

ECO 330: Economics of Development

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Key Concepts

- Features of the Development Gap
- Purchasing Power Parity
- Growth Rates

Features of the Development Gap

There are many ways in which advanced countries differ from less-developed countries.

- Advanced Countries: United States, Japan, Belgium
- Less Developed Countries (LDCs): Angola, Bangladesh, Haiti
- Middle-Income Countries: China, Brazil, Mexico, South Africa

Some of the most important differences are in Income, Health, and Education

- There is significant variation in these aspects even among LDCs
- These aspects are constantly evolving over time

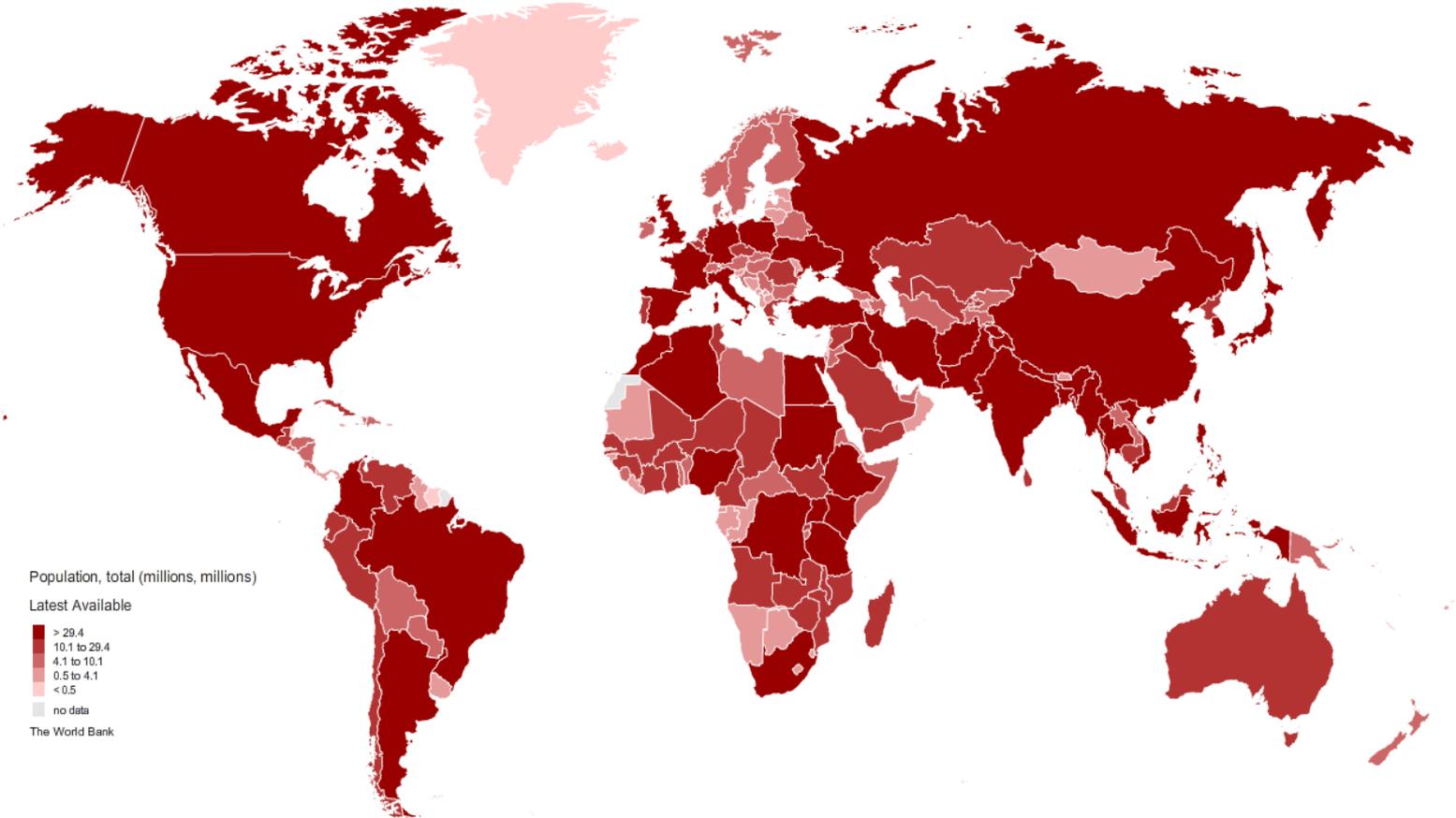
Measuring Income

In this class, income will typically refer to GDP per capita (PPP-adjusted)

- Gross Domestic Capita (GDP) is the total value of goods and services produced in a country
- Countries differ significantly in population, so GDP alone is an inadequate measure of development. Instead we use GDP per capita, which adjusts for population.

