

# ECONOMIC GROWTH: CONCEPTS AND PATTERNS

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EE 462 Development Macroeconomics

Semester 1/2014

# Topics

- Divergent Patterns of Economic Growth since 1960
- Factor Accumulation, Productivity Growth, Econ. Growth
- Saving, Investment, & Capital Accumulation
- Sources of Growth Analysis
- Characteristics of Rapidly Growing Countries

# Divergent Patterns of Economic Growth since 1960

Group	Ratios of 2009 to 1960 GDP/capita	Avg. Annual Growth Rates (%)	Examples of Countries
Negative growth	0.89 0.98	- 0.23 - 0.24	Madagascar Zambia
Slow growth	1.05 – 2.16	0.01 – 1.58	Senegal, Kenya, Peru, Chad, S.Africa, Philillines
Moderate growth	3.06 – 4.29	2.31 – 3.01	Turkey, Brazil, Chile, Lesotho, Mauritius
Rapid growth	4.55 – 18.94	3.14 – 6.18	India, Egypt, Malaysia, Thailand, Botswana, China
Industrialized	2.6 – 5.13	1.97 – 3.4	UK, US, Canada, Japan

# Calculating Future Values

- *Question: why small differences in growth rates can make a big difference in income levels over time?*
- Suppose a country's current income/capita is  $X_0$ , and the growth rate is  $r\%$  per year. What will be the income level in year  $t$ ?

$$\rightarrow X_t = X_0 \times (1+r)^t$$

- Example: GDP per capita (2005 PPP) in Thailand was 7,794 in 2009. If the average growth rate is 5% per year, what would be Thailand's GDP per capita GDP in 2019?

$$\rightarrow \text{GDP}_{2019} =$$

$$\rightarrow \text{GDP}_{2019}/\text{GDP}_{2009} =$$

- If  $r = 7\%$ ,  $X_{10} = ?$  **Ans.  $\text{GDP}_{2019} =$**

# Calculating Growth Rates

- Suppose a country's current income/capita is  $X_0$ , and the income level in year  $X_t$ ?. What's the annual average growth rate? (Recall:  $X_t = X_0 \times (1+r)^t$ )

