ME2708 Economic Growth

Lecture 1: Introduction

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Outline

Macroeconomics I

- **Macro- vs. Micro-** (Oxford Dictionary of Economics):
  - the macro aspects of economics, concerning the determination of aggregate quantities in the economy (markets, regions, nations, etc.)
  - the micro aspects of economics, concerning the decision-making of individuals (individuals, firms, etc.)
- Macroeconomics aims to understand the evolution of macro variables (GDP, investments, unemployment, interest rates, wages, prices, inflation, and so on) in the long-run as well as over the business cycle
- Several subfields in macro research

Macroeconomics II

Subfields of Macroeconomics:

- **Growth**
- Labor
- Trade
- International Macro
- Monetary Economics
- Public Finance
- ...

Macroeconomics III

Microfoundations:

- The *Lucas critique* (1976) addresses macroeconomic models that fail to recognize the optimizing behavior of economic agents and, as such, lead to inadequate policy advices
- Modern macroeconomic models get away from the Lucas critique through "*representative* agents" (e.g. consumer, households, firms, etc.)
- This means that aggregate relations are determined from optimizing behavior at the micro level

Macroeconomics IV

- The basic macroeconomic identity is given by

$$Y_t = C_t + I_t + G_t + NX_t \tag{1}$$

  - Y_t: Output
  - C_t: Consumption
  - I_t: Investment
  - G_t: Government spending
  - NX_t: Net exports, e.g. exports minus imports

- The additive structure of this identity assumes that the different elements are perfect substitutes

- To simplify analysis, we often abstract from the "state" and assume a closed economy. In this case the identity becomes:

$$Y_t = C_t + I_t \tag{2}$$

Figure: U.S. National Accounts, 2014

Line		2014	% of GDP
1	**Gross domestic product**	**17348.1**	**100**
2	**Personal consumption expenditures**	**11865.9**	**68**
3	Goods	3948.4	23
4	Durable goods	1280.2	7
5	Nondurable goods	2668.2	15
6	Services	7917.5	46
7	**Gross private domestic investment**	**2860**	**16**
8	Fixed investment	2782.9	16
9	Nonresidential	2233.7	13
10	Structures	507	3
11	Equipment	1036.7	6
12	Intellectual property products	690	4
13	Residential	549.2	3
14	Change in private inventories	77.1	0
15	**Net exports of goods and services**	**-530**	**-3**
16	Exports	2341.9	13
17	Goods	1618	9
18	Services	723.9	4
19	Imports	2871.9	17
20	Goods	2388.5	14
21	Services	483.4	3
22	**Government consumption expenditures and gross investment**	**3152.1**	**18**
23	Federal	1219.9	7
24	National defense	748.2	4
25	Nondefense	471.6	3
26	State and local	1932.3	11

"As long as a branch of science offers an abundance of problems, so long it is alive"

– David Hilbert, 1900

"Is there some action a government of India could take that would lead the Indian economy to grow like Indonesia's or Egypt's? If so, *what* exactly? If not, what is it about the 'nature of India' that makes it so? The consequences for human welfare involved in questions like these are simply staggering: once one starts to think about them, it is impossible to think about anything else"

– Robert Lucas Jr., 1988

Cross-country Income Differences I

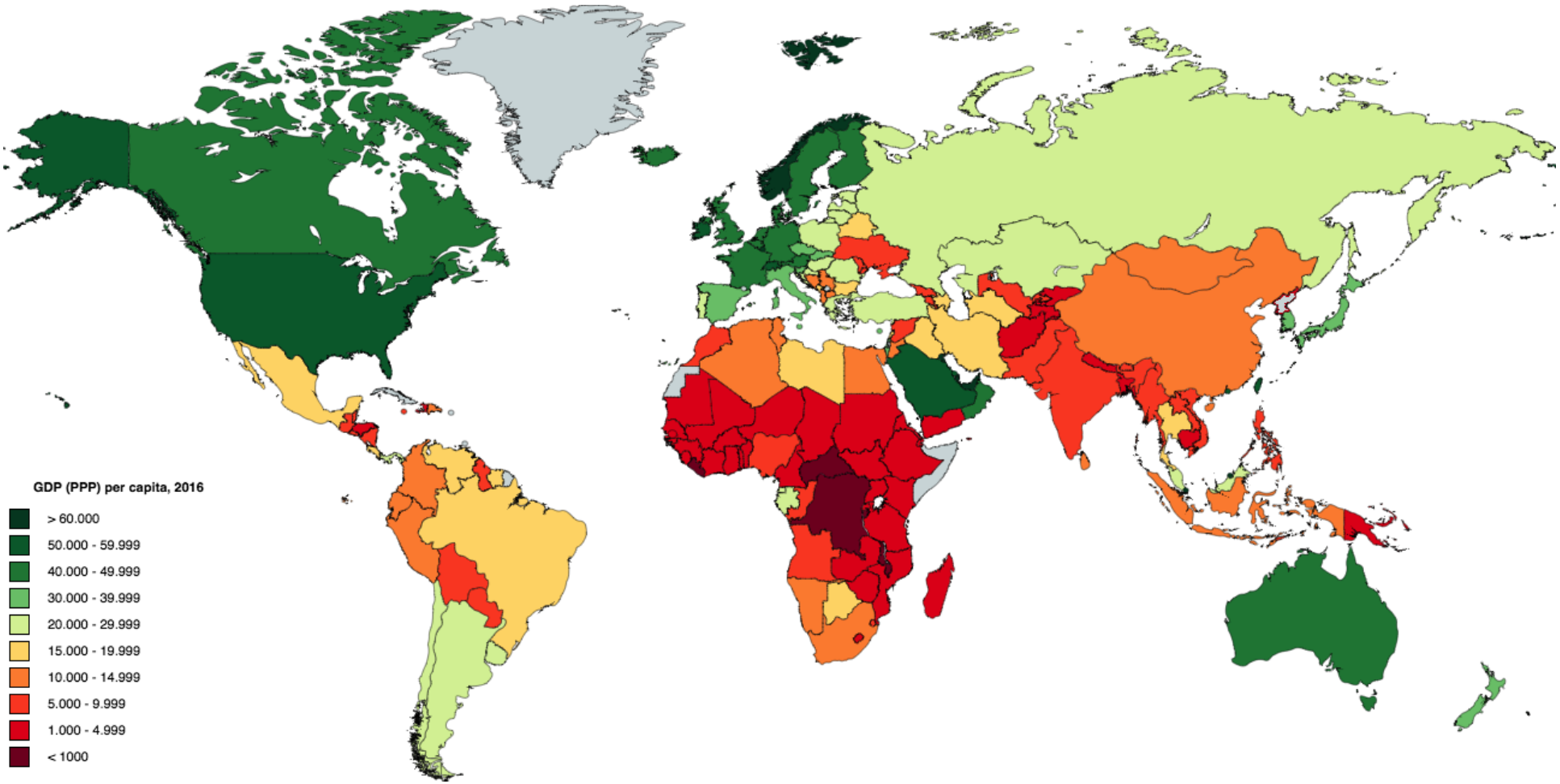


Figure: PPP-adjusted GDP per capita, 2016 US$

Cross-country Income Differences II

- Why GDP per capita? Also a measure of economic development; it (*highly*) correlates with measures of quality of life, e.g. life expectancy, infant mortality, etc.