$$\text{GDP per capita} = \frac{\text{GDP}}{\text{Population}}$$

Population



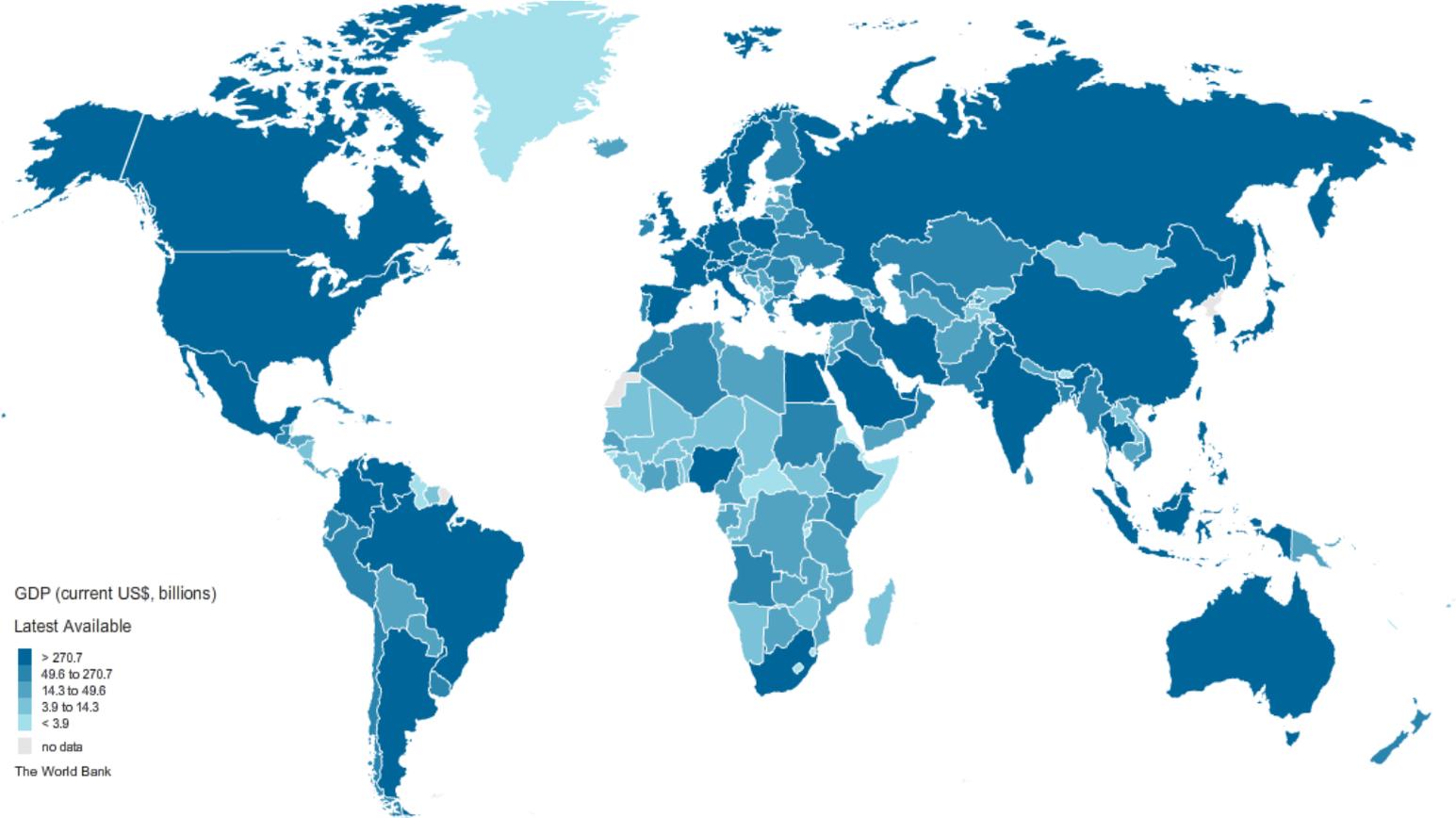
Population, total (millions, millions)

Latest Available

- > 29.4
- 10.1 to 29.4
- 4.1 to 10.1
- 0.5 to 4.1
- < 0.5
- no data

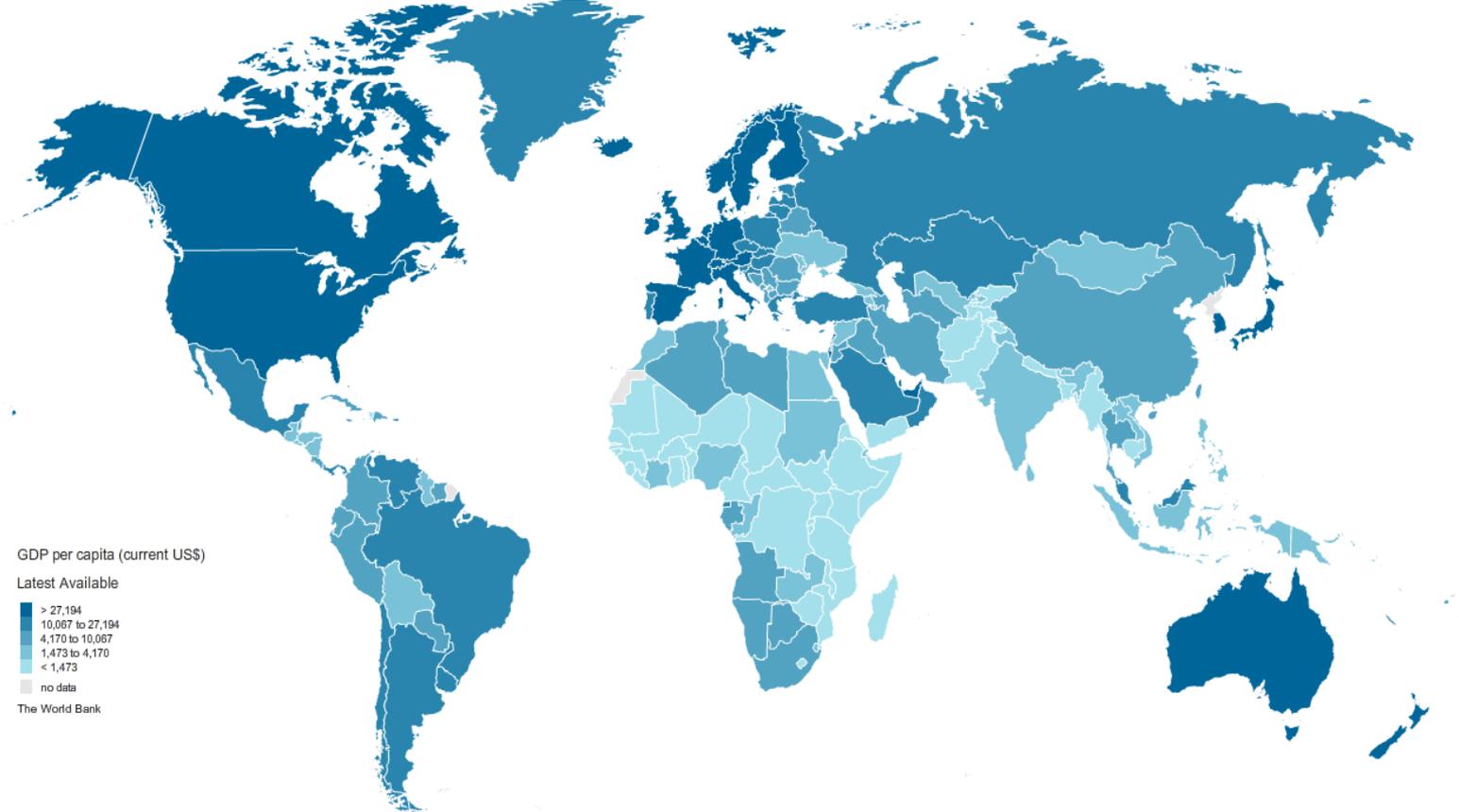
The World Bank

GDP in USD (Not Adjusted for Population)



Source: World Bank eAtlas

GDP per Capita in USD



GDP per capita (current US\$)

Latest Available

- > 27,194
- 10,067 to 27,194
- 4,170 to 10,067
- 1,473 to 4,170
- < 1,473
- no data

The World Bank

Making Income Comparable Across Countries

Issue 1: Countries do not use the same currency.

