ethiopia	8.4	Tanzania	7.2
Kazakhstan	8.2	Vietnam	7.2
Chad	7.9	Congo	7.0
Mozambique	7.9	Ghana	7.0
Cambodia	7.7	Zambia	6.9
Rwanda	7.6	Nigeria	6.8

Sources:
The Economist; IMF

*Excluding countries with less than 10m
population and Iraq and Afghanistan
†2010 estimate ‡IMF forecast

The forgotten continent

GDP growth, unweighted annual average, %

Asian countries

African countries

1970s   1980s   1990s   2000s   2011-15*
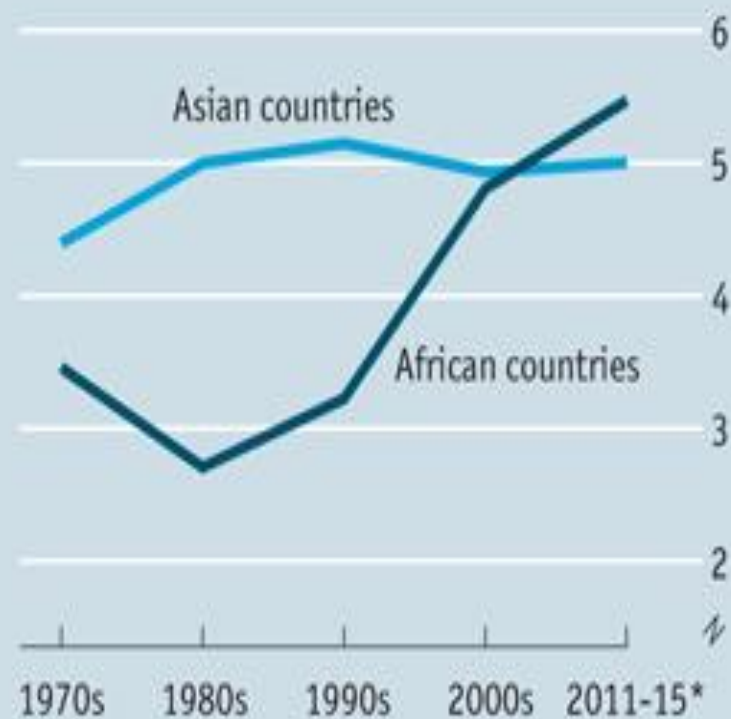
Sources: The Economist; IMF   *Forecast

The Economist 6 Jan 2011

- "In 1980 Africans had an average income per head almost four times bigger than the Chinese."
- "Today the Chinese are more than three times richer."

What about population growth?

