Introduction and Background

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SMU

Macroeconomic Theory II

Logistics

Tentative Course Outline:

1. Economic Growth (Solow model)
    (a) Acemoglu Ch.1-4 (required)
    (b) Stachurski Ch 1,2
    (c) Barro and Sala-i-Martin Ch.1.1-1.2
    (d) Romer Ch. 1
2. Economic Growth (Ramsey)
    (a) Acemoglu Ch. 5-8 (required)
    (b) Romer Ch. 2.1-2.7
    (c) Barro and Sala-i-Martin Ch.2-3
    (d) Blanchard and Fischer Ch. 4.5
3. Overlapping Generation Models of Growth, Money, and Prices
    (a) Acemoglu Ch. 9 (required)
    (b) Romer Ch.2.8-2.12
    (c) Blanchard and Fischer Ch. 3-4
    (d) Samuelson JPE Vol.66(6) 1958
    (e) Balasko JET1980
4. Endogenous Growth I: Human Capital and Economic Growth, AK models
    (a) Acemoglu Ch. 10 (required)
    (b) Romer Ch. 3
    (c) Barro and Sala-i-Martin Ch. 4, 5
5. Endogenous Growth II: Technological Change
    (a) Acemoglu Ch. 11-15 (required)
    (b) Barro and Sala-i-Martin Ch. 6-7

Logistics II

Additional Potential Topics:

6. Stochastic Growth and its applications
   (a) Acemoglu Ch. 16-17 (required)
   (b) Stachurski Ch 5, 6,
7. Technology Diffusion, Trade, and Interdependence
   (a) Acemoglu Ch. 18-19 (required)
   (b) Barro and Sala-i-Martin Ch. 8
8. Special Topics

TEXTS:

- Main Text: Introduction to Modern Economic Growth by **Daron Acemoglu**.
- Additionally Text: Economic Dynamics: Theory and Computation by **John Stachurski**.
- For future Macroeconomists: Modern Macroeconomics: Its Origins, Development And Current State by **Brian Snowdon** and **Howard R. Vane** (Edward Elgar, 2005).

Useful Links

- Gapminder - This is a very cool program and website that allows you to visualize economic data. Have fun playing with it.
  http://www.gapminder.org/
- Data Plotter: Plot the data from the Economic Growth by David Weil book! Very Nice!
  http://wps.aw.com/wps/media/objects/14734/15088217/plotter/weildataplotter.htm
- World Bank Data The definite source of international data!
  http://datacatalog.worldbank.org/
- US Statistics Combines and presents the data from over 100 agencies. You should be able to find US data here.
  http://www.fedstats.gov/
- Fed's historical statistics The name says it all...financial and monetary statistics for the US.
  http://www.federalreserve.gov/econresdata/statisticsdata.htm
- FRED More cool data from the Fed.
  http://research.stlouisfed.org/fred2/

Short Run Macroeconomics Theory Review

<table>
<tr><th>Classical</th><th>Keynes</th><th colspan="2">Keynesian</th><th>New Classical</th><th>Real Business Cycle</th><th>New Keynesian</th></tr>
<tr><td>Pre-1936</td><td>1936</td><td>1940-60's</td><td>1960's</td><td>1970's</td><td>1980's</td><td>1980's</td></tr>
<tr><td>Wicksell
Marshall
Pigou</td><td>Keynes</td><td>Tobin
Robinson
Samuelson
Modigliani</td><td>Friedman
Laidler</td><td>Lucas
Sargent</td><td>Kydland
Prescott
Long
Plosser</td><td>Fischer
Taylor
Akerlof
Romer</td></tr>
<tr><td colspan="4" rowspan="2">Non-optimizing
No micro Foundations/No Walrasian Framework</td><td colspan="3">Optimizing
Explicit Walrasian Micro Foundations
Agents & firms preferences well behaved</td></tr>
<tr><td colspan="2">Perfect comp</td><td>Imperfect comp</td></tr>
<tr><td colspan="4">No Continuous Market Clearing</td><td colspan="2">Continuous Market Clearing</td><td>NO</td></tr>
<tr><td colspan="5">Cycles are bad</td><td>Optimal</td><td>Bad</td></tr>
<tr><td colspan="3">Expectations not modeled explicitly</td><td>Adaptive Expect.</td><td colspan="3">Rational Expectations $X_{t+1}^e = E[X_{t+1}|\Omega_t]$
Agents know TRUE model</td></tr>
</table>

