Economic Growth in the Long-run

Chapter 3

The three main divisions.

- **<u>True long-term prosperity:</u>** Institutions and political stability are the necessary and sufficient conditions for countries to become rich.

- **<u>Long-run growth:</u>** It comes from potential growth, or the efficient use of resources. The supply side of the economy is more important. Innovation, new industries, and human capital are key drivers.

- **<u>Short-run growth:</u>** Demand factors determine the GDP growth of the current year. Behavior of consumers, companies, and government spending, coupled with foreign demand for a country's goods and services, influence the path of the economy in the next few quarters.

Growth in the Long run: Overview

Economic growth across history.

- The Solow Model and how countries can achieve economic prosperity.

- China and Vietnam success stories.

- Endogenous Growth Theory and the role of ideas.

Longest-run Economic Growth
GDP per capita in year 2000 international $ dollars

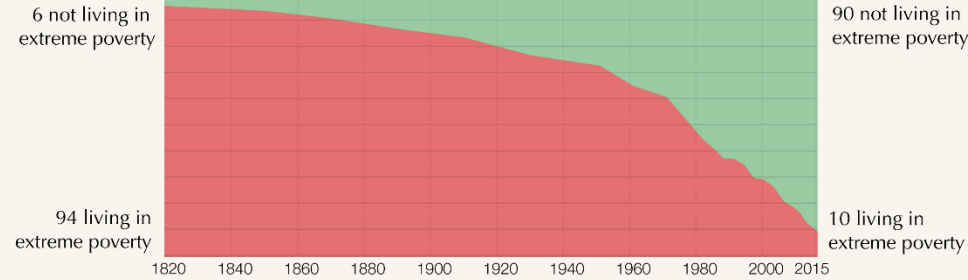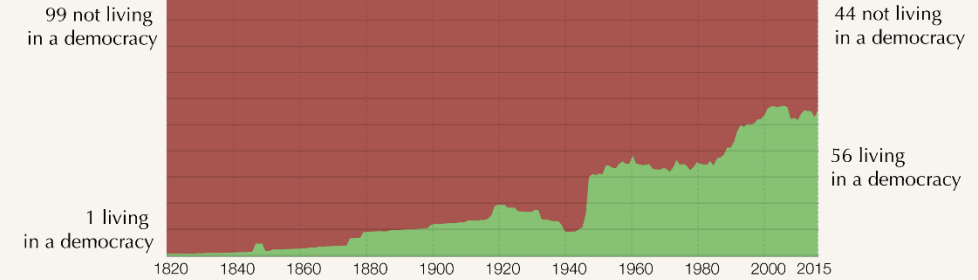| Year	Population (millions)	GDP per capita
-5000	5	$130
-1000	50	160
1	170	135
1000	265	165
1500	425	175
1800	900	250
1900	1625	850
1950	2515	2030
1975	4080	4640
2000	6120	8175

Source: Maddison, 2001.

Not much change for most of history

The World as 100 People
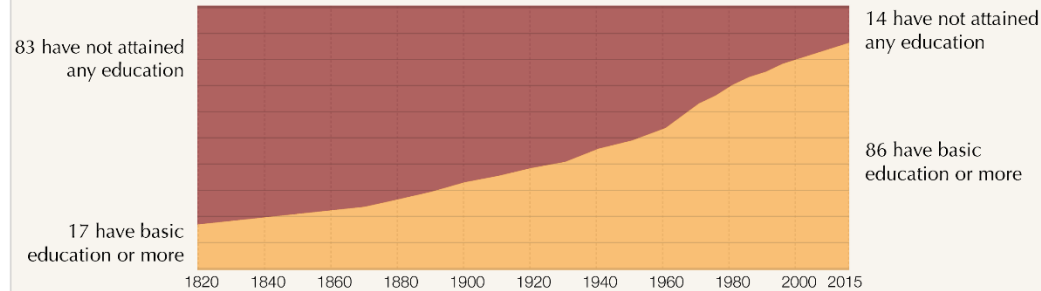## over the last two centuries

Extreme Poverty

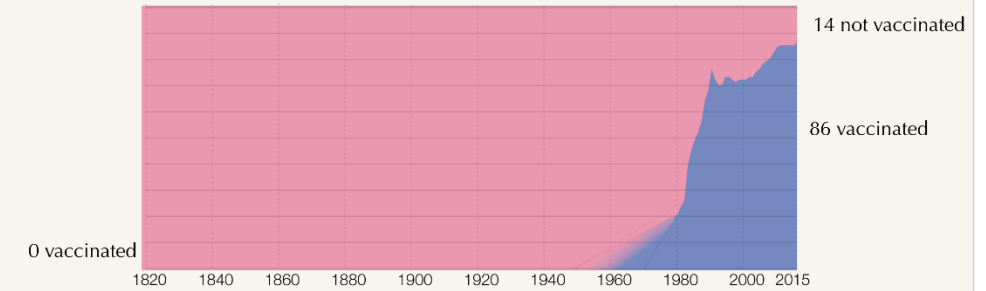6 not living in extreme poverty

90 not living in extreme poverty

94 living in extreme poverty

10 living in extreme poverty

1820 1840 1860 1880 1900 1920 1940 1960 1980 2000 2015

Democracy

99 not living in a democracy

44 not living in a democracy

1 living in a democracy

56 living in a democracy

1820 1840 1860 1880 1900 1920 1940 1960 1980 2000 2015

Basic Education

83 have not attained any education

14 have not attained any education

17 have basic education or more

86 have basic education or more

1820 1840 1860 1880 1900 1920 1940 1960 1980 2000 2015

Vaccination against diphtheria, pertussis (whooping cough), and tetanus
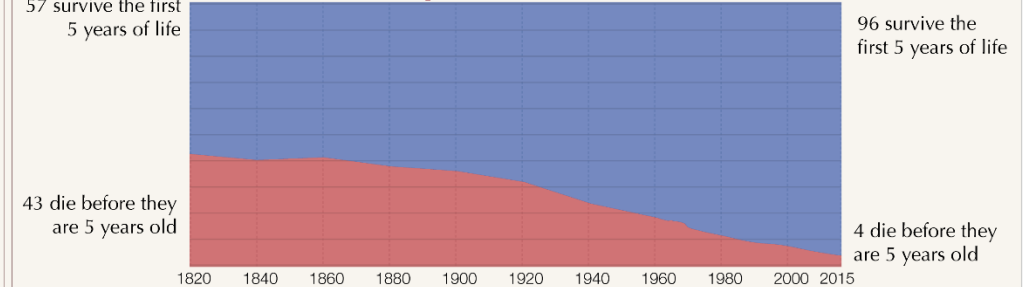
14 not vaccinated

86 vaccinated

0 vaccinated

1820 1840 1860 1880 1900 1920 1940 1960 1980 2000 2015

Literacy

15 are not able to read

88 are not able to read

12 are able to read

85 are able to read

1820 1840 1860 1880 1900 1920 1940 1960 1980 2000 2014

Child Mortality

57 survive the first 5 years of life

96 survive the first 5 years of life

43 die before they are 5 years old

4 die before they are 5 years old

1820 1840 1860 1880 1900 1920 1940 1960 1980 2000 2015

The world population increased 6.8-fold over these 2 centuries.

