Economic Growth

Lecture 1: Introduction

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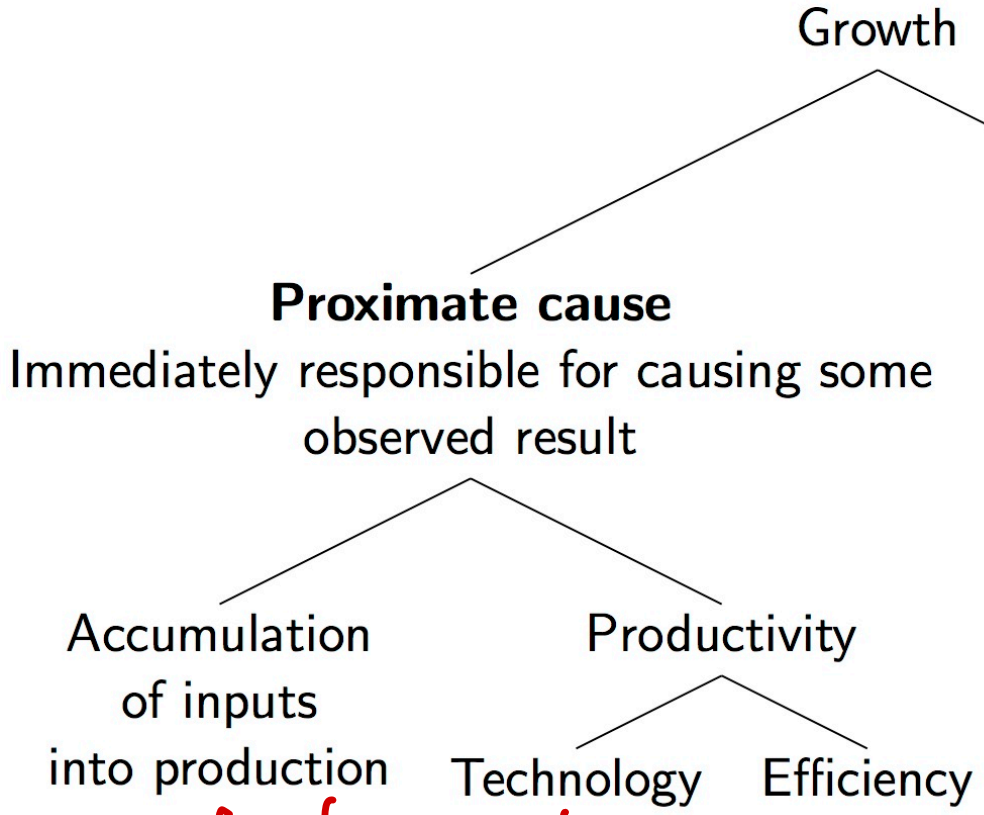
Questions

- Why do countries differ in their standards of living?
- Why do countries grow richer or fail to grow richer over time?
- What are the roles of physical capital, population, human capital, ideas, basic science, and public policy for growth?

Topics

- Facts and modern theories of economic growth
- The role of productivity on growth
- The relationship between government policies, income inequality and economic growth

Overview of the module



- physical capital
- human capital
- labor / population

- openness to trade
- gov. policies
- inequality
- climate change

Gross Domestic Product (GDP)

GDP: Market value of all the goods and services produced in a country within a period.

- GDP = domestic output = domestic income
- GDP is a rough-and-ready measure of standard of living.
- How to compare GDP of countries with different currencies and of a single country in different years?
    - Purchasing Power Parity (PPP) exchange rates: artificial exchange rates based on the prices of a standardized basket of goods and services (both traded and non-traded).