1. Calculate growth rate using the *endpoint data*.

→  $r =$

Ex.  $X_0=7,794$  and  $X_t=12,695$  →  $r = \dots\dots$

2. Estimate average growth rate by *least-square regression*.

➤  $\ln X_t = \ln X_0 + \ln(1+r) \times t$

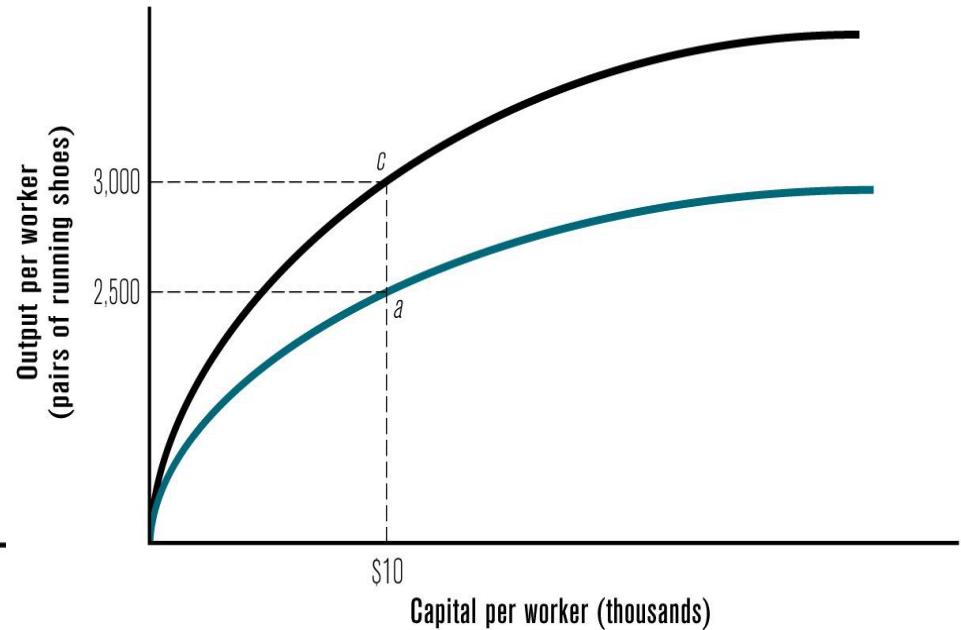
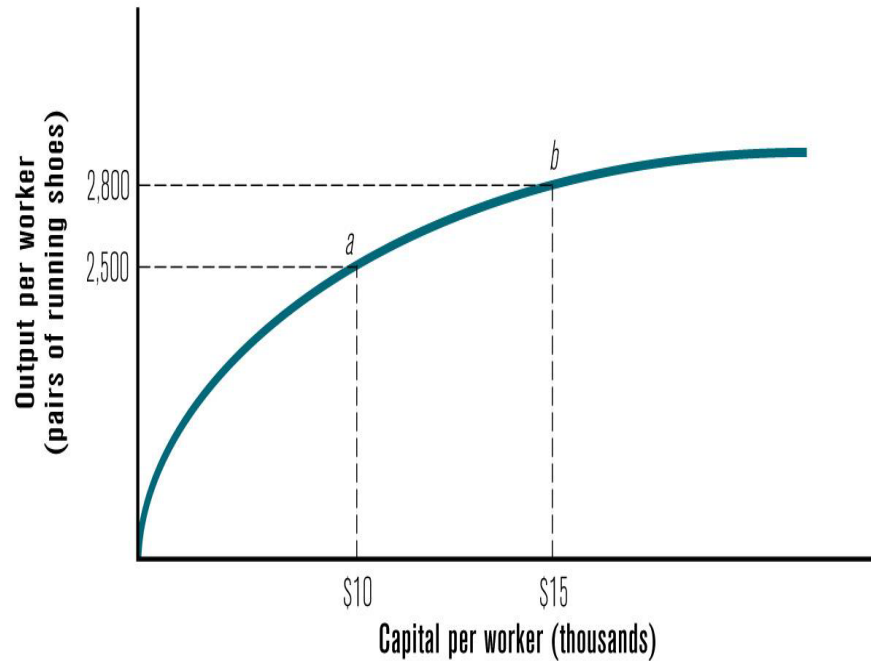
➤ Regression:  $\ln X_t = a + bt$  where  $a = \ln X_0$  and  $b = \ln(1+r)$

→  $r =$

# Factor Accumulation, Productivity Growth, Economic Growth

- Economic growth depends on two processes:
  1. *Factor Accumulation*
    - Increasing in the size of capital stock and labor force.
  2. *Productivity Growth*
    - Increasing the amount of output per unit of machine or worker
    - productivity can be increased by greater **efficiency** (e.g. specialization), and **technological change**.
- This can be explained using production function
$$Q = f(\text{Labor, Capital, etc...})$$

# Basic Sources of Economic Growth



# Saving, Investment & Capital Accumulation

- Solow growth model:
  - Explores the contribution of each factor to increase to output:  $Q(K, L, \text{Productivity gains})$
- Key elements of economic growth:
  - New investment increases the capital stock
  - Investment (I) is financed through savings (S)
  - Savings comes from current income of GDP:  $S = f(Y)$
- *Sustaining Growth requires both generating new investment and making sure it is productive.*

# Sources of Growth Analysis

- **Growth accounting** (or **source of growth analysis**) measures the relationship between productivity change and economic growth
- **Total factor productivity (TFP)**: contribution to production of efficiency, technology, and other influences on productivity
- The growth equation can be written as:

$$g_Y = (W_K \times g_K) + (W_N \times g_L) + a$$

where

- $g_Y$  = growth of total income (or GDP)
- $g_K, g_L$  = growth of capital and labor
- $W_K, W_N$  = share of capital and labor
- $a$  = rate of productivity of inputs = “**Solow residual**”

# Growth Accounting (Cont'd)

- Example: Assume the following:  $g_Y = 0.05$ ,  $g_K = 0.07$ ,  $g_L = 0.02$ ,  $W_L = 0.6$ , and  $W_K = 0.4$ .  $a = ?$ 
  - Recall  $g_Y = (W_K \times g_K) + (W_L \times g_L) + a$
  - Substitute:
    - TFP growth:
    - Growth in K accounts for % of  $g_Y$
    - Growth in L accounts for % of  $g_Y$
- Problems with Solow residual:
  - could represent influences other than productivity gains.
  - “a” captures the measurement errors and omitted variables because it is the residual in the equation.

