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Effects of globalization - economic growth

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References for this lecture

- BBGV
  - Chapter 13
    - All paragraphs
  - Chapter 14
    - Paragraphs 14.1, 14.2

Determinants of economic growth

- To understand the **influence** of **globalization** on economic **growth**, it is important to understand which are the **fundamental determinants** of economic **growth**
- We define economic growth as the **growth** of **total output per capita** produced in an economy
- Recall that **GDP** is a measure of
  - Value of **production** made by the **residents** in a country
  - Amount of **income** that is **distributed** to the residents of a country

The Solow model (1956)

- **Output** (Y) is produced by combining **technology** (T), **capital** (K) and **labour** (L) according to a certain **production function** (F)

$$Y=F(T,K,L)$$

- The production function is characterized by **constant returns to scale**
- With **full employment**, L=population

$$\text{GDP per capita}=Y/L=f(T,K/L)$$

- **Growth** of GDP per capita
  - Growth in **capital** per **worker** (K/L)
  - Growth in **technology** (T)
- Assumption: **closed economy**

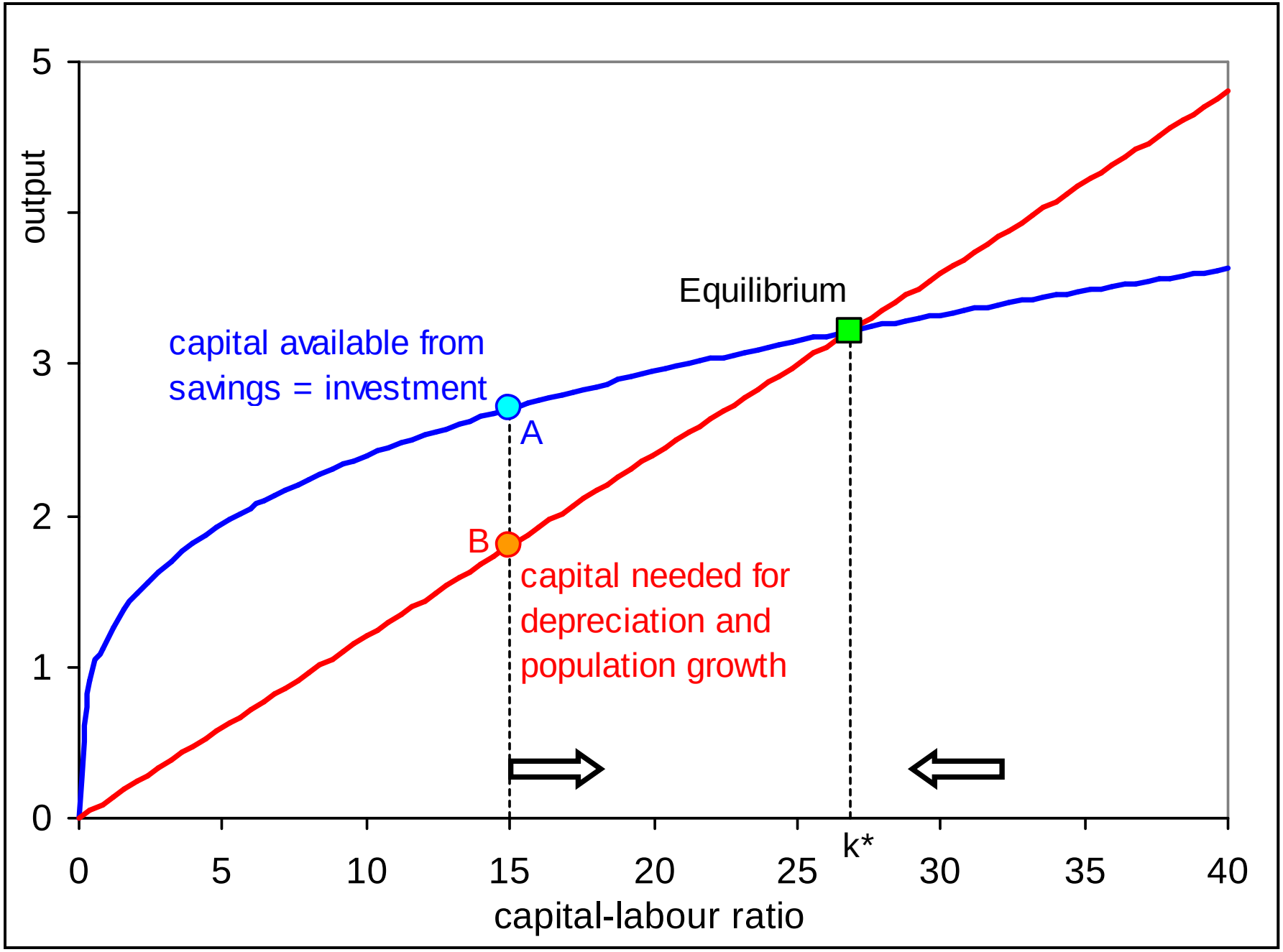
Growth of capital

- The **capital stock** is built by **cumulating investments**
  - Create **new capital**
  - **Substitute** obsolete capital
- Investments are financed through **savings**

Saving = income – consumption

- By **reducing consumption today** (i.e. increasing saving), the economy
  - **Increases** the **capital** stock **faster**
  - **Output** (and income and consumption) will **grow faster** in the **future**
- Due to **decreasing marginal returns**, **K/L will not grow indefinitely** (assumption of **constant share of income** devoted ot **savings**)
  - There is a level of **K/L** of **equilibrium**

Figure 13.2 Income levels and capital accumulation (Solow)



Growth of technology

- **Solow** assumes that **technology improvements** occur **exogenously**
- **Technology** improvements permit to produce a **larger** amount of **output** for the **same** level of **inputs** → **Total Factor Productivity** (TFP)