Population Growth

Population growth rate, 1975–2009 (% per year)
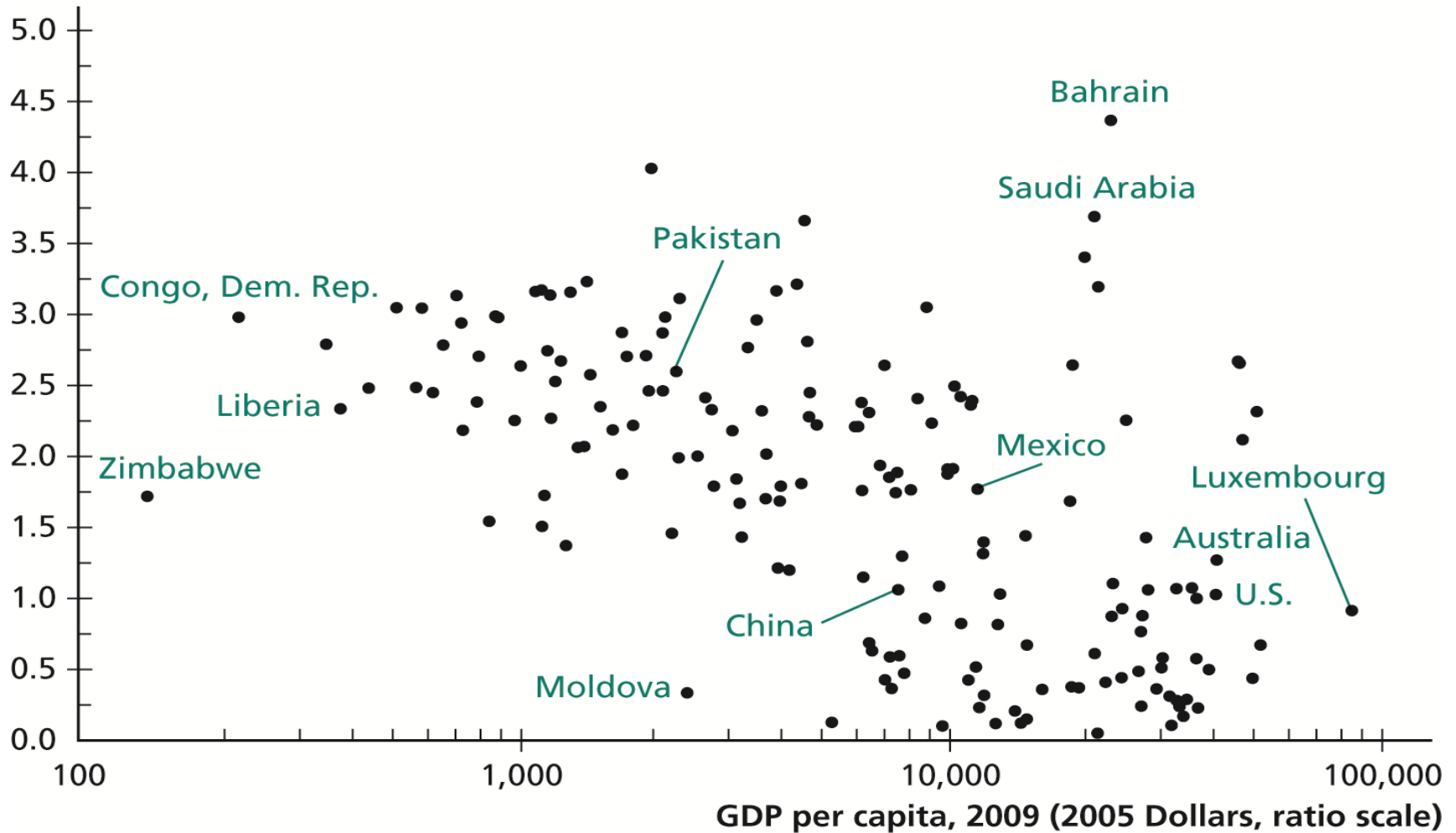
Population Growth

- Negative correlation between population growth and income per capita.
- Possible explanations:
  1. A higher population growth rate causes poverty.
  2. Poverty causes higher population growth.
  3. Causality runs both ways.
  4. No causality. Correlation does not necessarily imply causality. Case of missing variable.

What about resources and the environment?

Are we doomed?