# Sources of Growth: Empirical Evidence

## General findings:

- Economic growth in industrialized countries are attributed vastly by TFP, and less by capital accumulation.
- Data problems and price distortions are major concerns in developing countries.
- Sources of econ growth in LDCs attribute a larger role to capital accumulation than in industrialized countries. Why?
- Among developing countries, TFP growth in East Asia was faster than that in other regions.
- TFP growth tends to become more important as income rises.

# Sources of Growth Across Countries 1960-2000 (1980s)

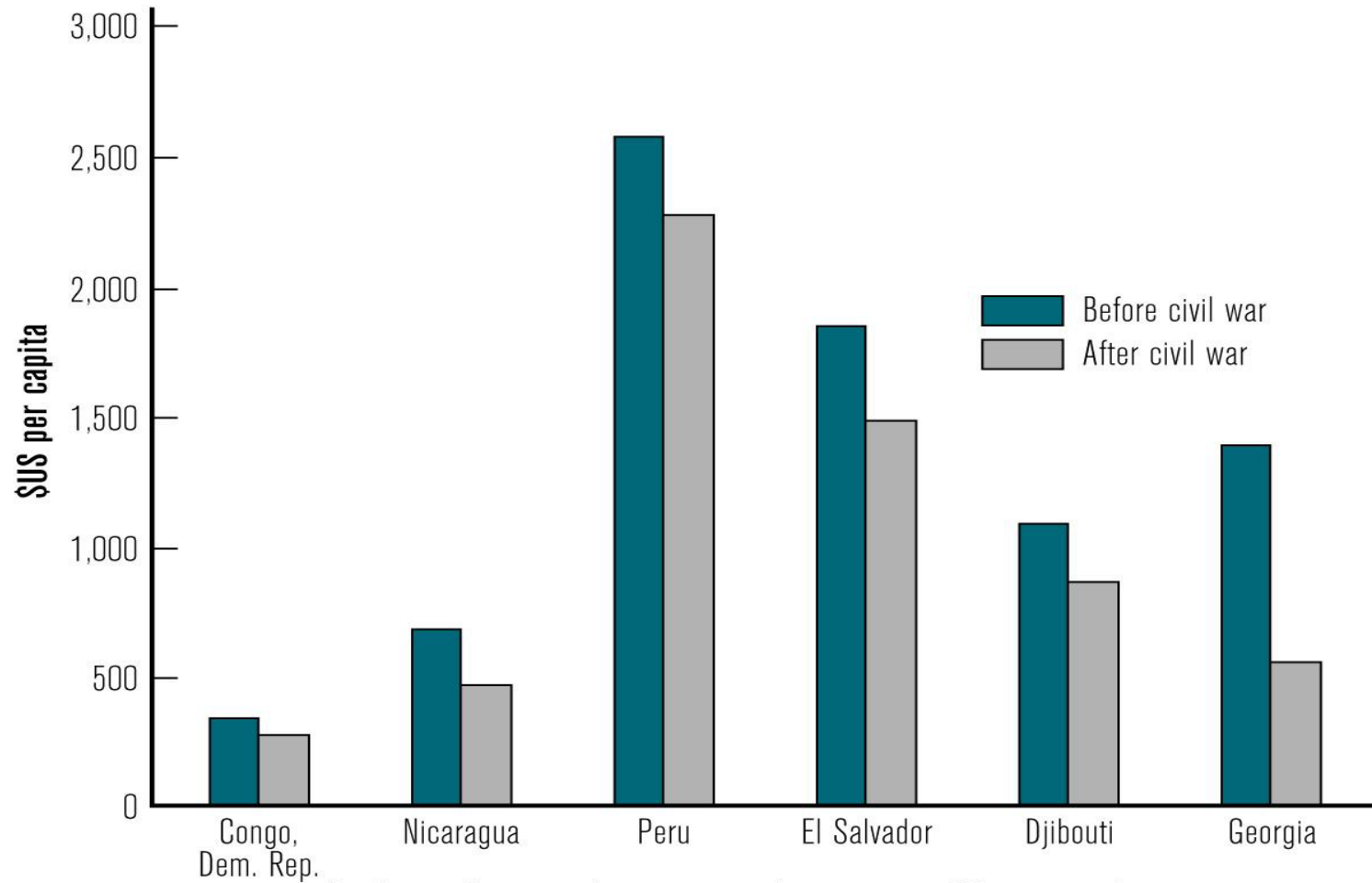
Country/ Region	Growth of Output per worker	Capital per worker	Education per worker	TFP
Brazil	-1.63	0.16	0.68	-2.47
Ethiopia	-1.74	1.11	0.27	-3.12
Ghana	-1.14	-1.23	0.15	0.07
Africa	-1.06	-0.07	0.42	-1.41
East Asia	4.36	2.45	0.66	1.25
Latin America	-1.77	0.04	0.47	-2.28
Middle East	1.15	0.55	0.53	0.07
South Asia	0.68	1.02	0.42	2.25
Industrialized	1.82	0.69	0.24	0.9

Source: Collins & Bosworth (2003). "The Empirics of Growth: An Update."