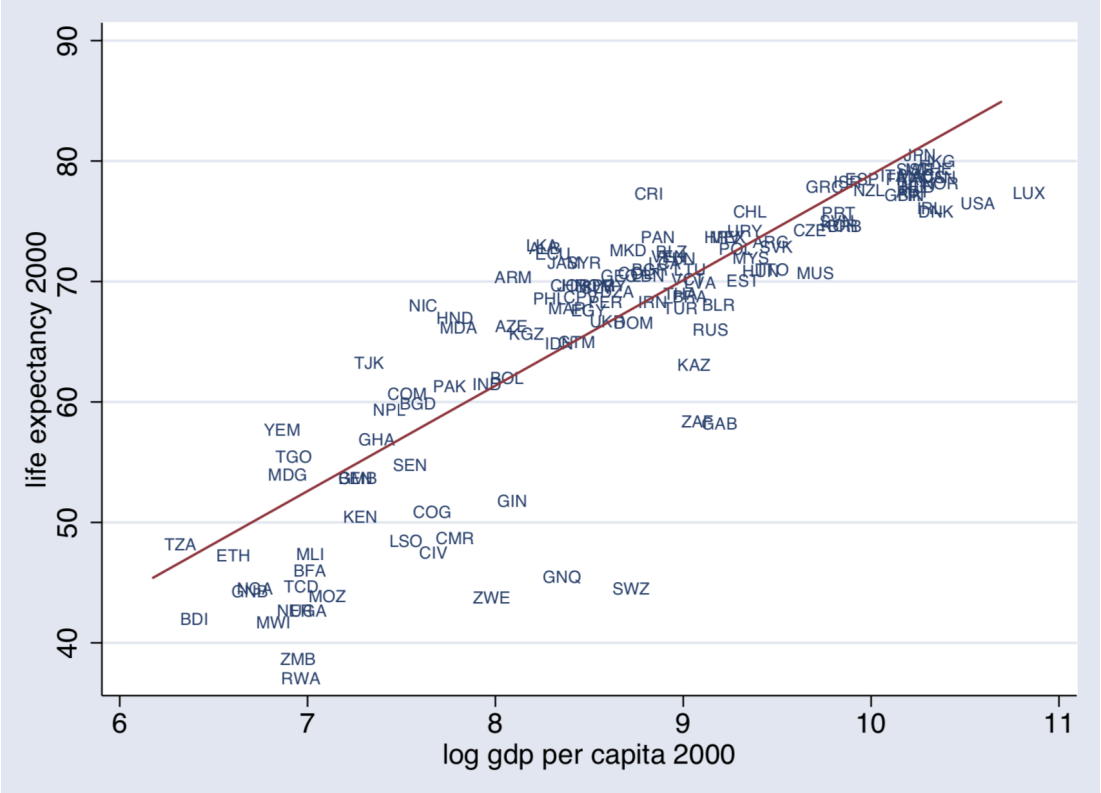


Figure: GDP per capita and life expectancy

Cross-country Income Differences III

- Is it better to adjust GDP per capita in terms of PPPs or market exchange rates (MERs)?
  - Exchange rates are extremely volatile
    - ⋆ USD/SEK= 9.1, April 2017 vs. USD/SEK= 7.9, September 2017
    - ⋆ EUR/GBP= 0.8, April 2017 vs. EUR/GBP= 0.93, August 2017
    - ⋆ EUR/USD= 1.40, May 2014 vs. EUR/USD= 1.05, March 2015
  - If we are to compare GDP per capita between US and SE in 2017, what is the 'right' exchange rate?
    - ⋆ Taking different exchange rates, same GDP in domestic currency: US is 16% richer than Sweden in Sept. than in Apr.
  - Most importantly, MERs balance the demand and supply for int. currencies whilst PPPs capture differences in the costs of a given bundle of goods and services in different countries

Cross-country Income Differences IV

- Large differences in income per capita across countries

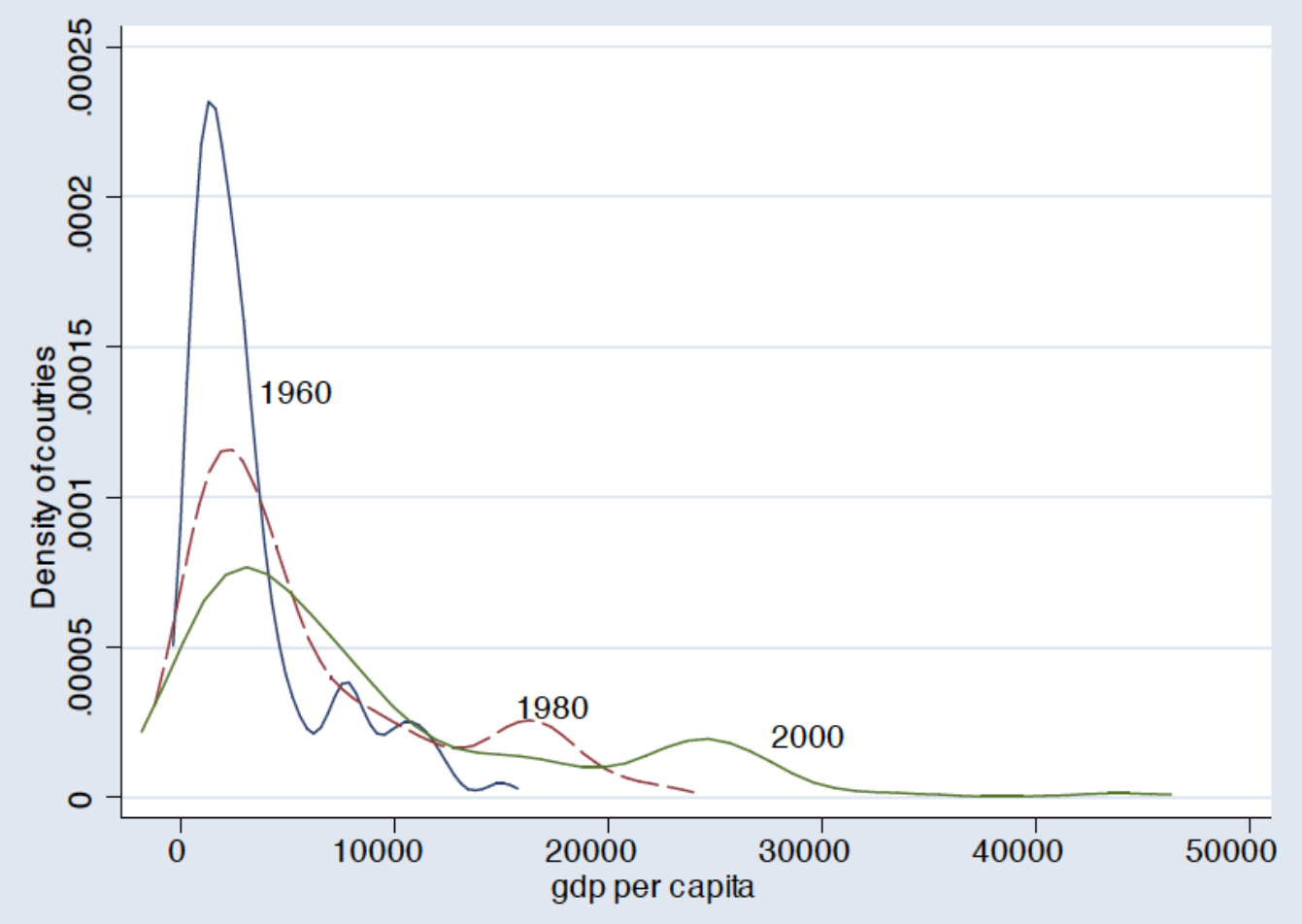


Figure: Distribution of PPP-adjusted GDP per capita

Cross-country Income Differences V

- The spreading out of the income distribution partly due to increases in average incomes
- More natural to look at the *log* of variables that grow over time such as income per capita:
  - when $x(t)$ grows at a proportional rate, $\log x(t)$ grows linearly
  - if $x_1(t)$ and $x_2(t)$ both grow by 10%, $x_1(t) - x_2(t)$ will also grow while $\log x_1(t) - \log x_2(t)$ will remain constant
- Next Figure shows a similar pattern but the spreading out is now more limited

Cross-country Income Differences VI

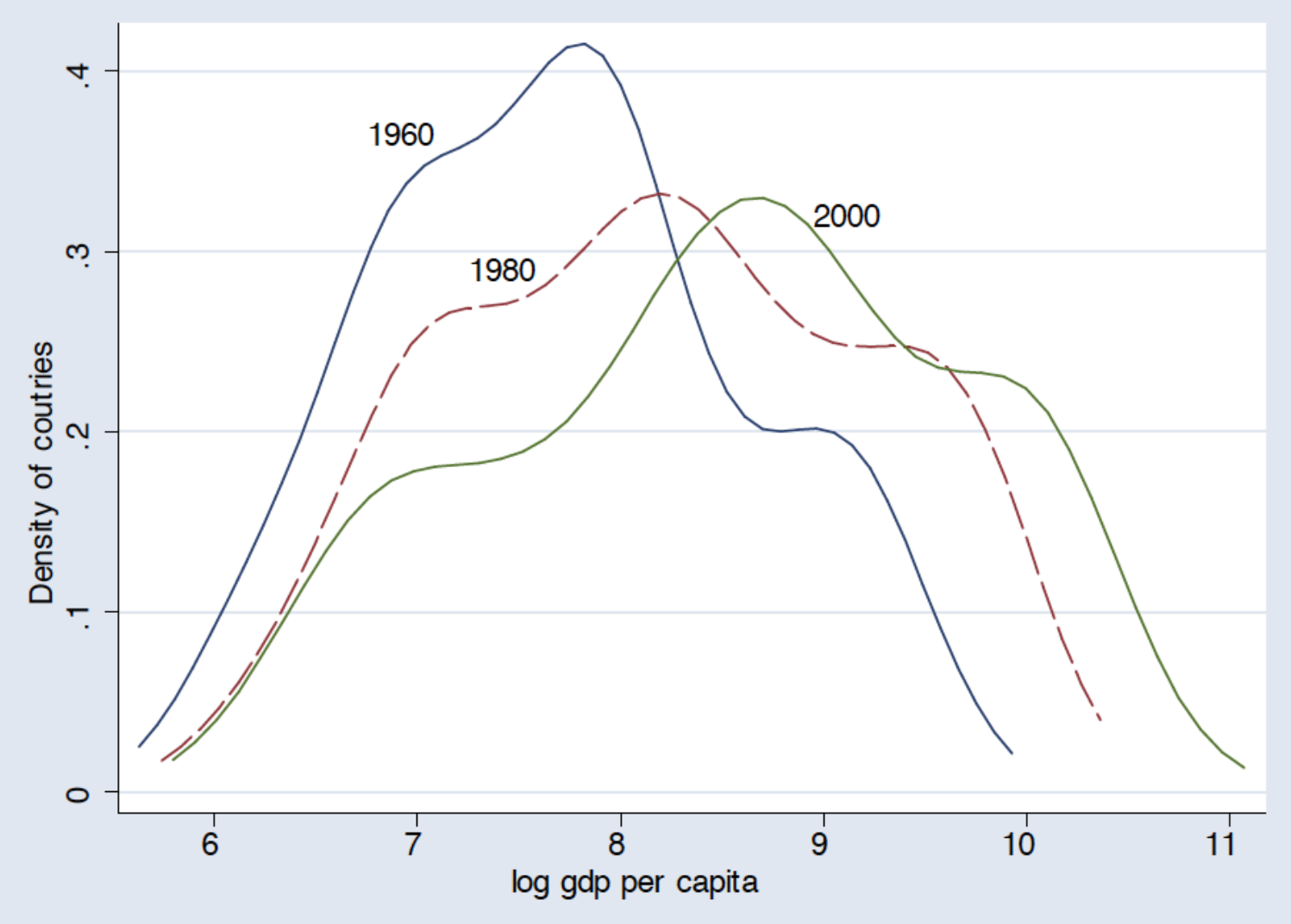


Figure: Distribution of log GDP per capita (PPP-adjusted)