FIGURE 16.3
Growth Forecast from *The Limits to Growth*

Resources

Population

Food per capita

Pollution

Industrial output per capita

1900   1950   2000   2050   2100

Year
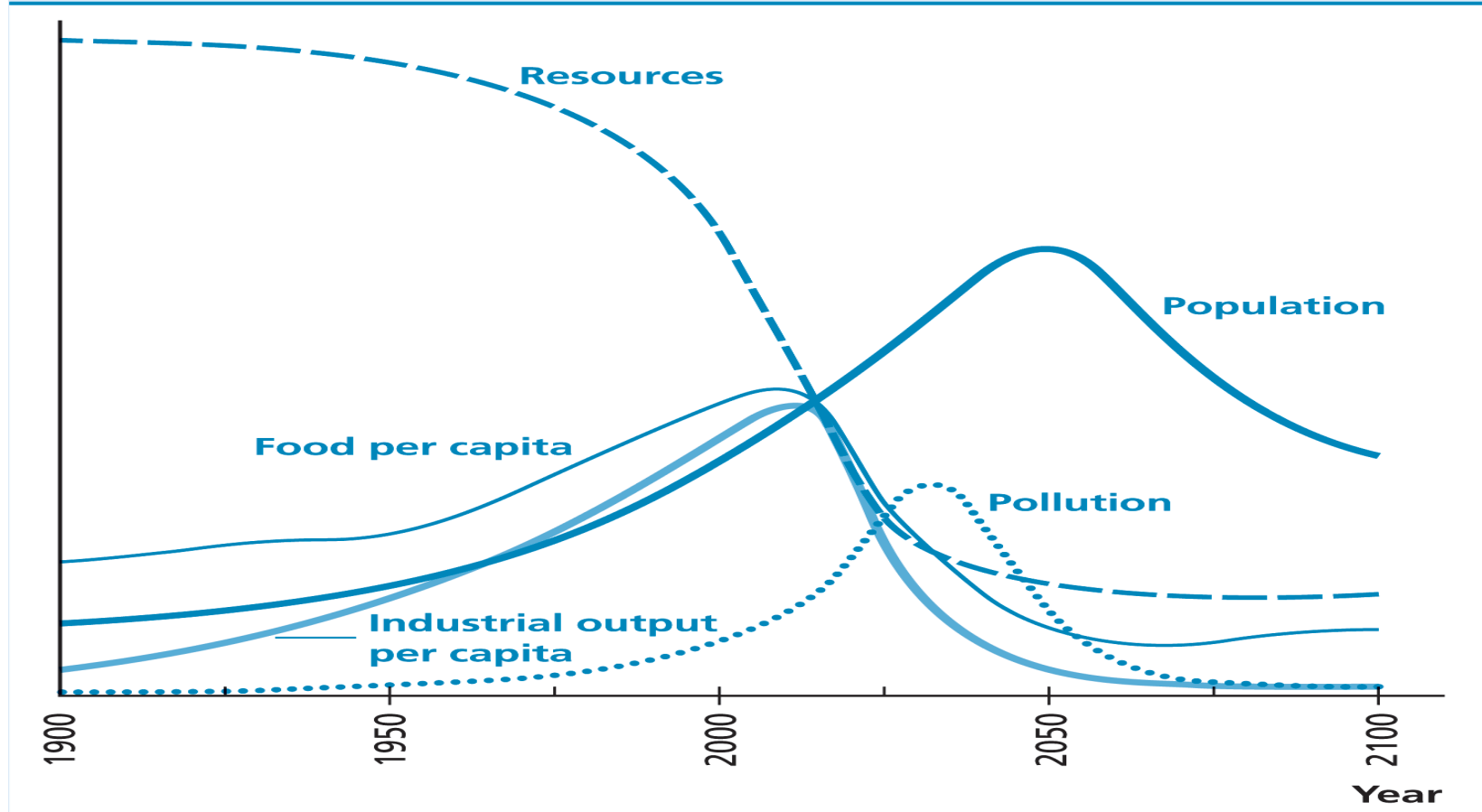
Source: Meadows et al. (1972), Figure 35.

Going back to 1820

GDP per Capita (2005 Dollars, ratio scale)

Country group and population in 2009 (in millions)