# Characteristics of Rapidly Growing Countries

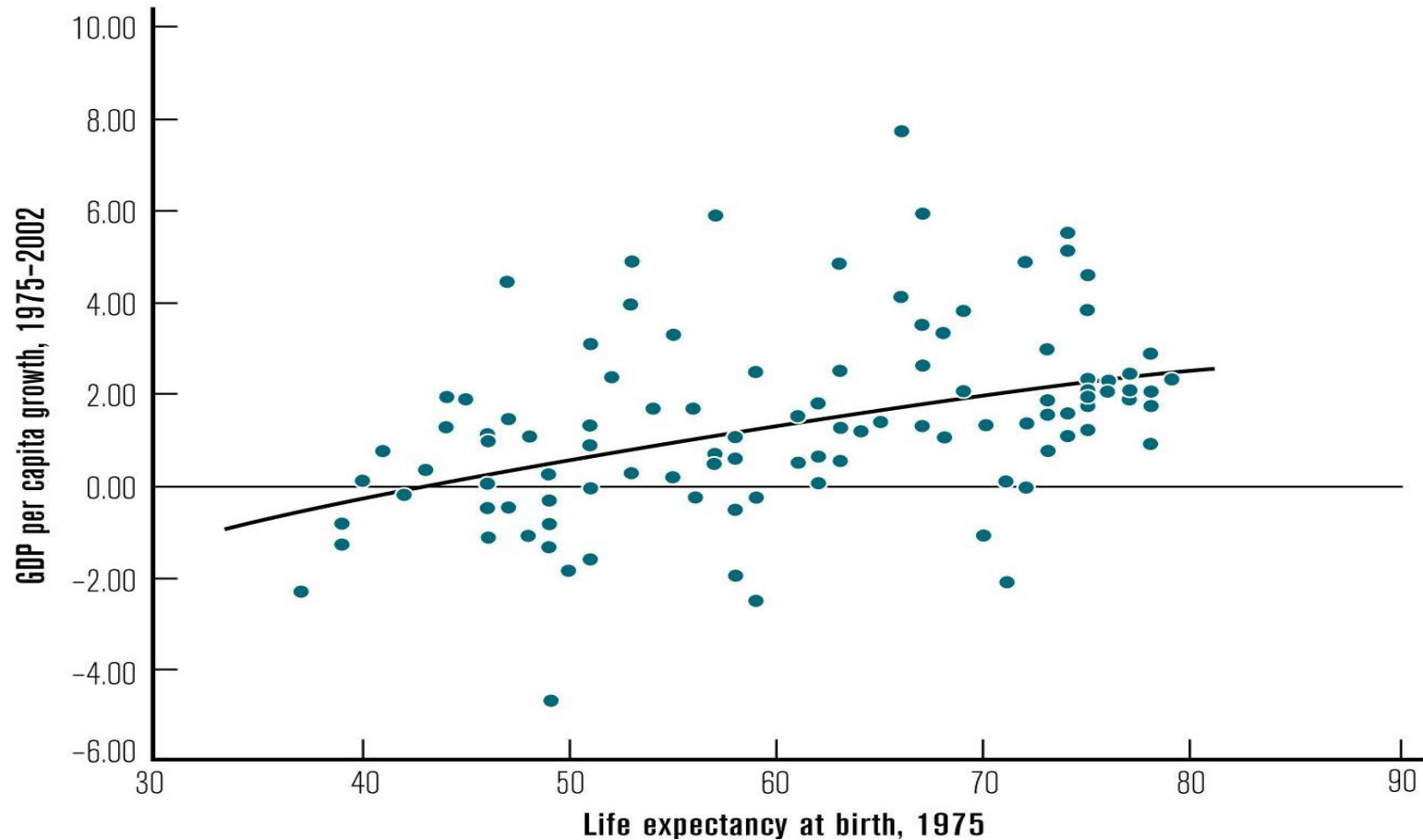
- Why some economies growth faster than others?
  - Need to look at empirical evidence; there's no consensus
  - Important to ask “which causes which?”
- Six broad characteristics that fast-growing countries share:
  1. Macroeconomic stability
  2. Investment in health and education\*
  3. Effective governance and institutions
  4. Favorable environment to private enterprise
  5. Trade, openness, and growth\*
  6. Favorable geography or location?