Cross-country Income Differences VII

- Two important facts:
  1. Large income inequality across countries
  2. Slight but noticeable increase in income inequality across countries (not necessarily across individuals)
     - Stratification: increase in the density of relatively rich countries, while many countries still remain quite poor
- Similar results when looking at GDP per worker (active population within the labor force)
- Institutions as a key source in explaining differences economic performance across nations (*more later!*)
- What about inequality across individuals? Previous figures treat each country identically, not controlling for population size

Cross-country Income Differences VIII

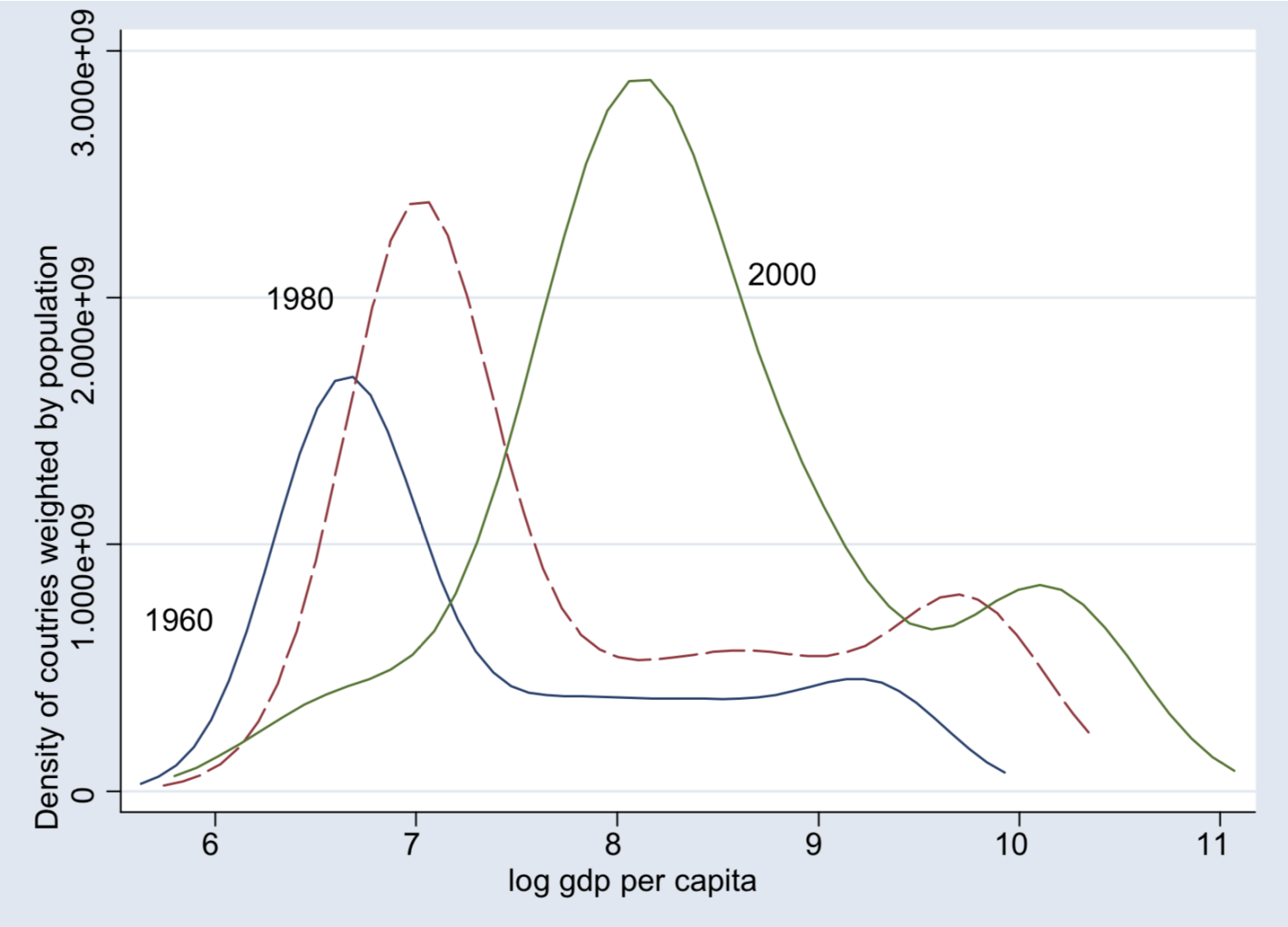


Figure: Population-weighted distribution of log GDP per capita (PPP-adjusted)

Cross-country Income Differences IX

- Countries like China (1,385m), India (1,297m), US (329m), Indonesia (263m) and Brazil (209m) receive great weights
- Very different picture: less spread-out distribution in 2000 than in 1960!
  - Mainly explained by China's and India's transition from poor- to middle- income economies
- Summarizing recent inequality trends:
  1. Slight but noticeable increase in income inequality across countries
  2. Equalization of income per capita among individuals
- The *Growth* literature focuses on productivity of countries, that's why in this course we will mainly look at GDP per worker (*as opposed to welfare measures*) and focus on the unweighted distribution of countries