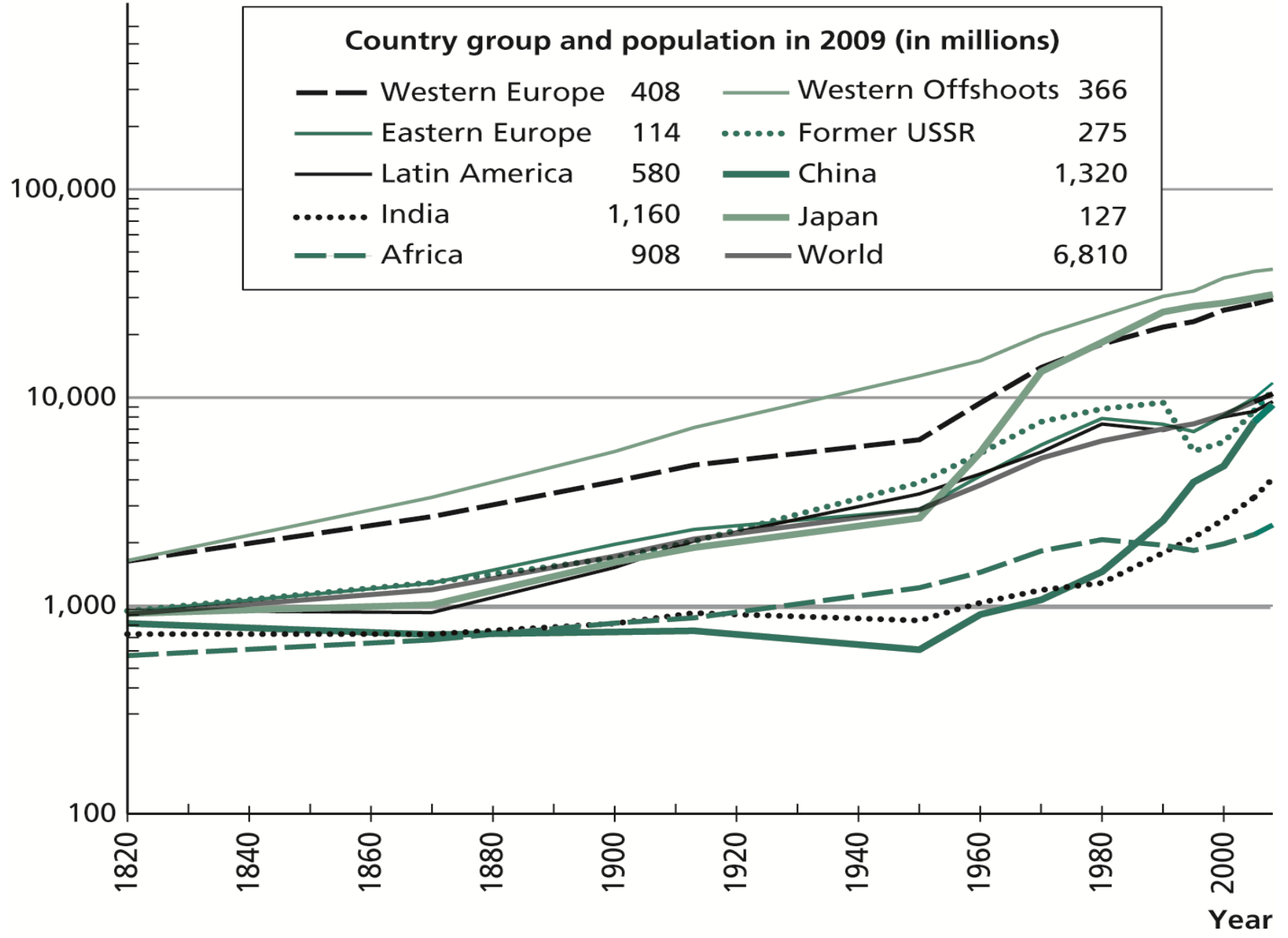|	
Western Europe 408	Western Offshoots 366
Eastern Europe 114	Former USSR 275
Latin America 580	China 1,320
India 1,160	Japan 127
Africa 908	World 6,810

Going back to 1820

- NB Choose groups of countries because data are less reliable.
1. Increasing growth rates:
    1. 1820-1870: 0.5%/y world
    2. 1870-1950: 1.1%/y
    3. 1950-2008: 2.2%/y
2. Amplified inequalities:
    1. 1820: the richest are 3X times richer than the poorest
    2. 2008: the richest are 17X times richer than the poorest
3. Leapfrogging:
    1. Japan overtakes Latin Am, USSR, East and West Europe
    2. USA, Canada, Australia et N-Z (Western offshoots): Poorer than Western Europe in 1820; 2X richer by 1950.
    3. China: Poorest in 1950; Overtakes Africa and India recently.

On structural changes
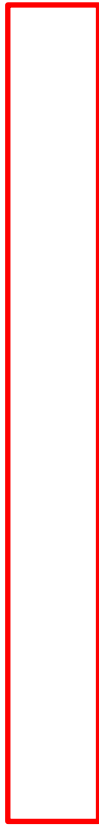
What about inequality between countries?