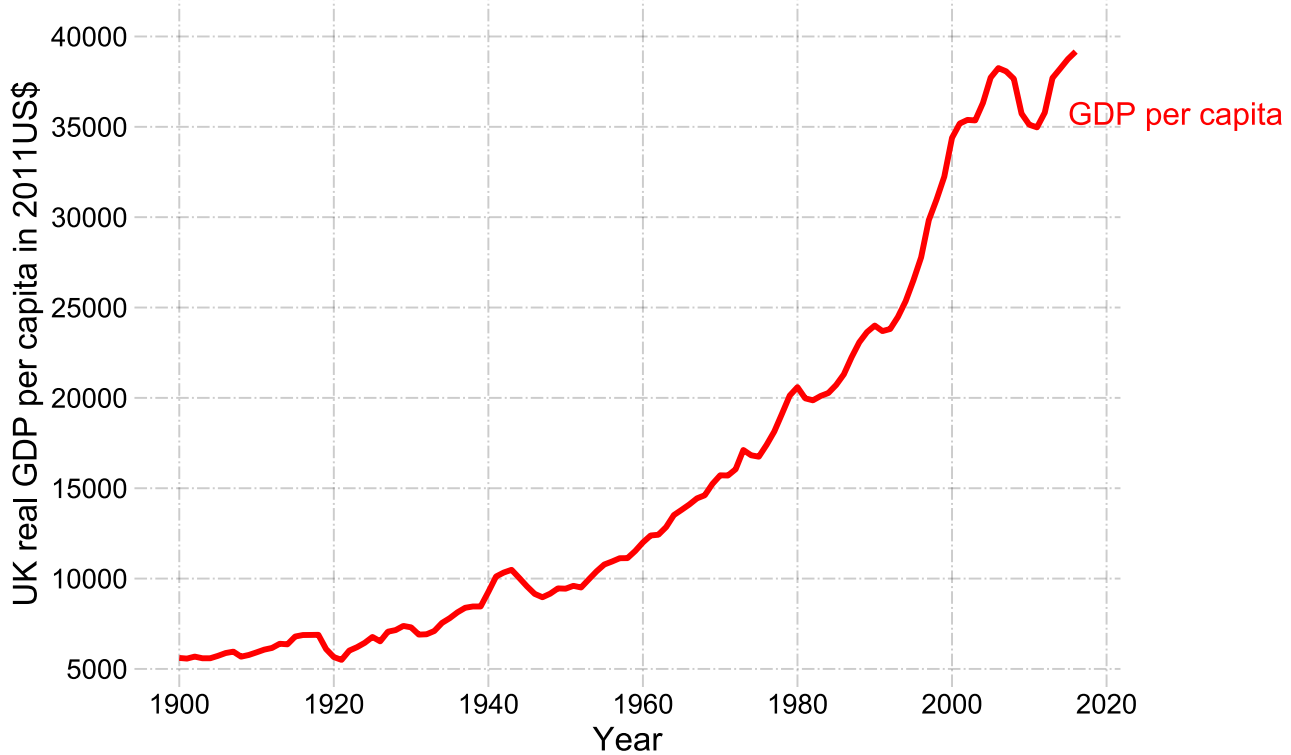
GDP per capita

GDP per capita = average income

$$y_t = \frac{\text{total GDP}}{\text{population}}$$

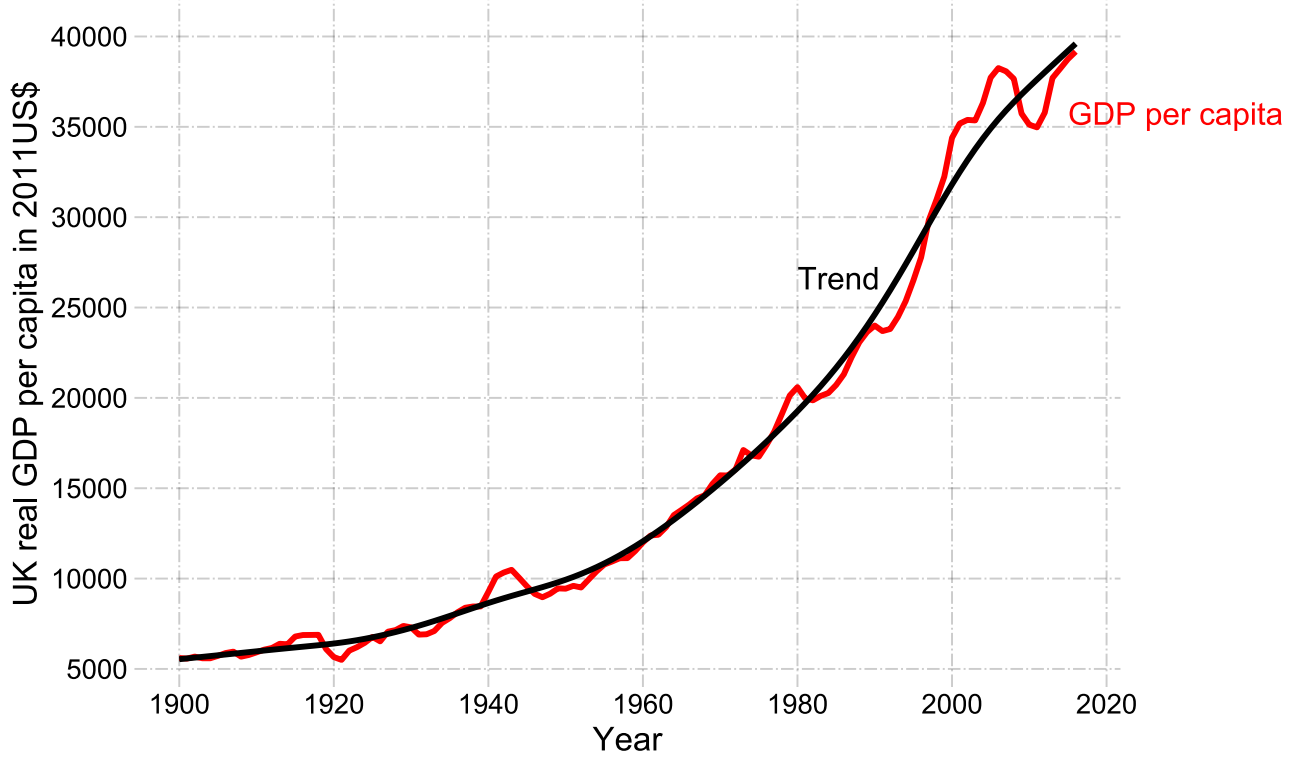
- Total GDP could be large because of high average income and/or large population
- US has high GDP per capita but China and India do not