$$F(T,K,L)<F(T+1,K,L)$$

- Once the **K/L** of **equilibrium** is reached, **growth** in per capita income is **driven** only by growth in **TFP** → **balanced growth path**

Summing up

- In the **long run**, **growth** in GDP per capita is driven by **technology improvements** (TFP)
- If **all countries** can access the **same technology**, they will all **converge** to the same level of GDP per capita in the **long run**
  - If **poor countries** have access to the same technology as rich countries, convergence just requires **patience** to built a sufficiently large **capital stock**

Table 13.1 GDP per capita 2000-2010 growth projections

Country	per capita GDP in 2000	per capita GDP in 2010	growth rate 2000-2010	year in which GDP per capita exceeds USA 2010	year in which GDP per capita exceeds USA in that year
China	3,174	7,746	8.92%	2030	2031
India	1,922	3,477	5.93%	2053	2057
USA	39,699	41,365	0.42%	-	-

Data source: Heston, Summers, and Aten (2012); projections based on 2000-2010 average compound growth rates; data are in 2005 international dollars, PPP; for China version 2 of the data is used.

Table 13.2 GDP per capita growth rates per decade, 1950-2010

Country	average annual compound growth rate of GDP per capita (%)					
	1950-60	1960-70	1970-80	1980-90	1990-2000	1950-2010
China	4.68*	0.59	2.82	4.59	6.14	4.62**
India	1.96	2.14	1.42	3.30	2.95	2.95
USA	1.64	2.83	2.00	2.30	2.34	1.92

Table 13.3 GDP per capita 1950-2010 growth projections

Country	per capita GDP in		growth rate	year in which GDP per capita exceeds	
	1950	2010	1950-2010	USA 2010	USA in that year
China	531*	7,746	4.62%**	2048	2075
India	592	3,477	2.95%	2096	2257
USA	13,069	41,365	1.92%	-	-

Beyond the Solow model: technology

- **Technology** improvements are considered as **exogenous** in the **Solow** model
- **TFP** growth, however, is the **result** of (substantial) **investments** in **R&D** by both the **public** and **private** sector
- Assuming **equal access** to **technology** by all countries is a very **strong assumption** (recall our discussion before introducing the **HOS** model…)