FIGURE 1.8

World Inequality and Its Components, 1820–1992

Inequality

Total world inequality

Inequality between countries

Inequality within countries

Year
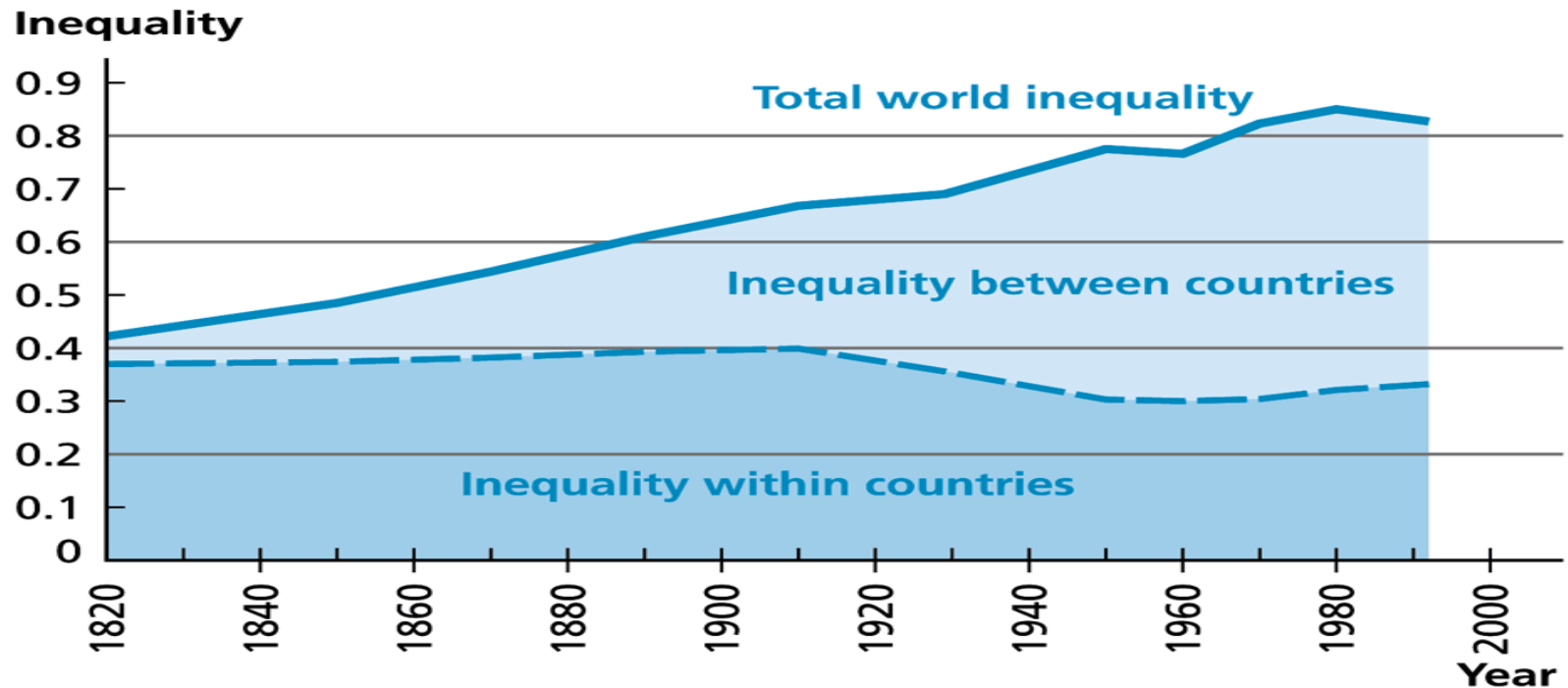
Source: Bourguignon and Morrison (2002).

And before 1820?

Before 1820

- Reliable data difficult to obtain.
- Data comes from
  - Historical records
  - Reports from explorers: Marco Polo in China 13^e c. and Spanish conquistadors in Aztec empire
  - Analysis of Human remains

Before 1820

- Low growth:
    - World:
        - 1700-1820: 0.07%/y
        - 1500-1700: 0.04%/y
    - Western Europe:
        - 1500-1820: 0.14%/y

Before 1500?

- Essentially no growth at all.
- Fluctuations still present:
  - Short term due to bad harvest
  - Long term due to epidemics, wars, famines
  - Little notable differences between countries.

Before 1500

According to economic historian Paul Bairoch's estimates,

- Rome 1st c. AD
- China 11th c.
- India 17th c.
- Europe early 18th c.

all had approximately the same living standards.

China

- 8th to 12th c.: largest economic growth in history before 18th c.
  - Innovations: gun powder, printing, water power, coal for smelters.
  - Infrastructure: 48 280 km network of canals and docks.
- China explorations during 15th c.: East African Coast, etc.
- Nevertheless overtaken by Western Europe afterwards.