Cycles vs trends



Source: Maddison Project Database (MPD) 2018

Cycles vs trends



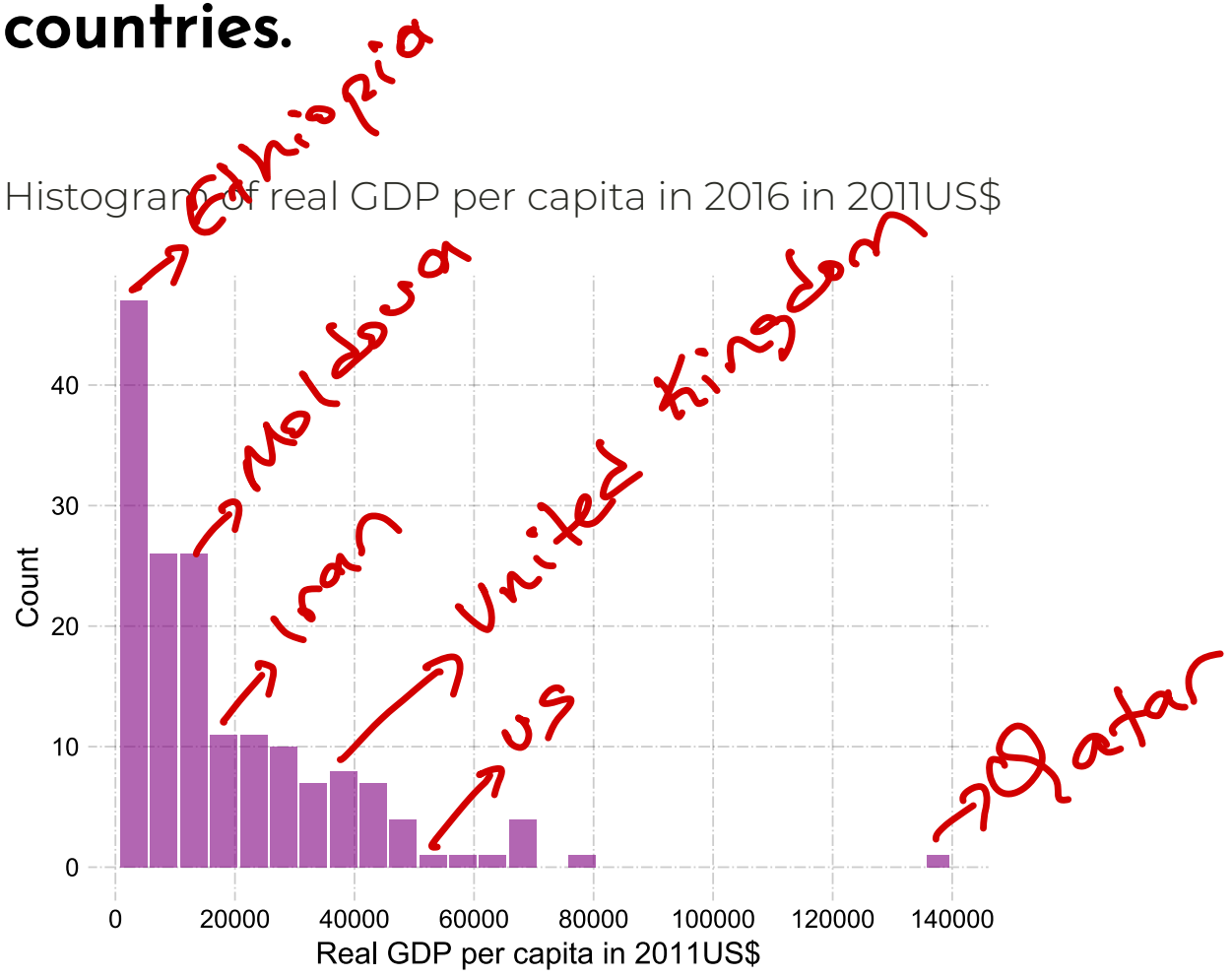
Source: Maddison Project Database (MPD) 2018

- Our primary focus is the long-run (or trend) component of GDP per capita over time.

Statistics on growth and development

Fact 1: There is a high variation in per capita income across countries.

Histogram of real GDP per capita in 2016 in 2011US$



Source: Maddison Project Database (MPD) 2018

Statistic	GDP per capita
# of Countries	166
Mean	18591.7
Std. deviation	19393.2
Minimum	619
25%	3892.25
50%	12134.5
75%	26450.5
Max	139783

Fact 1

- Per capita income in the poorest countries are less than 5% of per capita income in the richest countries.
- GDP per capita in 2016 (in 2011 US dollars)

$$\frac{\text{US (\$53015)}}{\text{Iran (\$15529)}} \approx \frac{\text{Iran (\$15529)}}{\text{Moldova (\$5851)}} \approx \frac{\text{Moldova (\$5851)}}{\text{Ethiopia (\$1659)}} \approx 3$$

- The 20% of world population that lives in the richest countries receive 60% of world income.

High-income countries

Country	Year	GDP per capita	GDP per worker	E/pop	Avg. Growth (1960-2016)	Years to double
Spain	2016	31556	79356.5	39.8	2.9	24.9
France	2016	38758	93949.6	41.3	2	36.2
United Kingdom	2016	39162	81439.1	48.1	1.8	39.7
Japan	2016	36452	68097	53.5	3.2	22.6
United States	2016	53015	112765	47	1.9	37.4

Data source: Maddison Project Database (2018)

The GDP data are in 2011 dollars.

Rule of 72:

- x% economic growth rate
- It takes 72/x years to double the income

Low-income countries

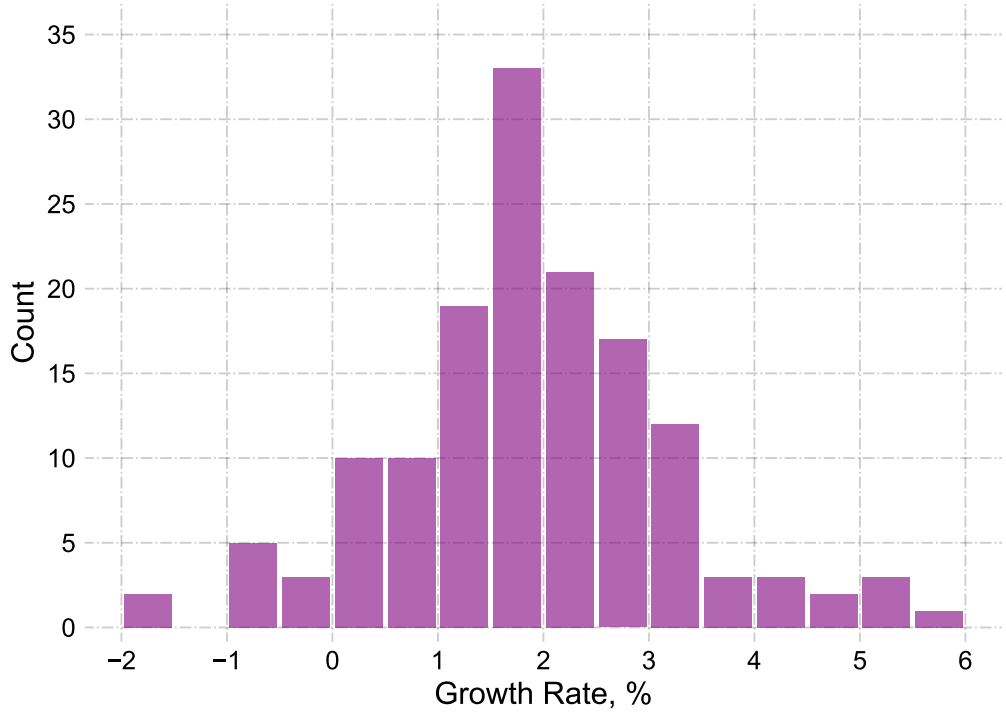
Country	Year	GDP per capita	GDP per worker	E/pop	Avg. Growth (1960-2016)	Years to double
India	2016	5961	14248.7	41.8	3.2	22.3
Nigeria	2016	5323	15641.8	34	1.6	43.8
Uganda	2016	1909	5036	37.9	1	69.3

Data source: Maddison Project Database (2018)

The GDP data are in 2011 dollars.

Fact 2: There is substantial variation in the rates of economic growth across countries.

Histogram of average GDP per capita growth from 1960 to 2016



Statistic	Avg. Growth (1960-2016)
# of countries	144
Mean	1.9
Std. deviation	1.34
Minimum	-1.73
25%	1.12
50%	1.89
75%	2.66
Maximum	5.89

Source: Maddison Project Database (MPD) 2018

Growth Miracles

Country/Province	Year	GDP per capita	GDP per worker	E/pop	Avg. Growth (1960-2016)	Years to double
Hong Kong	2016	47043	89121	52.8	4.3	16.7
Republic of Korea	2016	36151	71246.1	50.7	5.5	13.2
Singapore	2016	67180	108866	61.7	4.8	14.9
Taiwan	2016	42304	84298.5	50.2	5.4	13.2

Data source: Maddison Project Database (2018)

The GDP data are in 2011 dollars.

Growth Disasters

Country	Year	GDP per capita	GDP per worker	E/pop	Avg. Growth (1960-2016)
Central African Republic	2016	619	1958	31.6	-1.7
Haiti	2016	1636	4066.2	40.2	-0.7
Madagascar	2016	1307	2528.6	51.7	-0.9
Venezuela (Bolivarian Republic of)	2016	13159	28878.4	45.6	0.2
Zimbabwe	2016	1729	2845.4	60.8	-0

Data source: Maddison Project Database (2018)

The GDP data are in 2011 dollars.

Fact 3: Growth rates are not usually constant over time

- The pace of growth worldwide has accelerated
  - 1500 - 1700: 0.04%
  - 1700 - 1970: 0.2%
  - 1870 - 1950: 1.1%
  - 1950 - 2008: 2.26%
- Changes in growth rates of invididual countries

Country	Period	Average growth rate
India	1960-1980	2%
India	1980-2008	3.7%
China	1960-1978	2.1%
China	1978-2008	7.7%

Source: Jones and Vollrath, 2013

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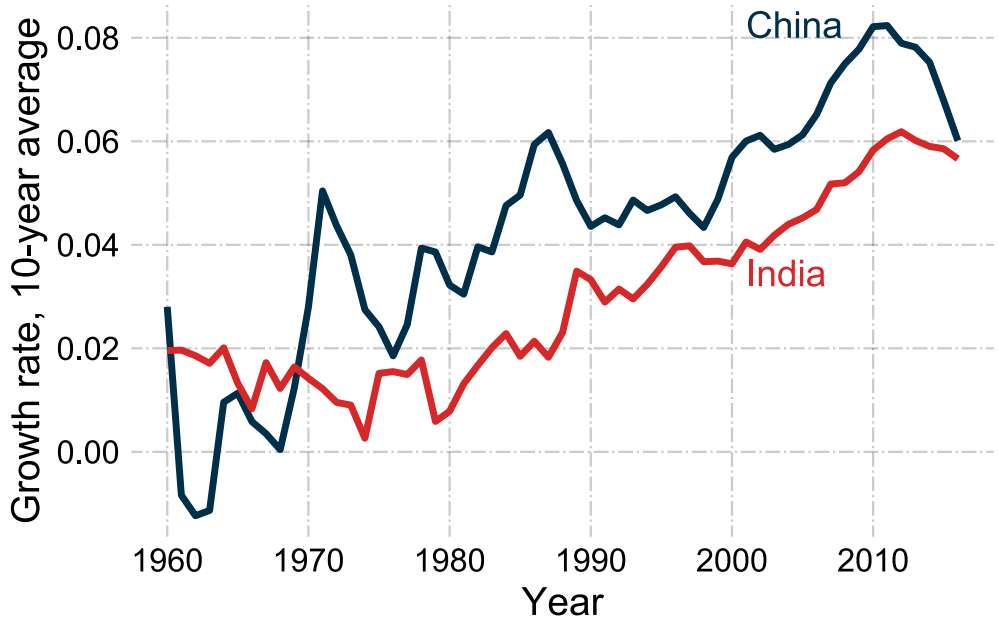
10-year moving average growth rates of China and India