Growth as a Modern Phenomenon I

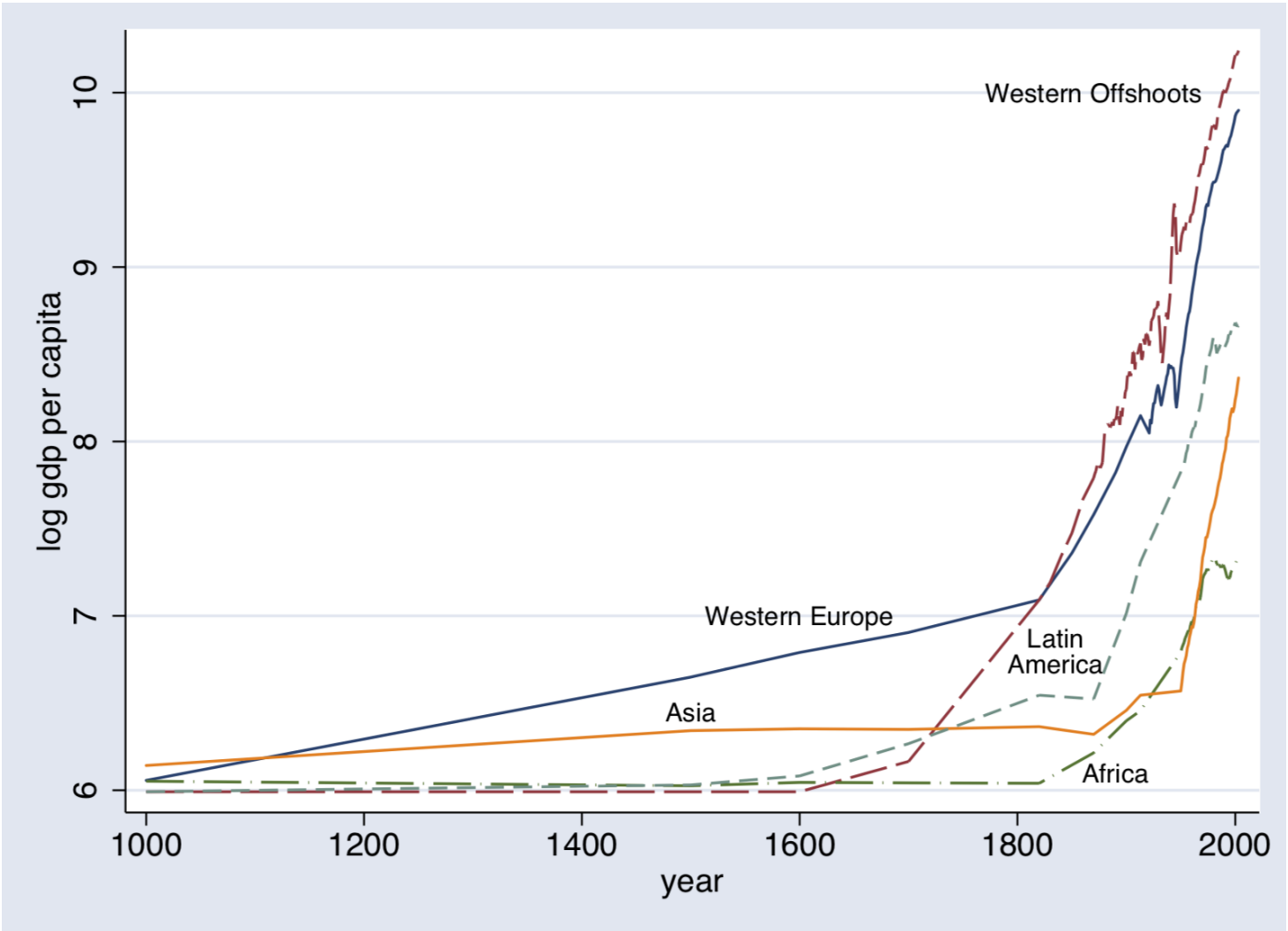


Figure: Growth throughout history

Growth as a Modern Phenomenon II

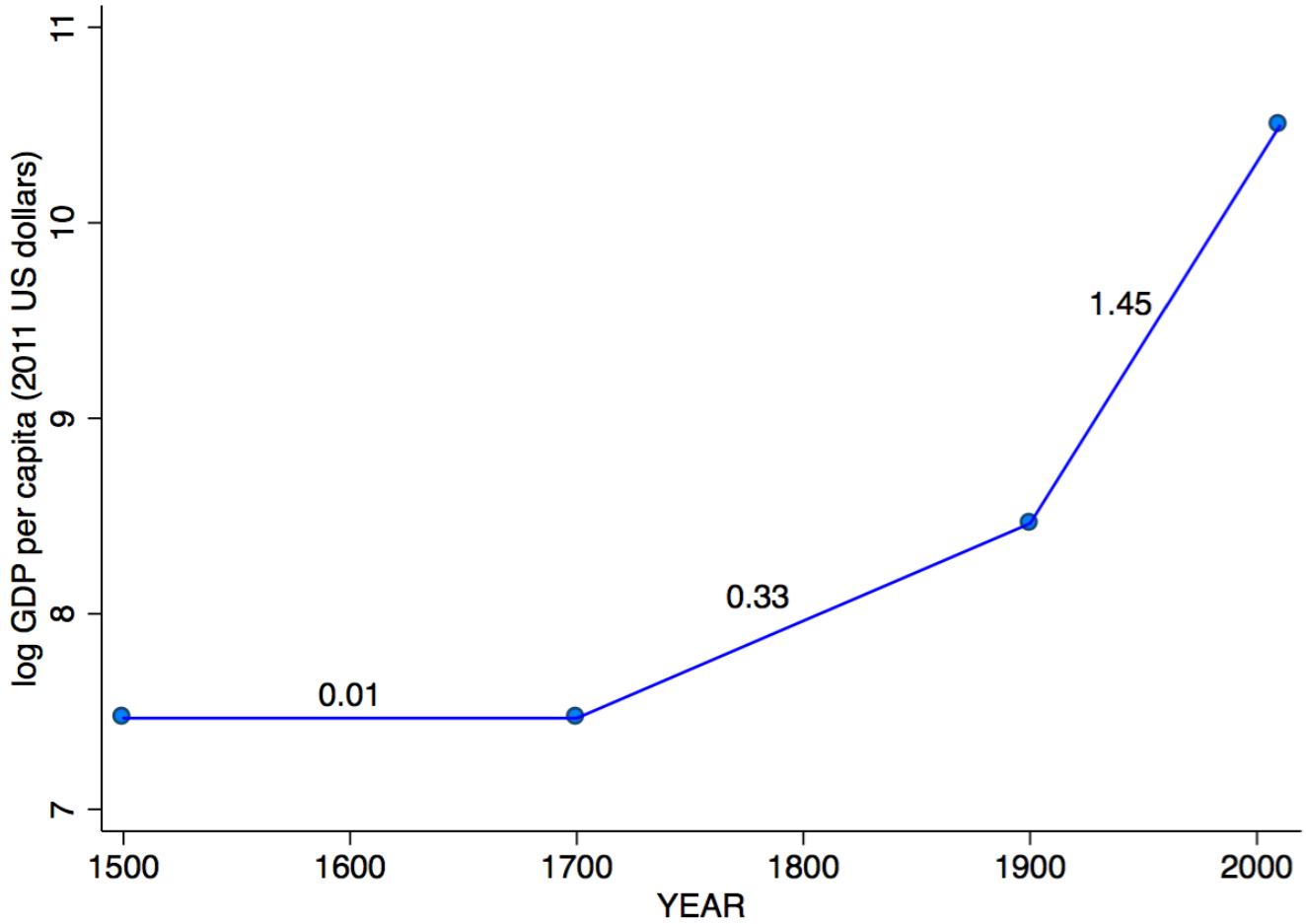


Figure: World GDP per capita growth, 1500-2016

Growth as a Modern Phenomenon III

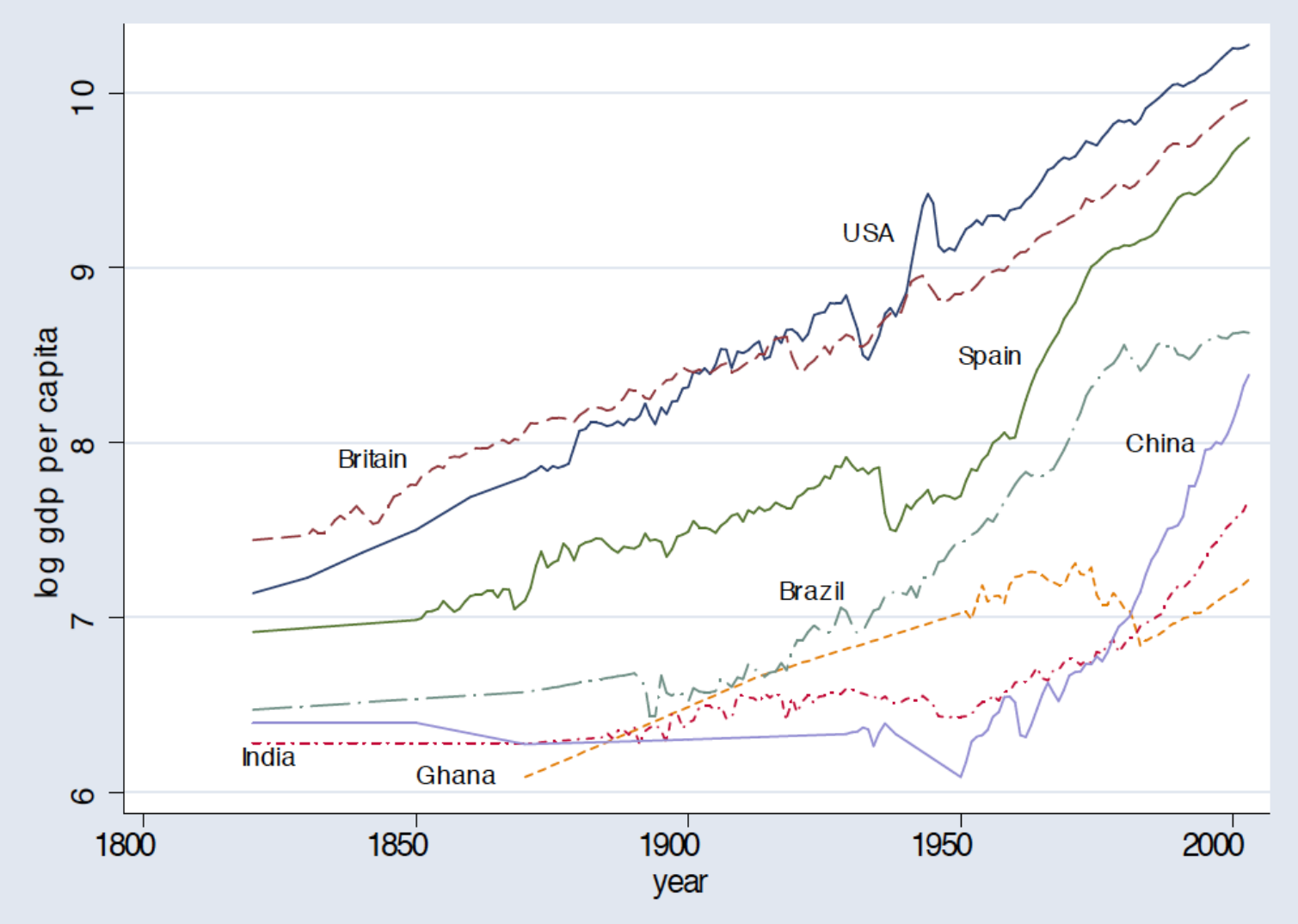


Figure: Growth in the last 200 years

Empirical Regularities I

1. Enormous variation in per capita income across economies
   - Norway: x140 richer than CAR; x7 times richer than the median!
   - Average individuals in the "median country" must work 1 month to earn what the average person in Norway earns in 4 days!!!!