Long Run Macroeconomics Theory Review

Dismal Science							
1798	1817	1848	1921	1936	1956	1970	1985
Malthus	Ricardo	Marx Engels	Ramsey	Harrod Domar	Solow	Brock Mirman	Romer
Population explosion Eternal Poverty Moral Restraint	Decreasing Land Productivity Lower Profits No Growth	Technology allows growth Capitalism Self-destructive Limits Potential	Agents Maximize Utility Optimize Savings and Consumption	Cycle growth same		1st RBC Need growth Mechanism turned on to get	Technology special good
				C vs. I		growth=cycle Microfoundations	
						Optimality	Not PO
Classical			NeoClassical	Keynesian		Walrasian	

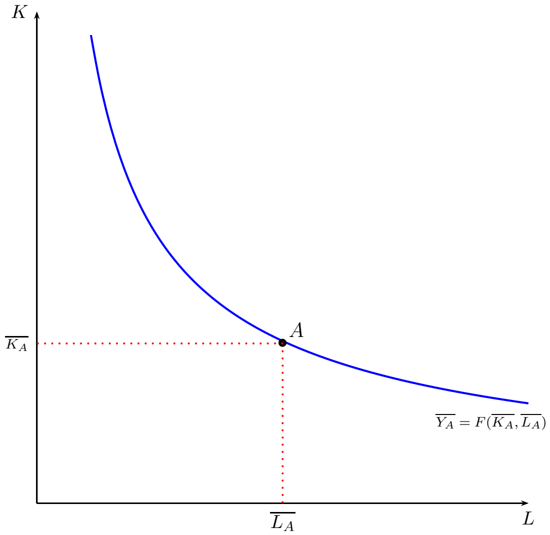
Some more links if interested...

- History of Economic Thought: http://web.archive.org/web/20110313054911/http://homepage.newschool.edu/ http://www.hetwebsite.net/het/
- History of Economic Thought http://en.Wikipedia.org/wiki/History_of_economic_thought
- Standup Economist: http://standupeconomist.com/

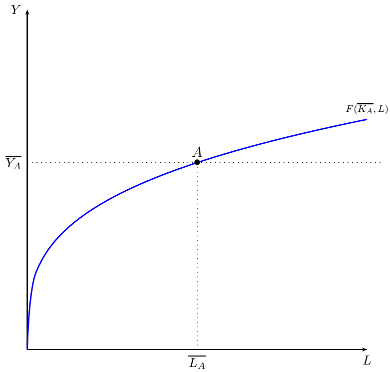
Classical Model - Review

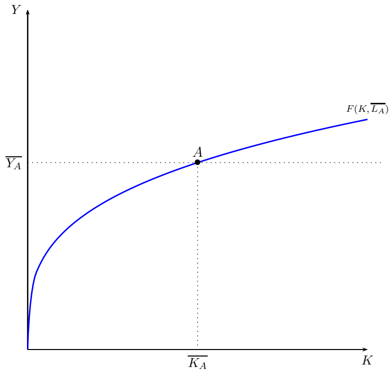
- Macro model
  - Explain equilibrium $Y, K, L, W/P, R/P, C, I, S, r, M/P, \mathcal{L}, P, i, W, R$
  - Rational agents (households + firms)
  - Perfect competition
  - Flexible prices
  - Complete (5) markets
  - Short-run equilibrium $\iff$ Supply=Demand
- Production Function $F(K, L)$
  - Differentiable $\implies$ MPK, MPL
  - Constant returns to scale
- Consumption function $C = C(Y)$
- Investment function $I = I(r)$