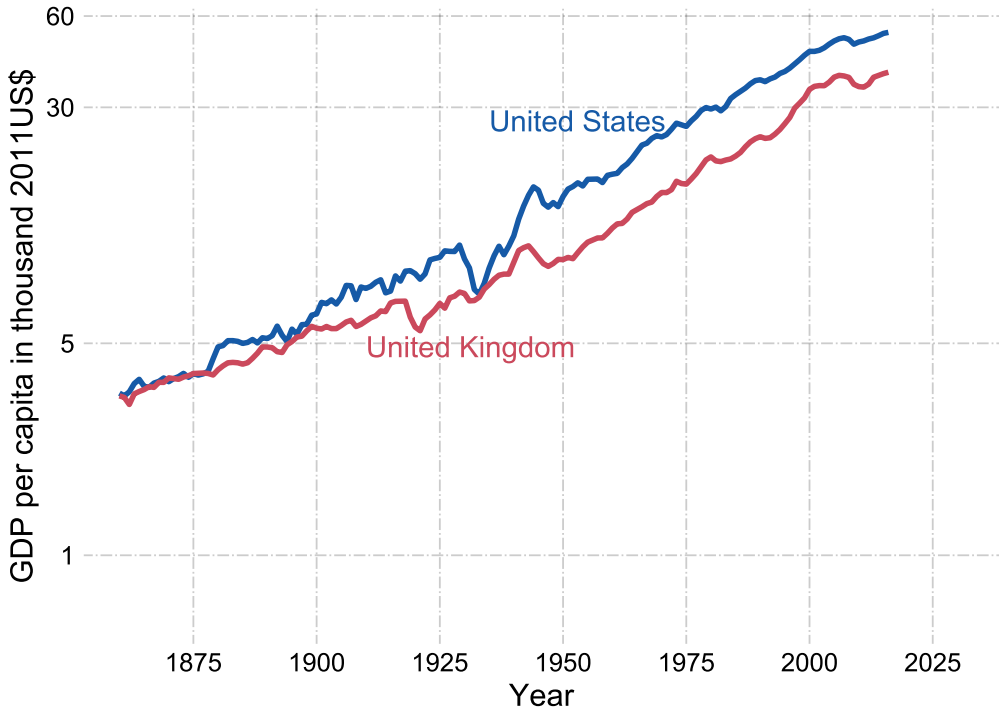


Source: Maddison Project Database (MPD) 2018

Fact 4: A country's relative position in the relative income rank may change over time

- "Low income" countries can move to be "low income"
- "High income" countries can move to be "high income"

GDP per capita over time

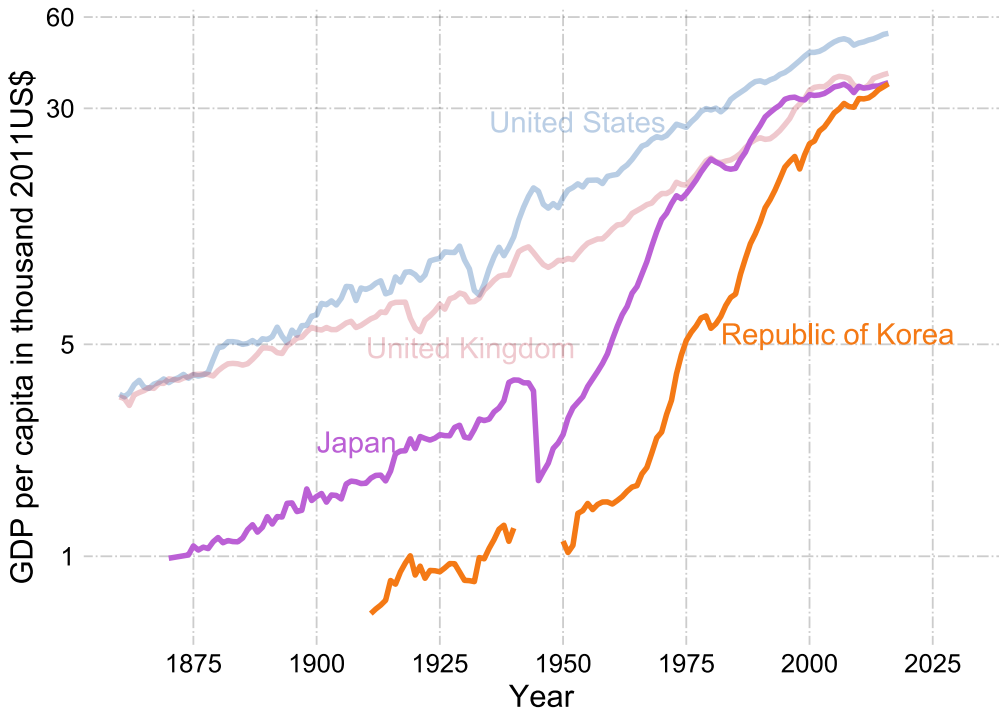


Source: Maddison Project Database (MPD) 2018

Importance of small difference in the rate of economic growth

- US GDP per capita in 2016 was 14 times as large as GDP capita in 1870
  - 1.8% average growth rate per year (US)
  - 1.3% average growth rate per year (UK)
- In 1870, UK was 3% richer than the US
- In 2016, UK was 26% poorer than the US