Table: Friends' income and consumption

Country	Real GDP per capita (2016 US$)	Position
Central African Republic	589	Poorest
Burundi	665	2^{nd} poorest
...	...	...
Median	12,465	50% below
...	...	...
Mean	18,632	
...	...	...
Sweden	44,659	
...	...	...
United States	53,015	
...	...	...
Norway	82,814	2^{nd} richest
Qatar	156,299	Richest

Empirical Regularities II

2. Rates of economic growth vary substantially across countries
3. Growth rates are not generally constant over time

Corollary from facts (2) and (3)

A country's relative position in the world distribution of per capita income is not immutable. Countries can move from poor- to middle- to rich-economies, and vice versa. Reversal of Fortune?

Empirical Regularities III

- The Kaldor (1963)'s facts (long-run):
  4. Growth of per-capita output is constant over time
  5. Real interest rate is constant over time
  6. The capital-output ratio is constant over time
  7. The labor income share is constant over time
- A macroeconomic workhorse model should, according to Kaldor, be consistent with these facts

Constancy of per-capita growth I

- A linear fit suggests that the series is well approximated by annual growth rate of 2.15% (R-squared=0.99)

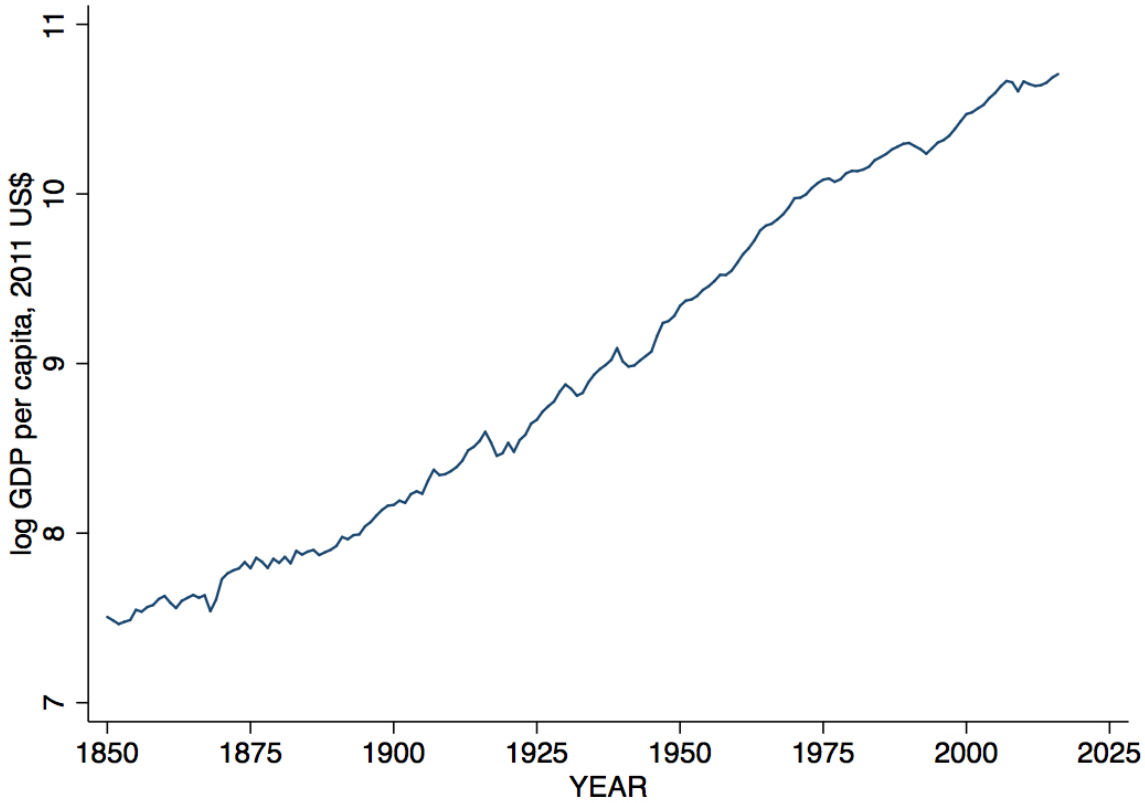


Figure: Sweden's GDP per capita growth, 1850-2016

Constancy of per-capita growth II

- A linear fit suggests that the series is well approximated by annual growth rate of 1.84% (R-squared=0.99)