Leapfrogging

- History is full of such leapfrogging cases.
- Is China now overtaking the USA?

Population through human history

(Log scale)

FIGURE 4.2
World Population, 10,000 B.C. to A.D. 2000

Population (in millions, ratio scale)
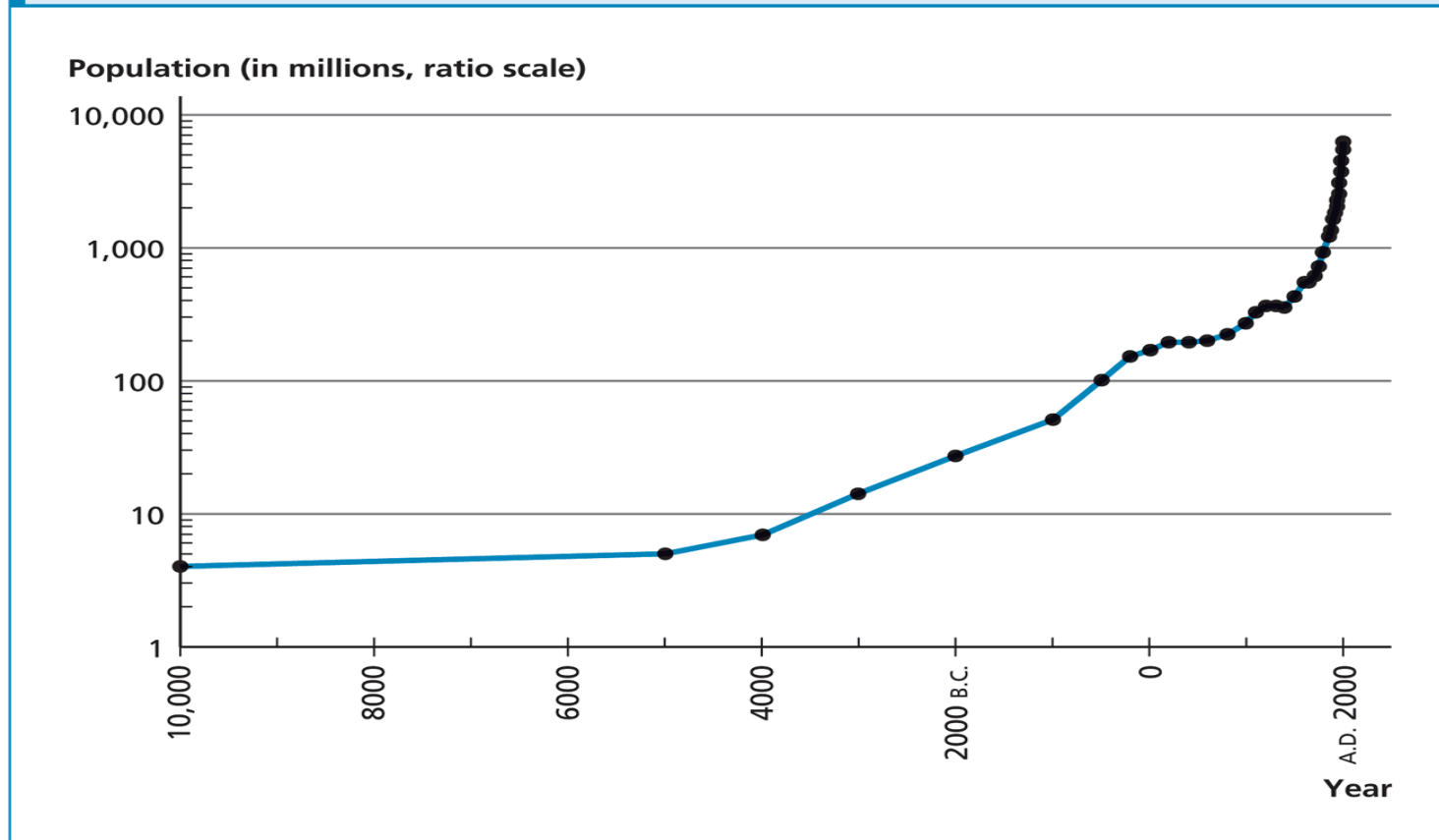
Source: Kremer (1993).

