Growth and Comparative Development
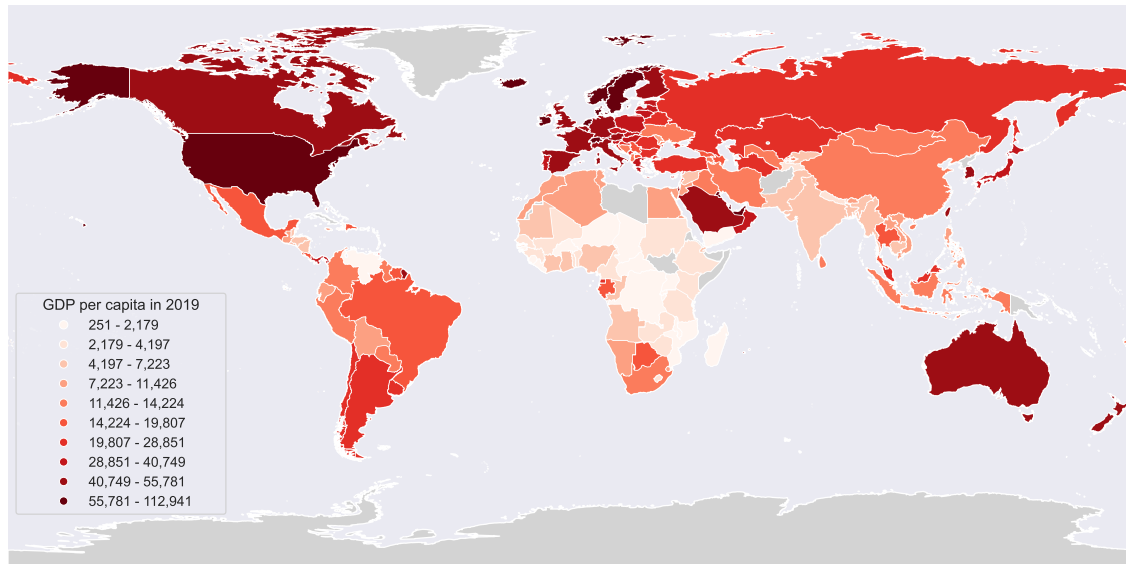# The Big Picture & Overview

Ömer Özak
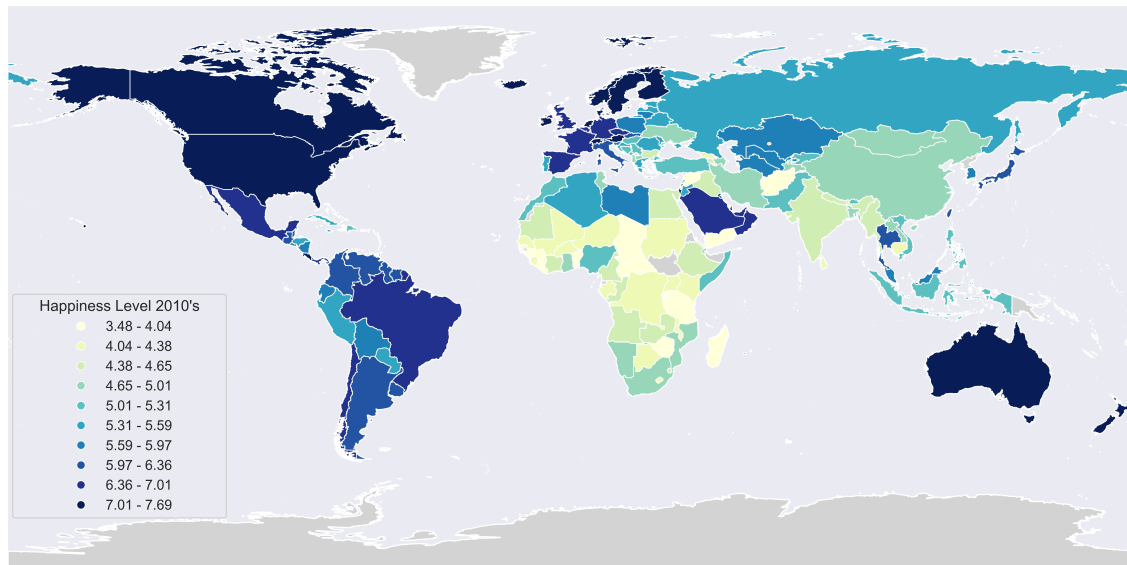
Department of Economics
Southern Methodist University

Economic Growth and Comparative Development
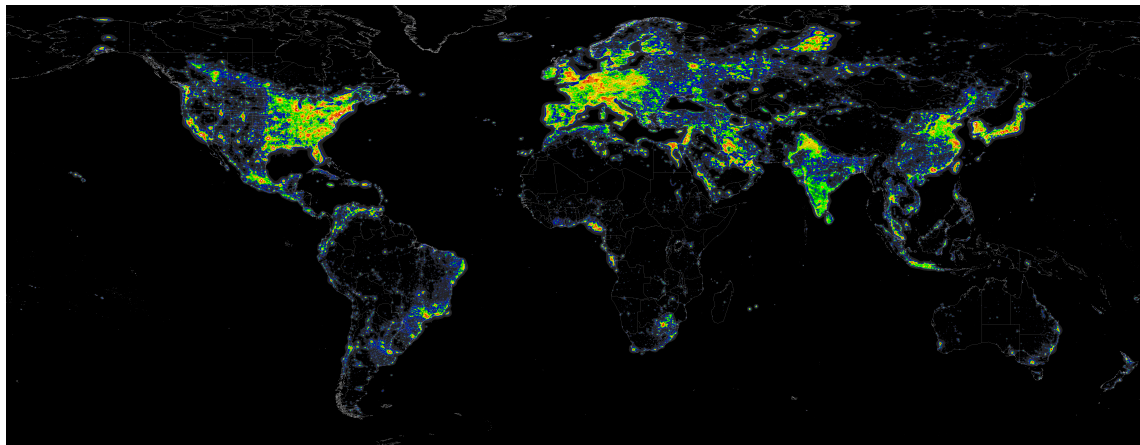
Income per Capita across the Globe in 2019

GDP per capita in 2019
- 251 - 2,179
- 2,179 - 4,197
- 4,197 - 7,223
- 7,223 - 11,426
- 11,426 - 14,224
- 14,224 - 19,807
- 19,807 - 28,851
- 28,851 - 40,749
- 40,749 - 55,781
- 55,781 - 112,941

Happiness across the Globe in 2005-2018

Happiness Level 2010's
- 3.48 - 4.04
- 4.04 - 4.38
- 4.38 - 4.65
- 4.65 - 5.01
- 5.01 - 5.31
- 5.31 - 5.59
- 5.59 - 5.97
- 5.97 - 6.36
- 6.36 - 7.01
- 7.01 - 7.69

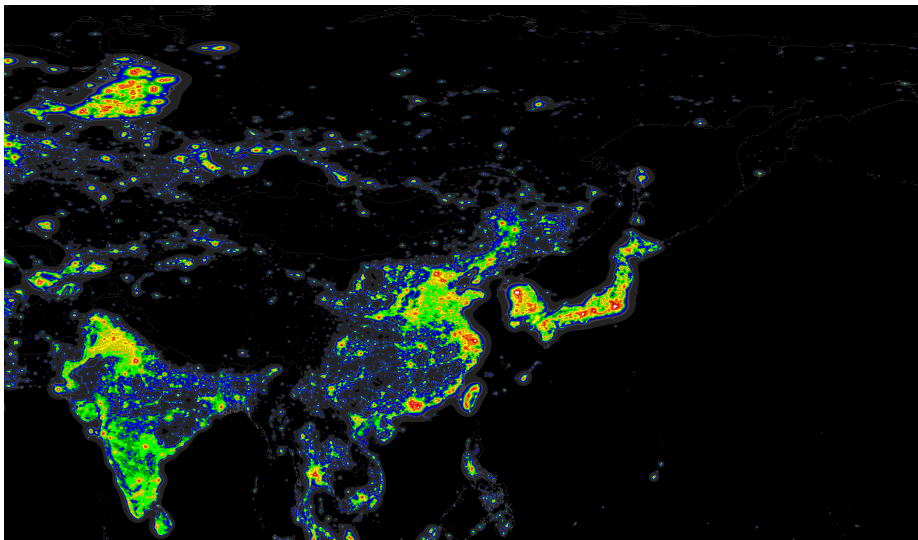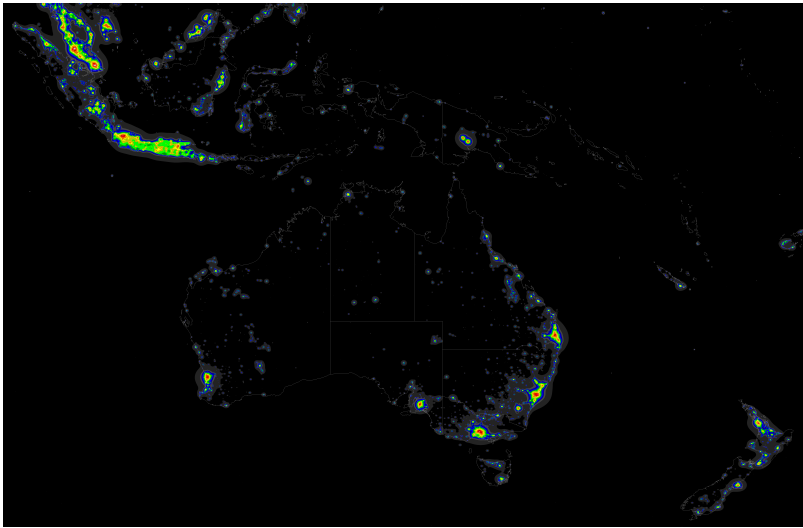# Night Lights across the Globe in 2016