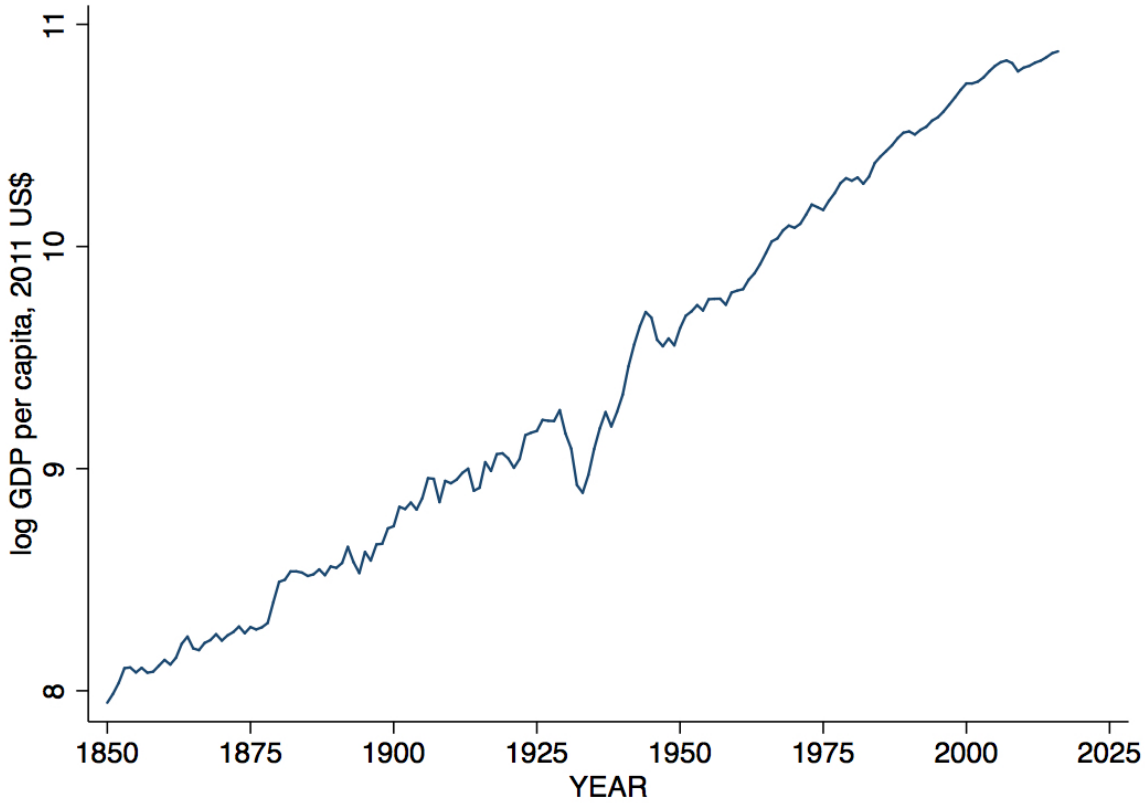


Figure: US's GDP per capita growth, 1850-2016

Constancy of real returns I

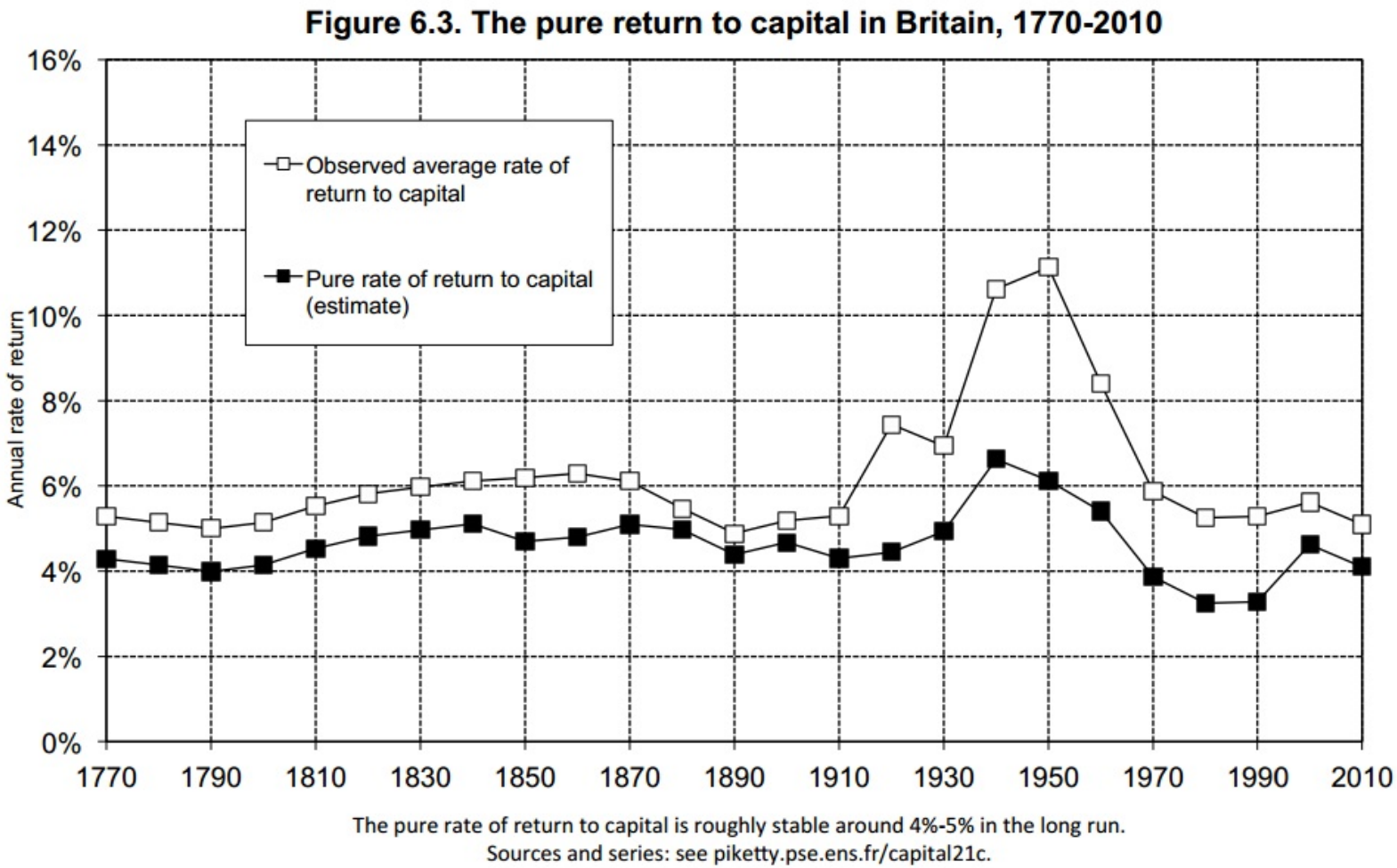


Figure: Britain's return to capital

Constancy of real returns II

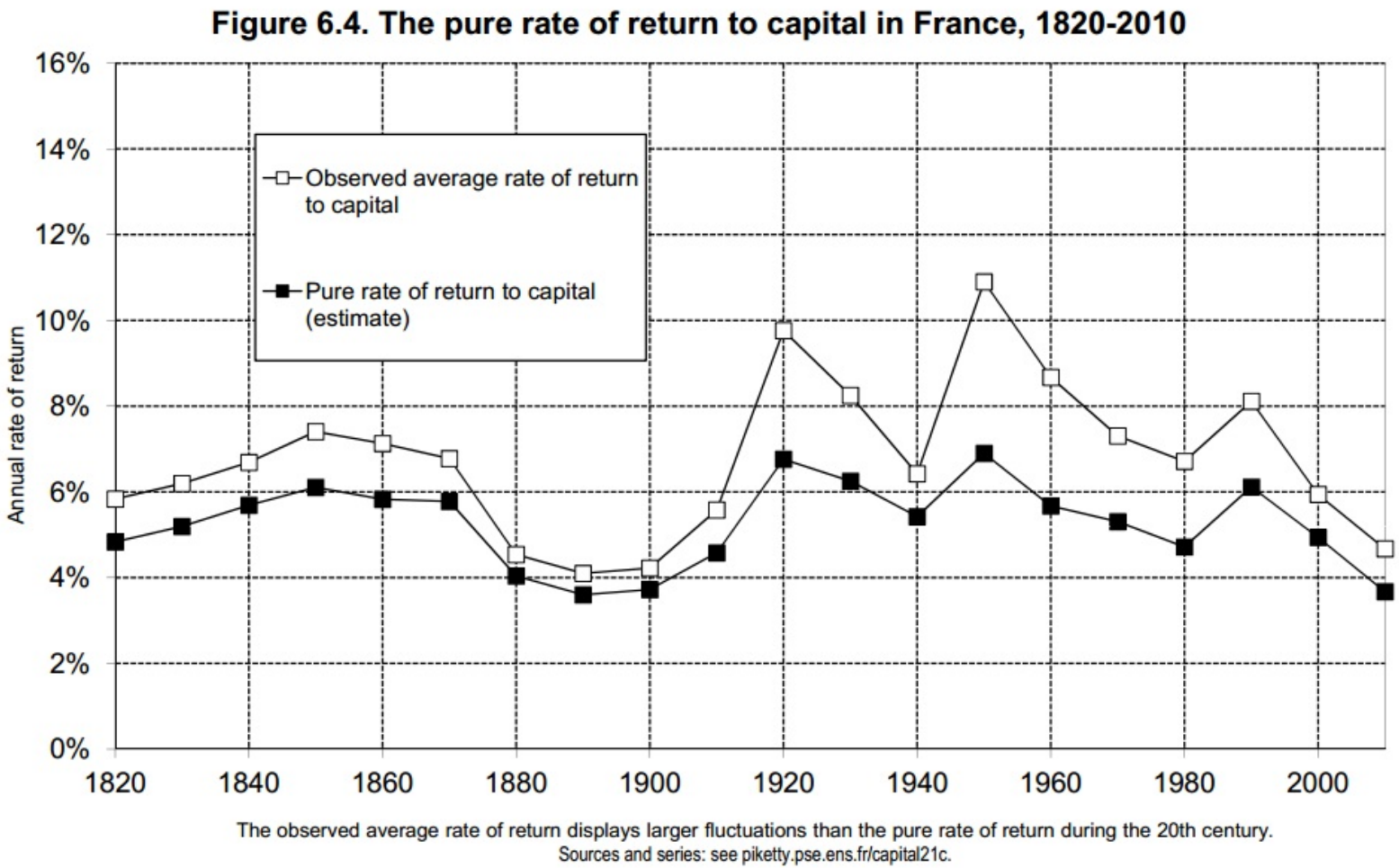


Figure: France's return to capital

Constancy of capital-output ratio

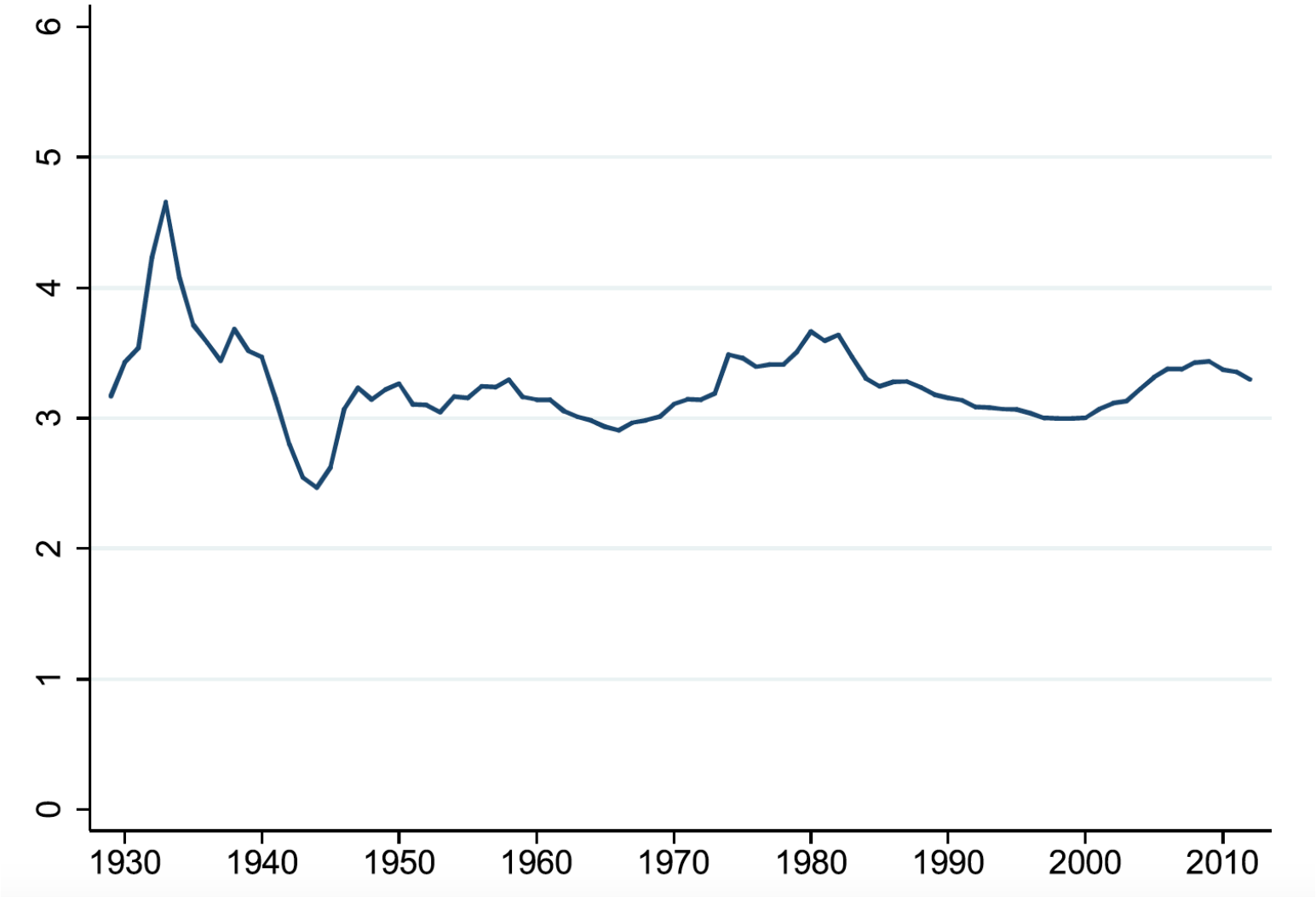


Figure: US capital-output ratio

Constancy of factor shares

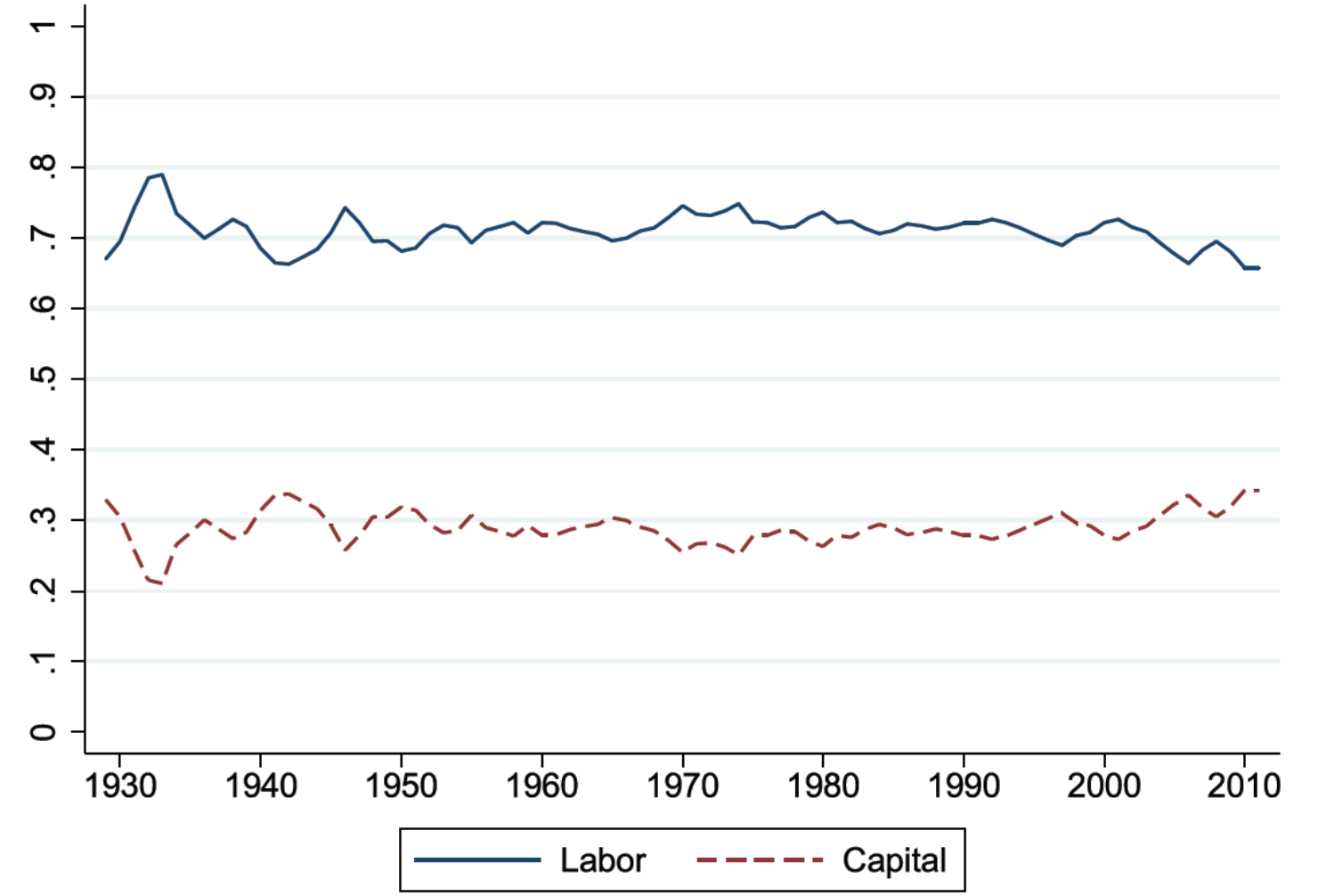


Figure: US factor shares

Sources of Prosperity I

- Vast differences in incomes per capita across countries. . . why?
- Standard answers (first part of the course):
  - ⋆ **Physical capital** (poor countries don't save enough)
  - ⋆ **HC** (poor countries do not invest enough in education and skills)