Population through human history

- During most of human history, world population was much smaller than today's.
- Population growth was also much smaller:
  - 0,04%/y: 10 000 BC to 1st. c. AD
  - 0,09%/y: 0 to 1800
  - 0,6%/y: 19th c.
  - 0,9%/y: early 20th c.
  - 1,8%/y: end of 20th c.

Facts to Explain Conclusions

Diversity of growth experiences.

- Parallel
- Catch-up
- Leapfrogging
- lagging behind
- Decline

Facts to Explain
Conclusions

Throughout human history, sustained growth is a recent phenomenon.

- Before and after 19th c.
- Large inequalities <u>between countries</u> is a recent phenomenon.

Facts to Explain Conclusions

Force of compounding

- Long term is a positive story.
- Short-term fluctuations pale in comparison.
- Africa is now considered a tragedy because we <u>now</u> know it could do better.

Outlook

- Can we identify the determinants of growth?
- If so, can we do something about it or is it just a question of chance?

Appendix 1
Working with Growth rates

See frame pp. 10-11.

To review by yourself.

Know rule of 72 by heart.

Appendix 2

Purchasing Power Parity (PPP)

Problem with GDP comparisons: exchange rate fluctuations

- How can we deal with often large, year-to-year variations of relative currency values?

- Surely, Canadians are not 20% richer compared to a couple of years ago simply because of the Canadian dollar's appreciation w.r.t. the US dollar.

Problem with GDP comparisons: purchasing power

- At given exchange rate, a $ generally buys a lot more in Delhi than New York.
- This is because <u>relative</u> to non-traded goods and services, the prices of traded goods tend to be much larger in poor countries than in rich countries. (A TV buys you a lot more haircuts in Delhi than in New York City.)
- NB The prices of traded goods tend to be the same between countries if we use the market exchange rate: *Law of one price* or *No-arbitrage condition.*
- Using current exchange rate greatly *exaggerates* income differences between poor and rich countries.

Solution: Purchasing Power Parity (PPP)

- Use a common currency measure, e.g. $US of year 2000.
- Adjust GDP measure for local purchasing power.

PPP: A simple example

TABLE 1.2

Production and Prices in Richland and Poorland

Country	Production of Televisions per Capita	Production of Haircuts per Capita	Price of Televisions in Local Currency	Price of Haircuts in Local Currency	GDP per Capita in Local Currency
Richland	4	40	10	2	120
Poorland	1	10	10	1	20

PPP: A simple example

- Real GDP in Richland is 4X higher than in Poorland.

- The price of non-tradable is 10 haircuts to 1 TV in Poorland and 5 to 1 in Richland. Non-tradable is cheaper in Poorland.

- According to the *Law of one price*, the market exchange rate should be 1$Poorland=1$ Richland. TVs cost the same.

- At the market exchange rate, Richland is 6X richer than Poorland. Poorland's revenue is undervalued at the market exchange rate.

PPP: A simple example

- Solution: Create a standard consumption basket.
- Standard basket here: 1 TV + 10 haircuts.
- Local $ cost of basket:
    - Poorland: 20 $Poorland
    - Richland: 30 $Richland
- PPP adjusted exchange rate: Both baskets cost the same at 2 $Poorland/3 $Richland.
- GDP Poorland = 20 $Poorland*(3 $Richland/2 $Poorland)=30 $Richland.
- With the PPP adjusted exchange rate, income in Richland is 4X that of Poorland, as it should be.

PPP in real life

Country	GDP per Capita in 2009 Using Market Exchange Rates (dollars)	GDP per Capita in 2009 Using PPP Exchange Rates (dollars)
United States	41,099	41,099
Japan	36,651	30,008
Germany	36,702	32,488
Argentina	6,519	11,961
Mexico	7,257	11,629
India	1,041	3,239

To do this week

- ❑ See the course's website.

Figure 1.1. **Levels of GDP per capita by region, 1820-1992**

Legend:
- Western Offshoots
- Western Europe
- Southern Europe
- Eastern Europe
- Latin America
- Asia
- Africa