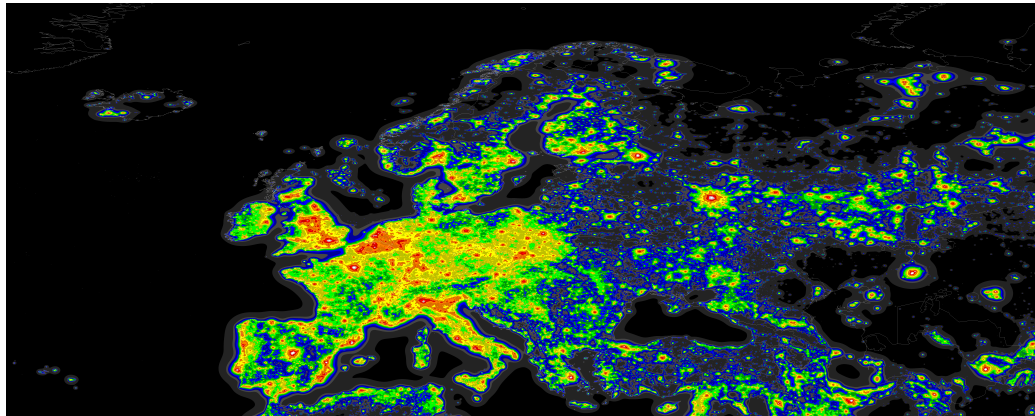# Night Lights across Regions – Africa
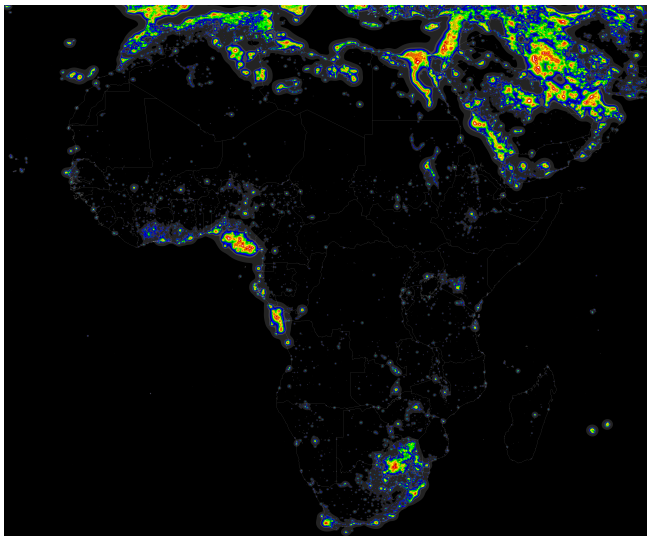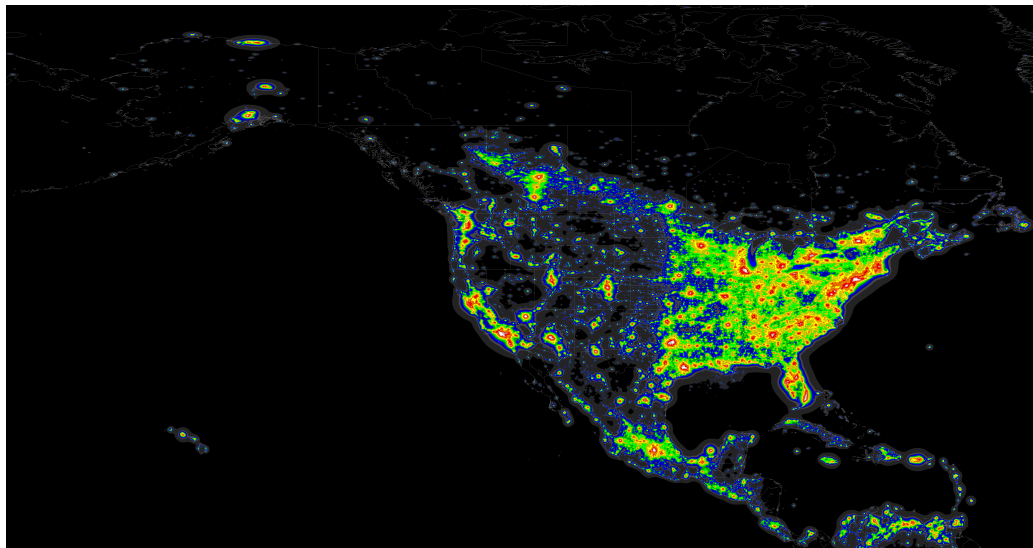
Night Lights across Regions – Asia

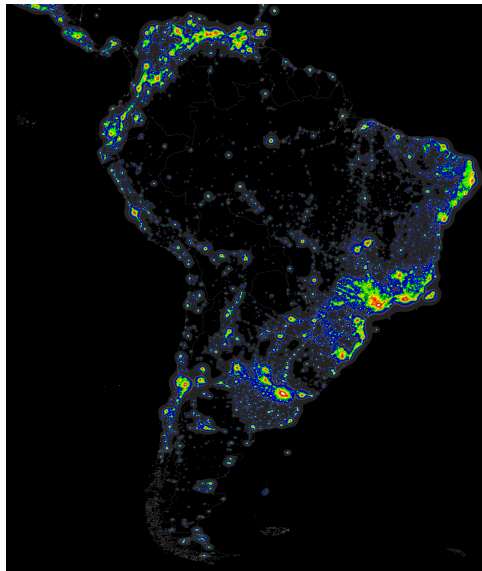# Night Lights across Regions – Australia

Night Lights across Regions – Europe

Night Lights across Regions – North America

Night Lights across Regions – South America

Fact 1: Income Differences across Countries/Regions/Societies

There is enormous variation in per capita income across economies. The poorest countries have per capita incomes that are less than 5 percent of per capita income in the richest countries.

Several notes:

- Income per capita (or GDP per capita) is not the sole measure of what is good: but it's a useful summary statistic
- Income per capita ignores distribution of income within a country
- Comparing income per capita across countries is not trivial
  - You have to convert between currencies
  - Countries have different relative prices for goods
  - What is the "right" way to value haircuts, apples, or cars across countries?

Top Countries - Different Measures (2009)

Rank	Highest GDP per Capita		Largest Economies		Most Populous Countries	
	Country	GDP per Capita ($)	Country	Total GDP ($ trillions)	Country	Population (millions)
1	Qatar	159,469	United States	12.62	China	1,320
2	Luxembourg	84,525	China	10.08	India	1,160
3	United Arab Emirates	52,946	Japan	3.81	United States	307
4	Bermuda	52,090	India	3.76	Indonesia	240
5	Macao	51,057	Germany	2.66	Brazil	199
6	Norway	49,945	United Kingdom	2.07	Pakistan	181
7	Singapore	47,373	Russia	2.05	Bangladesh	154
8	Kuwait	46,639	France	1.98	Nigeria	149
9	Brunei	46,229	Italy	1.68	Russia	140
10	Australia	41,304	Brazil	1.62	Japan	127
11	United States	41,099	Mexico	1.29	Mexico	111

Rich Countries

Country	GDP per capita 2008	GDP per worker 2008	LF Part. Rate 2008	Avg. Growth 1960-2008	Years to Double
United States	$43,326	$84,771	0.51	1.6	43
Japan	33,735	64,778	0.52	3.4	21
France	31,980	69,910	0.46	2.2	30
United Kingdom	35,345	70,008	0.51	1.9	36
Spain	28,958	57,786	0.50	2.7	26

Poor Countries

Country	GDP per capita 2008	GDP per worker 2008	LF Part. Rate 2008	Avg. Growth 1960-2008	Years to Double
China	6,415	10,938	0.59	5.6	13
India	3,078	7,801	0.39	3.0	24
Nigeria	1,963	6,106	0.32	0.6	114
Uganda	1,122	2,604	0.43	1.3	52

Distribution of Population by GDP per Capita, 2009

GDP per capita, 2009 (2005 Dollars)

World Average $9,909

Percentage of the World population that has passed by
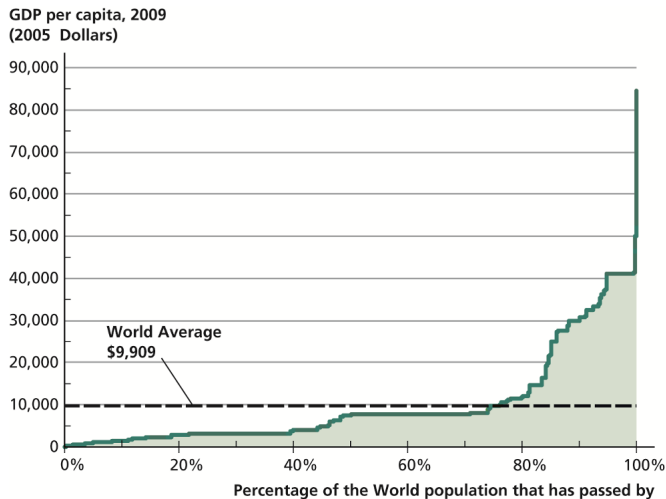
Source: Heston, Summers, and Aten (2011).

Distribution of Population by GDP per Worker, 2008
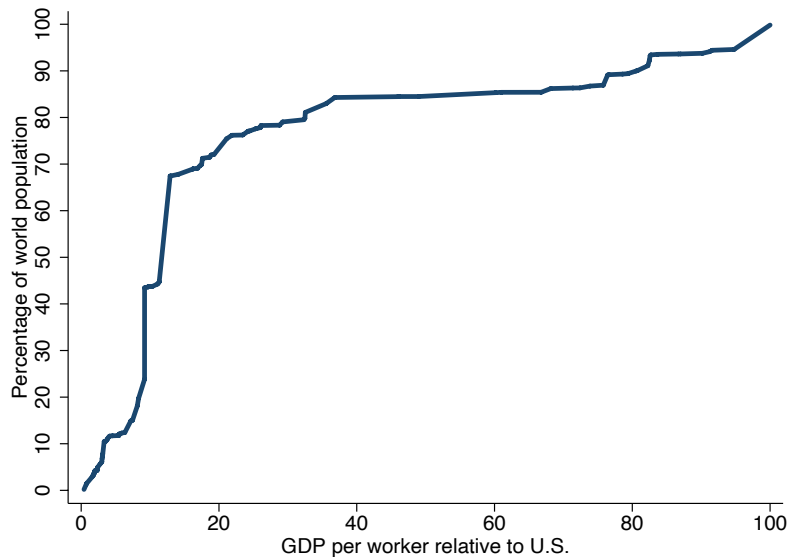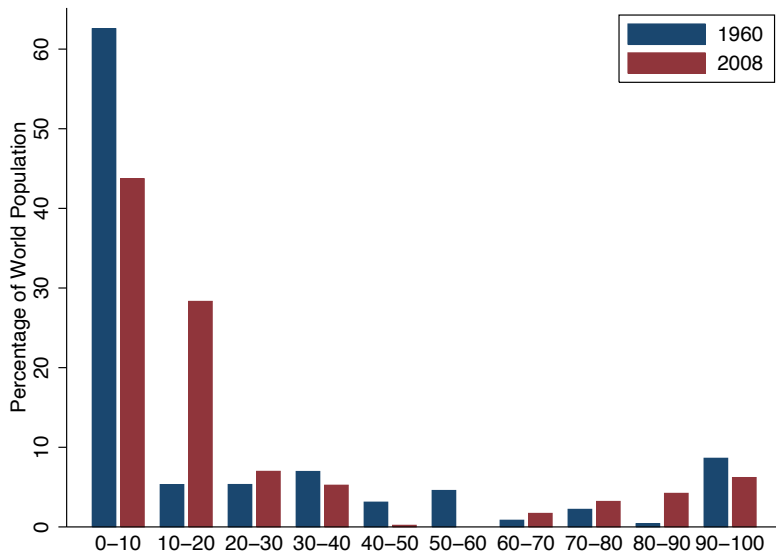
World Population by GDP per Worker, 1960 and 2008

Fact 2: Growth Rates across Time and Countries

- **Rates of economic growth vary substantially across countries**
  - Important to distinguish permanent from transitional differences
  - If permanent $\implies$ divergence
  - Economists think most differences are transitional
- Rates of economic growth vary substantially across time
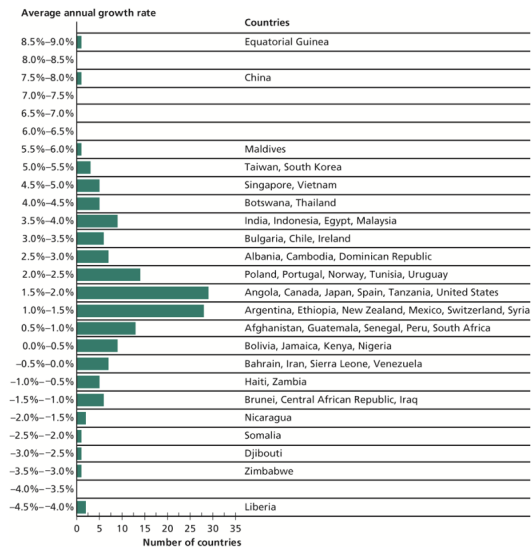 - Growth rates within countries tend to decrease as they become rich

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Growth Rates 1975-2009

Average annual growth rate

Average annual 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: 0 5 10 15 20 25 30 35

Source: Heston, Summers, and Aten (2011).