7.4 Billion

1.1 Billion   1.7 Billion

1820   1900   2015
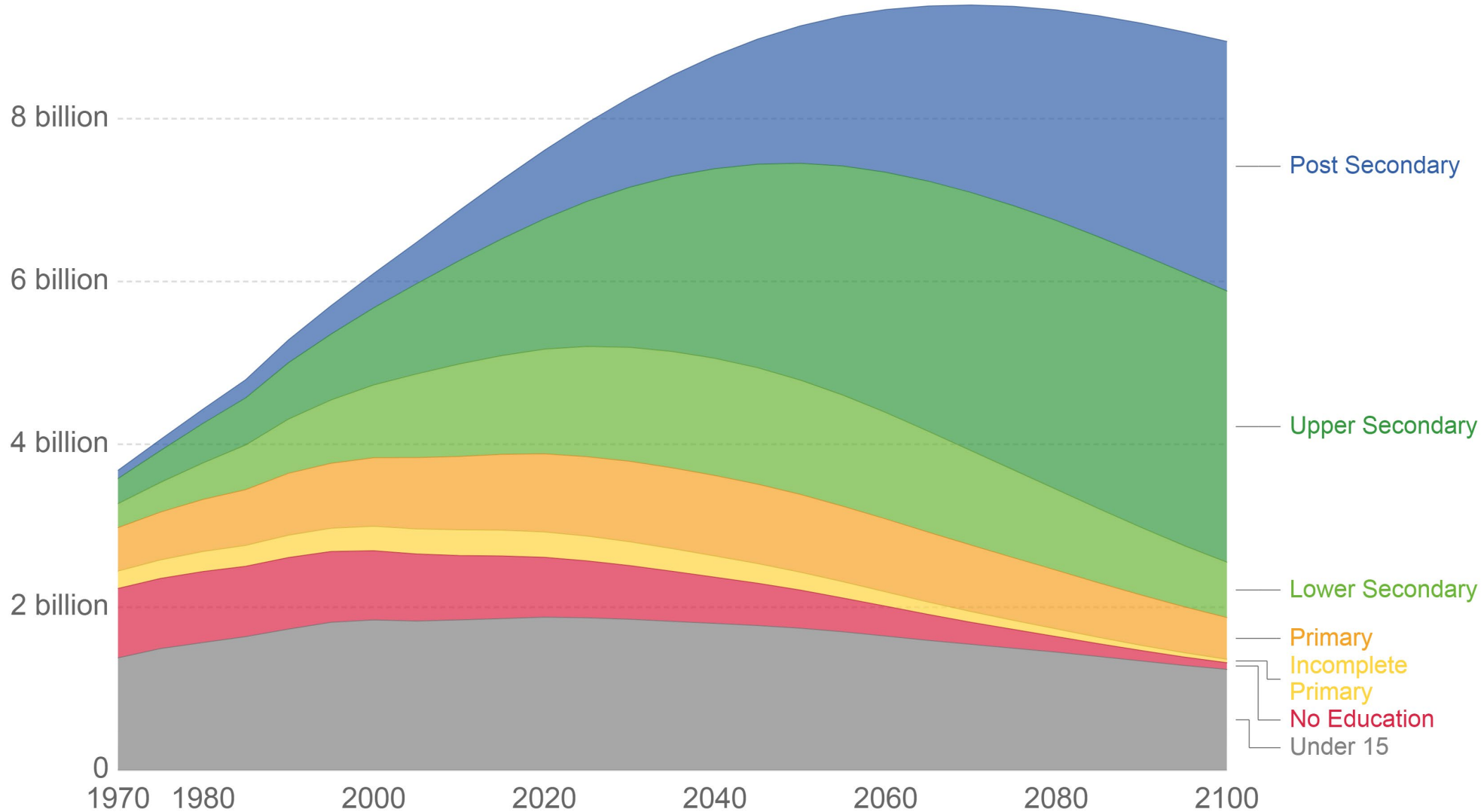
All these visualizations are from OurWorldInData.org an online publication that presents the empirical evidence on how the world is changing.

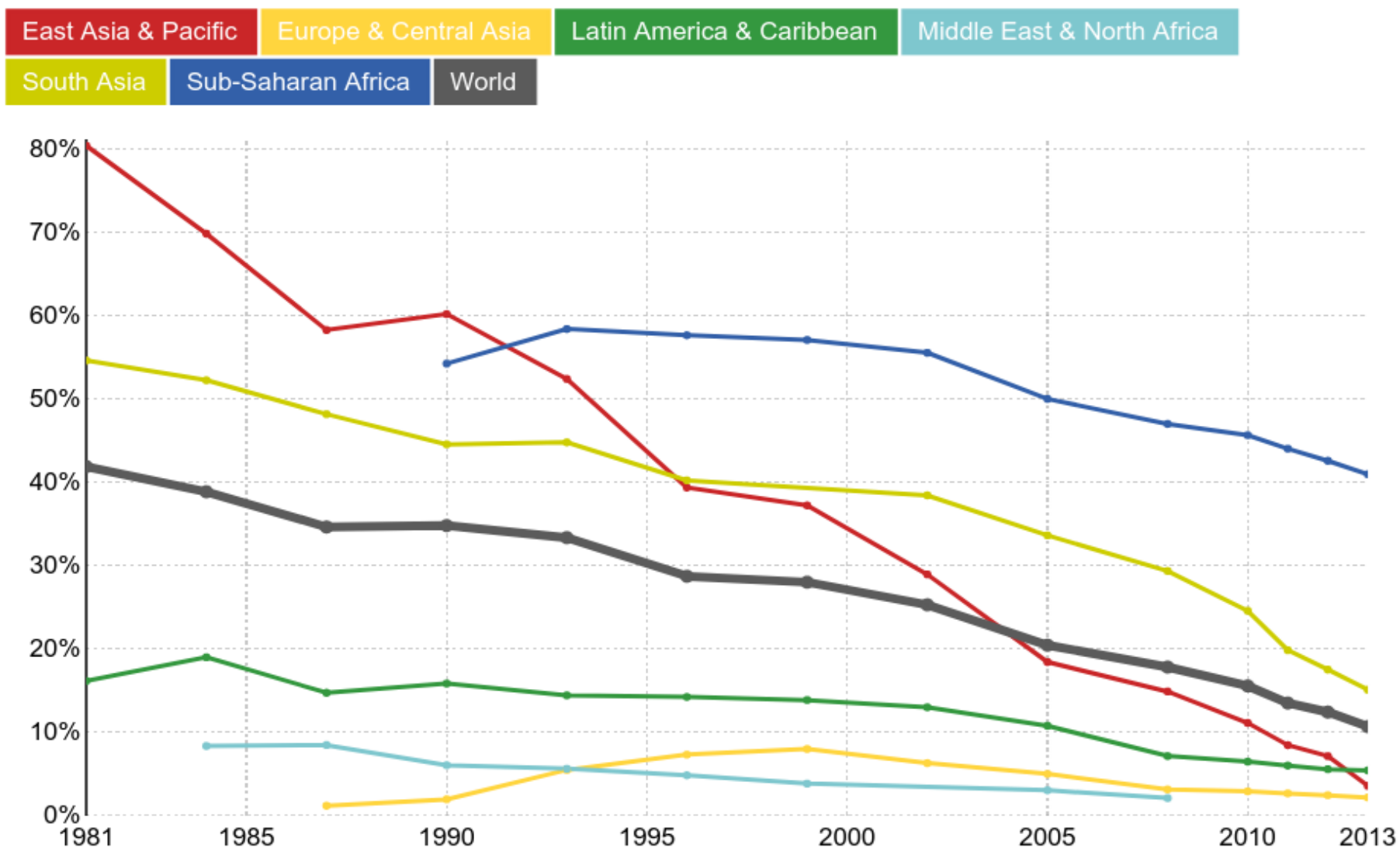# Projected world population by level of education

This visualization shows the Medium projection by the International Institute for Applied Systems Analysis (IIASA).
The researchers who created this projection describe it as their "middle of the road scenario that can also be seen as
the most likely path".