Classical Model - Review

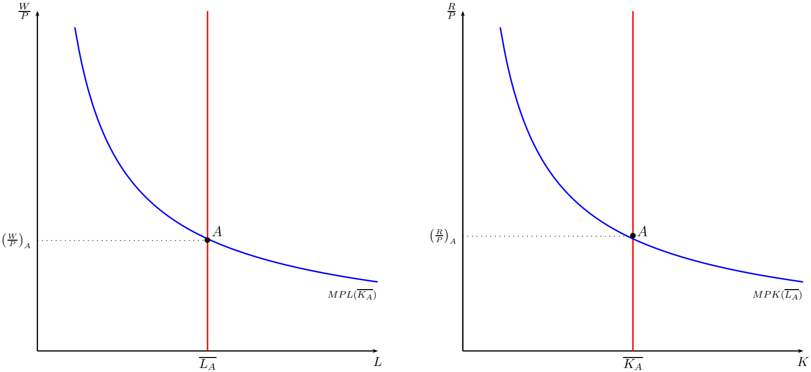


Classical Model - Review

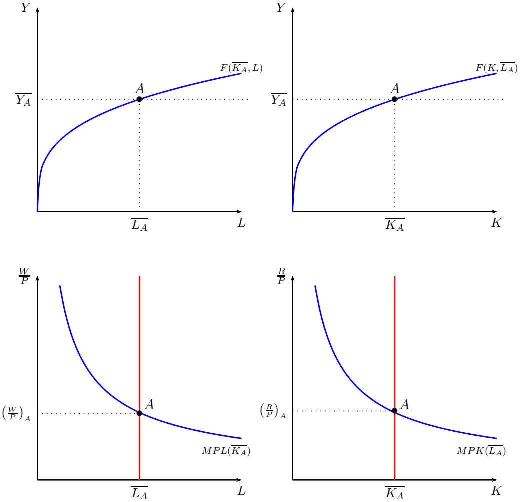




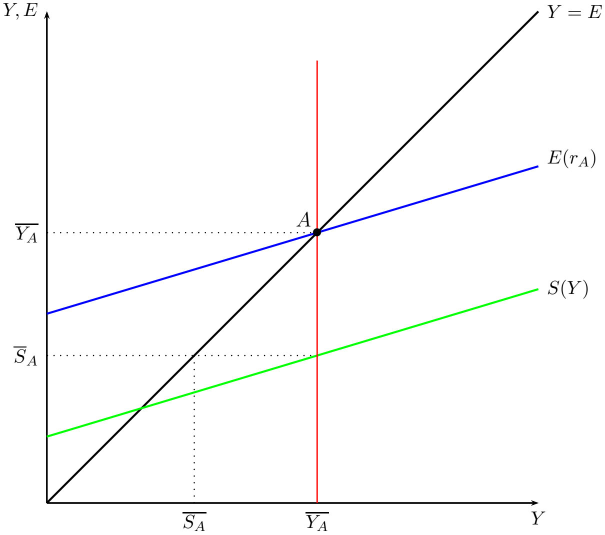
Classical Model - Review



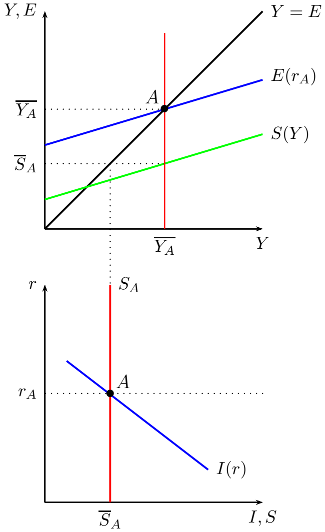
Classical Model - Supply Side



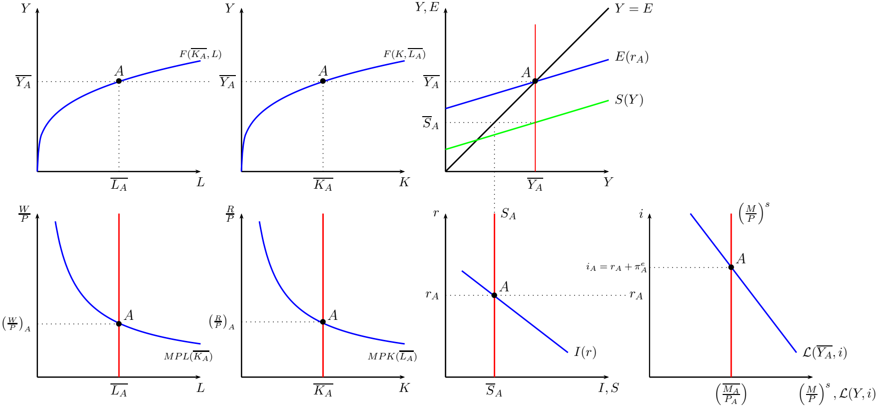
Classical Model - Demand Side I



Classical Model - Demand Side II



Classical Model - Equilibrium



What does the data look like?