- We need to units to be the same to compare incomes across countries.

Partial Solution: Market Exchange Rates

- Can exchange one currency for another currency. Example: 1 USD = 0.92 Euros (1/21/2016)
- Exchange rates will put income in same units.

Making Income Comparable Across Countries

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Partial Solution: Market Exchange Rates

- Can exchange one currency for another currency. Example: 1 USD = 0.92 Euros (1/21/2016)
- Exchange rates will put income in same units.
- **Problem:** Market exchange rates do not fully take into account **non-traded goods**
- **Problem:** Exchange rates fluctuate significantly, much more than we would expect income to

Purchasing Power Parity

Issue 2: Even for countries that use same currency, goods and services often differ in prices

- Average cost of a woman's haircut: \$73 in NYC, \$41 in Minneapolis, \$95 in Oslo, \$10 in Beijing
- Average cost of a McDonald's Big Mac: \$4.93 in USA, \$2.81 in Mexico, \$1.82 in Malaysia

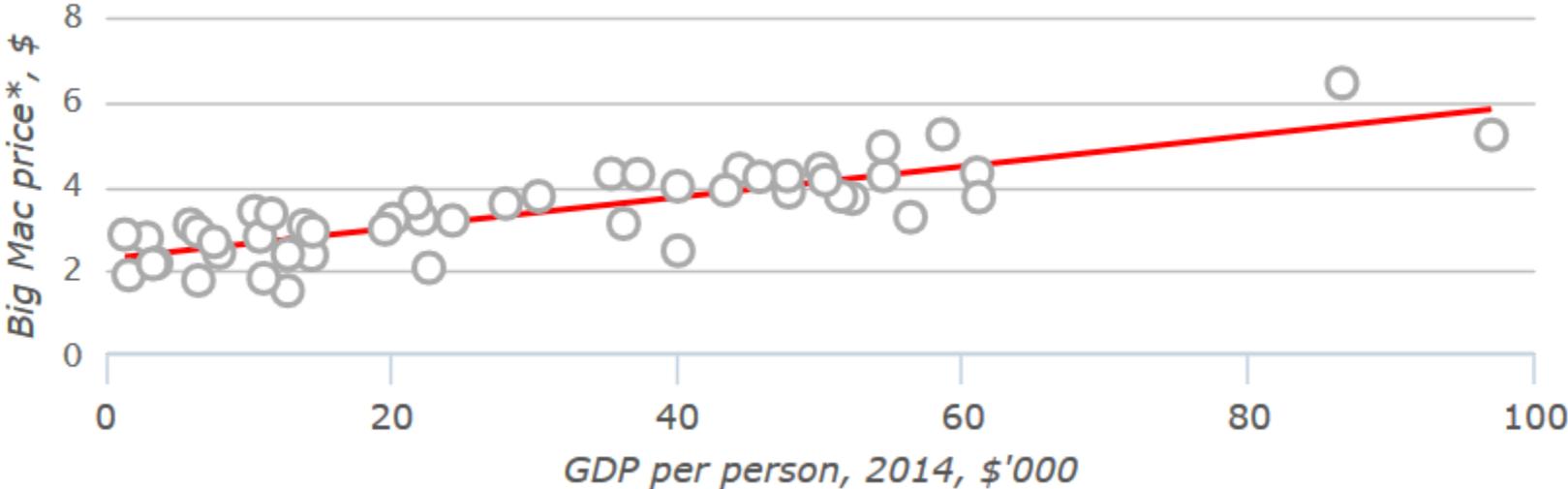
Purchasing Power Parity (PPP) adjusts for differences in average prices of goods and services