Our World in Data

- Post Secondary
- Upper Secondary
- Lower Secondary
- Primary
- Incomplete Primary
- No Education
- Under 15

8 billion
6 billion
4 billion
2 billion
0

1970 1980 2000 2020 2040 2060 2080 2100

Share of population living in extreme poverty by world region

Extreme poverty is defined as living with less than 1.90$ per day (in 2011 International Dollar). International dollars are adjusted for price differences across countries and across time.
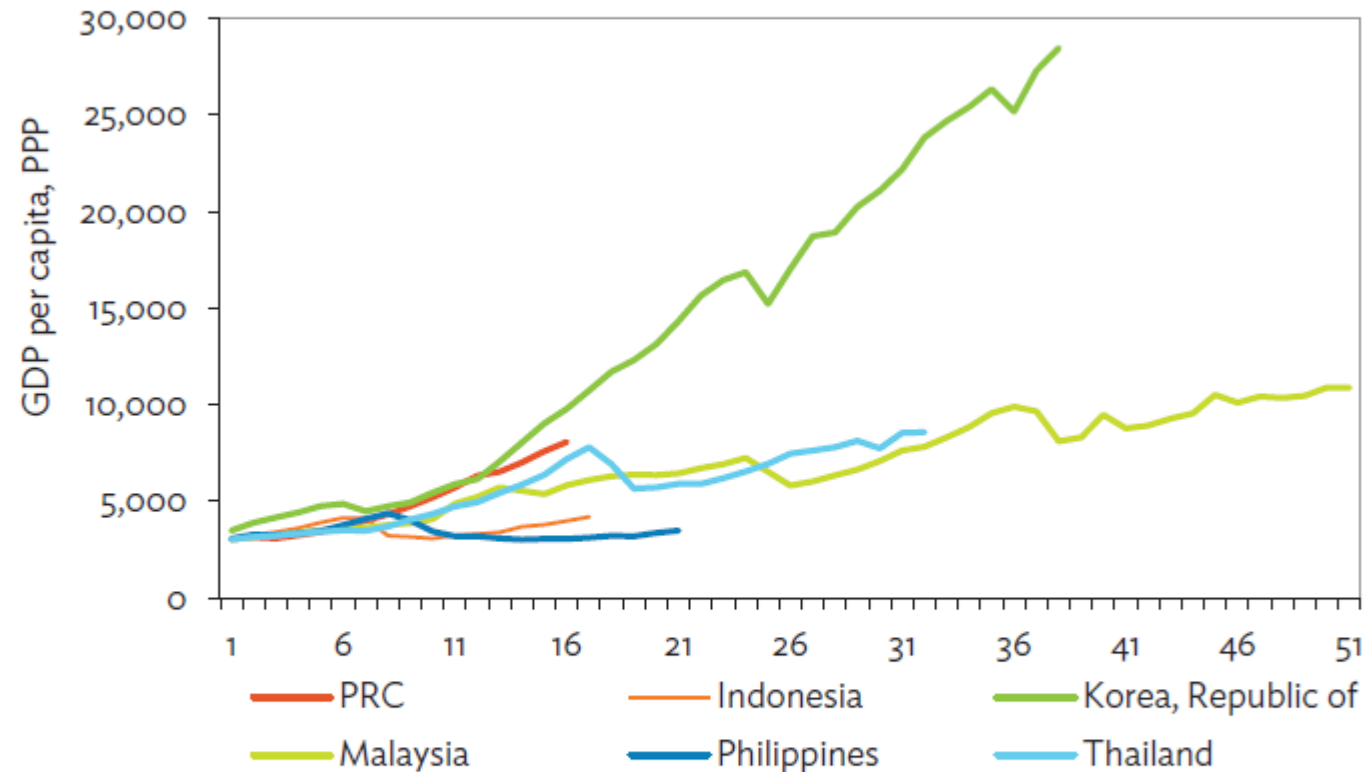
East Asia & Pacific **Europe & Central Asia** **Latin America & Caribbean** **Middle East & North Africa**

South Asia **Sub-Saharan Africa** **World**

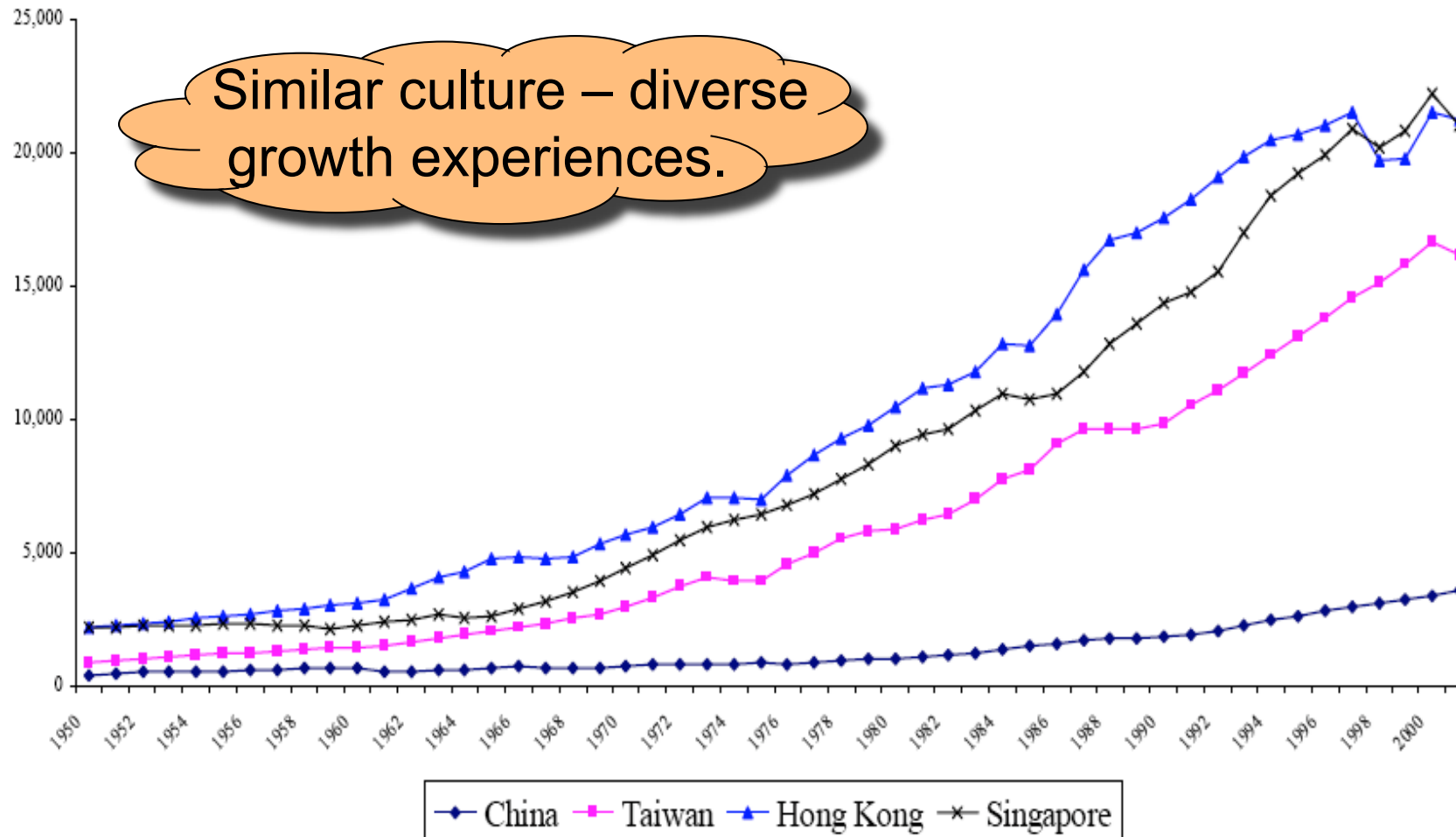OurWorldInData.org/world-poverty/ • CC BY-SA

The Middle-Income Trap?