Beyond the Solow model: technology

- **Technological change**
  - Improvements in **organization** that increase **productivity**
  - Increases in productivity associated with **new** types of **capital goods**
  - **Quality improvements** of existing **technology** for **intermediate** goods
  - **Newly** created **final goods**
  - **Quality improvements** in **existing goods** and services

Beyond the Solow model: technology

- **Endogenous R&D**
  - **Governments** (public research institutes and public universities) play a crucial role for **fundamental research** → basic research, based on '**science**', that has **no** immediate **commercial** value → the government invests in basic research as the **market 'fails'** to provide this crucial input as the **uncertainty** about the success is too high
  - **Firms** invest large amounts of resources in **applied R&D** → the **reward** of applied R&D is the **commercial** value of the innovation

Beyond the Solow model: technology

- **Knowledge** as **non-rival** input
  - **Labour** and **capital used** by **one firm cannot** be used by **other** firms → **rivalry**
  - **Knowledge** created by one firm can be **used** with **no cost** by other firms

- Non-rivalry implies that the **advantage** from the **knowledge** created by one firm can be **enjoyed** also by **other firms**

- Source of **increasing returns** to **scale**

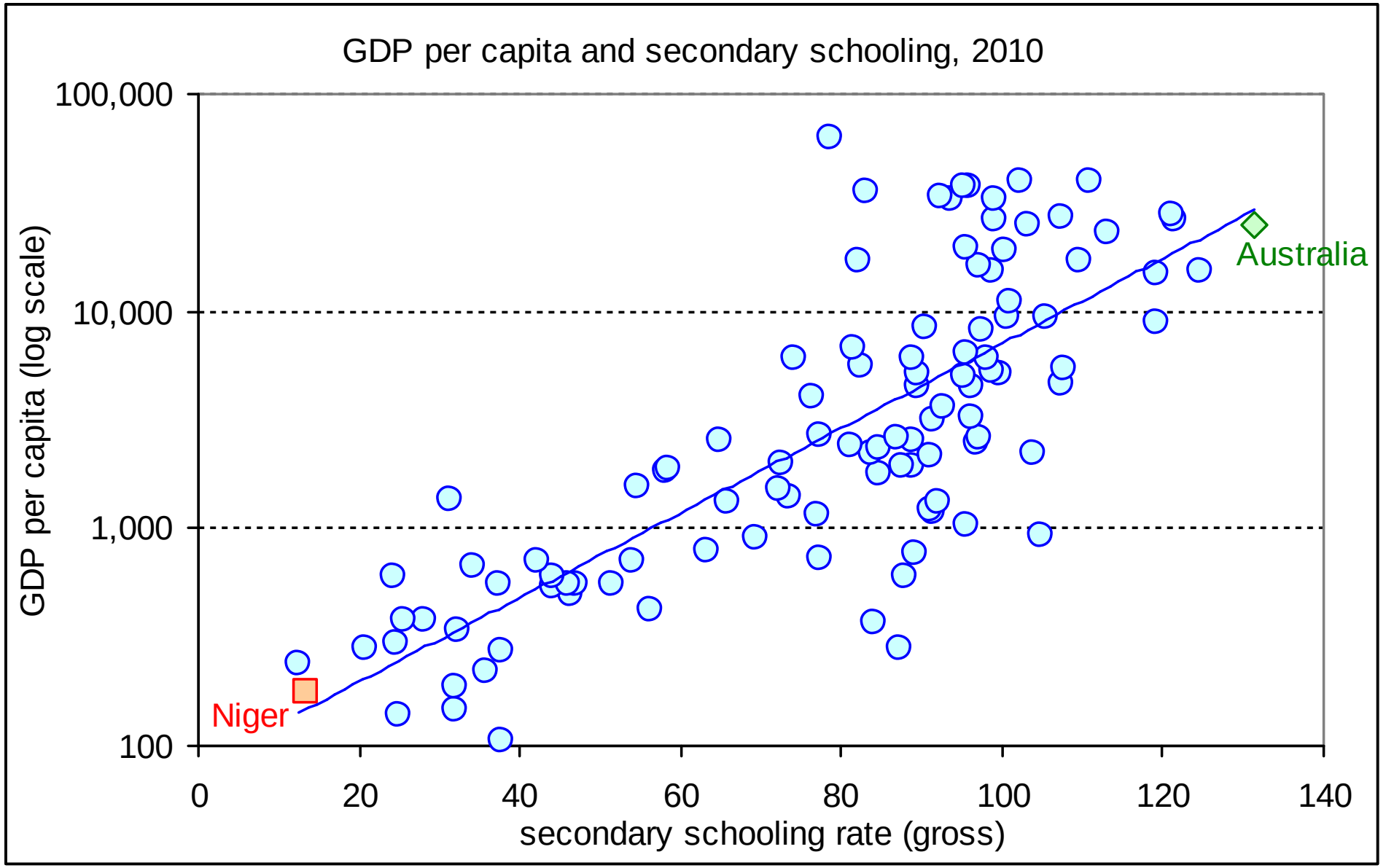
Market power and growth

- The **entrepreneur** is at the **center** of **technological improvements** (**Schumpeter**, 1912)
- Innovative **entrepreneurs** successfully **exploits** new ideas **commercially**
- The success is **rewarded** by the **enjoyment** of **market power** by successfull innovative entrepreneurs
- Market power, by generating **extra-profits**, allows to **recover** the **investments** in innovation activities made by the entrepreneur and provides a **premium** for the **risk** incurred

Beyond the Solow model: human capital

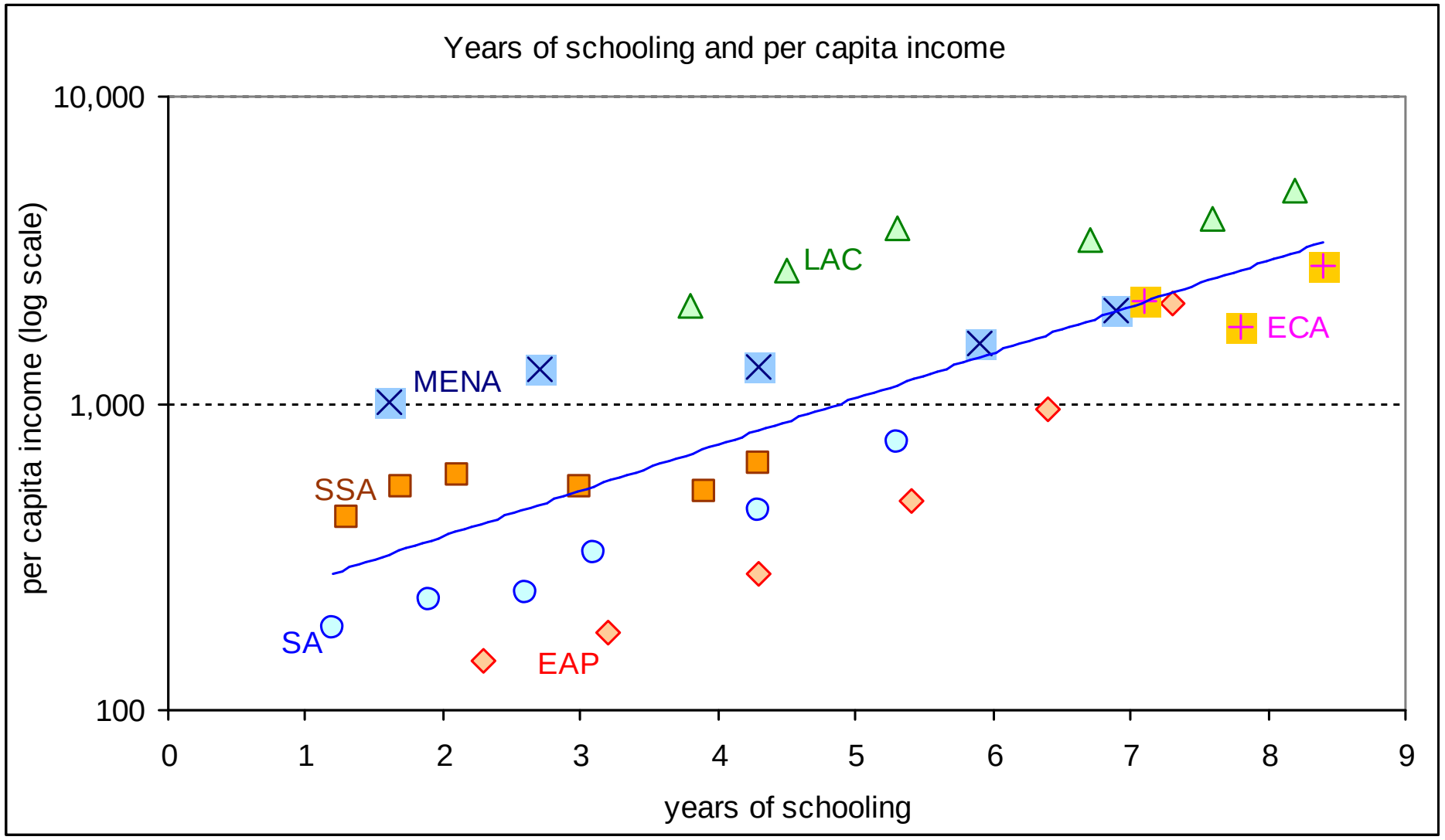
- The role played by **human capital** (schooling, education, skills, etc) is **disregarded** by the **Solow** model
- More **recent** growth **models** (e.g. **Romer**, 1990) consider the role of the (**endogenous** formation of) **human capital** as a **fundamental driver** of long term economic growth
- Human capital is crucial to
  - **Develop** new **technologies**
  - **Adopt** new technologies
  - **Improve** labour **productivity**