- This is important because goods are typically cheaper in poor countries

Big Mac Index: Prices Higher in Richer Countries

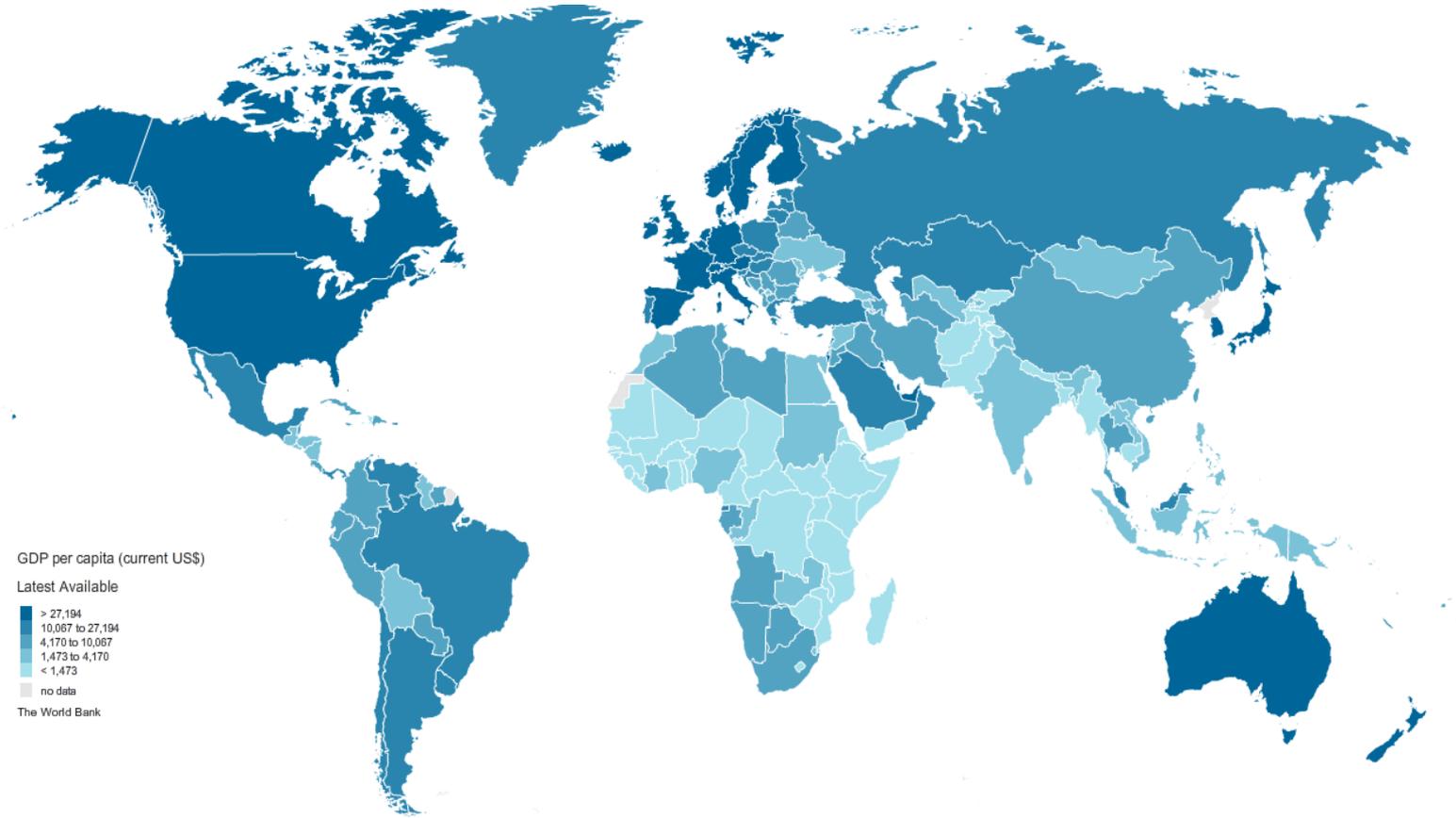
Big Mac prices v GDP per person

Latest



Sources: McDonald's; Thomson Reuters; IMF; *The Economist*

GDP per Capita in USD (not PPP-Adjusted)



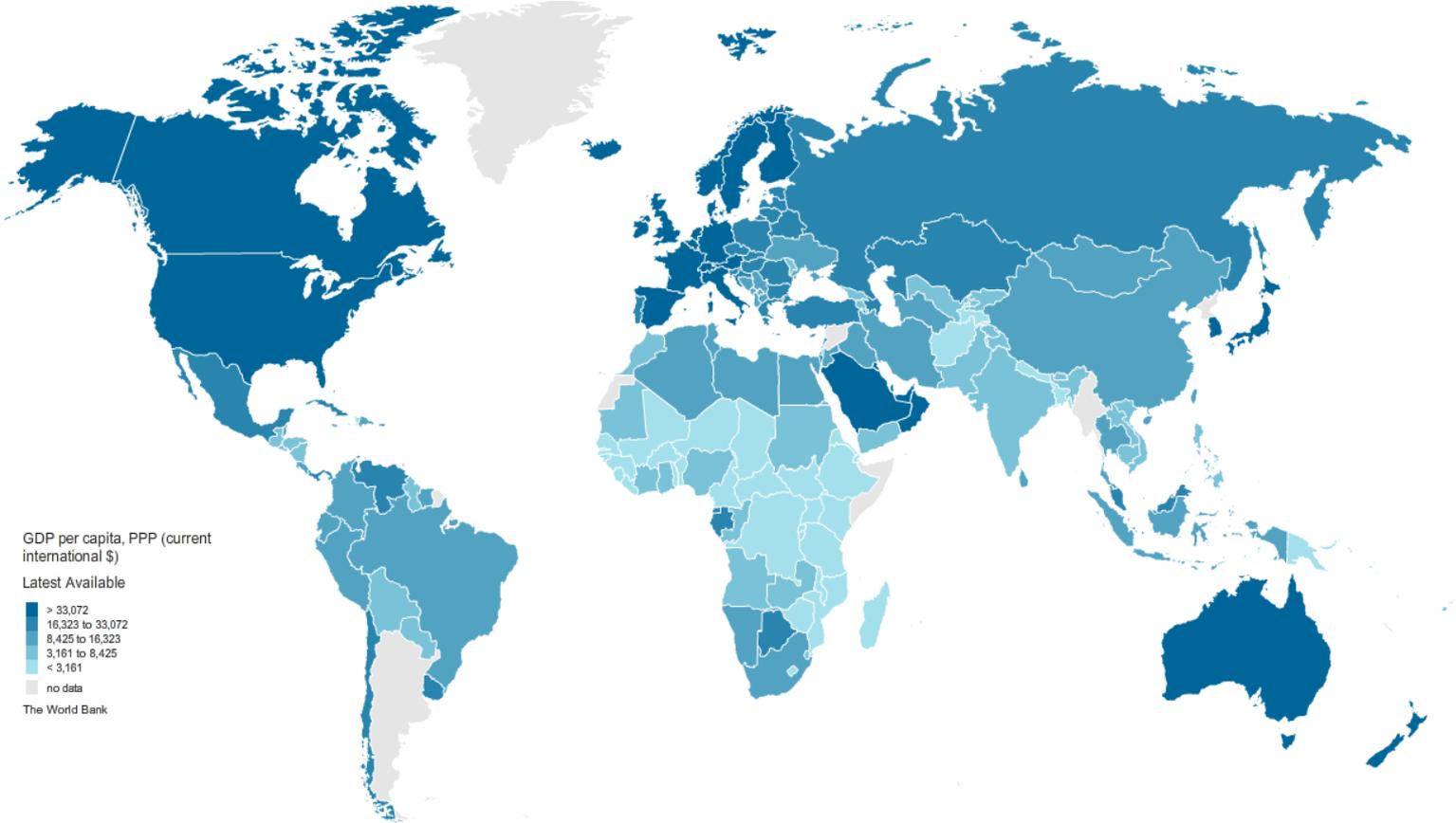
GDP per capita (current US\$)