Figure 2: Gross Domestic Product per Capita and Time Elapsed After Reaching $3,000
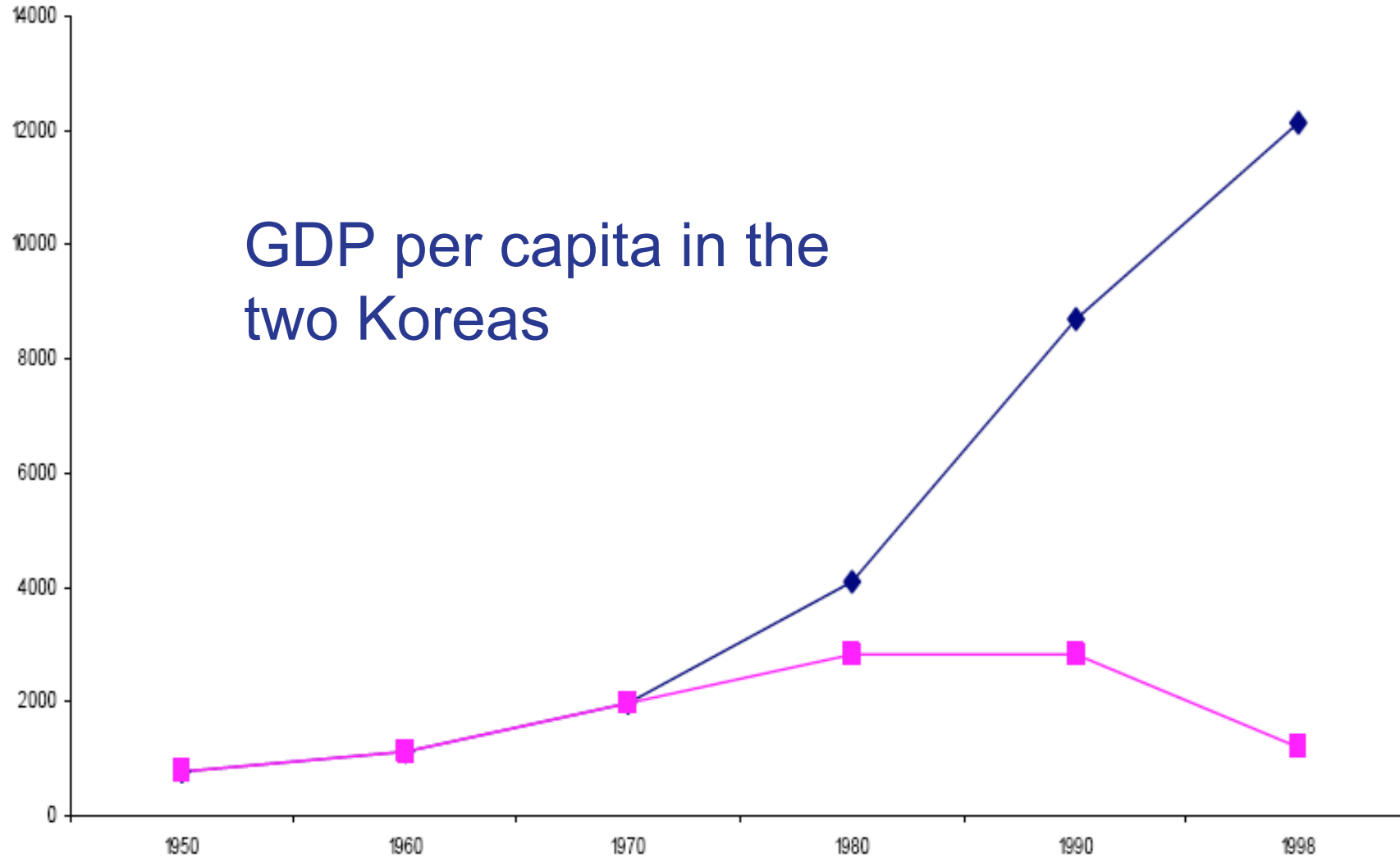
GDP = gross domestic product, PPP = purchasing power parity, PRC = People's Republic of China.
Notes: GDP per capita is calculated as the ratio of GDP to population. GDP in PPP is from the Penn World Tables database, version 8.0. The series is the output-side real GDP at chained PPP, in 2005 $. Population is from the World Development Indicators database. We take the ratio. The PRC reached $3,000 in 1996, Indonesia in 1991, the Republic of Korea in 1974, Malaysia in 1961, the Philippines in 1989, and Thailand in 1980.

Felipe et al (2016) The People's Republic of China's Potential Growth Rate: The Long-Run Constraints

Not Just Culture

GDP per capita in China, Taiwan, and Hong Kong, 1950-2001

Similar culture – diverse growth experiences.

China — Taiwan — Hong Kong — Singapore

Source: Acemoglu, *Introduction to Modern Economic Growth*, 2009.

Institutions matter –
Same culture, diverging experience

GDP per capita in the
two Koreas

And, most importantly, growth matters

WHERE WAS REAL PER CAPITA OUTPUT HIGHER?

- Thailand or Myanmar in 1960?
- Argentina or Canada in 1900?
- India or Korea in 1950?

Despite growth······

- Inequality across countries persists.
- Inequality among individuals in a given country widens.

- Only a little evidence of convergence of countries.
- Growth across globe very uneven.

Growth in the Long Run

Long run analysis: establishing the conditions for prosperity:

➢ What factors influence a country's level of prosperity?
➢ Why do some countries never escape the middle income trap? Will China be able to make the jump?

Three Observations about Long-term Growth

True long-term prosperity hinges on the country's institutions and its political stability. They are the necessary conditions for countries to become rich.

➢ Long-run growth stems from potential growth, or the efficient use of resources. The supply side of the economy is more important. Innovation, new industries, and human capital are the key drivers.

➢ Short-run growth is mostly determined by demand factors. They shape the GDP growth of the current year. Behavior of consumers, companies, and government spending, coupled with foreign demand for the country's goods and services all influence the path of the economy in the next few quarters.

Historic Economic Growth

❑ Prior to the Industrial Revolution, annual GDP per capita growth was glacial.

❑ Chinese GDP per Capita grew only 30% from 1AD to 1820.

❑ Since 1800, real GDP per capita has increased over 14 times, but economic growth around the world has been unequal.

Converging Vs. Diverging

- Australia: What went right?
- Argentina: What went wrong?

GDP per capita (USD)
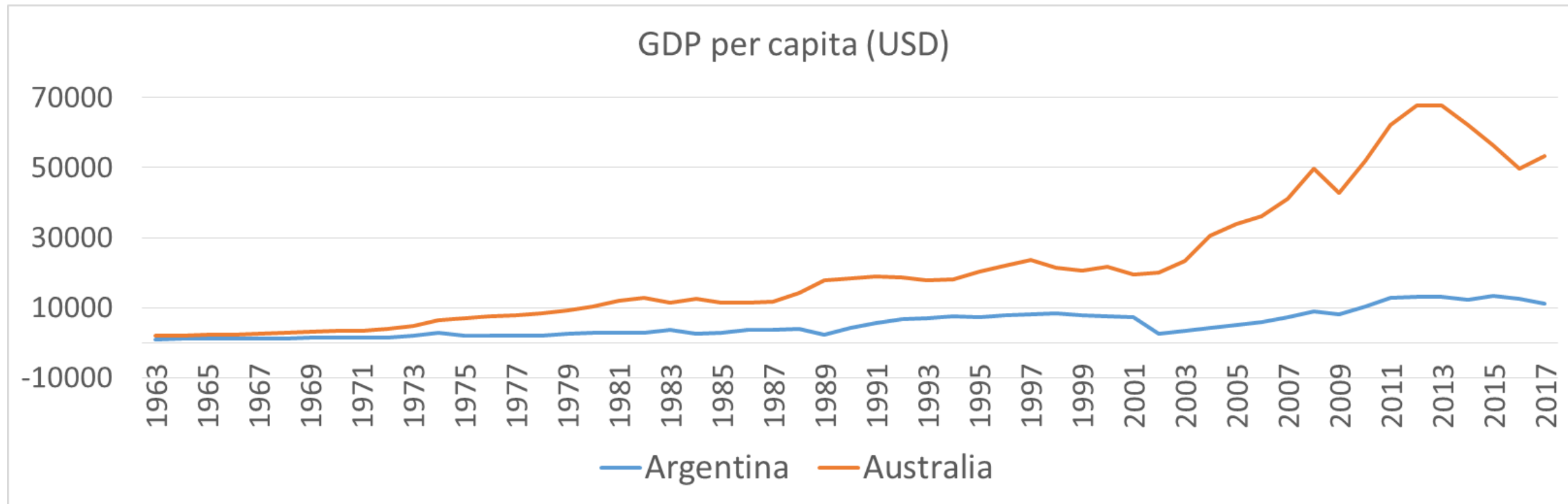
The Bourgeois: virtuous or exploiters?