Figure 13.4 Income per capita and secondary schooling rate, 2010



Data source: World Development Indicators online; GDP per capita measured in constant 2000 US $.

Figure 13.5 Income per capita and years of schooling; World Bank regions, 1960-2010



Data sources: Cohen and Soto (2007) for years of schooling (population 15-64; population-weighted averages) and World Bank Development Indicators online for per capita income (GDP in constant 2000 dollars); World Bank regions (developing countries only) are: MENA = Middle East & North Africa; LAC = Latin America & Caribbean; SSA = Sub-Sahara Africa; SA = South Asia; EAP = East Asia & Pacific; ECA = Eastern Europe & Central Asia; data for 1960, 1970, 1980, 1990, 2000, 2010

From closed to open economy

- To evaluate how **globalization** influences economic **growth**, we need to evaluate the **impact** of '**openness**' (to trade, investments, migration, knowledge) on the **fundamental determinants** of economic growth
  - **Specialization** according to **comparative advantage**
  - **Increasing returns to scale** and competition
  - Access to **capital**
  - Access to **knowledge**
  - **Risk sharing**

Comparative advantage and growth

- **Openness** to **trade** allows countries to specialize according to their **comparative advantage** (Ricardo model)

- Thanks to trade, **resources** (i.e. production inputs) can be **allocated** in a more **effective** and **efficient** way for the production of the **commodities** for which the country has a **comparative advantage**

Increasing returns to scale, competition and growth

- If production is characterized by **increasing returns to scale,** the **home market** may be too **small**
  - Firms cannot produce at their '**minimum efficient scale**'
  - Only **few** (or even only one) **firms** are on the market
    - High **mark-ups**
    - High **prices**
- **Openness** induces **competition** (recall the **Krugman** model) and thus **efficiency** (e.g. through selection)

Access to capital and growth

- **Capital accumulation** is a crucial driver of **convergence** (and growth)
- If **domestic saving** are **not** large **enough**, access to **foreign savings** may help in **accelerating** the pace of capital **accumulation**

Access to knowledge and growth

- **Knowledge incorporated** into **imports** of intermediate inputs and capital goods
- Knowledge **spillovers**

Access to knowledge and growth

- **New technologies** developed **abroad** are '**ebodied**' in the **products** manufactured in foreign countries
  - This is relevant both for **intermediate** inputs and **capital** goods