Latest Available

- > 27,194
- 10,067 to 27,194
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The World Bank

GDP per Capita in PPP-adjusted International \$



GDP per capita, PPP (current international \$)
Latest Available

Dark Blue	> 33,072
Medium-Dark Blue	16,323 to 33,072
Medium-Light Blue	8,425 to 16,323
Light Blue	< 3,161
Grey	no data

The World Bank

Notes about PPP-adjusted GDP per Capita

Adjusting for PPP does not do much to change the ordering of countries by income

- It is important for understanding how big the gap in income is between advanced and developing countries. GDP per capita in 2012: Afghanistan \$690 (non-PPP), \$1930 (PPP). For USA \$51,450 (both)

Some countries lack PPP-data for certain periods

- Adjusting for PPP requires going to each country and collecting prices for identical goods and services. This is done by the World Bank International Comparison Program (ICP).
- *Note there are different ways to estimate GDP and PPP Indices, so GDP per Capita numbers may differ slightly across data sources.*

GDP per capita (2010, PPP)

Richest Country: Luxemburg at \$86,000

Very Rich Countries: United States, Norway, Qatar ~\$50,000

Western-European Countries: France, Spain, Portugal ~\$30,000-\$40,000

Middle Income Countries: Brazil, Mexico, Belarus, China ~\$8,000-15,000

Very Poor Countries: South Sudan, Sierra Leone, Kiribati <\$2,000

Poorest Country: Democratic Republic of Congo at \$350

Population Growth and GDP Growth

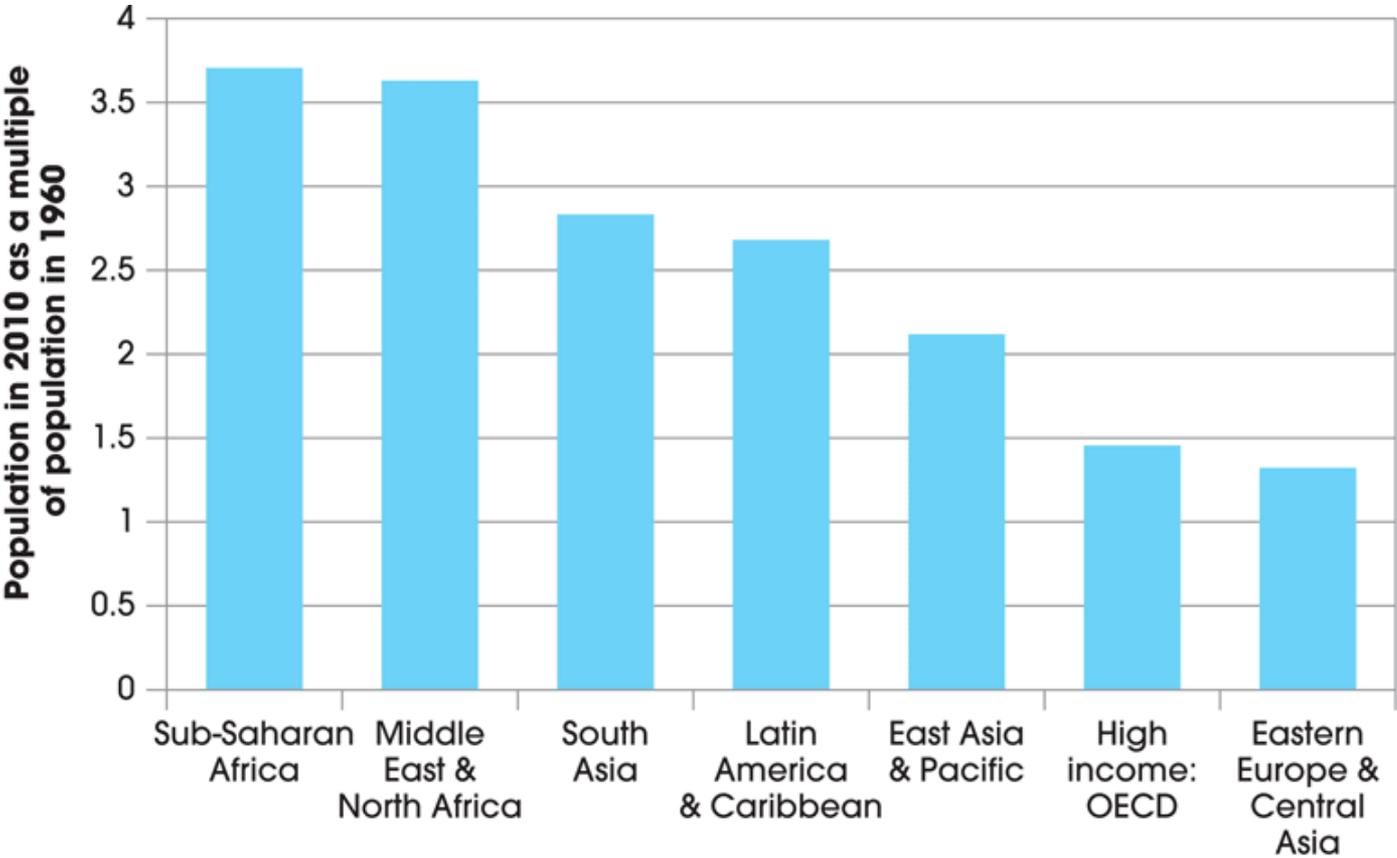
Population growth increases GDP since there is a larger labor supply

- However Population growth does not necessarily increase GDP per capita

If GDP growth is slower than population growth than GDP per capita decreases

- Typically, poorer countries have higher population growth rates
- This is why population growth is sometimes thought to be an important part of development

Total Population in 2010 Relative to Total Population in 1960



The Income Development Gap and Economic Growth

The richest countries in the world have much higher incomes than the poorest countries

These gaps are not constant over time, as countries grow at different rates

- The United States and other developed countries grow around 2% per year on average
- Poor countries can only catch up if they grow faster than 2% per year