## Growth Miracles

Country	GDP per capita 2008	GDP per worker 2008	LF Part. Rate 2008	Avg. Growth 1960-2008	Years to Double
Hong Kong	37,834	70,940	0.53	4.3	16
Singapore	49,987	92,634	0.54	4.1	17
Taiwan	29,645	62,610	0.47	5.1	14
South Korea	25,539	50,988	0.50	4.5	16

Growth Disasters

Country	GDP per capita 2008	GDP per worker 2008	LF Part. Rate 2008	Avg. Growth 1960-2008	Years to Double
Venezuela	9,762	21,439	0.46	-0.1	
Haiti	1,403	3,164	0.44	-0.4	
Madagascar	810	1,656	0.49	-0.1	
Zimbabwe	135	343	0.40	-1.5	

GDP per capita in U.S. (1870-2009)

GDP per capita (2005 Dollars)
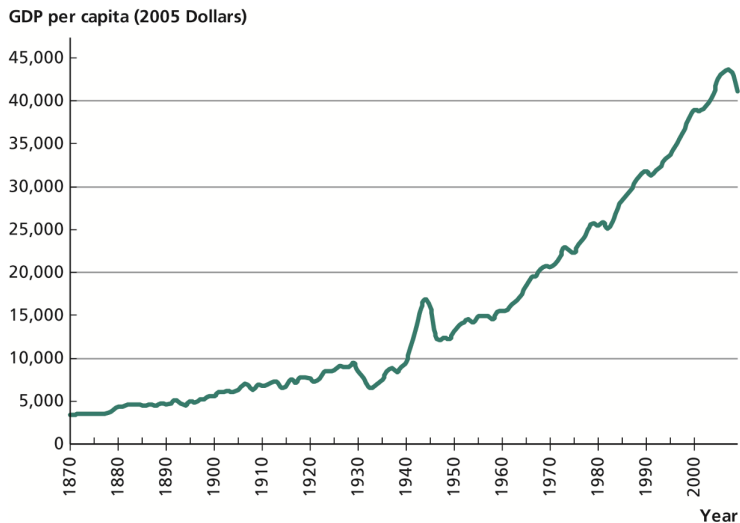
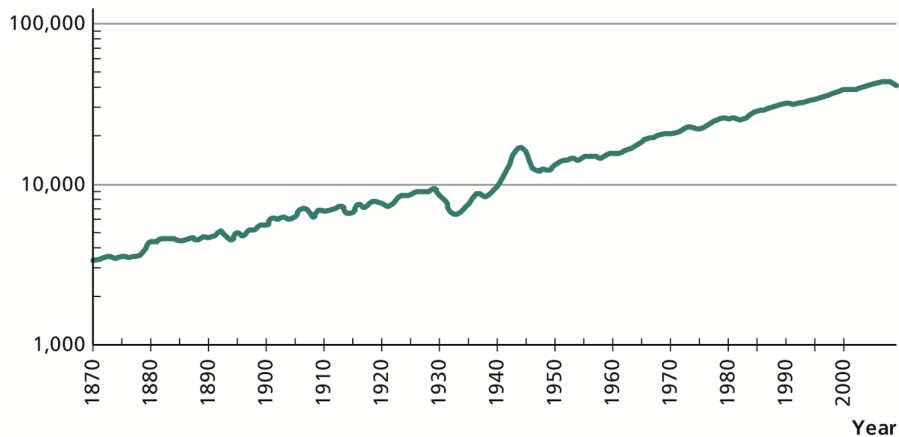# Effect of Using a Ratio/Logarithmic Scale
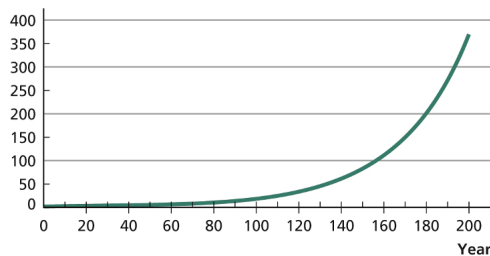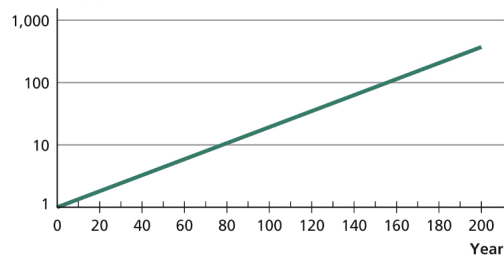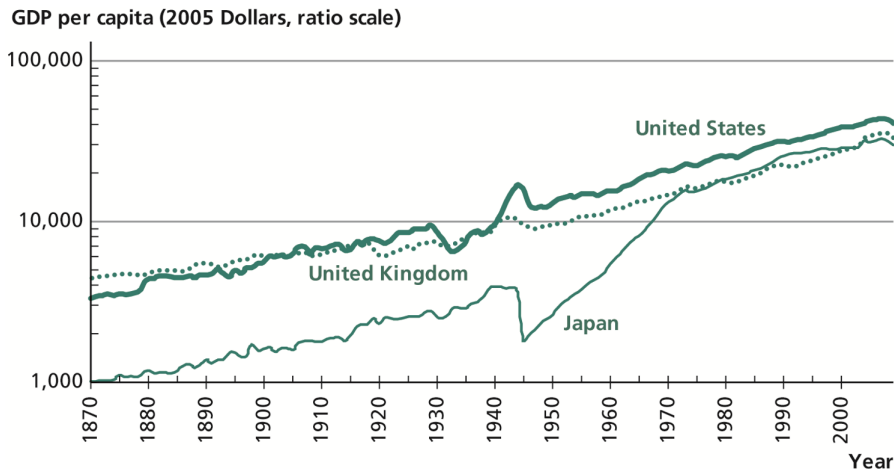

(a) $X_t = X_0(1+g)^t$ (b) $\ln(X_t) = \ln(X_0) + (1+g) \cdot t$

GDP per capita in U.S. (1870-2009, Ratio Scale)

GDP per capita (2005 Dollars, ratio scale)

GDP per capita in Japan, U.K., & U.S. (1870-2009, Ratio Scale)

GDP per capita (2005 Dollars, ratio scale)

Sources: Maddison (1995), Heston, Summers, And Aten (2011).

What does this all suggest?

- Large differences in income per capita

- Smaller differences in growth rates of income per capita

- Constant and positive growth rates in the long-run

- Catch-up of poor to rich countries

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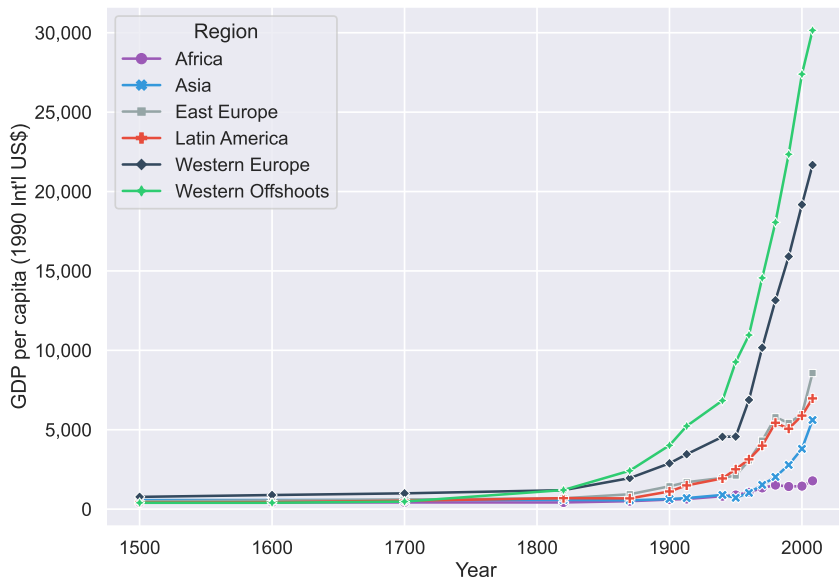
- Catch-up of poor to rich countries

Fact 3: Last 200 Years are Special

- Income differences were small/non-existent before 1800

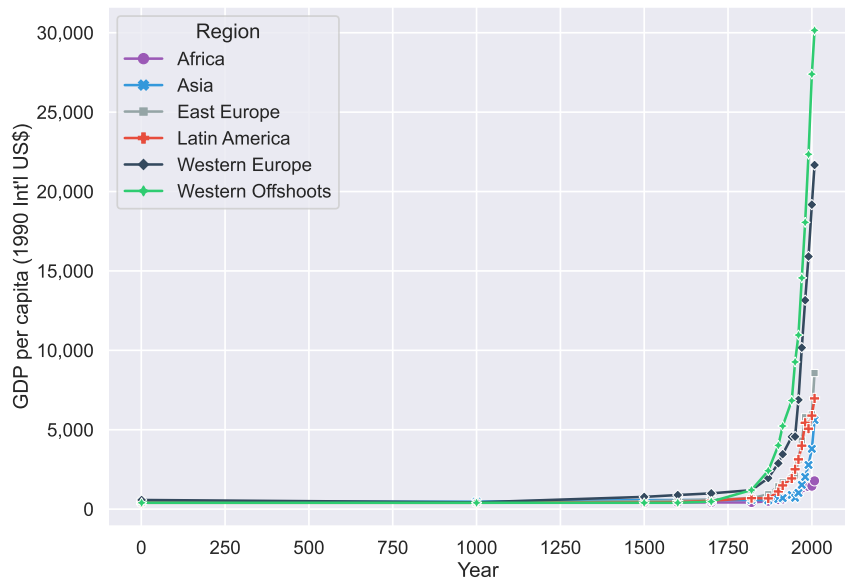- Growth rates were small ≈ 0 for most of human history

Divergence across Regions: 1820–2010
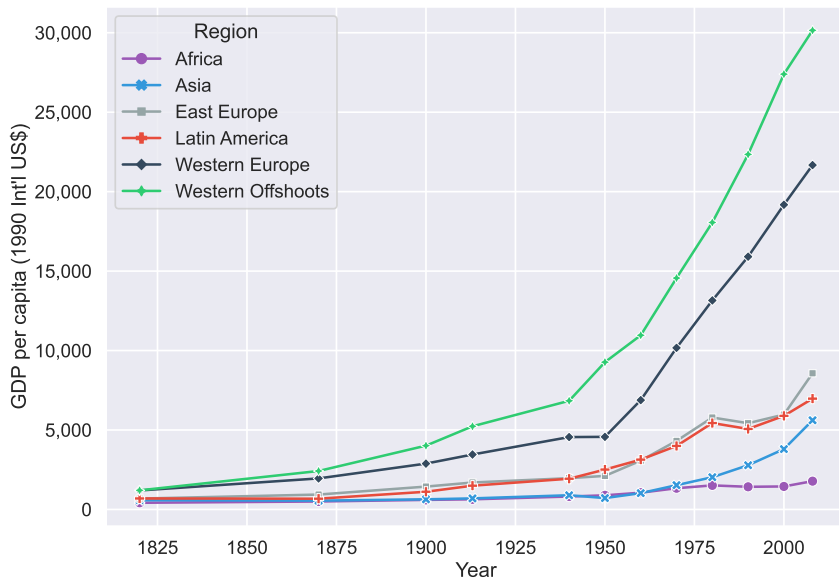
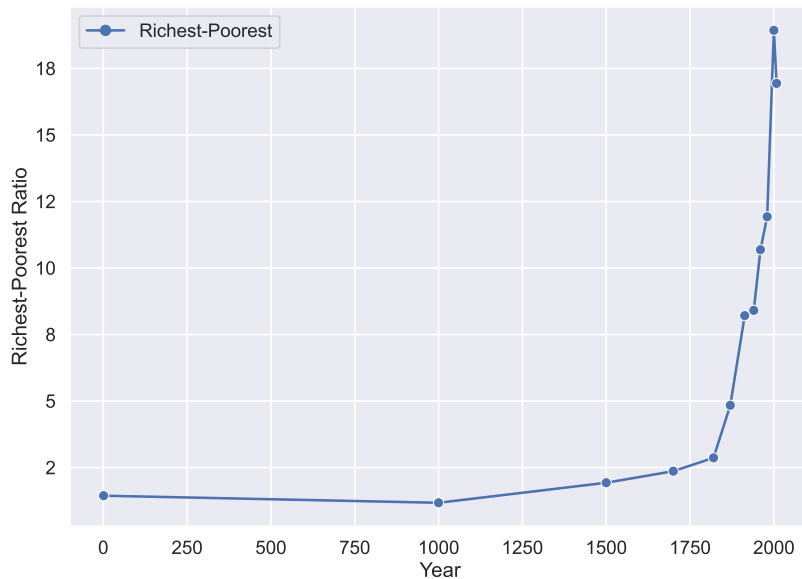# Divergence across Regions: 1500–2010

Regional Income per Capita: 1–2010

Evolution of Inequality across Regions: 1–2010

	Income per Capita (1990 Int'l $)				
	1	1000	1500	1820	2010
Western Offshoots	400	400	400	1,302	29,564
Western Europe	576	427	771	1,455	20,889
Latin America	400	400	416	628	6,767
Asia	456	470	568	591	6,307
Africa	472	425	414	486	2,034
Richest-Poorest Ratio	1.4	1.2	2	3	15

Western Offshoots: USA, Canada, Australia, New Zealand.