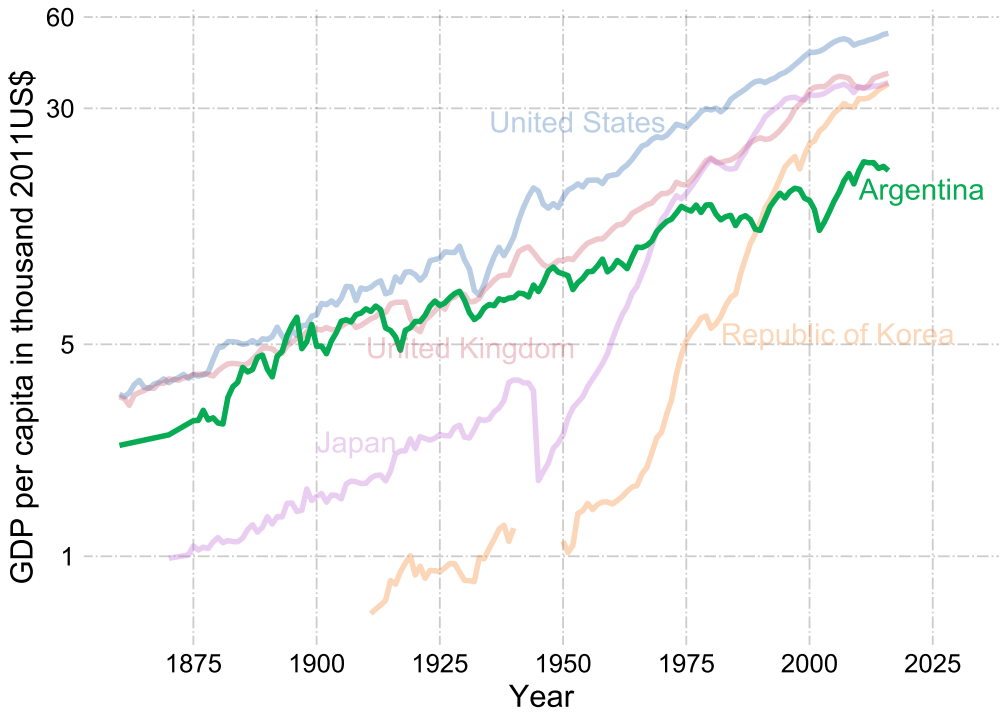
GDP per capita over time



Source: Maddison Project Database (MPD) 2018

- Japan and Korea are examples of countries which managed to reach high income levels

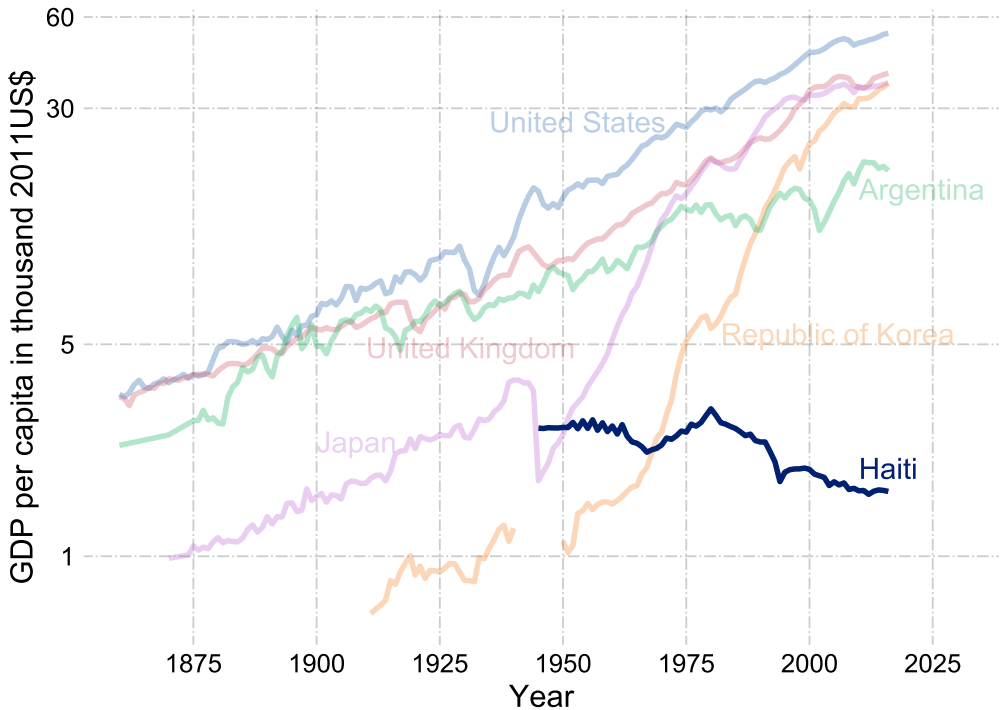
GDP per capita over time



Source: Maddison Project Database (MPD) 2018

- Argentina was as rich as the US and UK in late 19th century.
- GDP per capita of Argentina in 2016 is about 35% of the US.