Growth Rates and Convergence Over Time

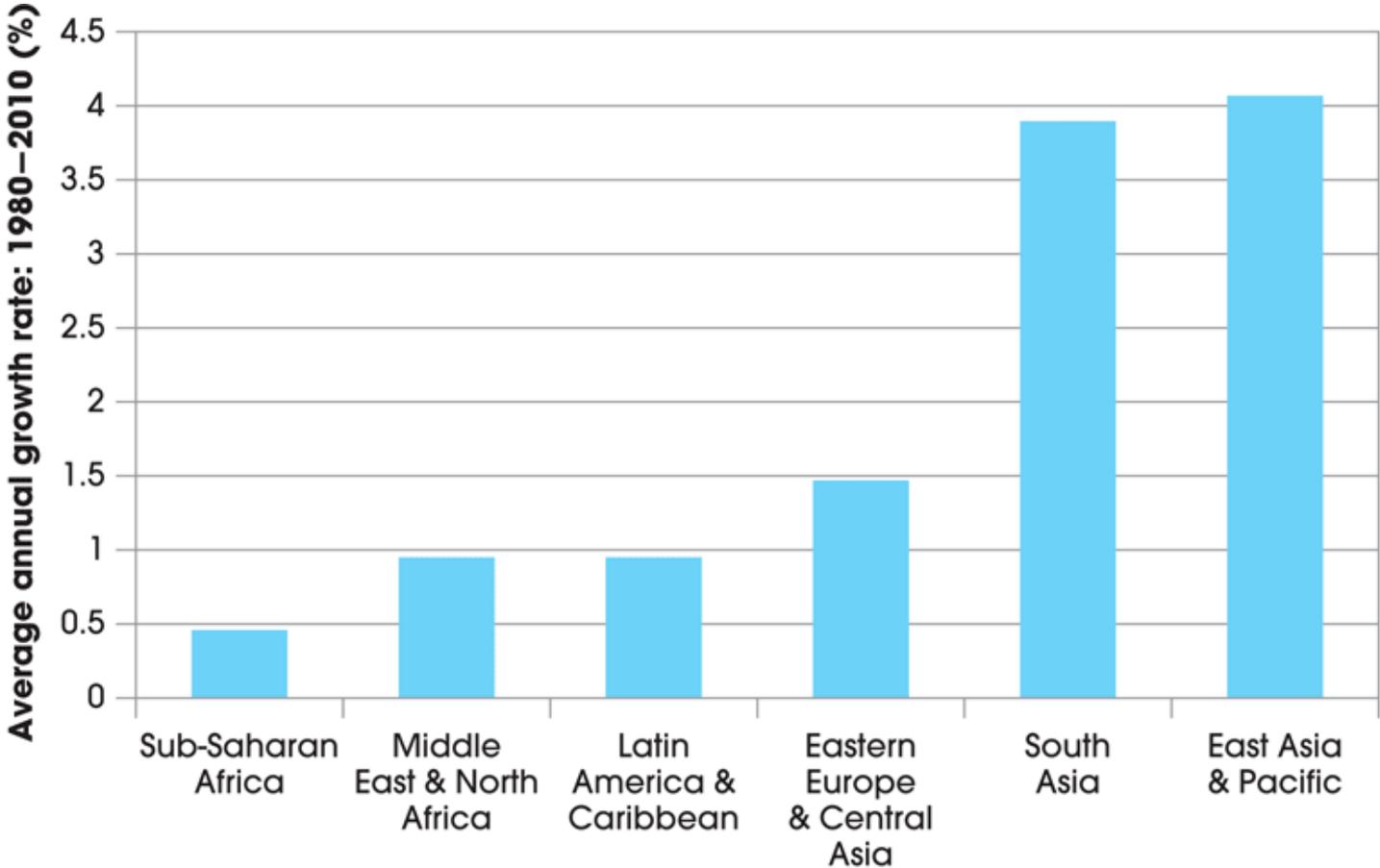
Poor countries need to grow faster than 2% per year to catch up to rich countries

- Some poor countries have gained significant ground, while others have lost ground