Evolution of Inequality across Regions: 1–2010

Inferences from Neoclassical/Solow Growth Theory

- Diminishing returns to physical and human capital accumulation

- Diminishing effect of technological progress on productivity

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  $\implies$ Reduction in inequality

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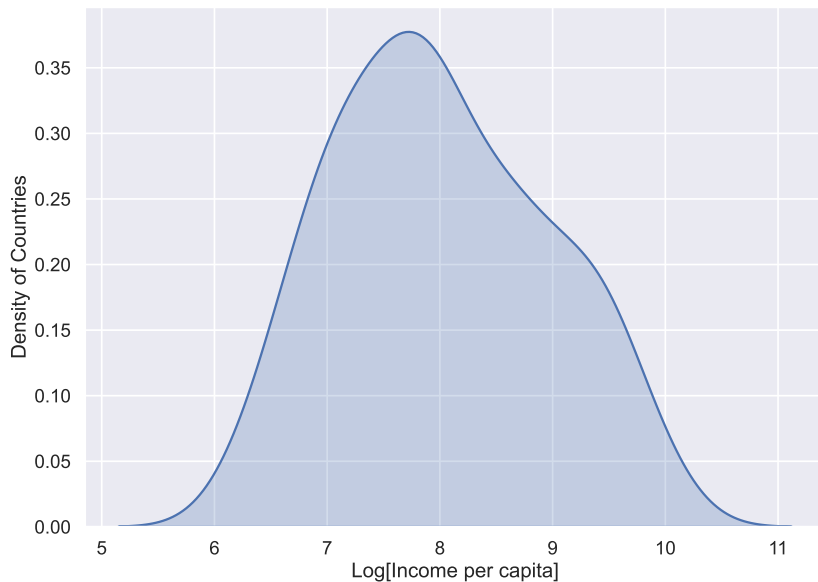 $\implies$ Reduction in inequality

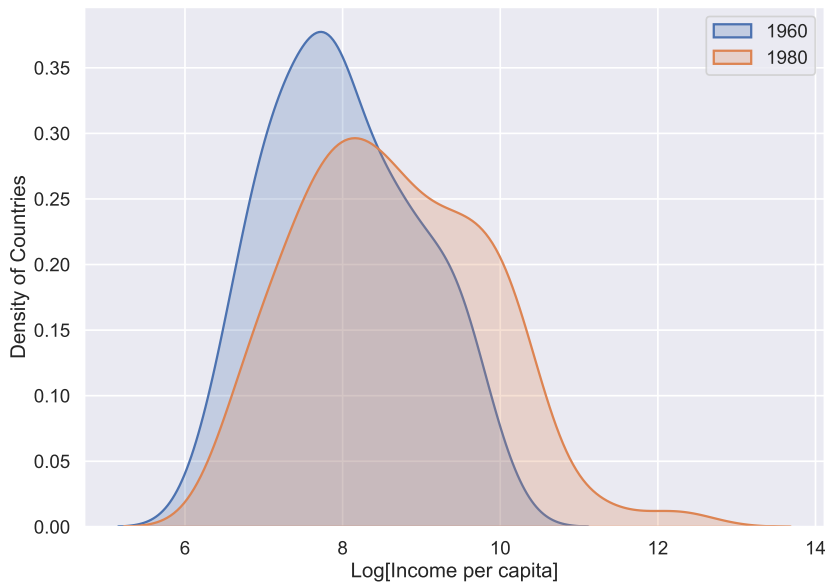 $\implies$ Convergence

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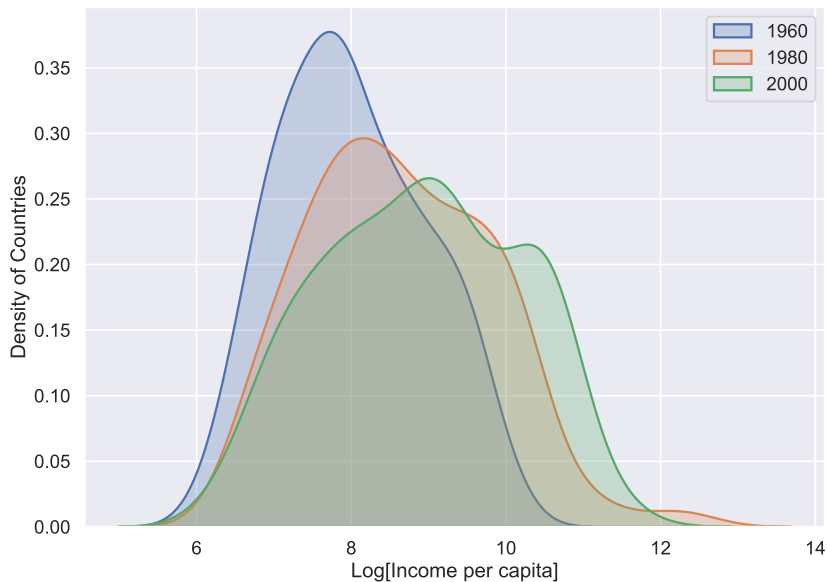
Income Distribution in 1960

Lack of Convergence across Nations: 1960–1980

Lack of Convergence across Nations: 1960–2000

Lack of Convergence across Nations: 1950–2017
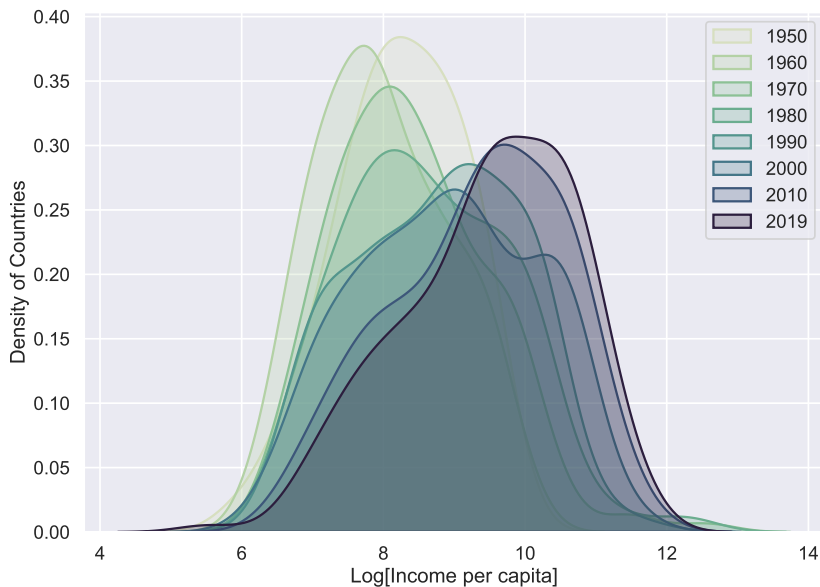
World Inequality and Its Components
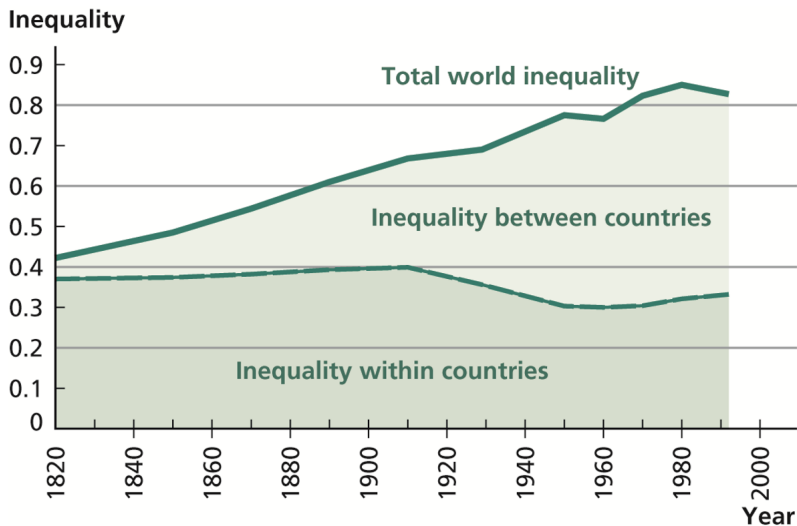
Source: Bourguignon and Morrison (2002).

Persistent Inequality across Nations: 1980–2010

Phases of Development

Phases of Development: Modes of Production
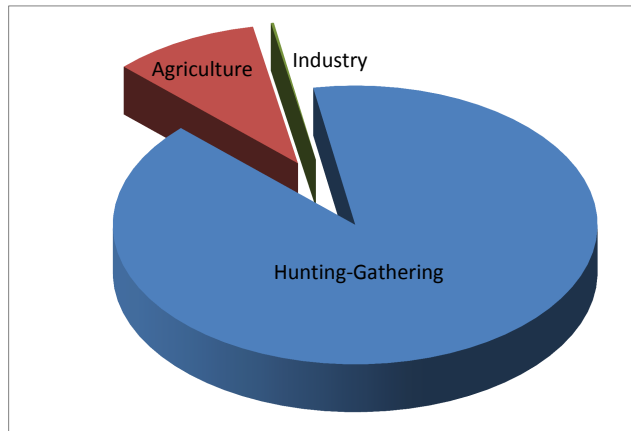
Phases of Development: Standard of Living

- The Malthusian Epoch

- The Post-Malthusian Regime

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Phases of Development: Timeline of the Most Developed Economies