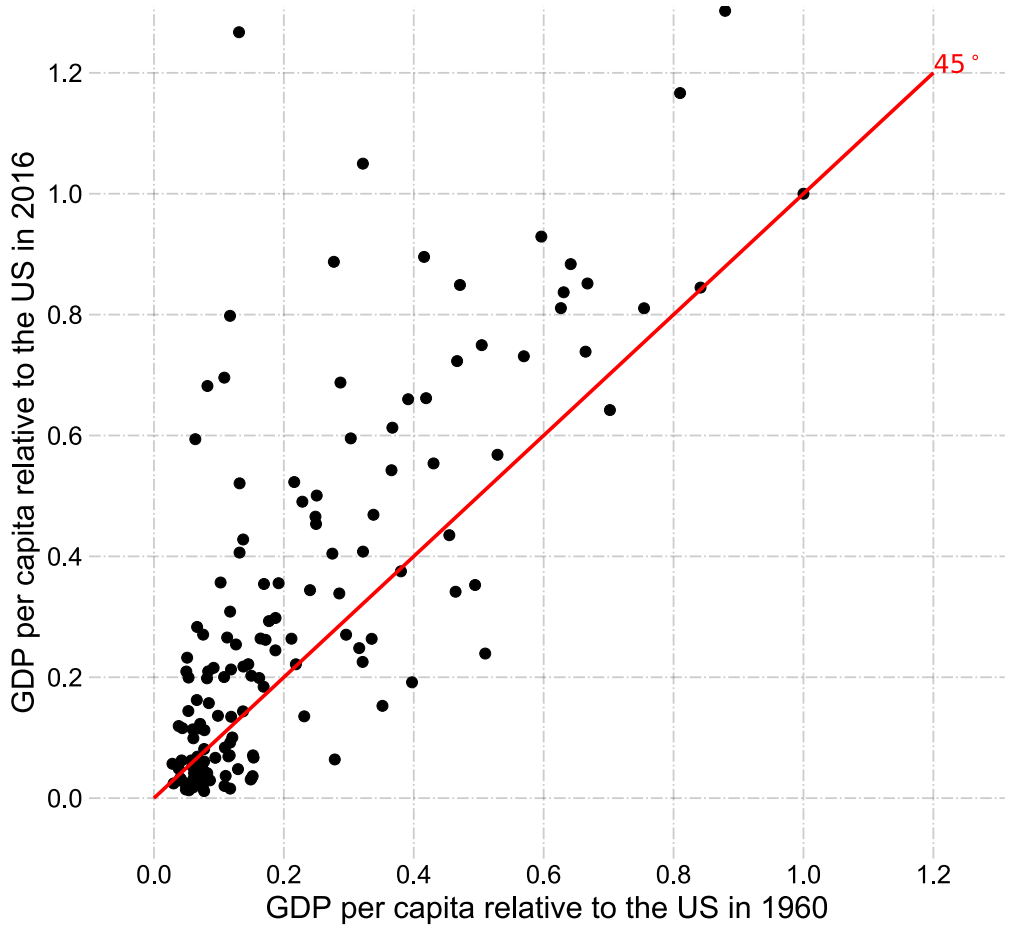
GDP per capita over time



Source: Maddison Project Database (MPD) 2018

- Haiti is an example of countries with negative average growth since mid-20th century.
- In 2016, Haiti's GDP per capita was about 3% of the US.

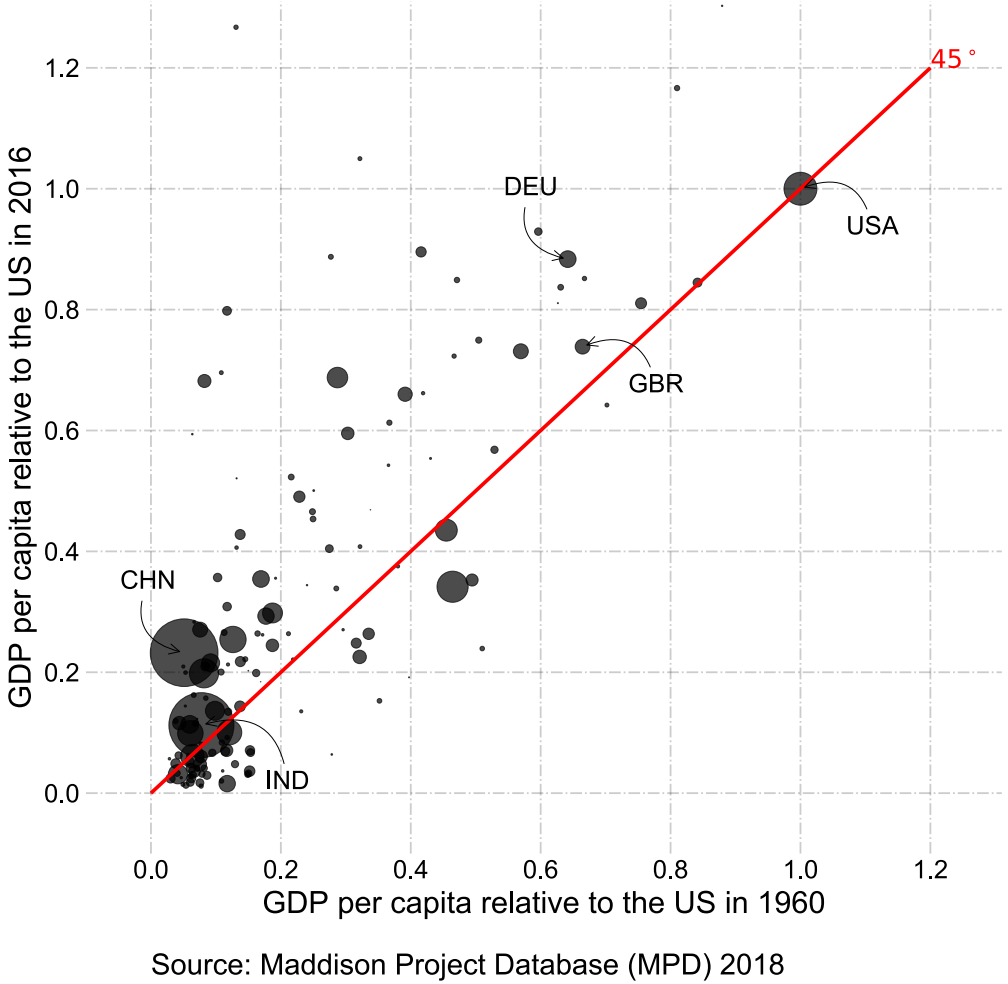
Persistence of income rankings



Source: Maddison Project Database (MPD) 2018

- Income rankings of the countries may change
  - Not all of them are on the 45-degree line
- Income rankings are highly persistent
  - Strong positive correlation of the 1960 and 2016 income levels