Show some real world data...

- Use Gapminder
  https://www.gapminder.org/tools

Cross-Country Income Differences I

Cross-Country Income Differences II

There are very large income per capita & output per worker differences across countries today.

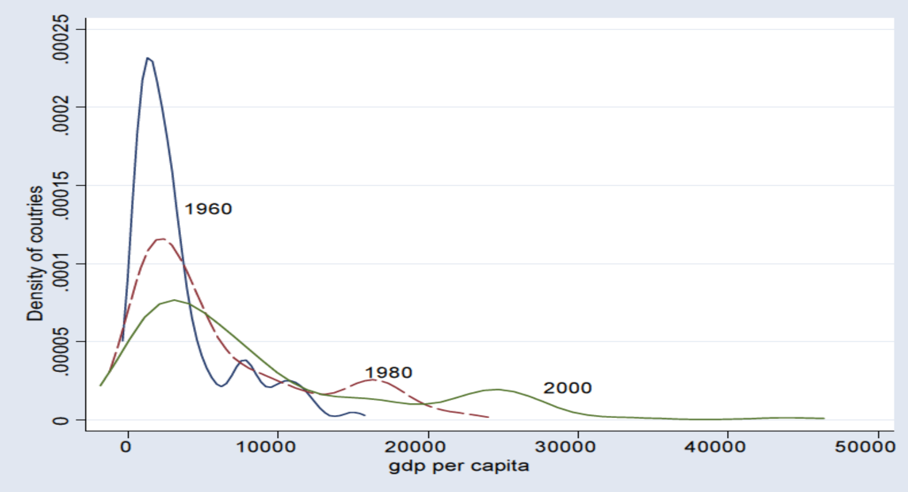


Figure 1.1. Estimates of the distribution of countries according to PPP adjusted GDP per capita in 1960, 1980 and 2000.

Cross-Country Income Differences III

- Part of the spreading out of the distribution in the Figure is because of the increase in average incomes.
- More natural to look at the log of income per capita when growth is approximately proportional:
  - when $x(t)$ grows at a proportional rate, $\log(x(t))$ grows linearly,
  - if $x_1(0)$ and $x_2(0)$ 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.
- The next Figure, 1.2 "Log GDP per capita," shows a similar pattern, but now the spreading-out is more limited.

- Quah (1993, 1997) shows bimodal twin peaks distribution of income:
  - Very difficult to move (jump) between regions.

Cross-Country Income Differences IV

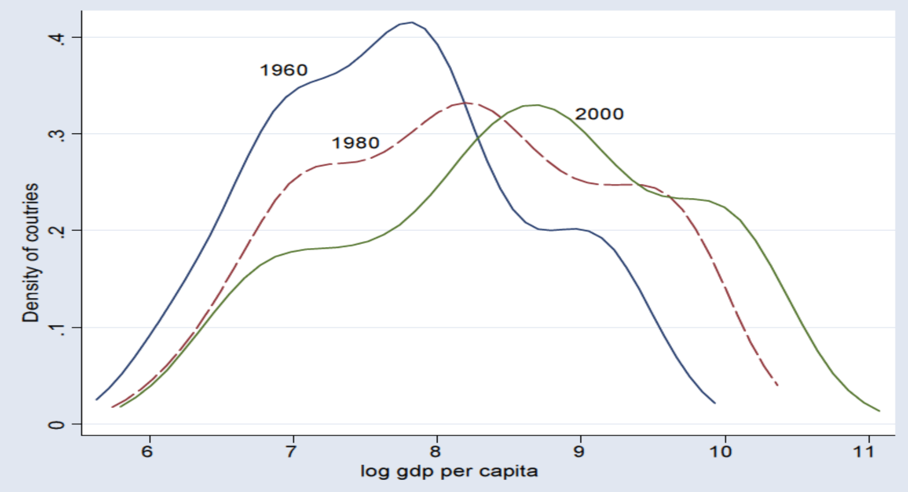


Figure 1.2 – Estimates of the distribution of countries according to log GDP per capita (PPP-adjusted) in 1960, 1980 and 2000.