Deirdre McCloskey

"the assaults on the alleged vices of the bourgeoisie and capitalism after 1848 made an impossible Best into the enemy of an actual Good."

"we have been and can be virtuous and commercial, liberal and capitalist, democratic and rich."

"The American bourgeoisie, beginning in the late 19th century, organized official and unofficial apartheids. It conspired violently against unions. It supported the excesses of nationalism. It claimed credit for a religious faith that had no apparent influence on its behavior. Nowhere does being bourgeois ensure ethical behavior."

Australia Vs. Argentina

At the beginning of the 20th Century Australia was a poor country, but was able to converge with the rest of the world and is now a rich country. Australia has leveraged high levels of foreign investment, low public debt, free markets and capital flows, and its trade relations with other Asia/pacific/oceania to develop rapidly.

At the beginning of the 20th Century, Argentina was one of the richest countries in the world. Instability, dictatorships, short-sighted economic policies and corruption stalled and hurt argentina's economy, and argentina is now a middle-income country. Argentina has fallen back from its original standing in the world as a wealthy country, a century ago.

Summing up

❑ Economic growth has picked up in the last 200 years.

❑ Long-run prosperity is based on institutions that enable (and somewhat constrain) economic activity.

❑ Poverty has fallen all over the globe.

❑ Extreme poverty, in particular, has been greatly reduced in the last 40 years.

❑ All other outcomes (e.g. health and education) have also markedly improved.

❑ But not all countries converge.

Chapter 3.2

The Solow Model

Growth in the Long Run

___

Basis of our version of the Solow Model

For the economy to grow in the long run, aggregate supply factors are more important than aggregate demand.

Solow Growth Model isn't indicative of actual GDP, but rather its potential--the level at which the economy would be if all production factors were used efficiently.

Solow Model Equation

$Y = f(K, AL, AN)$

Y – economic output

A – an index of productivity (technology)

K - capital

L – labor

N – natural resources.

Rapid economic growth since the Industrial Revolution is result of accumulation of K and L, the exploitation of N, and the improvement of A.

Because of the diminishing returns of all factors of productions (K, L, N), technological improvements are the only way to increase GDP per capita sustainably, because it allows for better combinations of

Assumptions of the present version of the model

❑ Marginal Productivity of any input is positive and diminishing.

❑ F(cK, cAL, cAN) = cF(K, AL, AN).

❑ Labor grows at rate l, productivity at rate g, and natural resources at rate r.

❑ All growth in l, g, and r is exogenous.

❑ No government.

Basic Progression of a Developing Country

Accumulation of labor, natural resources, and capital leads to growth-->eventually, accumulation of factors of production slows, and economic growth becomes more dependent upon A (technological improvements).

Technological Improvements Are Key

Increases in potential output (especially for rich countries) are primarily dependent on increases in productivity and technology, and less dependent on accumulation of capital, labor and resources.

Illustration of increasing importance of A as countries become richer

Growth accounting – United States.

Period	Annual Growth Rate of			Contribution of
	Y	Y/L	A	K/L
1948-1973	4.0%	3.0%	1.8%	1.2%
1973-1995	2.7%	0.9%	0.1%	0.8%
1995-2000	4.2%	3.0%	1.9%	1.1%

Source: Brad DeLong, 2001.

Industrialization for Emerging Economies

❑ Industrialization has been key to China's economic rise, particularly in the past 30 years.

❑ It was also a primary reason for the USA's economic growth a century earlier.

Industrialization in the United States

Contribution of economic sectors to total output in the US
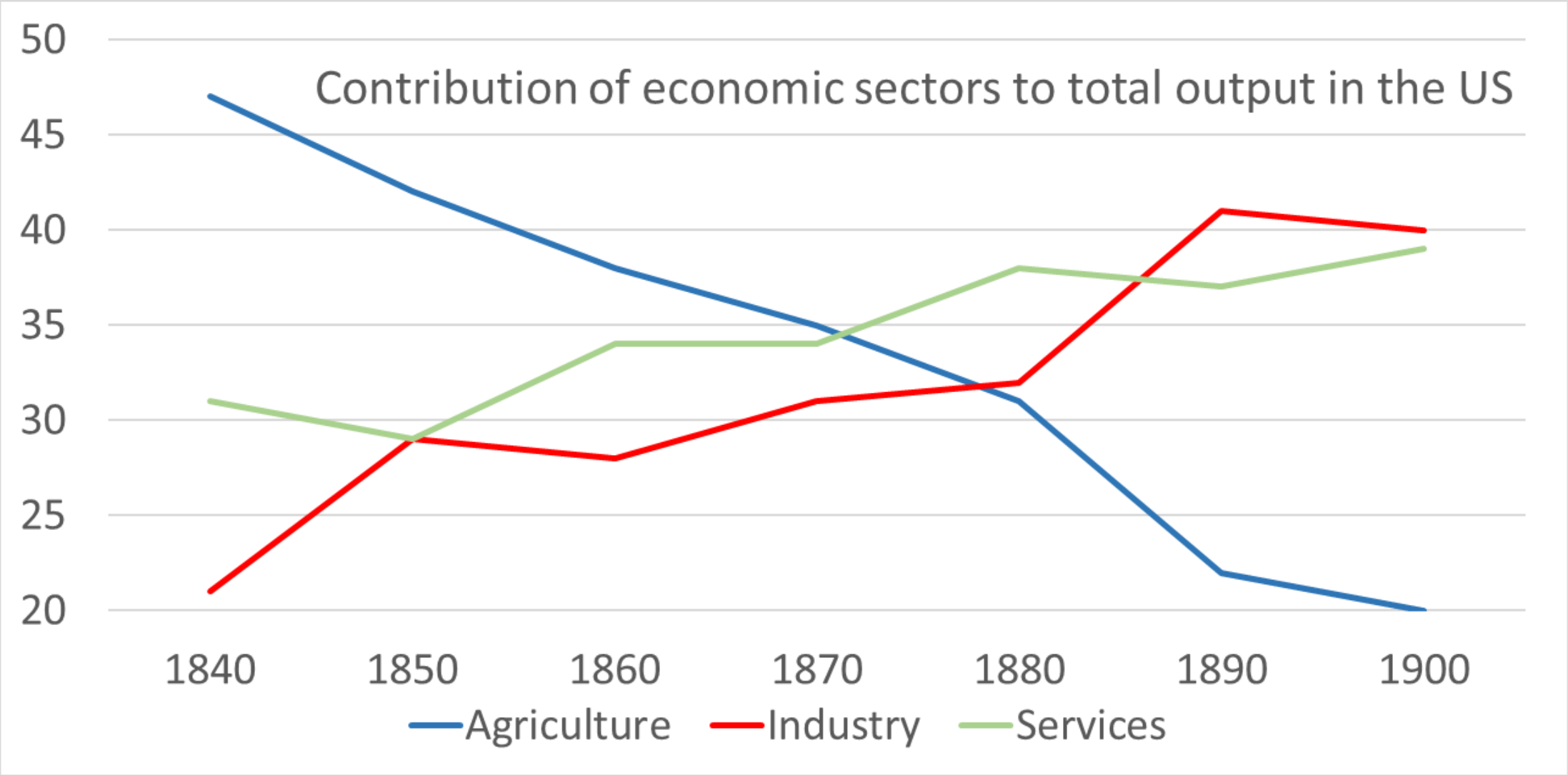
Investing in Human Capital (not only
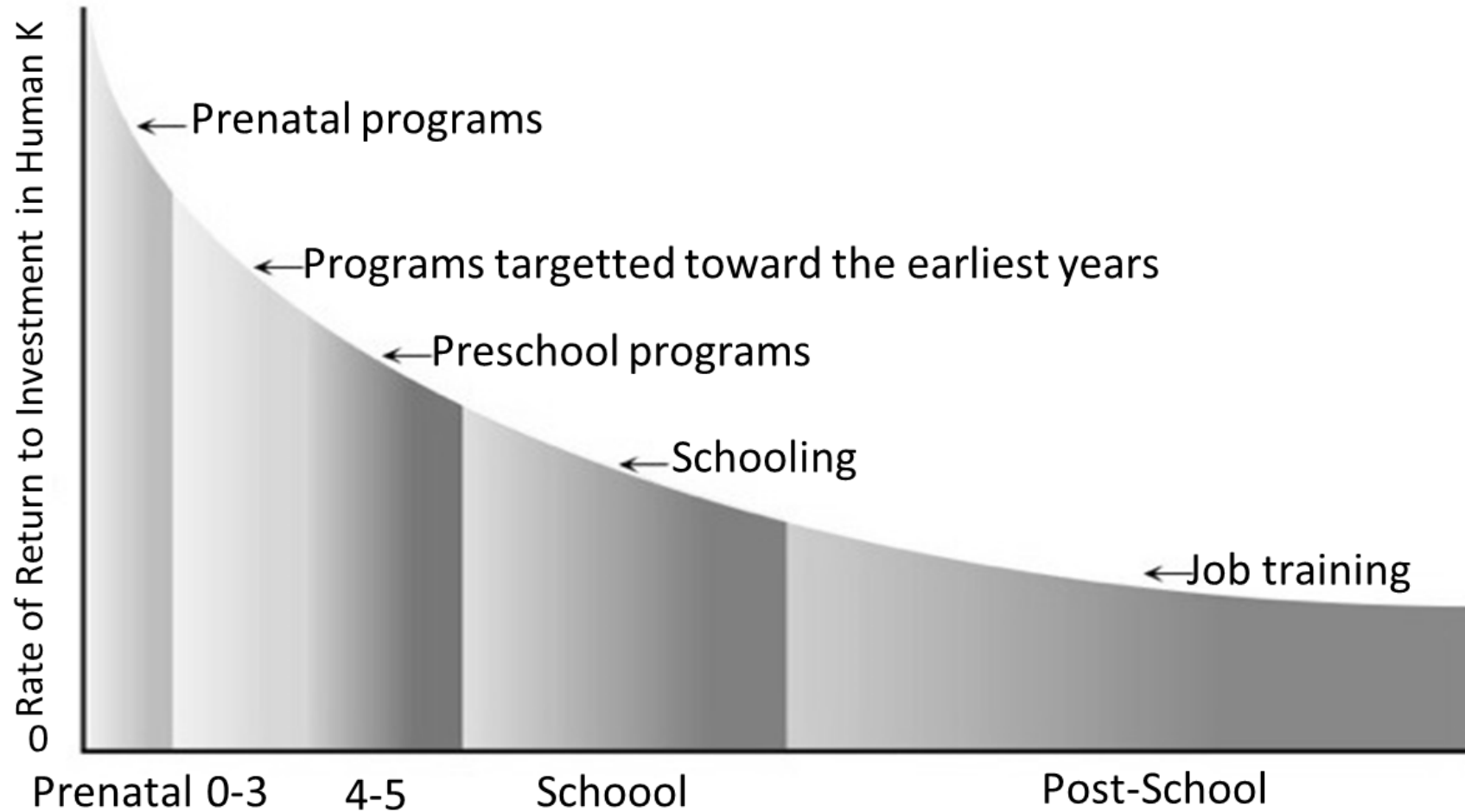
Source: James Heckman.