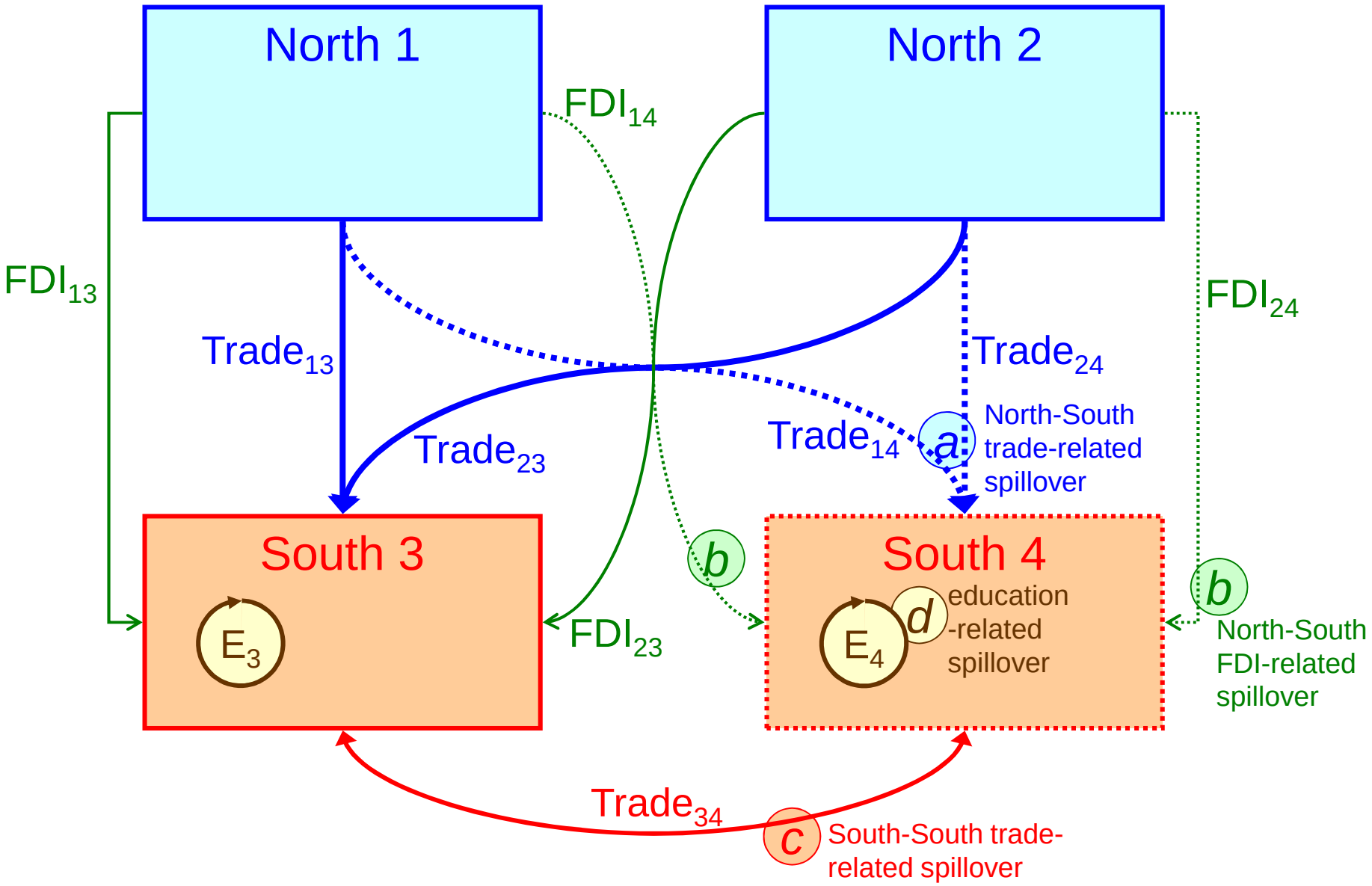
- By **importing** these products, **other countries** may **use** these **technologies** and improve their **productivity**

- Moreover, through '**reverse engineering**', **imitation** in importing countries allows to **further exploit** the **knowledge** that is embodied in import