Cross-Country Income Differences V

- Theory is easier to map to data when we look at output (GDP) per worker.
- The next Figure looks at the unweighted distribution of countries according to (PPP-adjusted) GDP per worker
  - "workers": total economically active population according to the definition of the International Labor Organization.
- Overall, two important facts:
  1. Large amount of inequality in income per capita and income per worker across countries.
  2. Slight but noticeable increase in inequality across nations (though not necessarily across individuals in the entire world).

Cross-Country Income Differences VI

Figure 1.4 – Estimates of the distribution of countries according to log GDP per worker (PPP-adjusted) in 1960, 1980 and 2000.

Economic Growth and Income Differences

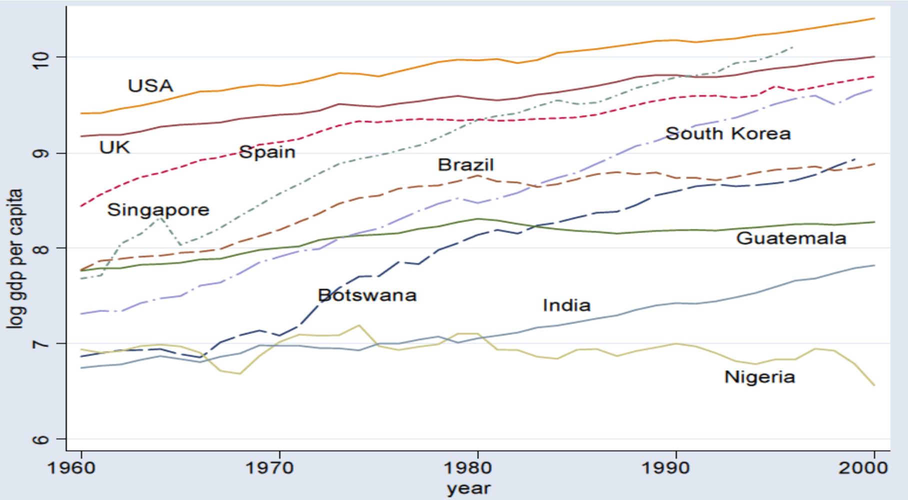


Figure 1.8 – The evolution of income per capita in the United States, United Kingdom, Spain, Singapore, Brazil, Guatemala, South Korea, Botswana, Nigeria and India, 1960-2000.

Economic Growth and Income Differences

- Why is the United States richer in 1960 than other nations and able to grow at a steady pace thereafter?
- How did Singapore, South Korea and Botswana manage to grow at a relatively rapid pace for 40 years?
- Why did Spain grow relatively rapidly for about 20 years, but then slow down? Why did Brazil and Guatemala stagnate during the 1980s?
- What is responsible for the disastrous growth performance of Nigeria?
  - Central questions for understanding how the capitalist system works and the origins of economic growth.
  - Central questions also for policy and welfare, since differences in income related to living standards, consumption and health.
- Our first task is to develop a coherent framework to investigate these questions and as a byproduct we will introduce the workhorse models of dynamic economic analysis and macroeconomics.

Origins of Income Differences and World Growth I

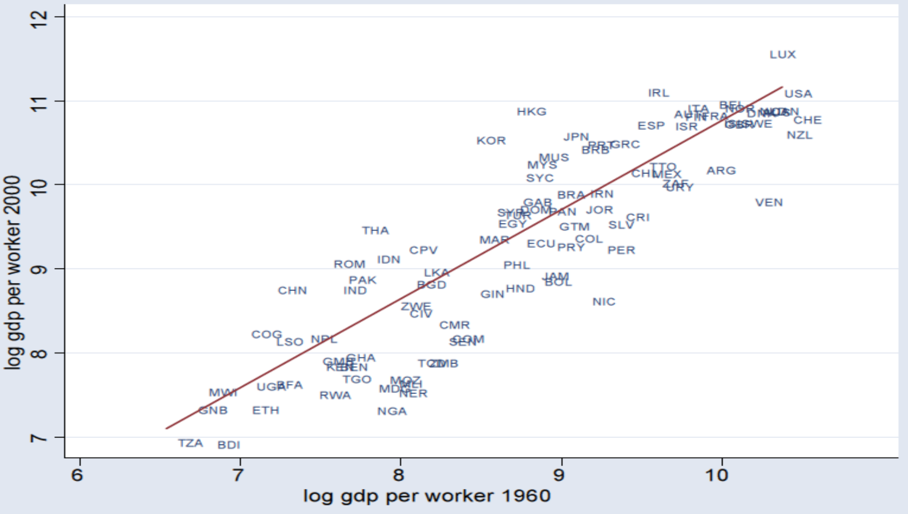


Figure 1.9 – Log GDP per worker in 2000 versus log GDP per worker in 1960, with 45º line.