Chapter 3.3

Beyond the Solow Model

Theory Vs. Actuality

Theory:

- Poor countries converge through accumulation of K, L, and exploitation of N.
- Investment in R&D and education leads to long-term prosperity in rich countries.
- Productivity can rise unimpeded.

Empirics:

- Convergence is domestically and internationally context dependent.
- Investments in R&D and education still have to be effective and efficiently allocated to spur true long-term growth.
- Productivity is lagging in rich countries.

The Solow Model

The model also shows a wide range of other interesting results:

- ❑ Economies can grow because of accumulation of capital, the growth in population and the exploitation of natural resources.
- ❑ Yet, because of diminishing marginal returns, economic output cannot increase forever based solely on these factors.
- ❑ Without growth in technology (productivity), there can be no growth in prosperity for rich countries.
- ❑ We need more.

Chapter 3.4

Sustaining Productivity

Long-Term Growth

How to sustain long-run growth?

❑ Growth is dependent on investment. Whether it be in capital, or human capital (labor) or in research and development (improving technology).

❑ In the short run aggregate investment increases demand. As investments mature, they increase the country's productive capacity.

❑ Aggregate investment is facilitated by good institutions, a stable environment, and rules that are transparent and enforceable etc.

What Affects Long-Term Growth

Good for Long-Term Prosperity

- Strong Institutions
- Access to resources
- Increased education
- Improvements in Doing Business
- Incentives for investment and innovation
- Productive population

Harms Long-Term Prosperity

- Poor or corrupt institutions
- Lacking resources
- Low education
- Incompetent bureaucracy
- No reason for people/government/companies to invest
- Aging, unproductive population

Extractive Vs. Non-Extractive Regimes

Extractive Regimes:

- Upward distribution of resources;
- Typically Authoritarian, though don't have to be;
- Controlled by elites;
- Typically More Corrupt.

Non-Extractive Regimes

- "Greener";
- More egalitarian;
- More equal distribution of resources;
- Typically less corrupt.

Doing Business (World Bank)

Pinelopi Koujianou Goldberg,
World Bank Chief Economist, 2018.

Doing Business (World Bank, 2018)

Top	Middle	Lowest
1 New Zealand	76 Ukraine	181 Haiti
2 Singapore	77 Kyrgyz Republic	182 Congo, Dem. Rep.
3 Denmark	78 China	183 Afghanistan
4 South Korea	79 Panama	184 Central African Republic
5 Hong Kong	80 Kenya	185 Libya
6 United States	81 Botswana	186 Yemen
7 United Kingdom	82 South Africa	187 South Sudan
8 Norway	83 Qatar	188 Venezuela
9 Georgia	84 Malta	189 Eritrea
10 Sweden	85 Zambia	190 Somalia

Aggregate Supply

- Solow Model determines Aggregate Supply.
- Aggregate Supply (AS) represents Potential Output.
- Potential Output: what the economy can produce if it uses all factors of production (K, L, N).
- We divide AS in two components: the elastic part (growth happen without inflation increasing much) and the inelastic part (when actual output reaches potential, engendering

Aggregate Supply: Short-term Vs. Long-Term

➢ Initially: Price stickiness → more horizontal Aggregate Supply curve, less susceptible to price and wage changes.

➢ Near Potential output: AS Curve becomes more vertical because maximum potential output cannot be exceeded.

Aggregate Supply: Short-term Vs. Long-Term

Price level

AS

AS does not change in the short run.