Access to knowledge and growth

- Knowledge **spillovers**
  - Knowledge about **new technologies**, **products** and **organizational** arrangements may be transmitted through **trade** or **FDI**
  - Successfull **assimilation** of **foreign knowledge** requires the presence of **capabilities** (e.g. experience in R&D, human capital) at **home** → **absortive capacity**

Figure 13.7 Overview of technology spillovers in an open developing economy



Access to knowledge and growth

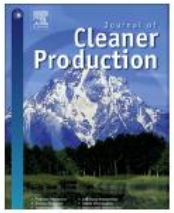
- **North-South trade**
  - **Producers** in the **South learn** from **technology incorporated** in imported intermediate inputs and capital goods
  - **Sector specificities**
- **North-South FDI**
  - **Producers** in the **South** can **imitate** subsidiaries of Northern firms located in the South
- **South-South trade**
  - The **absorption** of **knowledge** form the **North** by **one country** in the South can be **transmitted** to **other** countries in the South

Case study: role of 'foreign knowledge' for improving environmental performance

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro



Eco-innovation, sustainable supply chains and environmental performance in European industries[1]

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- In this paper we evaluate the extent to which **new 'environmental' technologies embodied** in **imported intermediate inputs** contribute to **improved environmental performance** at **home** for EU countries

- We measure the '**technological content**' (**patents** in foreign sectors) of **imported** intermediate **inputs** and **contrast** it with the **change** in **air polluting emissions** of manfuacturing sectors