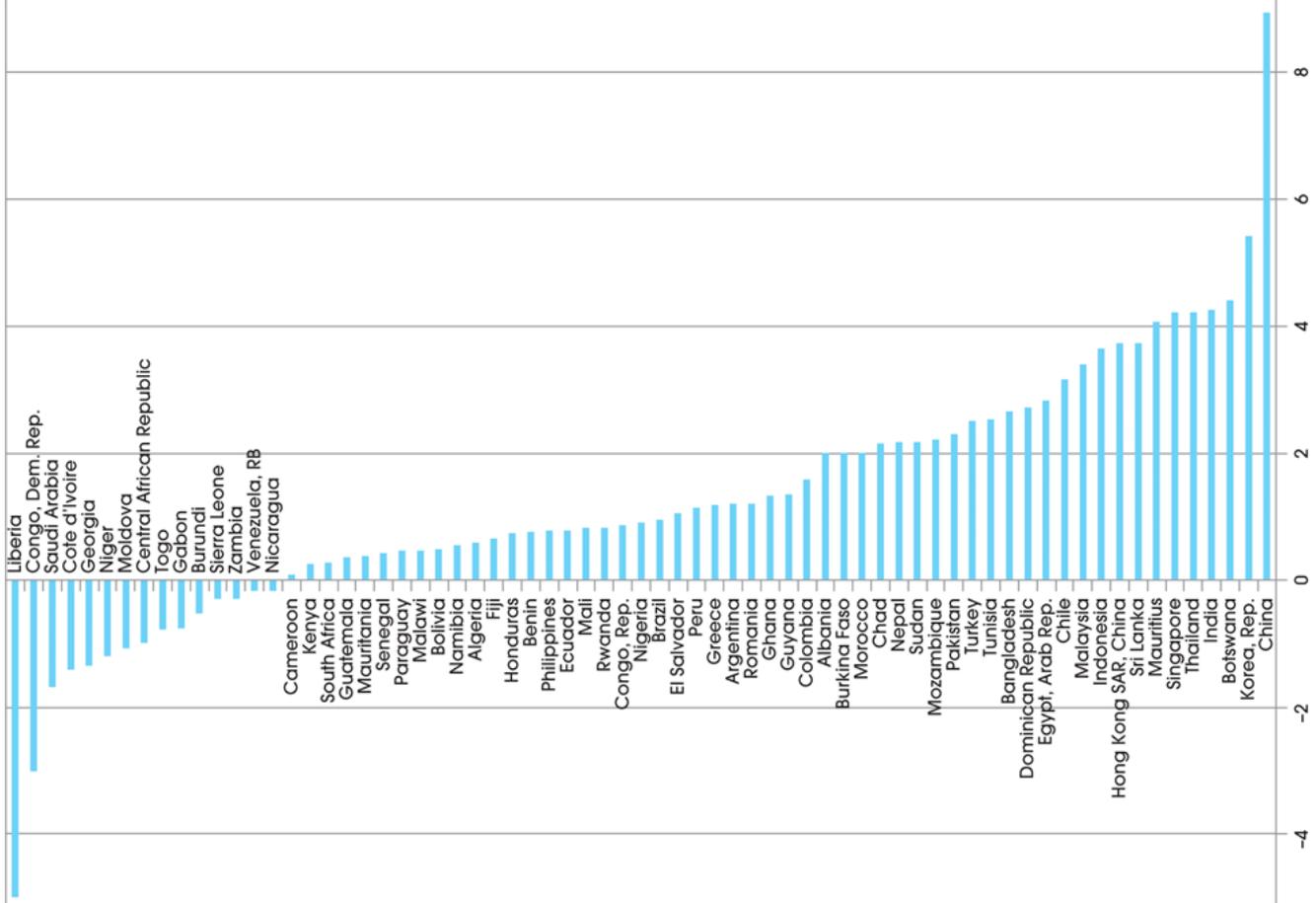
Between 1980-2010

- China grew 8% per year on average
- Thailand, India, and Botswana grew over 4% per year
- Venezuela, Togo, Gabon, and Burundi experience negative growth

Real GDP per Capita (PPP), Average Growth Rates (1980-2010)



Real GDP per Capita (PPP), Average Growth Rates (1980-2010)



Adjusting for Inflation

When computing growth rates, we need to adjust for inflation

- In 1955 a Men's Haircut cost \$1.42 on average in the US. In 2014, the average cost was \$28.
- Some goods become cheaper over time, or did not previously exist, such as computers

The concept is similar to adjusting for Purchasing Power Parity across countries. Our PPP data will typically already be adjusted for inflation.

- Inflation can be accounted for by using the Consumer Price Index, which adjusts for overall changes in the average price of goods and services
- Constant Price GDP (Real GDP) is inflation adjusted, Current Price GDP (Nominal GDP) is not

Using Growth Rates

Growth Rates are **multiplicative** over time

- This means if you grow 10 percent two years in a row your growth is 10 percent times 10 percent, which totals 21 percent. (NOT equal to 10 percent plus 10 percent)
- Given a constant annual percentage growth rate, r , the formula for total percent growth is

$$\text{Total Growth after N Years} = 100 \times \left(\left[\frac{100 + r}{100} \right]^N - 1 \right)$$

Growth Rates Example

If GDP per Capita is \$10,000 now, and will be \$10,600 next year, the growth rate is 6%, so $r = 6$

- After 5 years, total growth would be (recall $X^5 = X \times X \times X \times X \times X$):

$$100 \times \left(\left[\frac{100 + 6}{100} \right]^5 - 1 \right) = 100 \times ([1.06]^5 - 1) = 100 \times (1.338 - 1) = 100 \times (0.338) = 33.8 \text{ percent}$$

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- Note that we can transform growth rates to relative values by adding 100

$$100 \times \frac{\text{GDP per capita in 5 years}}{\text{GDP per capita this year}} = \text{Total Growth after 5 years} + 100 = 133.8 \text{ percent}$$

Therefore GDP per capita 5 years from now will be equal to $\$10,000 \times (133.8/100) = \$13,380$

Finding Growth Rates from Changes in Values

We can similarly compute the average growth rate if we have a final and initial value

- Inverting formula on the previous slide gives:

$$r = 100 \times \left[\left(\frac{\text{value in N years}}{\text{value this year}} \right)^{\frac{1}{N}} - 1 \right]$$

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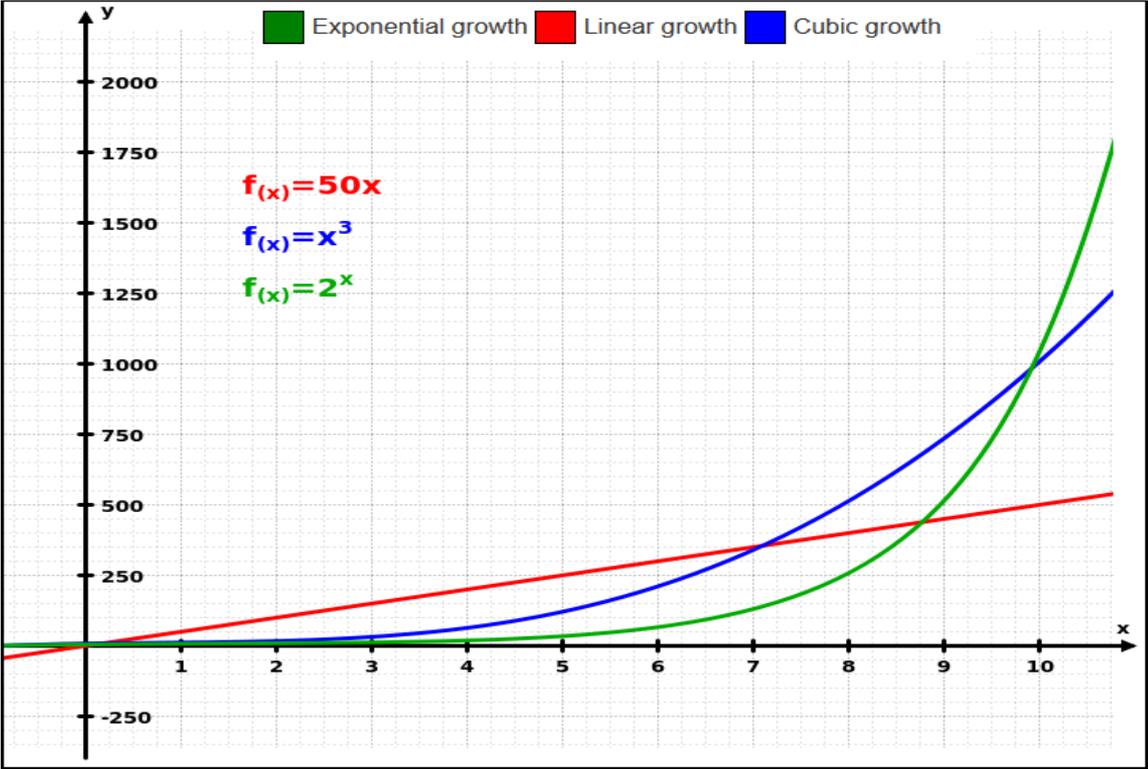
- If GDP per capita was \$10,000 in 1990 and \$15,000 in 2010 then $N = 20$ and