Origins of Income Differences and World Growth II

Conditional Convergence

- How do we capture conditional convergence?
- Consider a typical "Barro growth regression":

$$g_{i,t,t-1} = \alpha \ln y_{i,t-1} + \mathbf{X}_{i,t-1}^{T}\beta + \varepsilon_{i,t} \qquad (1.1)$$

  - Where $g_{i,t,t-1}$ is the annual growth rate between dates $t-1$ and t in country i,
  - $y_{i,t-1}$is output per worker (or income per capita) at date $t-1$, and
  - $\mathbf{X}$ is a vector of variables that the regression is conditioning on with coefficient vector β.
- These variables are included because they are potential determinants of steady state income and/or growth.
- The equation (1.1) is quite similar to the relationship shown in Figure 1.9 above.
- In particular, since $g_{i,t,t-1} \simeq \ln(y_{i,t}) - \ln(y_{i,t-1})$, equation (1.1) can be written as

$$\ln(y_{i,t}) \simeq (1+\alpha)\ln(y_{i,t-1}) + \varepsilon_{i,t}$$

- Figure 1.9 showed - relationship log GDP/worker in 2000 and in 1960 is approximated by the 45º line, so $\alpha \simeq 0$.

Origins of Income Differences and World Growth III

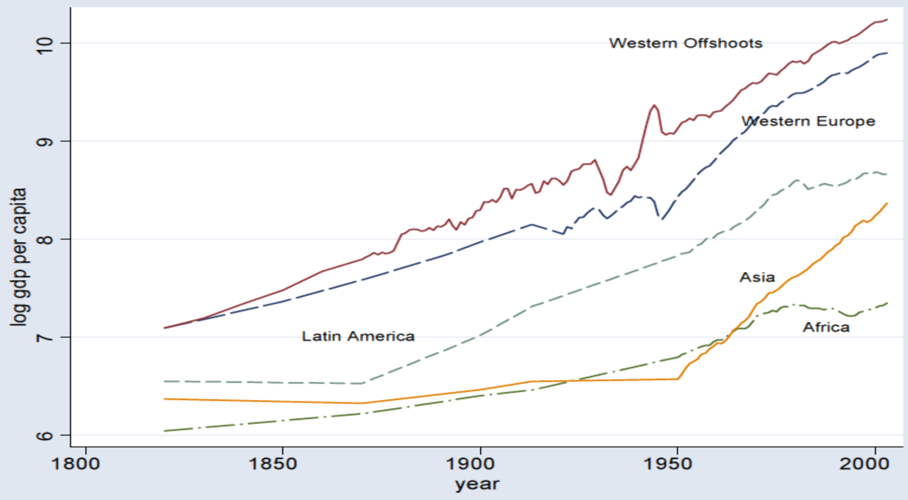


Figure 1.10 – The evolution of average GDP per capita in Western Offshoots, Western Europe, Latin America, Asia and Africa, 1820- 2000.