  - ⋆ **Technology** (poor countries do not invest enough in R&D, do not adopt new technologies, etc.)
- However, these factors (innovation, capital accumulation, education) are not causes of growth, *they are growth* (North and Thomas, 1973)
- Proximate vs. fundamental causes of growth

Sources of Prosperity II

Proximate vs. fundamental causes of growth:

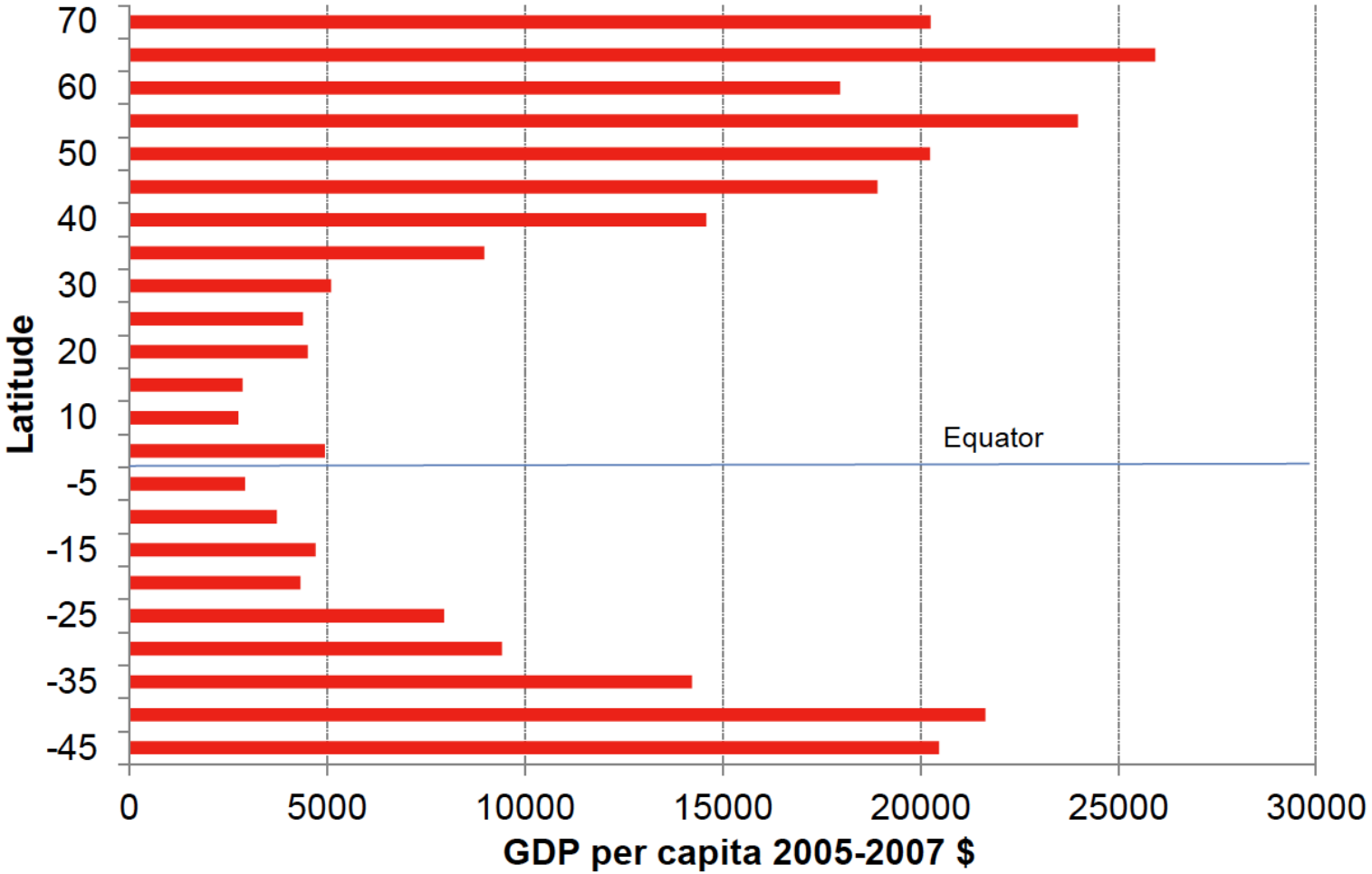
- If physical capital accumulation is so important, why did CAR or Burundi not invest in it?
- If education is so important, why did CAR or Burundi not invest in it?
- If technology is so important, why did CAR or Burundi not adopt or push for them?
- . . . SOMETHING IS MISSING! what could it be? Major candidates to fundamental causes of growth:
  1. **The luck hypothesis**
  2. **The geography hypothesis**
  3. **The culture hypothesis**
  4. **The institutions hypothesis**