# GDP per capita before and after a Civil War



➔ Average income was 28% lower after the civil war than before.

# Growth and Life Expectancy

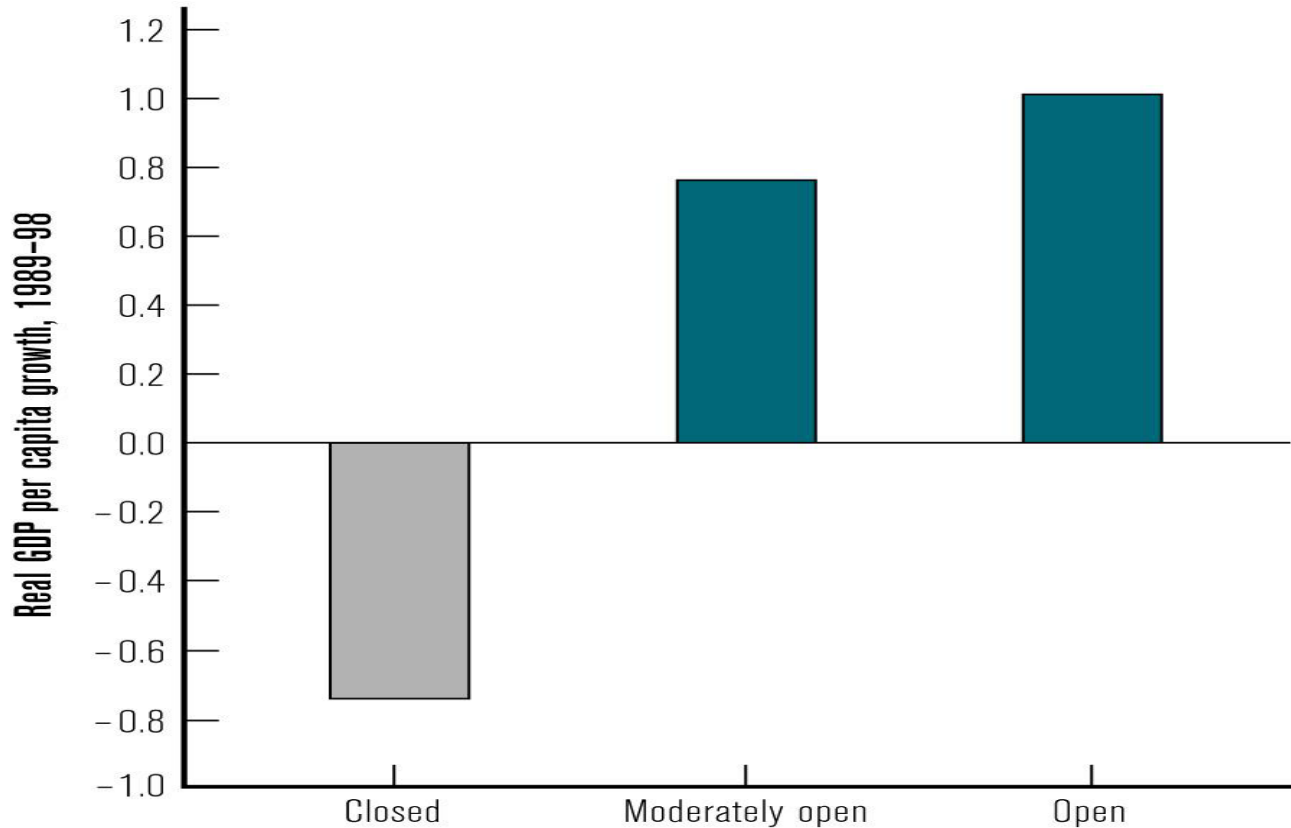


Better health → faster growth OR faster growth (higher income) → improve LE?