Origins of Income Differences and World Growth IV

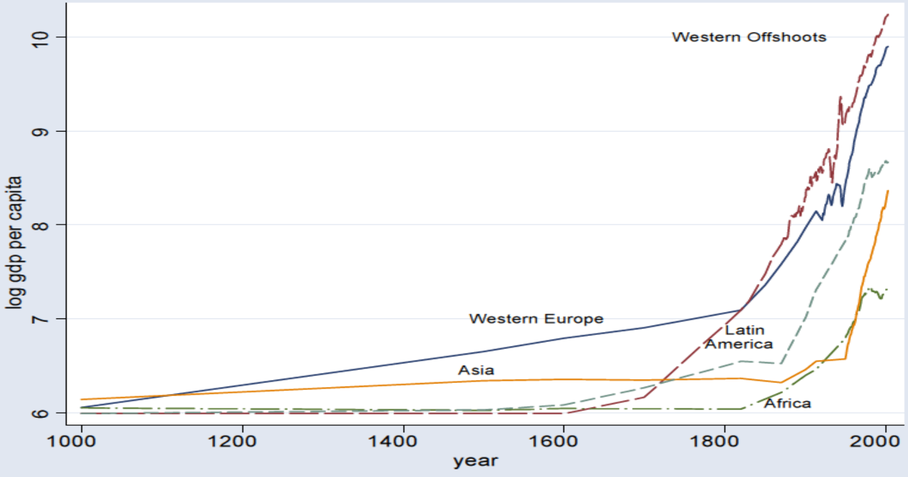


Figure 1.11 – The evolution of average GDP per capita in Western Offshoots, Western Europe, Latin America, Asia and Africa, 1000- 2000. Income divergence ratio *Rich/Poor* as recently as 1800 was 1.8 to 3.0 x, now is closer to 40 x. Divergence mostly post industrial Revolution.

Origins of Income Differences and World Growth V

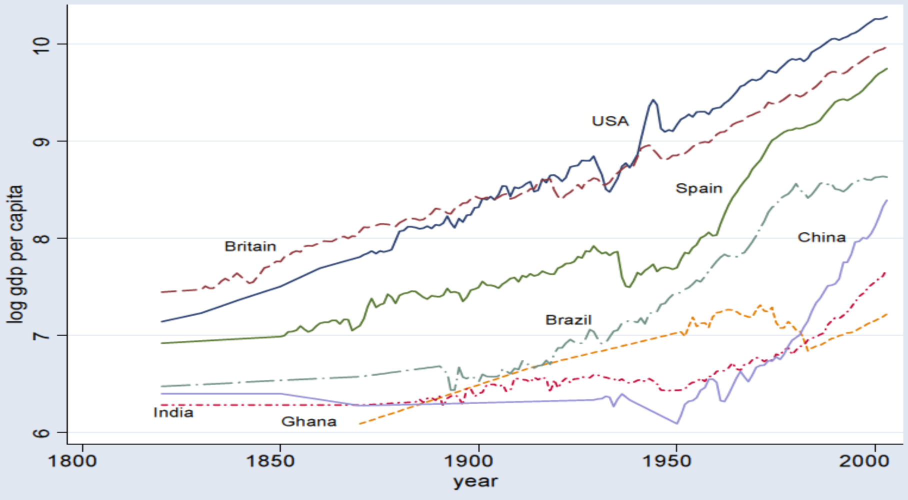


Figure 1.12 – The evolution of income per capita in the United States, Britain, Spain, Brazil, China, India and Ghana, 1820-2000.

Correlates of Economic Growth I

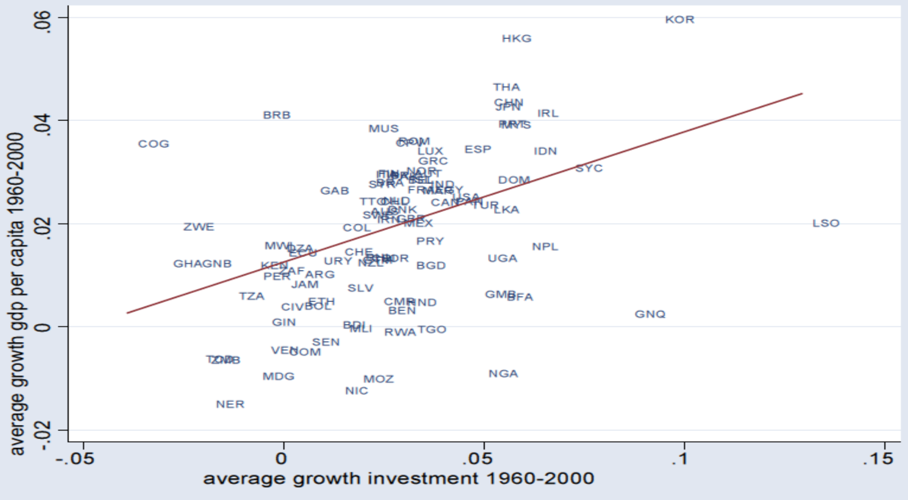


Figure 1.15 – The relationship between average growth of GDP per capita and average growth of investments to GDP ratio, 1960-2000.