Fundamental Causes of Growth I

1. **The luck hypothesis**: possible but highly unlikely!
   - ⋆ Multiple equilibria, e.g. in tech adoption
   - ⋆ Multiple steady states and path dependence
2. **The geography hypothesis** emphasizes the role of nature
   1. Climate determines work effort and incentives to produce (Montesqieu, 1748; Marhsall, 1890)
   2. Ecology and technology: soil quality, natural resources, topography, technology in temperate- vs. tropical- climates (Myrdal, 1968; Sachs, 2001)
   3. Disease burden: tropics more sensible to diseases, e.g. malaria, AIDS (Sachs, 2000)

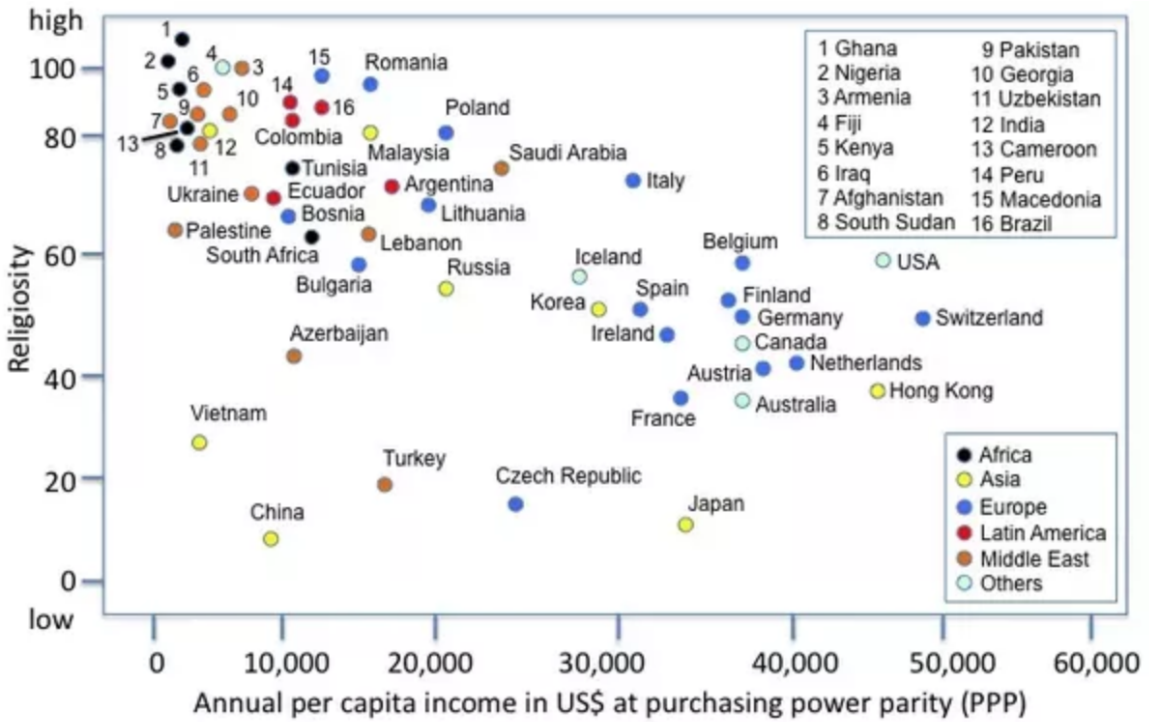
Fundamental Causes of Growth II

Geography: The Importance of Climate



Fundamental Causes of Growth III

3. **The culture hypothesis**: beliefs, values, religions affect economic outcomes
   - willingness to engage in productive activity vs. leisure
   - degree of cooperation and trust
   - Protestantism vs. Catholicism (Weber, 1930; 1958)
   - Southern- vs. Northern- Italy (Banfield, 1958)



Fundamental Causes of Growth IV

4. **The institutions hypothesis**: institutions shape economic incentives to invest in technology, physical capital, HC, etc.
   - Knack and Keffer (1995), Hall and Jones (1999), Acemoglu, Johnson and Robinson (2001, 2002)
   - Connection between institutions, geography and culture
   - Institutions are *endogenous*: man-made factors, i.e. societies' own choices
   - Institutions set constraints (formal- and informal-) on individual behavior:
     - ⋆ PRs, infrastructure, limiting firms' power, political rights, corruption, social insurance, stabilization,

     Natural experiments: South- vs. North- Korea, East- vs. West-Germany, colonial experiments and the reversal of fortune...

Fundamental Causes of Growth V

The Institutions Hypothesis: Korea

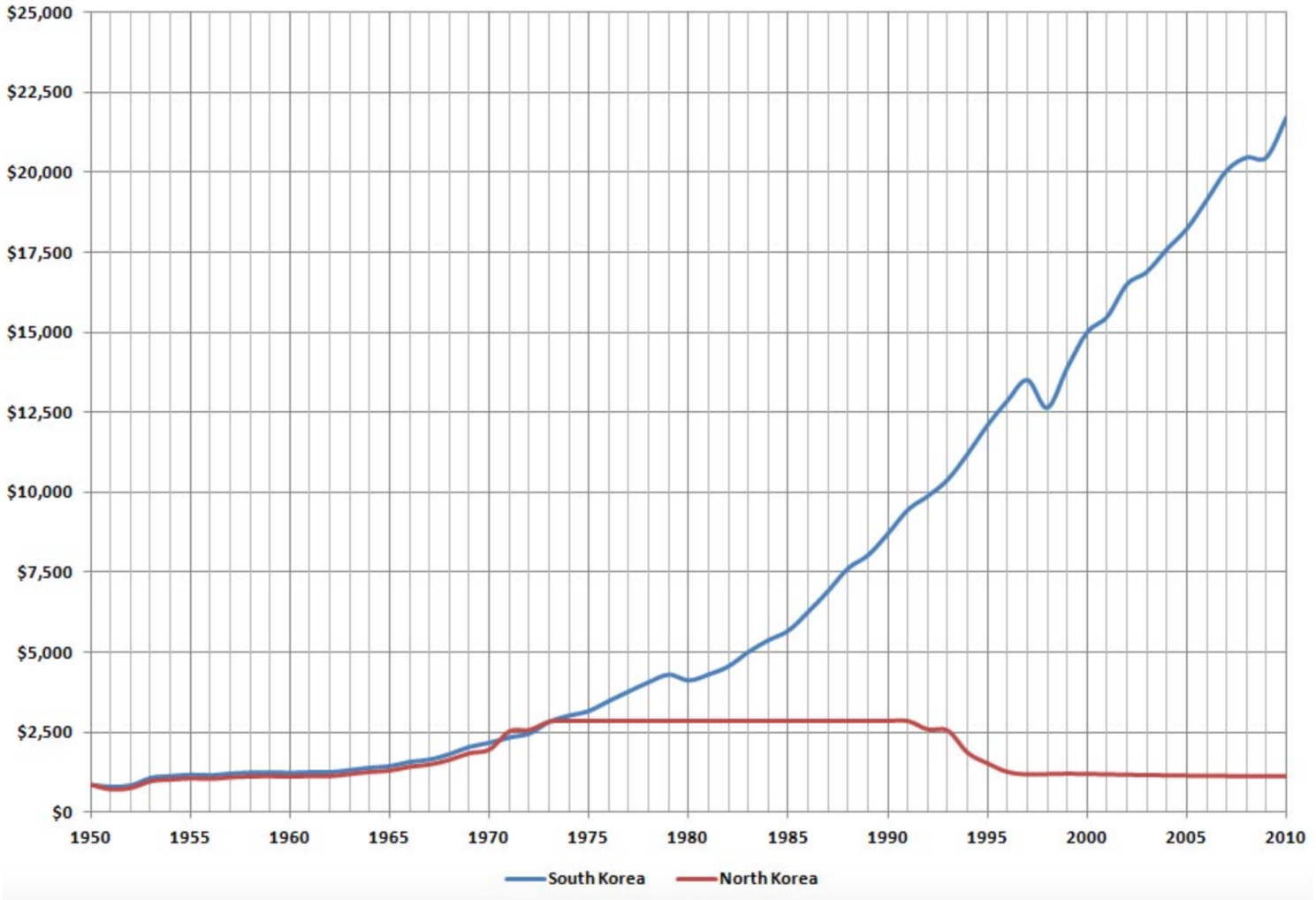


Figure: Economic performance in Korea, 1950-2010

Aims of this course

- Introduce several workhorse models of economic growth, both exogenous and endogenous
- Two objectives:
  - Build practice and skills in the analysis of growth
  - Obtain intuition and insights about the sources and causes of differences in long-run economic growth across countries
- In this course we will focus on the **proximate** causes of economic growth (*physical capital, human capital and technology*) but the student is advised to bear in mind that **fundamental** causes (*arguably, institutional differences*) ultimately explain the vast and systematic variations in income per capita that we witness in the data

Further reading!

1. Jones (2013). Introduction to Economic Growth (*Chapter 1*). Norton & Company, Inc.

2. Acemoglu (2009). Introduction to Modern Economic Growth (*Chapter 1*). Princeton University Press

3. Quah (1997). Empirics for growth and distribution: Stratification, polarization, and convergence clubs. *CEPR Discussion Paper No. 324*

4. Jones (1997). On the Evolution of the World Income Distribution. *Draft for the Journal of Economic Perspectives*

Thank you for your attention!