Persistence of income rankings



Source: Maddison Project Database (MPD) 2018

- Income rankings of the countries may change
  - Not all of them are on the 45-degree line
- Income rankings are highly persistent
  - Strong positive correlation of the 1960 and 2016 income levels
- Countries with larger populations are usally poorer than the US
  - Size of the circles is proportional to the population of the countries

Persistence

PC Session

Goals

1. Provide an introduction on Python so that you can read and understand my code/solutions of the problem sets
2. Incetivize you to learn a modern programming language

Materail to be covered

The following lectures from https://quantecon.org/

- Python essentials
- An introductory example:

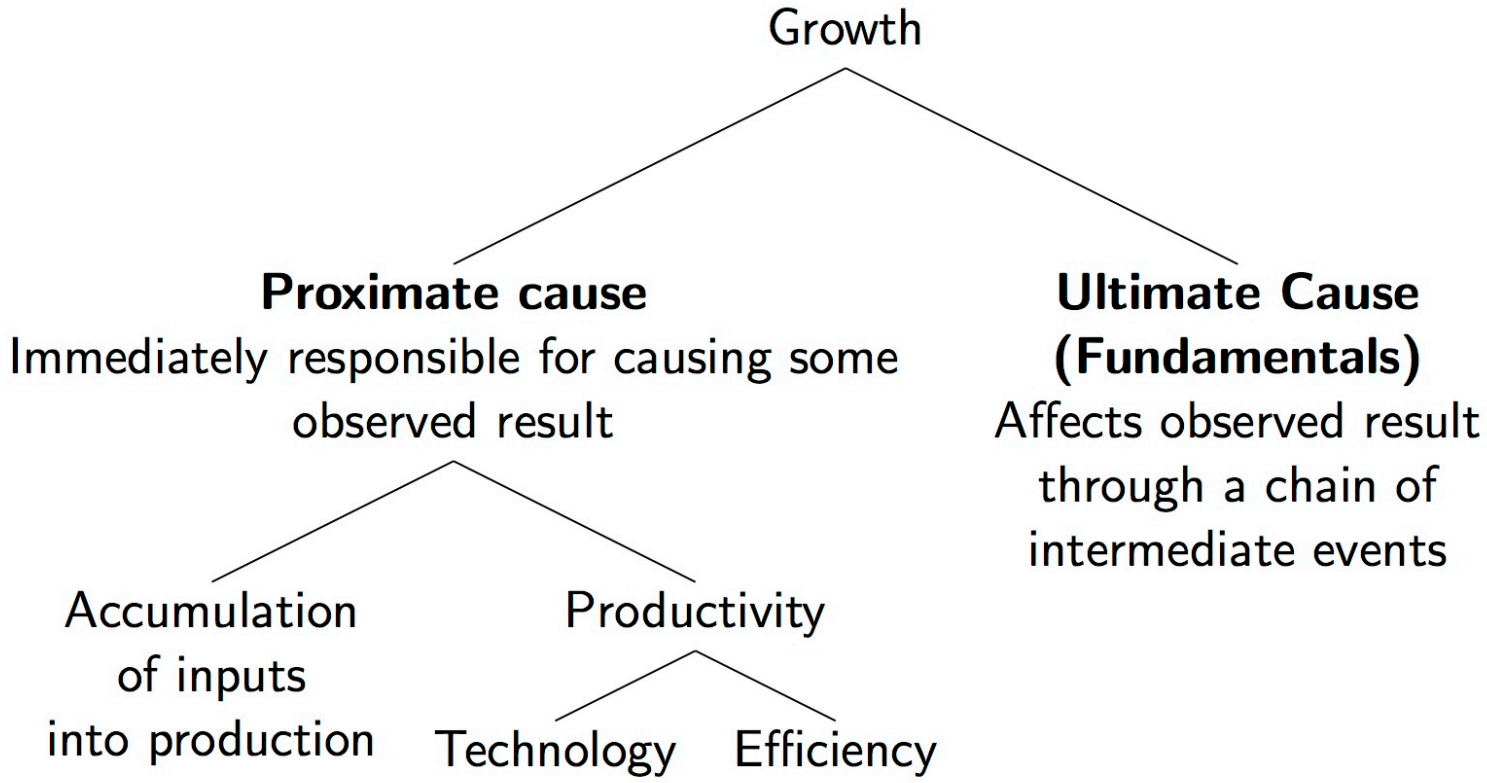
Overall quantecon is a great resource to learn Python.

Follow the materials here: https://python.quantecon.org/index_undergrad.html

Or here: https://datascience.quantecon.org/

Next Week

- Learn about the Solow Growth Model
  - A model to explain the role of factor accumulation in economic growth



Review

- To review lecture 1, read Chapter 1 of Jones and Vollrath, 2013
- To prepare for the next lecture, read Chapter 2.1 of Jones and Vollrath, 2013