$$r = 100 \times \left[\left(\frac{15000}{10000} \right)^{\frac{1}{20}} - 1 \right] = 100 \times \left[(1.5)^{\frac{1}{20}} - 1 \right] = 100 \times [1.02 - 1] = 100 \times [.02] = 2$$

Which means the country grew 2 percent per year on average between 1990 and 2010

Exponential Growth

Because growth rates are multiplicative over time, GDP per Capita exhibits exponential growth

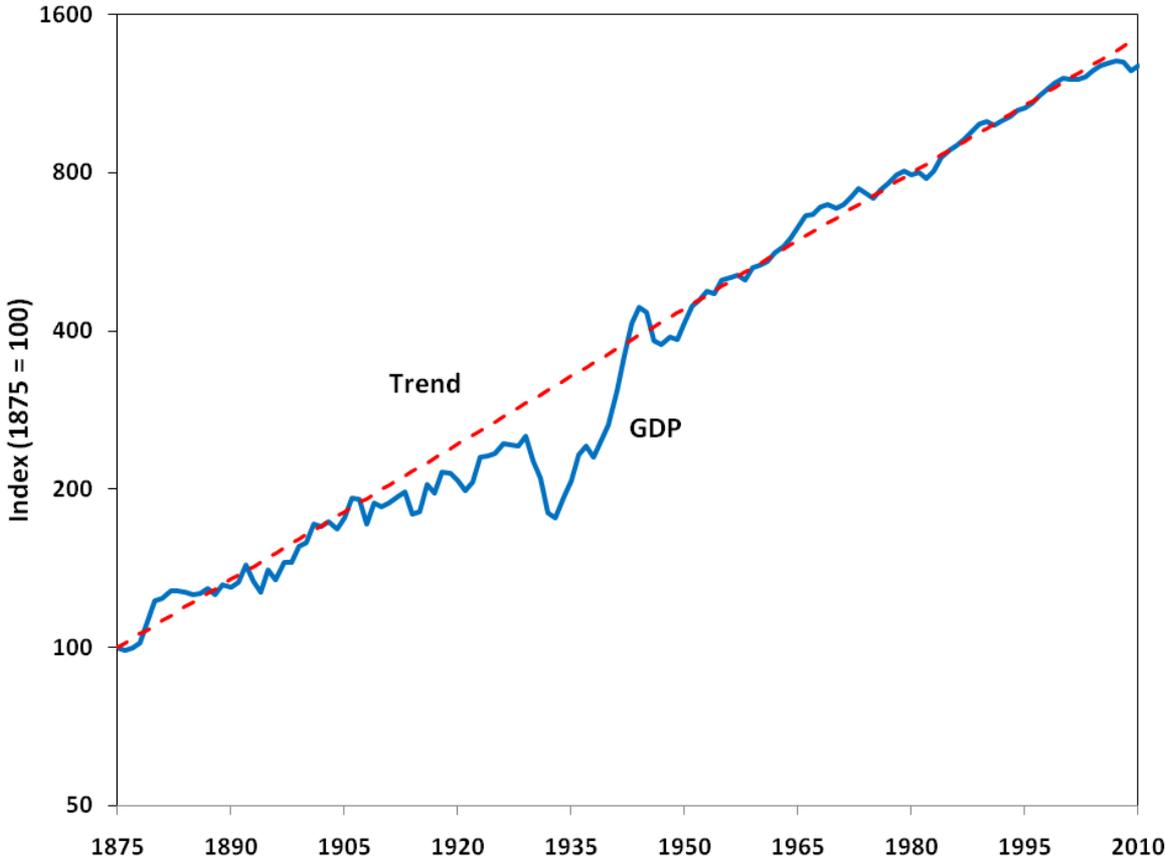


Exponential Growth

Because growth rates are multiplicative over time, GDP per Capita exhibits exponential growth

- This means countries have much higher GDP per Capita now than they did in the past
- For this reason we often display GDP per Capita on logarithmic scales
- Logarithms are the inverse operation to exponentiation. Example: $16 = 2^4 \Rightarrow \log_2(16) = 4$

Real GDP per working-age person in the United States



Convergence and Divergence

We can compute how much two countries converged or diverged in incomes using the formulas for total growth rates for each country. **Note: GDP below refers to GDP per Capita (PPP)**

$$\frac{\text{Country 1 GDP after N years}}{\text{Country 2 GDP after N years}} = \frac{\text{Country 1 Total Growth after N Years} + 100}{\text{Country 2 Total Growth after N Years} + 100} \times \frac{\text{Country 1 GDP now}}{\text{Country 2 GDP now}}$$

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Luxembourg is currently 250 times richer than DR Congo. Suppose the DR Congo grows at 6 percent per and Luxembourg grows at 2 percent year. After 100 years:

$$\frac{\text{Luxembourg GDP per capita in 100 years}}{\text{DR Congo GDP per capita in 100 years}} = \left(\frac{(1.02)^{100}}{(1.06)^{100}} \right) \times 250 = \left(\frac{726 \text{ percent}}{3393 \text{ percent}} \right) \times 250 = 5.34$$

Which means Luxembourg would still be over 5 times richer