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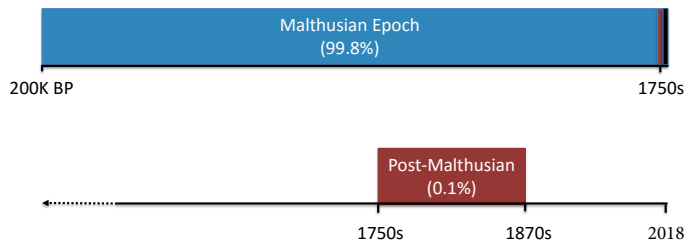
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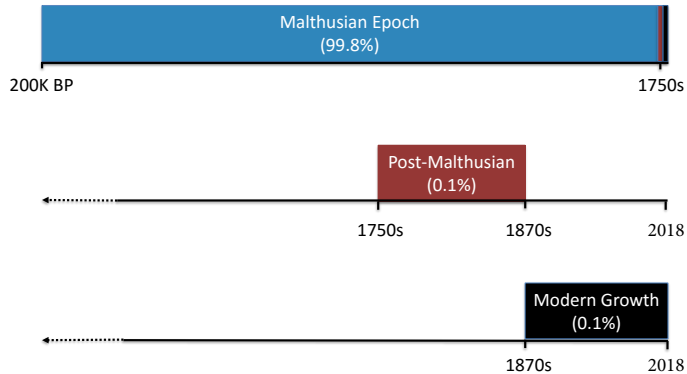
World Income per Capita: 1–2010
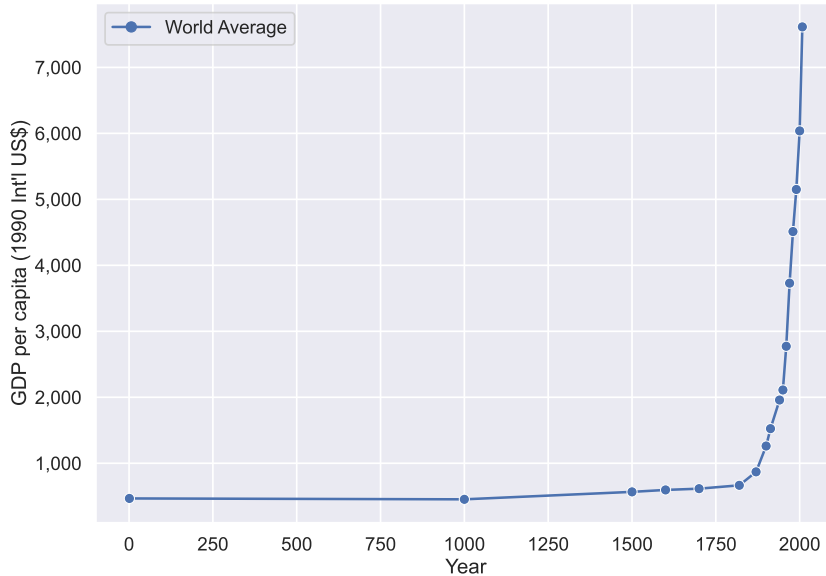
Growth of World Income per Capita: 1–2010

The Malthusian Epoch

- Characterized by Malthusian dynamics and the absence of economic growth

- Central characteristics of the period:

- Technological progress over this period

- Technologically advanced & land-rich economies:

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    - Higher income densities
    - tend to results in larger population rather than higher living standards

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- Technologically advanced & land-rich economies:
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Malthusian Dynamics - Prominent Examples

- The dynamics of Irish economy (1650 - 1850)
    - Triggered by the cultivation of a new world crop – potato

- The dynamics of the Chinese Economy (1500 - 1800)
    - Triggered by a gradual agricultural technology

- The dynamics of the English economy (1348 - 1700)
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- The Columbian Exchange $\implies$ massive cultivation of potato post-1650

  - 1650-1840s

  - 1845-1852 Potato blight destroys crops $\implies$ Great Famine

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    - 1650-1840s
        - Population increases from 2 to 6 million
        - Income per capita increases only very modestly
    - 1845-1852 Potato blight destroys crops $\implies$ Great Famine
        - Population declines by about a quarter
        - 1.1 Million people died & 1 Million migrated over the Great Famine

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    - Population increases from 2 to 6 million
    - Income per capita increases only very modestly
  - 1845-1852 Potato blight destroys crops $\implies$ Great Famine
    - Population falls, but income per capita increases
    - 1.1M Persons died; 1 to 1.5M emigrated in less than 10 years

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Malthusian Adjustments to the Black Death: England, 1348–1750

Land Productivity and Population Density in 1500
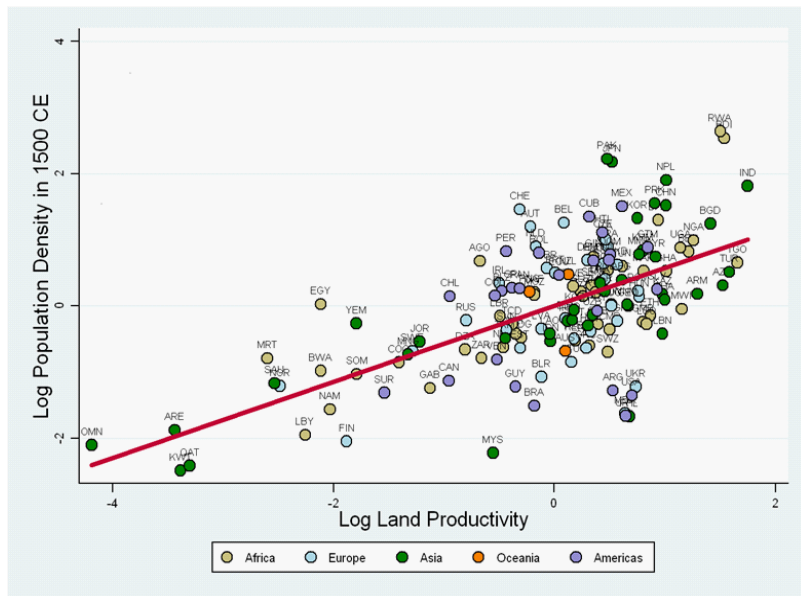
Land Productivity and Income per Capita in 1500
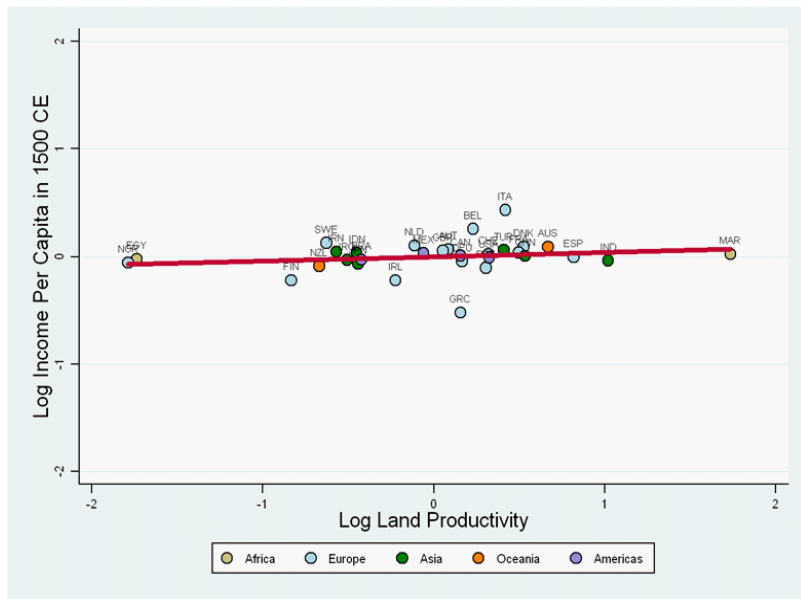
Technology and Population Density in 1500
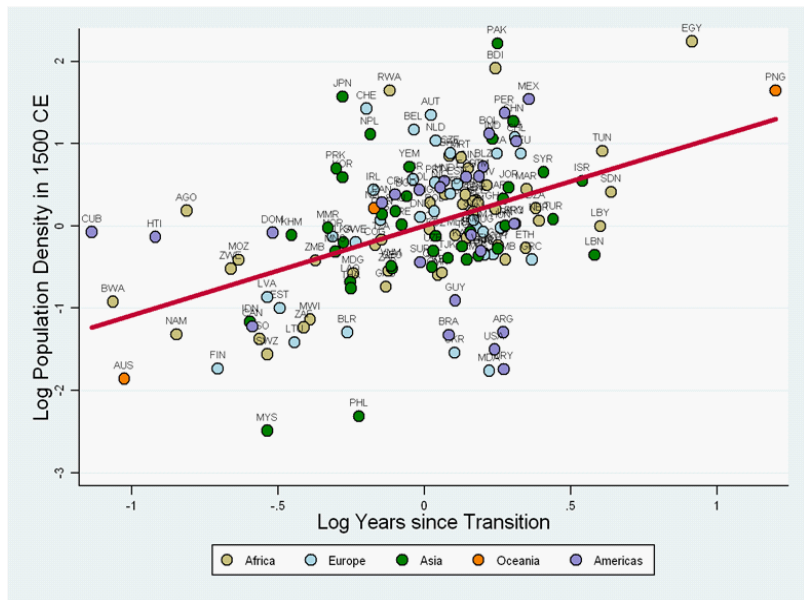
Technology and Income per Capita in 1500

The Post-Malthusian Regime

- Characterized by the onset of economic growth:

    - Technological progress accelerates

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        - Its benefits are barely offset by population increases