Correlates of Economic Growth II

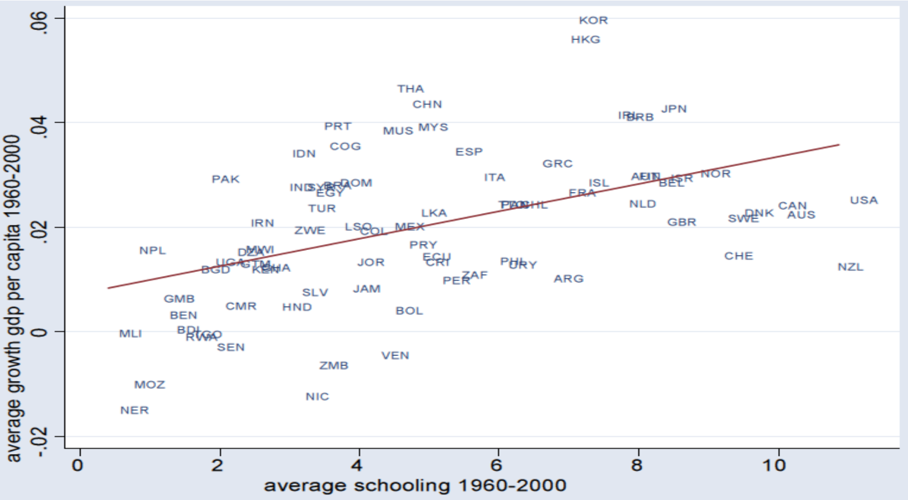


Figure 1.16 – The relationship between average growth of GDP per capita and average years of schooling, 1960–2000.

From Correlates to Fundamental Causes I

- Correlates of economic growth, such as physical capital, human capital and technology, will be our topic of study.
- But these are only *proximate causes* of economic growth and economic success:
  - why do certain societies fail to improve their technologies, invest more in physical capital, and accumulate more human capital?
- Return to Figure 1.8 "The evolution of income per capita ... 1960-2000" above to illustrate this point further:
  - how did South Korea and Singapore manage to grow, while Nigeria failed to take advantage of the growth opportunities?
  - If physical capital accumulation is so important, why did Nigeria not invest more in physical capital?
  - If education is so important, why are education levels in Nigeria still so low and why is existing human capital not being used more effectively?
- The answer to these questions is related to the *fundamental causes* of economic growth.

Proximate vs. Fundamental Cause of Growth Example

Proximate vs. Fundamental Cause of Growth Example:

- Madame Bovary:
  - Grand perfect romance $\rightarrow$ Boring romance$\rightarrow$ Boring to have child $\rightarrow$ Affairs offer spice to life $\rightarrow$ Finds perfect lover $\rightarrow$ But lover chooses someone else $\rightarrow$ Suicide by Poison and dies.
- Why did she die?
  - Died $\leftarrow$ Poison (proximate how not why) $\leftarrow$ Depressed not satisfied$\leftarrow$ Failure of affair $\leftarrow$ Failure of romance $\leftarrow$ Women had no opportunities in society in that period (Fundamental cause!)

Proximate vs. Fundamental Cause of Growth?

- Proximate causes (correlations, relatively easy to measure and model): capital, human capital (education), savings rate, technology, rate of technological development...

From Correlates to Fundamental Causes II

- We can think of the following list of potential fundamental causes (current hard empirical work):
  1. Luck (or multiple equilibria)
  2. Geographic differences
  3. Institutional differences
  4. Cultural differences or
  5. Biology
- An important caveat should be noted: discussions of geography, institutions and culture can sometimes be carried out without explicit reference to growth models or even to growth empirics. But it is only by formulating parsimonious models of economic growth and confronting them with data that we can gain a better understanding of both the proximate and the fundamental causes of economic growth.

Study of Economic Growth

There are 3 questions that the study of economic growth tries to answer:

1. Why are there large differences in GDP per capita and per worker productivity?
2. Why do some countries grow rapidly while others stagnate?
3. What sustains economic growth over long periods of time, and why did sustained growth start 200 years ago?

We start our study of growth by trying to understand its mechanism: how technology (A), capital (K) and labor (L) affect growth?