Potential GDP

GDP=Y
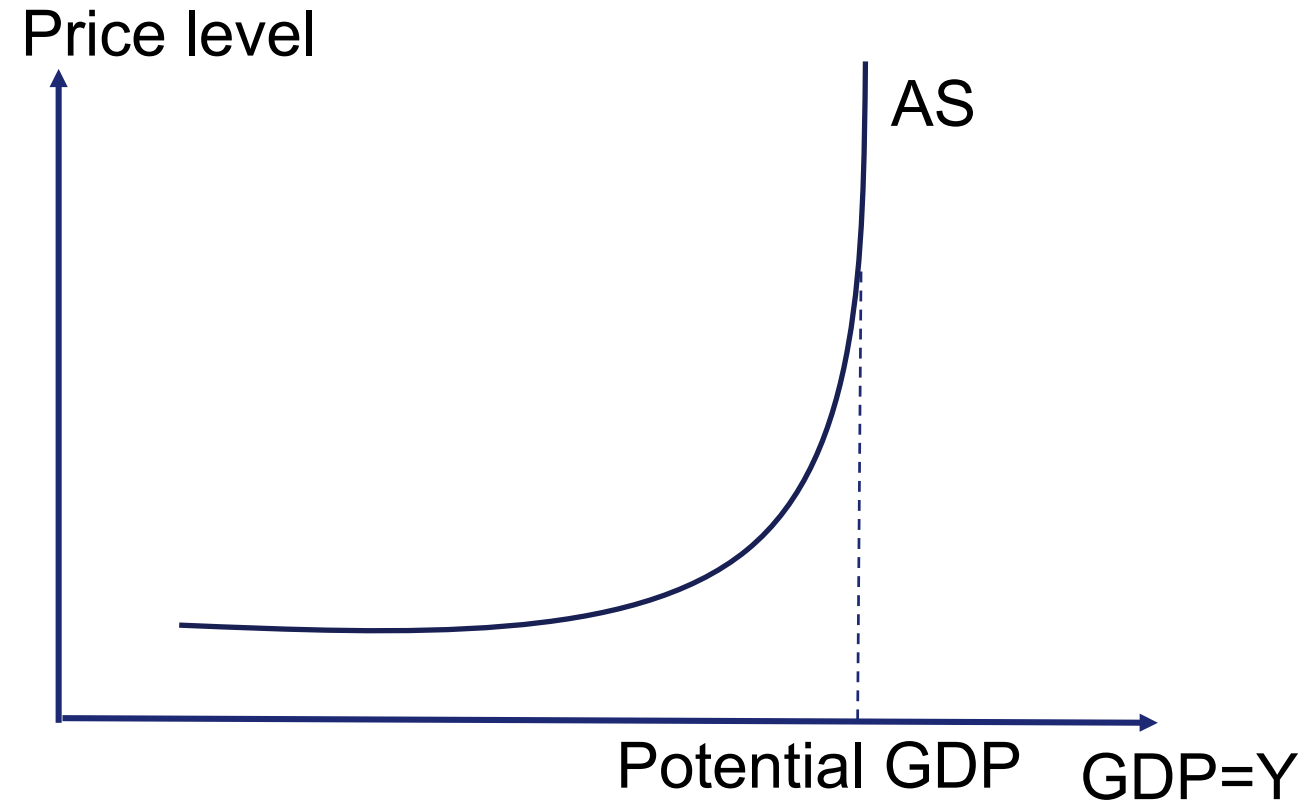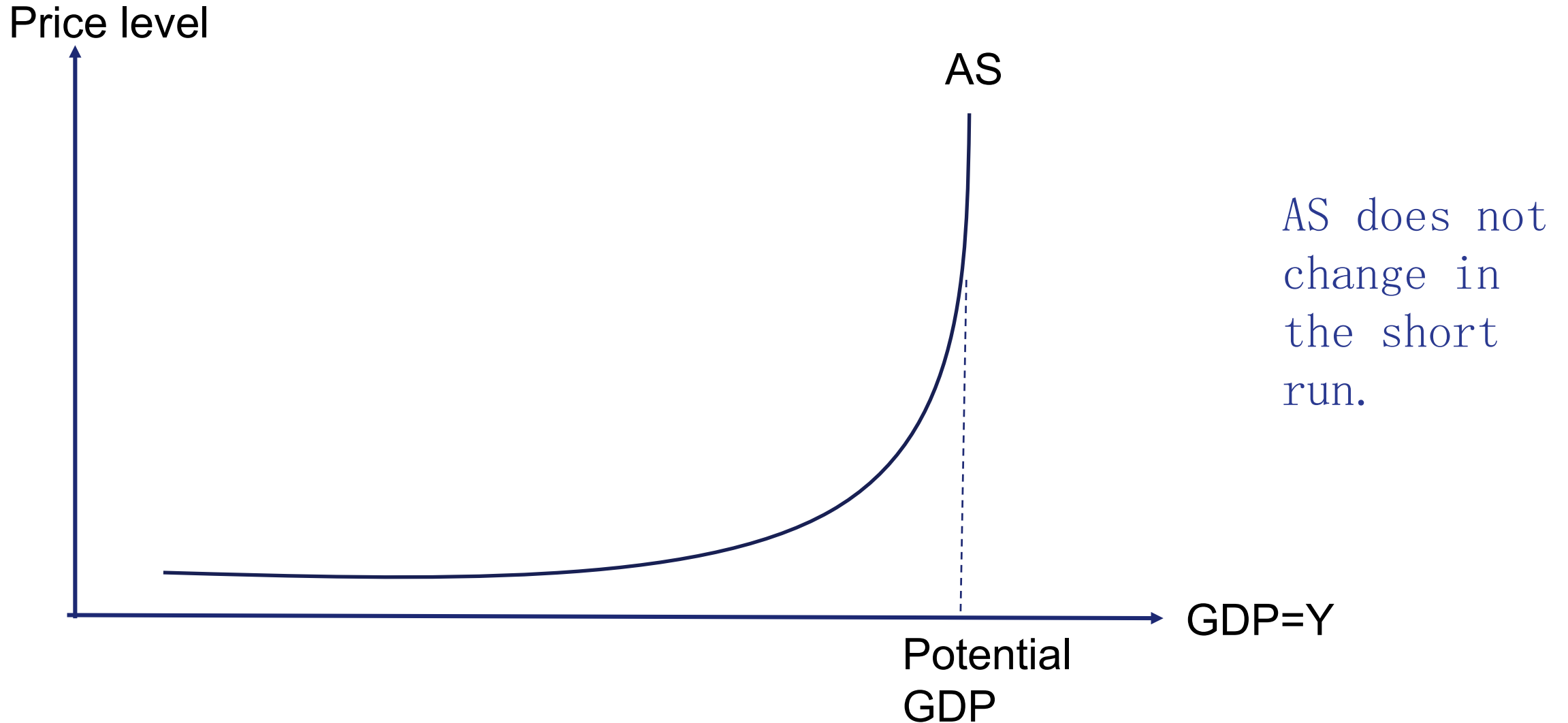
Aggregate Supply: Long-Term