        - A segment is left to increase per capita income

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Regional Variation in the Timing of the Take-off
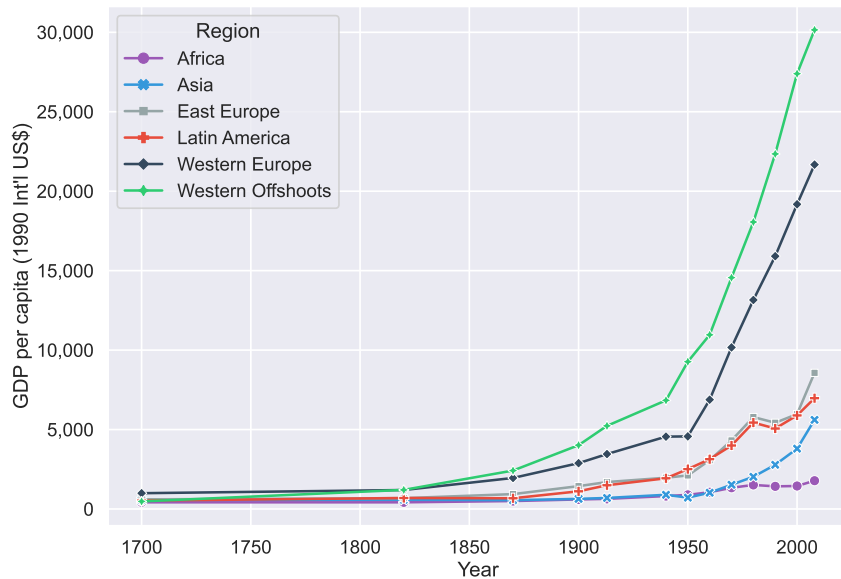
Take-off: Growth of Population & Income per Capita – World
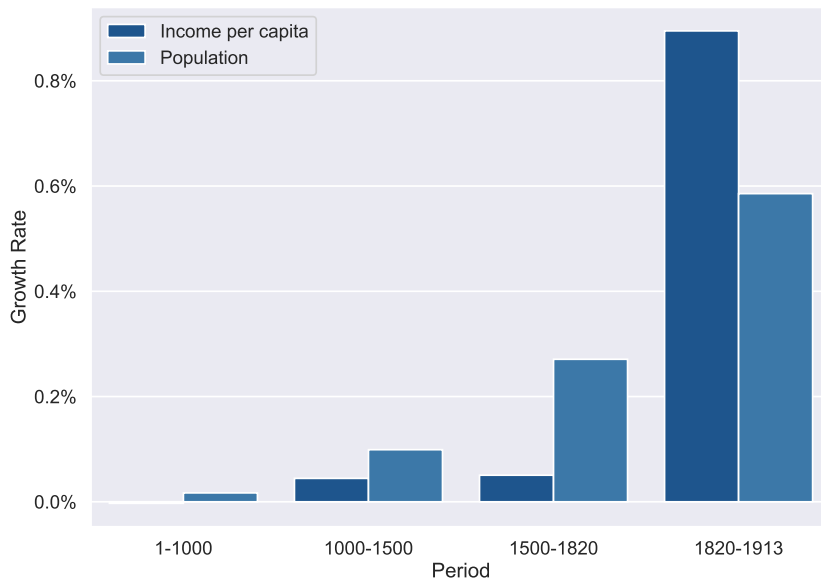
Take-off: Growth of Population & Income per Capita – Western Offshoots
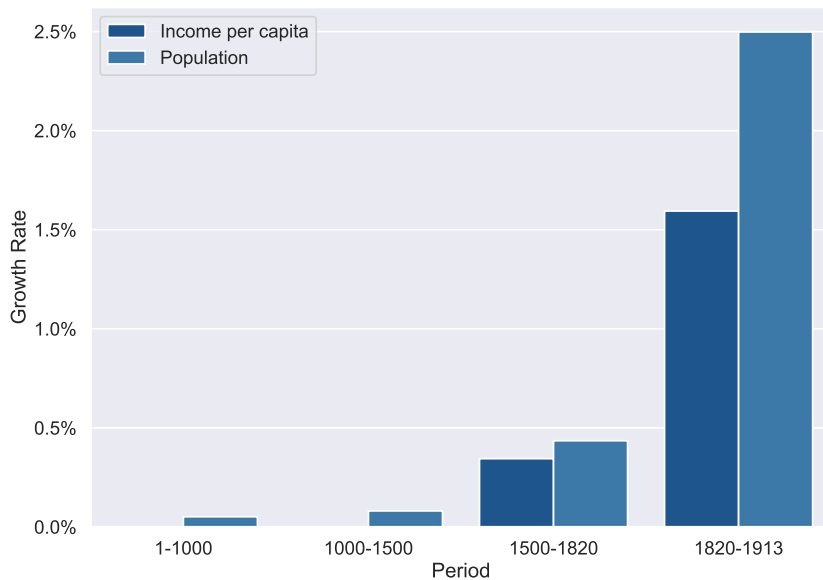
Take-off: Growth of Population & Income per Capita – Western Europe
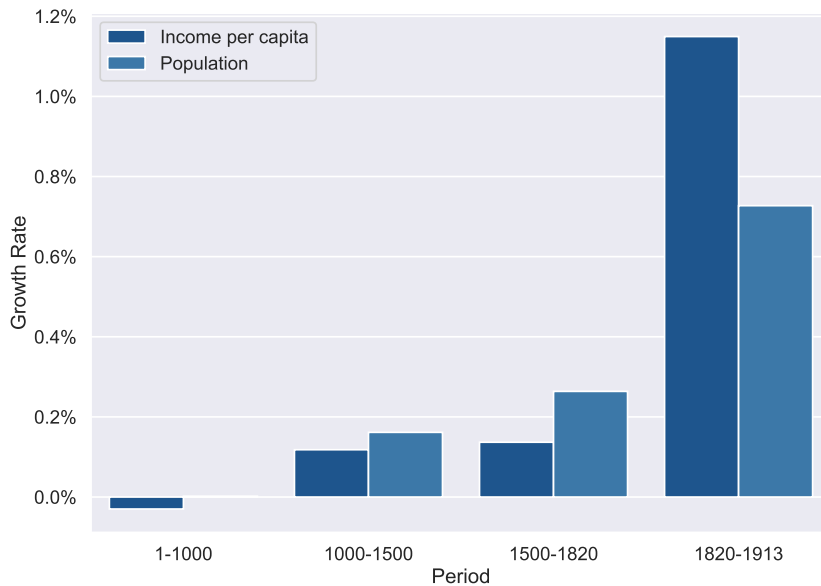
Take-off: Growth of Population & Income per Capita – Latin America
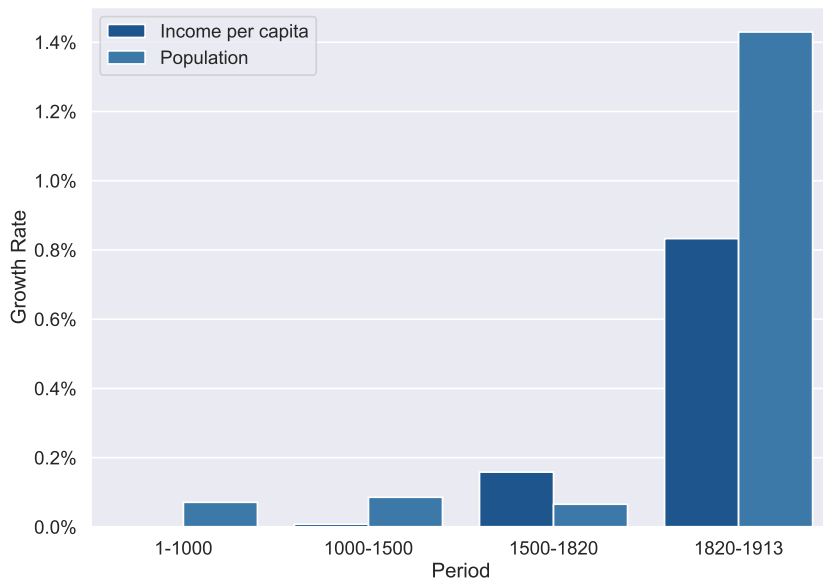
Take-off: Growth of Population & Income per Capita – Africa
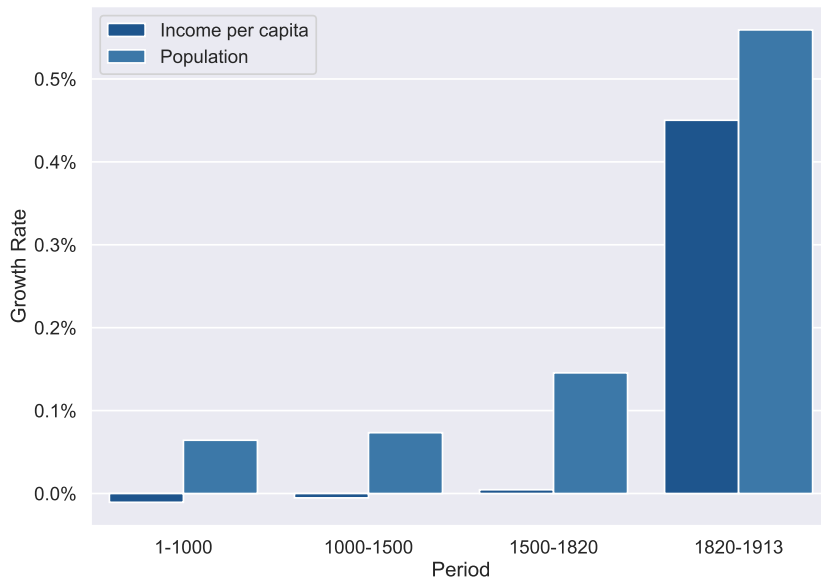
Take-off: Growth of Population & Income per Capita – Asia
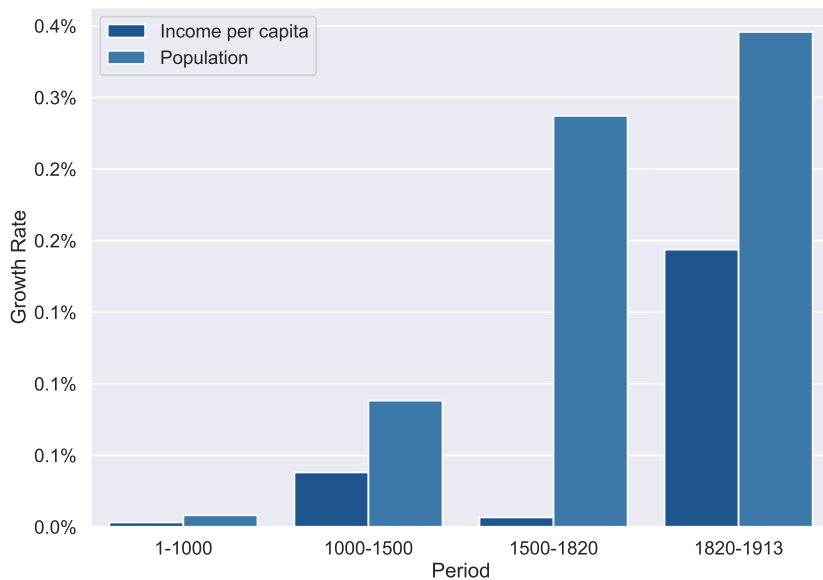
Take-off & Increased Industrialization per Capita
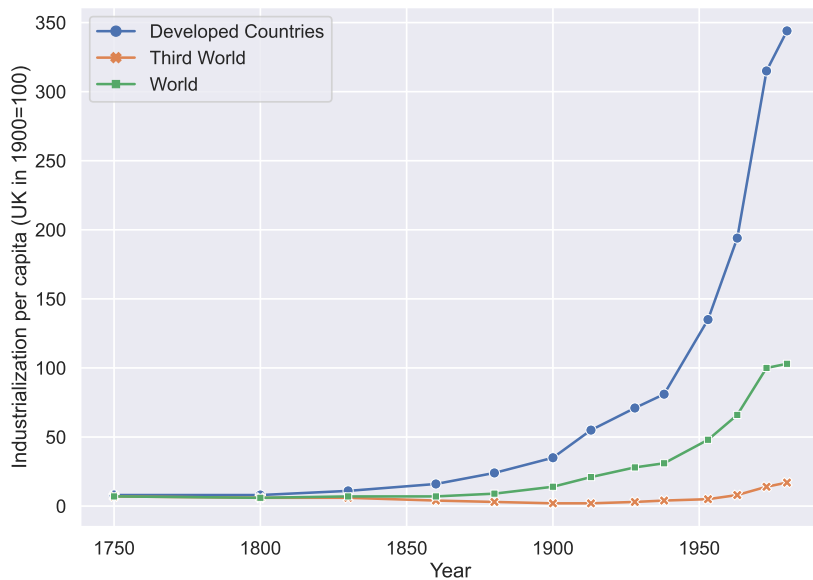
Take-off & Increased Industrialization per Capita – Developed Countries
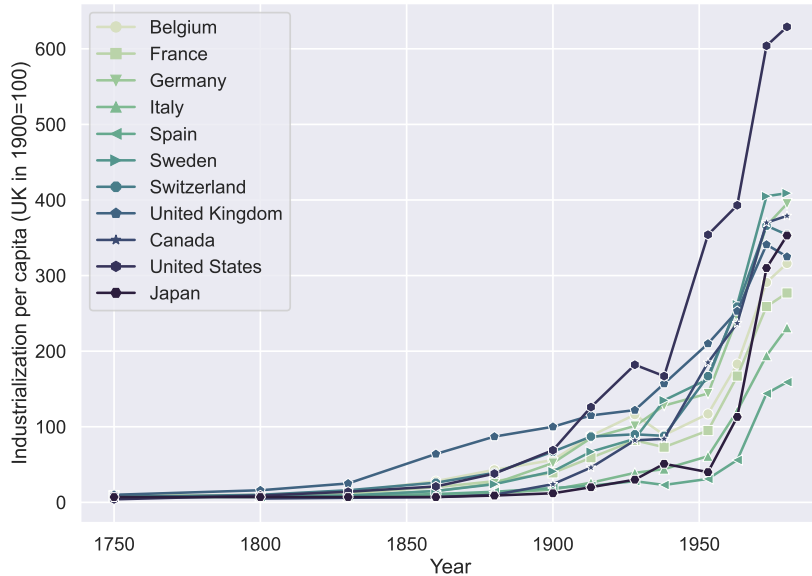
Take-off in Developed Economies & Decline in Industrialization in LDCs

The Modern Growth Regime

- Sustained economic growth

  - Acceleration in technological progress

    - Increase in demand for human capital

  - Human capital formation

    - Income rate of return based technological growth in the absence of

  - The decline in population growth

    - Provided that population growth, income pressure a key difference would make for technological