# Institutions, Governance & Growth [Box 3.2]

- 5 institutions are necessary according to Rodrik and Subramanian (2003):
  1. *Market-creating institutions*: protect property rights
  2. *Market-regulating institutions*: deal with market failure
  3. *Market-stabilizing institutions*: control macroeconomic volatility
  4. *Market-legitimizing institutions*: provide social protection and insurance
  5. *Political institutions*: how a country is governed & extent of political participation

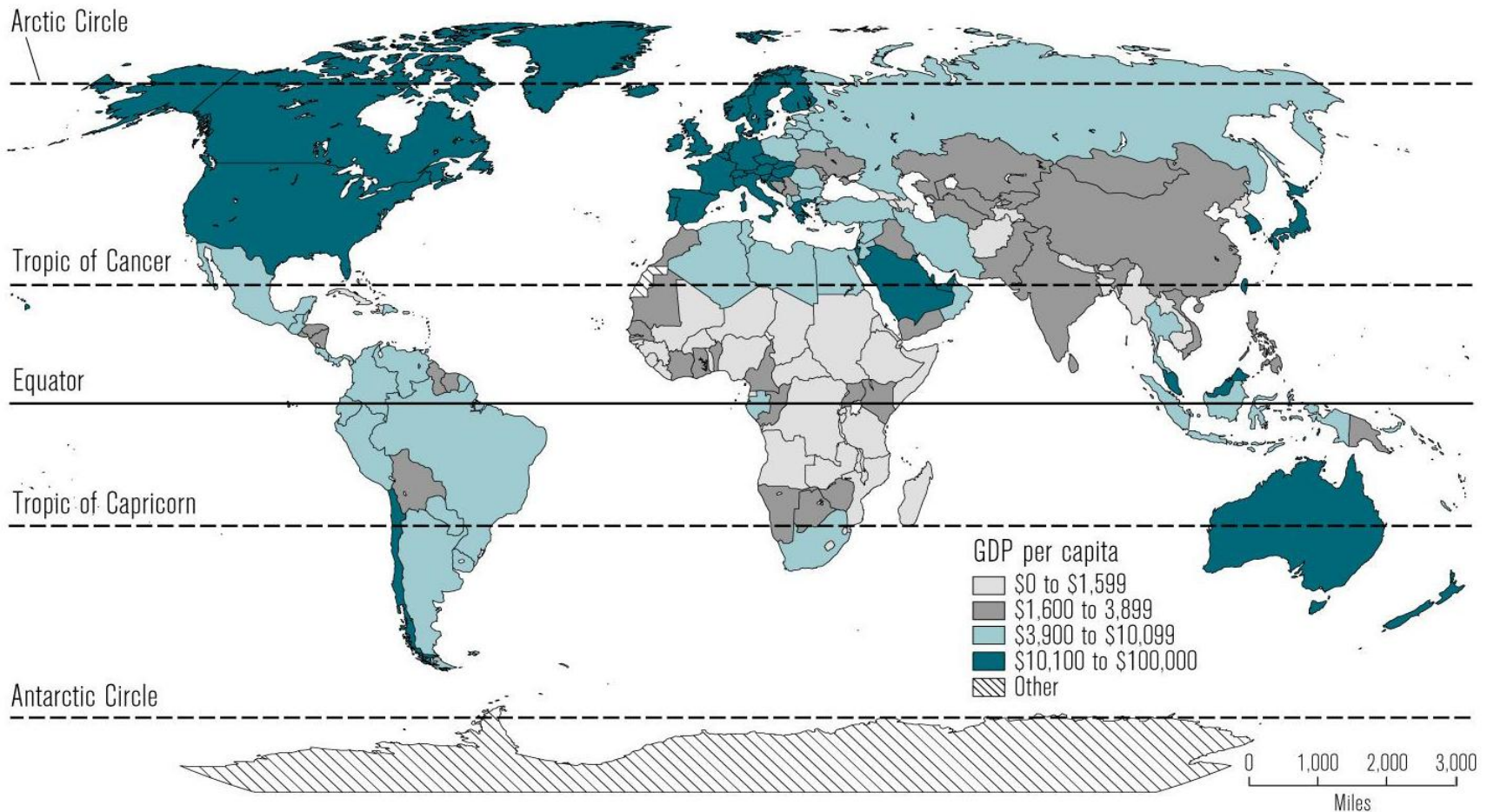
# Openness and Growth



Inconclusive evidences:

1. How to construct measure of trade policy orientation
2. Pro-trade policies → growth?

# Does geography matter?



More recent data:

<http://data.worldbank.org/indicator/NY.GNP.PCAP.PP.CD/countries?display=map>