Price level

AS   AS'
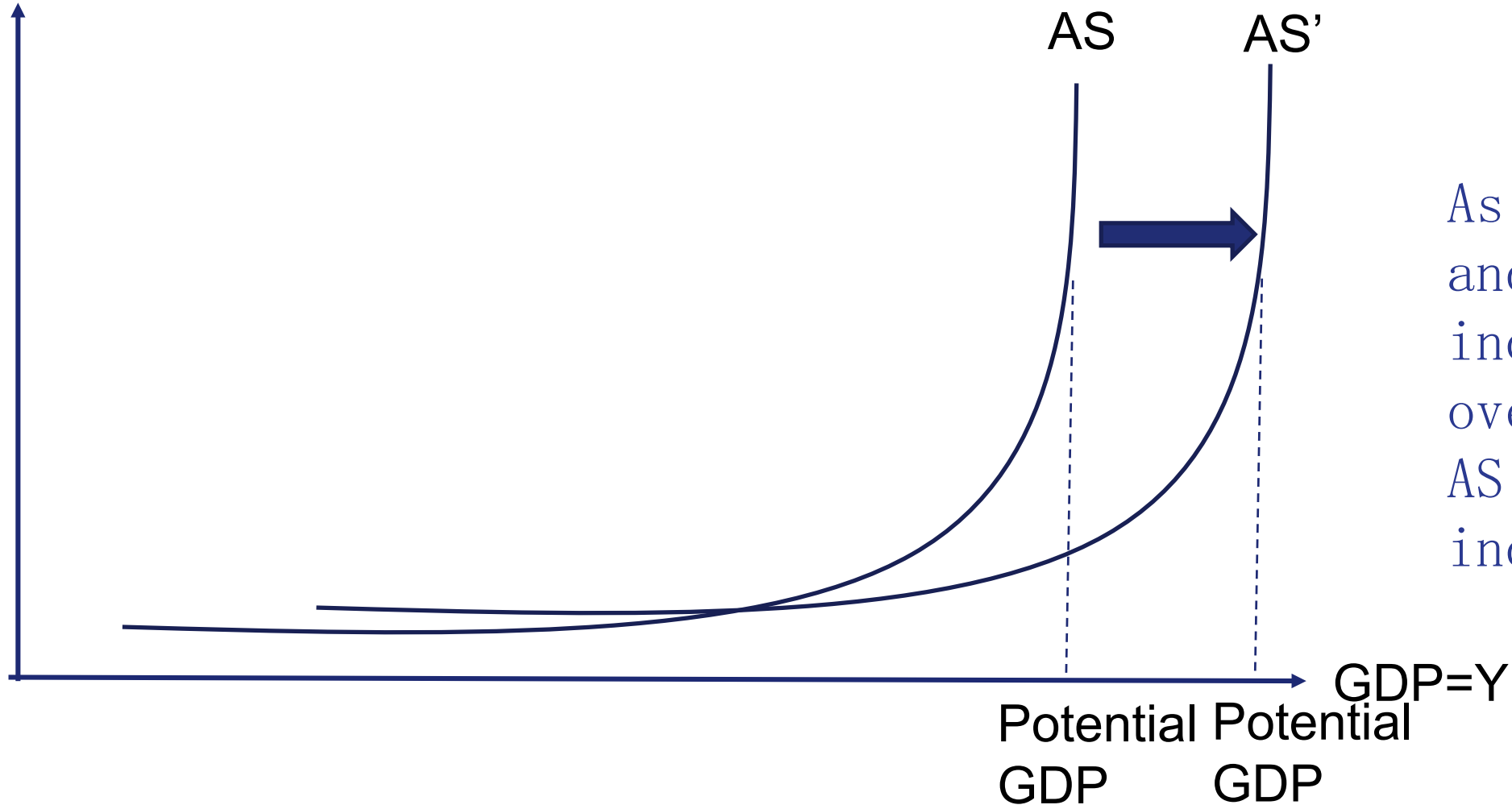
As K,L,N
and A
increase
over time,
AS
increases.

GDP=Y

Potential Potential
GDP   GDP

Measuring Potential Output is hard.

- Potential Output is not directly observable.
- Estimating potential output gives an important target for policy makers.

Aggregate Supply

In poor countries that industrialize or otherwise reform their institutions, AS can increase fast and even shift in the short run.

In rare instances (the mid 1990s because of the Internet), AS can shift to the right in developed economies.

Supply-shocks may cause AS to contract (currency devaluations, energy or water rationing, the Oil Crises of the 1970s).

Chapter 3.5

Levels of Development

Two Dimensional Classification of Development (for now)

Actual Levels of Development (Poor, middle-income, and rich)

- For now, income (GDP per capita) will determine a country's development
- GDP per capita isn't a perfect description (Equatorial Guinea – massive oil reserves skew GDP numbers)
- Over the long-run, countries trend upwards
- Very few instances of countries falling backwards (Argentina, Venezuela)
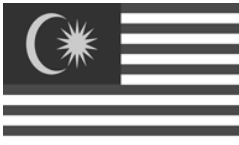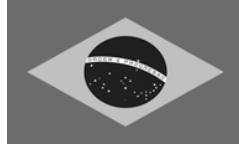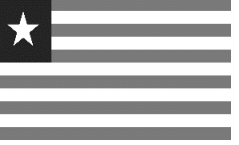
Position in the business cycle (Recession, static and Dynamic)

- Recessions typically not strong enough to knock countries back.
- Majority of growth from dynamic "boom" periods
- We expect lower growth from rich countries than middle income and poor countries
- National vs regional conditions (Detroit struggling while U.S.A. grows)

9 Possible Combinations

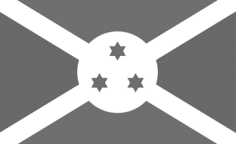|	Poor	Middle-Income	Rich
Recession – Negative GDP Growth	Burundi, Liberia (early 2010s)	Brazil (2015-16), Venezuela	United States (2008-2009)
Static (Stagnant?) - 0 - 2.5% GDP growth	Angola, Congo Republic (2017)	Russia (2014-2016)	Japan (2014), Italy (2010s)
Dynamic – > 2.5% growth)	Rwanda, Tanzania (2010s)	China	United States (2017)

More Examples

	Rich		Middle-Income			Poor		
Dynamic	Australia USD 54,420 2.8%	Sweden USD 54,630 3.2%	China USD 8,260 6.7%	Malaysia USD 9,850 4.2%	Peru USD 5,950 3.9%	Rwanda USD 700 5.9%	Senegal USD 950 6.6%	Tanzania USD 900 7.0%
Stagnant	Italy USD 31,590 0.9%	Japan USD 38,000 1.0%	Jamaica USD 4,660 1.4%	Mexico USD 9,040 2.3%	South Africa USD 5,480 0.3%	Afghanistan USD 580 2.2%	Gambia USD 440 1.6%	Haiti USD 780 1.4%
Recession	Greece USD 18,960 0.0%	Trinidad and Tobago USD 15,680 -5.1%	Argentina USD 11,960 -2.3%	Brazil USD 8,840 -3.6%	Russia USD 9,720 -0.2%	Burundi USD 280 -0.6%	Chad USD 720 -7.0%	Liberia USD 370 -1.6%

Can China Avoid the Middle Income Trap?

With its new five-year plan, Beijing aims to rebalance its troubled economy and forge a path to lasting national wealth.

THE RISK OF THE MIDDLE-INCOME TRAP JUST INCREASED FOR CHINA. HERE'S WHY

Xi Jinping's jettisoning of specific GDP goals post 2020 might soothe those who fear a growth-at-all-costs culture, but without such targets, local governments may lose their dynamism

Can slowing China escape the middle income trap?

Chapter 3.6

Financial systems, inequality, climate change and long run growth

___

Implicit but Often Errant Assumptions for Solow Model

❏ Financial markets are working properly and are not an obstacle to long-term prosperity.

❏ Growth lifts all boats.

❏ Exploiting natural resources has no adverse environmental effect.

Endogenous Growth Theory: How Innovation Affects Growth

❑ While the Solow model views the factors that go into economics as exogenous, the Endogenous Growth Theory views changes in the factors of production as (shockingly, given the name of the theory) endogenous, meaning within the control of those within the system.

❑ It emphasizes the importance of human capital, innovation, and knowledge.

Appendix

Endogenous Growth Theory and The Thirteenth Five-Year Chinese Plan

Differences From Solow Model

Primary difference is that A (coefficient of technology) is not a fixed coefficient, but rather determined by the creation of new products and services, or inventions

Also, g, or the coefficient of per capita productivity, is determined by the following equation:

$$g = \frac{\lambda n}{1 - \phi}$$

Where λ is the extent of marginal productivity as we add more researchers;

Φ is the effect of past innovations on current inventions; n is the growth rate of the number of researchers.

As researchers increase, cumulative innovation increases while marginal effect of researchers decreases

The Thirteenth Five-Year Chinese Plan

❑ Five-year plans were used by the USSR and China as their central planning tool.

❑ Now, aspirational.

❑ China has moved from poverty to middle income status.

❑ In early plans, key variables were close to the Solow models. In the tenth five-year old plan, 2001 to 2005, tasks were: optimize and upgrade the industrial structure, strengthen China's international competitiveness, build more infrastructure facilities, and raise levels of urbanization.

❑ Now, productivity: five guiding principles are innovation, coordination, green development, opening up, and sharing.