  - Technological progress, human capital formation & decline in population growth

    - Representing the process developed

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Variation in Years Elapsed since the Onset of the Fertility Decline
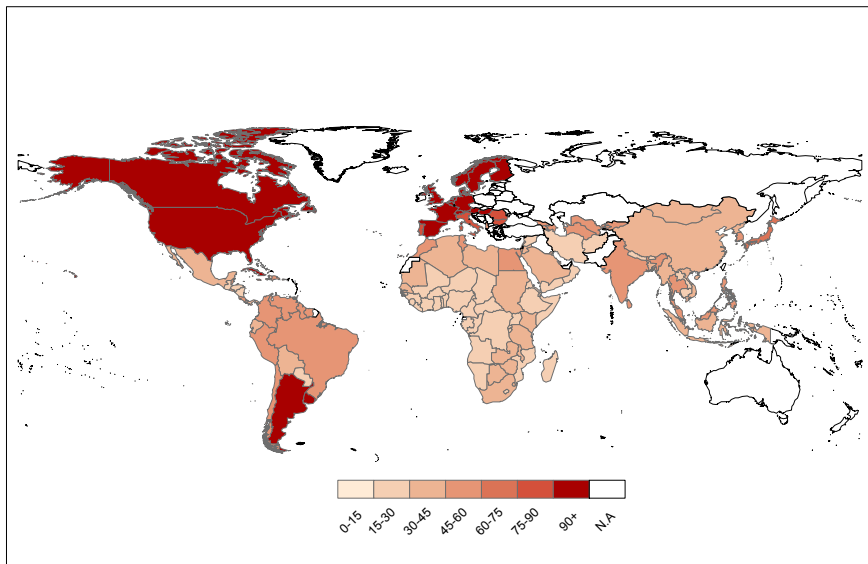
Early Fertility Decline – Western Offshoots
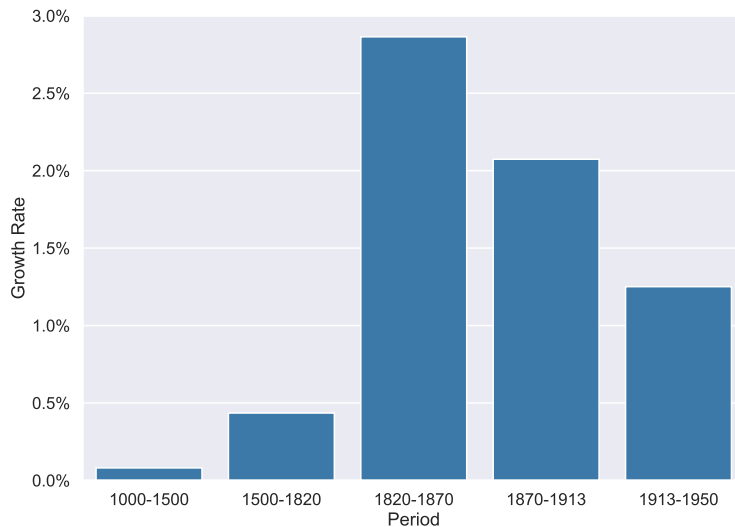
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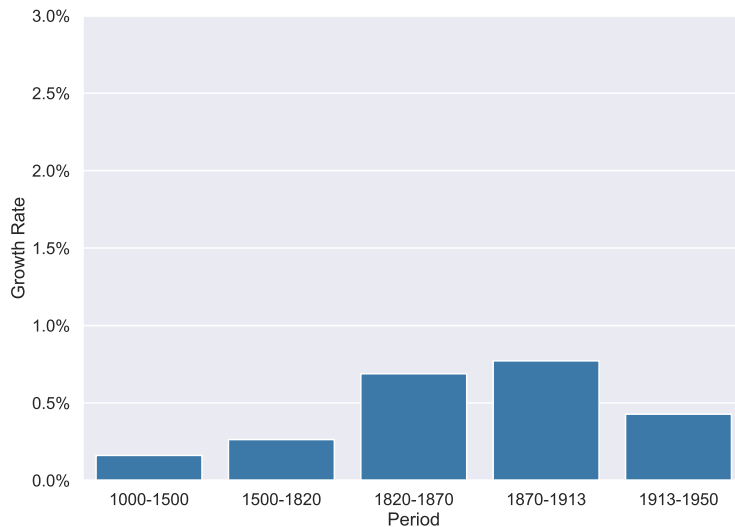
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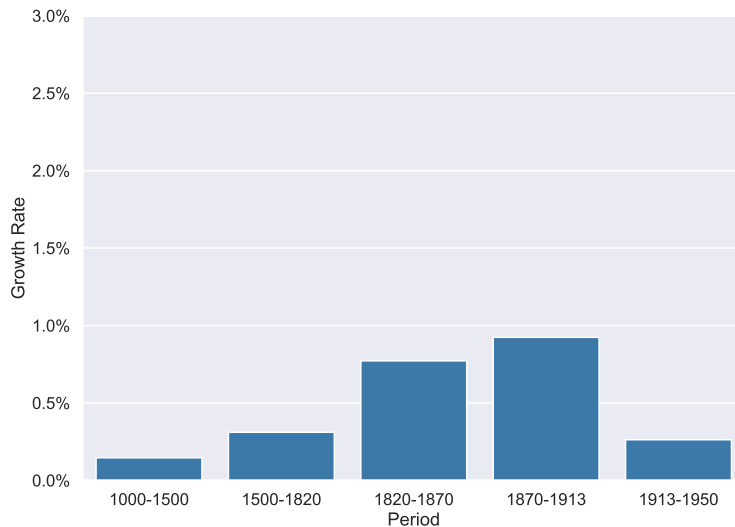
Late Fertility Decline – Latin America
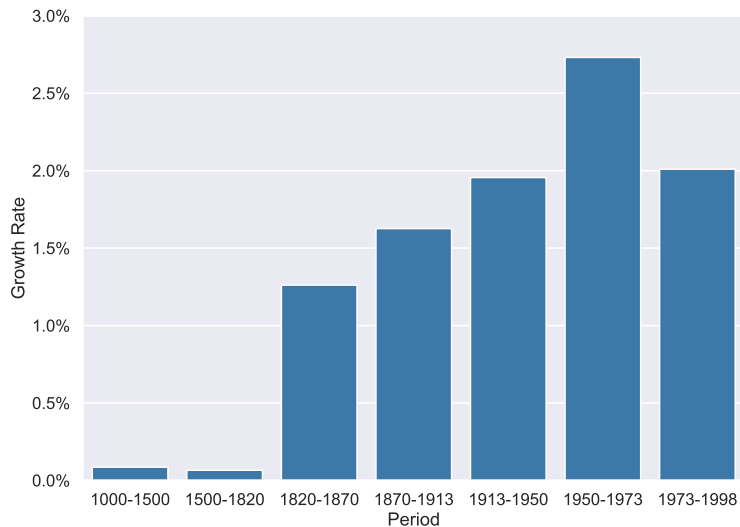
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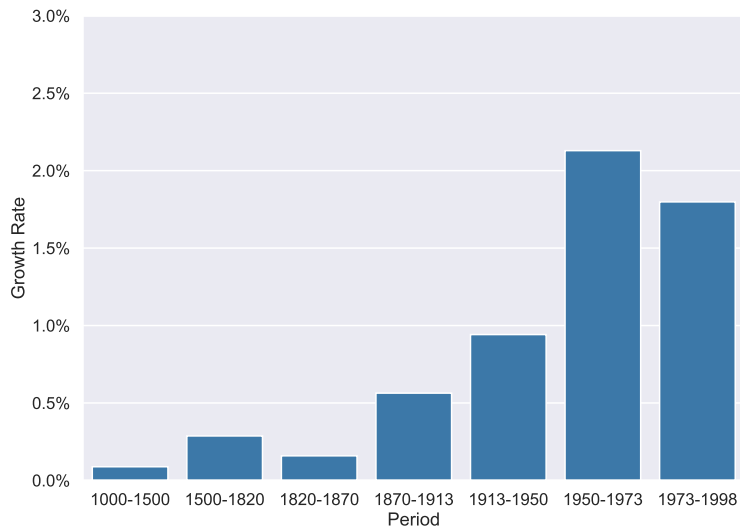
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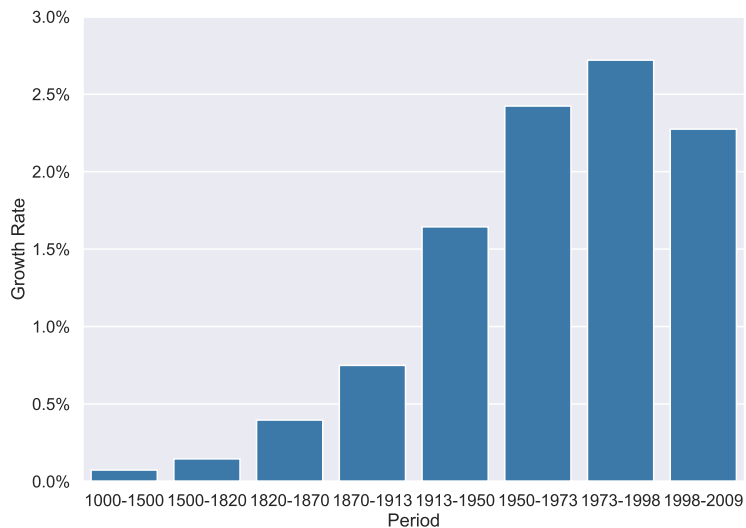
Timing of the Demographic Transition and Current Income per Capita

coef = 1.3462847, (robust) se = .10852591, t = 12.41
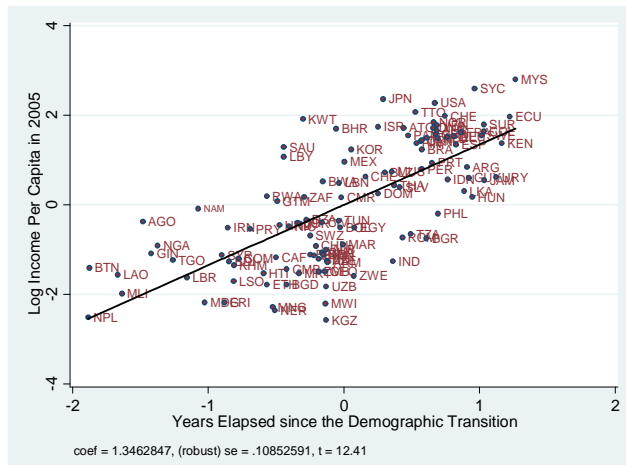
Conditional on absolute latitude.

Timing of the Demographic Transition and Divergence across Regions
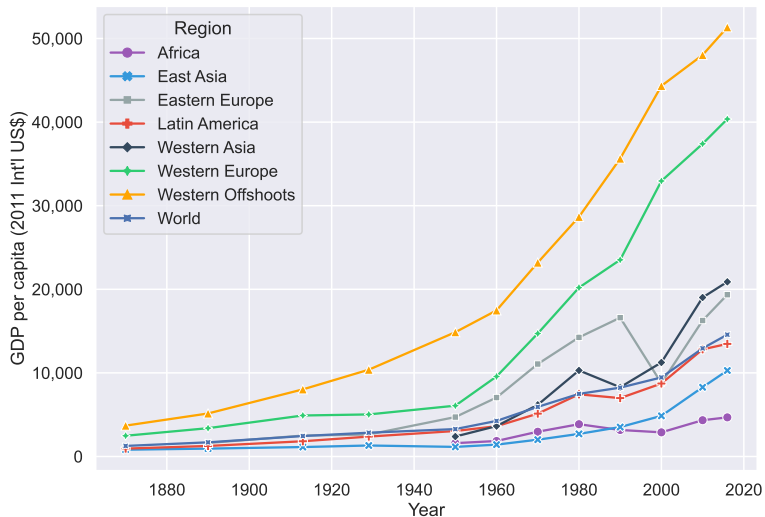
Sustained Economic Growth: 1870–2000
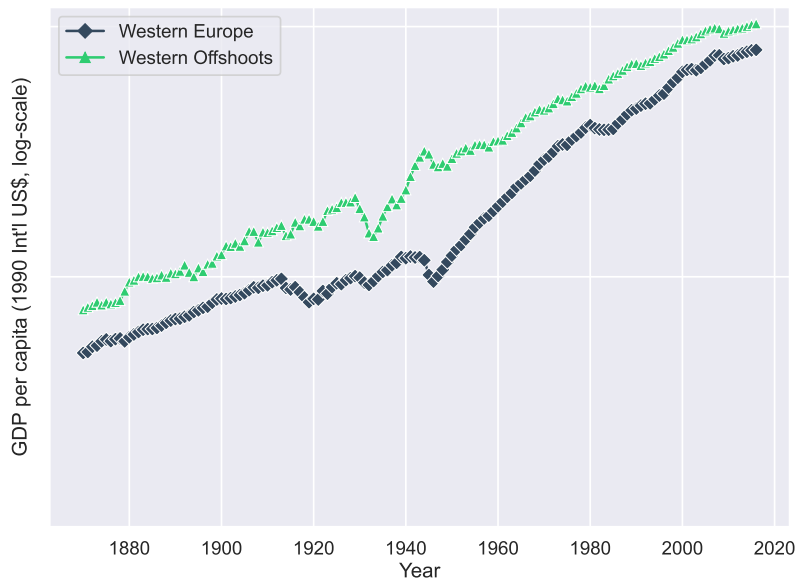
Regional Variation in Growth of Income per Capita: 1950–2000
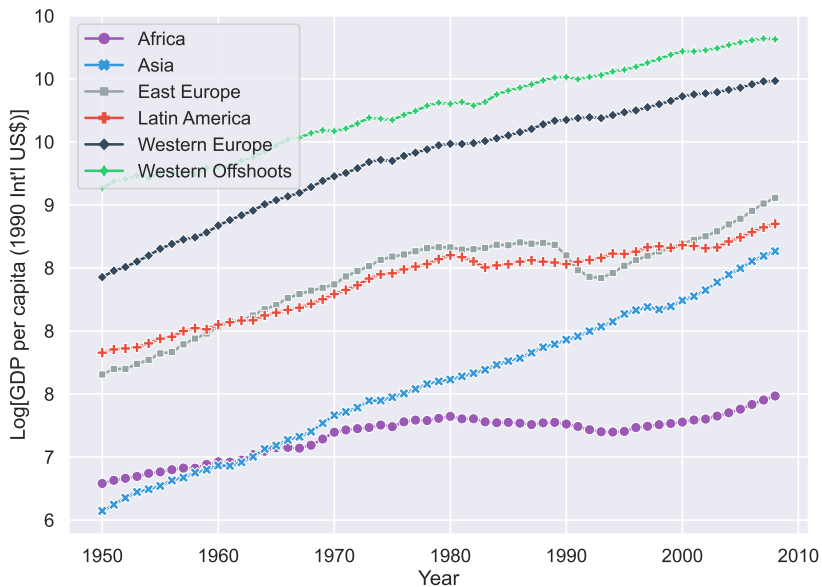
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Framework

A Simple Parable

Freedonia (Rich)

2 Countries

Sylvania (Poor)

Sylvania vs. Freedonia

We observe

$$\frac{GDP_F}{GDP_S} = 16, \qquad \frac{L_F}{L_S} = 2, \qquad \implies \frac{GPDpc_F}{GPDpc_S} = \frac{GDP_F/L_F}{GDP_S/L_S} = 8.$$

We know/assume

$$Y_F = F_F(K_F, L_F), \qquad Y_S = F_S(K_S, L_S),$$

and we observe

$$\frac{K_F}{L_F} > \frac{K_S}{L_S}.$$

From your macroeconomics class, we know that

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Sylvania vs. Freedonia

One possible answer:

Freedonia invests more in K than Sylvania.

How do we test this?

We observe

$$\frac{I_F}{I_S} = 32$$

We know in equilibrium $I = S$ and $S = s \cdot Y$.

So,

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Freedonia invests more in K than Sylvania.

How do we test this?

We observe

$$\frac{I_F}{I_S} = 32$$

We know in equilibrium $I = S$ and $S = s \cdot Y$.

So,

$$\frac{S_F}{S_S} = \frac{s_F \cdot Y_F}{s_S \cdot Y_S} = \frac{s_F}{s_S} \cdot 16.$$

Which implies that

$$32 = \frac{I_F}{I_S} = \frac{S_F}{S_S} = \frac{s_F}{s_S} \cdot 16 \iff \frac{s_F}{s_S} = 2.$$

Sylvania vs. Freedonia

Note

Given the data we have, Freedonia would need to save twice as much as Sylvania to explain the differences in investment.

But, the rato of their actual savings rates may be different from the computed ratio of 2.

What now?

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Sylvania vs. Freedonia

Two possible outcomes

Sylvania vs. Freedonia

Two possible outcomes

- Difference in s explains **all** the difference in income per capita y

  $\implies$ Why are there differences in s?

- Difference in s explains **only part** of the difference in y

  - What else can account for differences in y

  - Why are there differences in s

Sylvania vs. Freedonia

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Sylvania vs. Freedonia

Additional possible answer:

Freedonia is more technologically advanced than Sylvania.

Additional possible answer:

Freedonia is more efficient than Sylvania at production, i.e., with same technology and inputs it can produce more output.

Assume these three forces explain all the differences in income

- Why are there differences in savings/investment rates?
- Why are there differences in technology?
- Why are there differences in efficiency?

Our original answers

Do not provide **fundamental** answers

They are only **proximate** answers to our big questions

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Proximate vs. Fundamental/Ultimate/Deep Causes

How shall we answer

Two Types of Answers

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Both are important and interesting!

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Plot

- Charles Bovary becomes a doctor in Normandy, France in XIX century
- Emma Rouault is a young, beautiful, and educated woman
- She has a powerful yearning for luxury and romance inspired by reading popular novels
- She marries Charles Bovary, becomes Madame Bovary
- She is disappointed at married life and motherhood
- She takes on lovers, but is disappointed
- She indulges in shopping sprees using credit
- Huge debt that gets collected...
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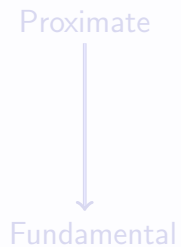- Desperate, she kills herself with arsenic
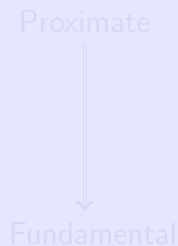
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Possible answers:

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$\downarrow$

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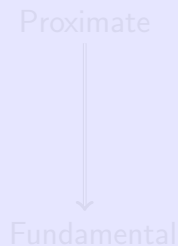
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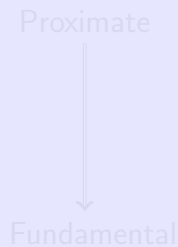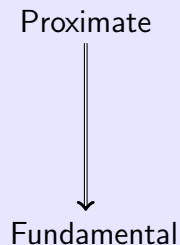
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Causes of Economic Development

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- Institutions
- Culture
- Geography & Climate

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- Production Function: Recipe - $F(A, K, L)$

- Factor Accumulation: Ingredients - K, L, H, etc.

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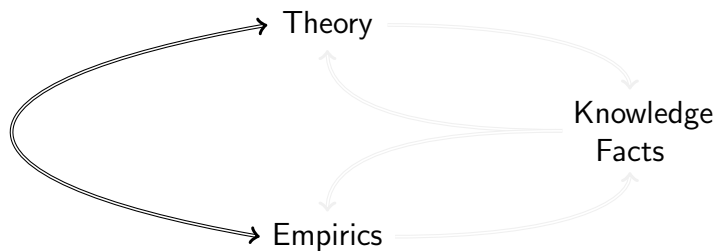
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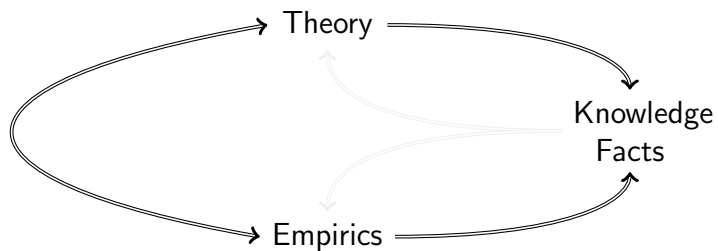 - Technology
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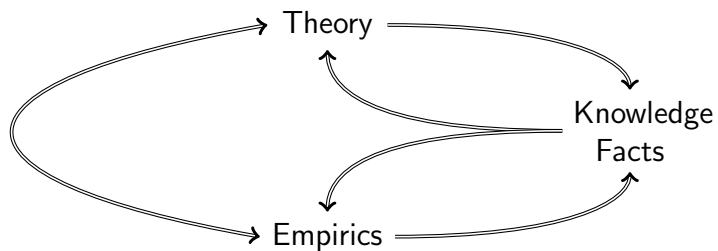- Institutions
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Finding and Understanding Causes

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Proximate Causes of Growth

- Factor Accumulation:
    - Physical capital accumulation (Solow, QJE 1956)
    - Human capital accumulation (Lucas, JME 1988)

- Technological Progress:

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- Inconsistent with the development process over most of human history:
    - GT: growth rates decline in the transition to sustained growth
    - GT: technological progress increases steady-state income per capita
    - GT: does not capture the demographic transition (DT)
    - GT: does not capture the take-off from stagnation to growth
    - GT: convergence

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        - Evidence: take-off the understanding of what drives stagnation & growth
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        - Evidence: divergence in income per capita over time

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        - Evidence: divergence across the past two to centuries

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        - Evidence: Led to the understanding of relevant forces facilitating it
    - GT: convergence
        - Evidence: Divergence in the past few centuries

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        - Evidence: Divergence in income per capita prior to take-off

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Non-Unified Growth Theory

- Captures the role of factor accumulation and technological progress in the modern growth regime

- Not designed to shed light on:

Non-Unified Growth Theory

- Captures the role of factor accumulation and technological progress in the modern growth regime

- Not designed to shed light on:
  - The historical origins of vast and persistent inequality across countries
  - The forces that triggered the transition of DCs from stagnation to growth
  - The hurdles faced by LDCs in their take-off from stagnation to growth
  - The factors that hindered convergence across countries

Non-Unified Growth Theory

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Origin and Persistence of Cultural Factors

- Geographical origins and persistence of:
  - Trust & Cooperation (Guiso et al., QJE 2009; Algan-Cahuc, AER 2010; Durante, 2010; Litina, 2016)
  - Cultural diversity (Ashraf-Galor, 2012)
  - The European Marriage Pattern (Voigtlander-Voth, AER 2013)
  - Female labor force participation (Alesina et al., QJE 2013)
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- Religious origins of:
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Persistent Effects of Geographical Factors

- Biogeographical conditions that triggered the Neolithic Revolution
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- Land suitable for large plantations
  - Inequality:
  - Concentration of landownership:

- Soil quality conducive for agriculture

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- Range of soil quality
  - Emergence of geographical specific human capital $\implies$ reduced mobility $\implies$ ethnic fractionalization (Michalopoulos, AER 2012)

- Ecological diversity & storable crops

- Geographical determinants of body size

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- Natural selection of traits that are complementary to the growth process:
  - Preference for education (Galor-Moav, QJE 2002; Galor-Klemp, 2018)
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