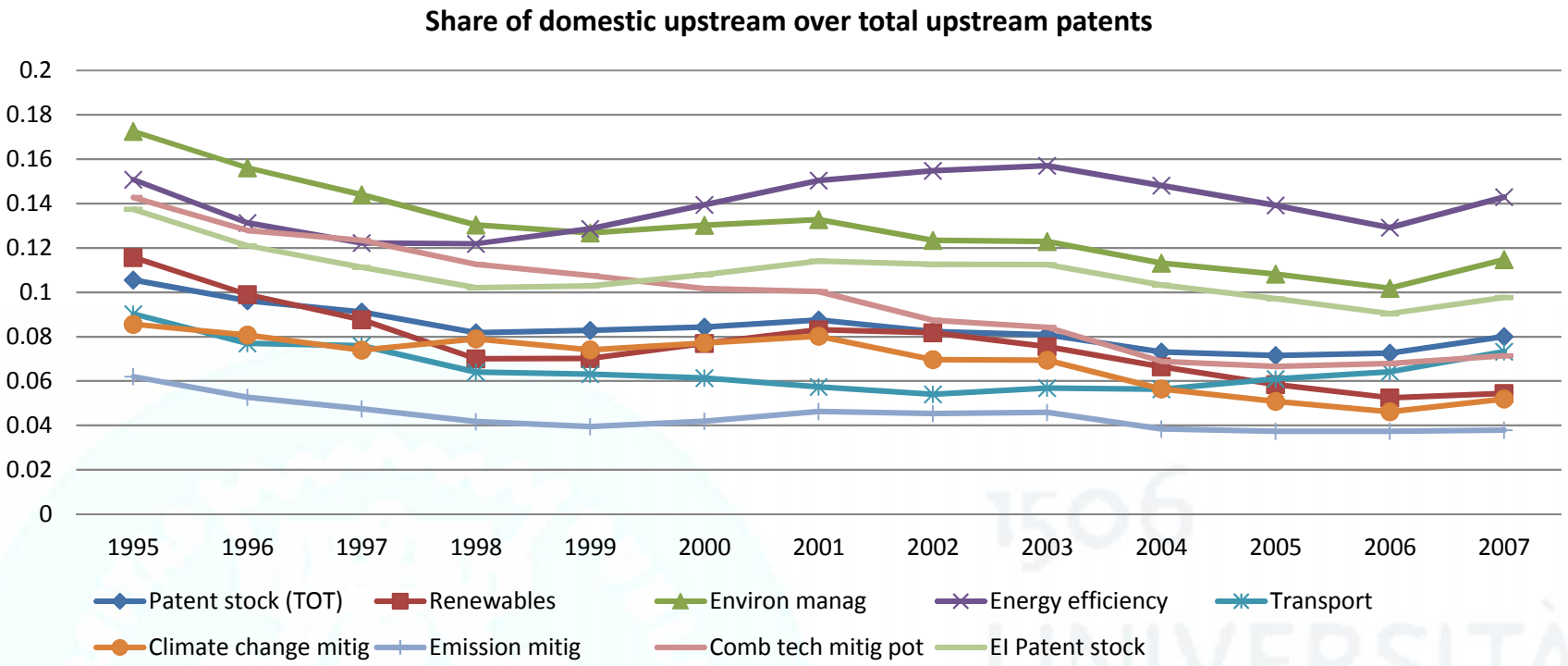

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Table 2
Drivers of EP by emissions type, including upstream spillovers.

	(1) (GHG/L)	(2) (CO2/L)	(3) (NOx/L)	(4) (SOx/L)
Value added per employee (Y/L)	0.405***	0.434***	0.480***	0.298***
	(0.061)	(0.061)	(0.055)	(0.087)
Patent stock (TOT)	−0.049*	−0.064**	−0.071**	0.061
	(0.028)	(0.028)	(0.028)	(0.048)
Patent stock (EI)	−0.054***	−0.057***	−0.024	−0.059**
	(0.016)	(0.016)	(0.016)	(0.029)
Patent stock (EI-DU)	−0.094***	−0.099***	−0.130***	−0.099**
	(0.022)	(0.022)	(0.023)	(0.040)
Patent stock (EI-FU)	−0.100**	−0.093*	−0.235***	−0.322***
	(0.051)	(0.052)	(0.050)	(0.085)
No. obs.	3869	3869	3869	3869
R-sq.	0.763	0.750	0.689	0.599
F test excl IV	38.47	38.47	38.47	38.47

IV Estimator adopted. Robust standard errors in parentheses. Sector, country and year dummies included.
*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

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GM1 Giovanni Marin; 05/04/2017

Risk sharing and growth

- **Open economies rely** on (many) other countries for the **supply** of some **inputs** or for the consumption of some **goods**
- In case a **catastrophic event** that interrupts production at home, an open country can **rely** on **foreign** inputs and production to **satisfy domestic demand**, at least temporarily
- **Closed economies** are more **exposed** to famines

Three cases

- Japan
- China
- Korea

Japan

- Until the **XVI century**, the most important **trade partner** of **Japan** was **China**
  - Reason for the **similarity** in **culture**, **language**, **writing**, etc

- After a period of **civil wars**, **Japan** became a **closed** (and **rigid**) economy
  - **Dutch** were the **only** merchants allowed to enter the country between **1641** and **1854**
  - Very strict **limitations** also for the Dutch
  - Despite limited, the **Dutch link** was **crucial** for the **prosperity** of Japan → **technological** improvements transmitted by the contact with the Dutch

Japan

- **End** of **Dutch** monopoly (**1854**) resulted into an increasing **openness**
  - Japan imitated the **institutions** of **other countries**
    - **German/French educational** system
    - **German**-like **army**
  - **Migration** (inward and outward) as a **source** of **knowledge**
    - **Foreign** scientists were invited to **teach** to Japanese students (inward)
    - **Japanese** students and scientists were **sent abroad** to **learn** from other countries (outward)

- **Back to the Future III (1990)**
  - https://www.youtube.com/watch?v=c1QcjsjjtRc

- **DOC (from 1955)**:
  - «Unbelievable that this little piece of junk can be such a big problem. Now wonder this circuit failed, it says 'made in Japan'»
- **Marty (from 1985)**:
  - «What do you mean, DOC? All the best stuff is 'made in Japan'»
- **DOC (from 1955)**:
  - «Unbelievable…»

Japan

- **After WWII**, Japan built its **success** by first **copying** and **imitating US technology** in a few (important) **export-oriented industries**
  - Automobiles
  - Electronic equipment

- Successful **adoption** up to the **point** of becoming **technological leader**

China

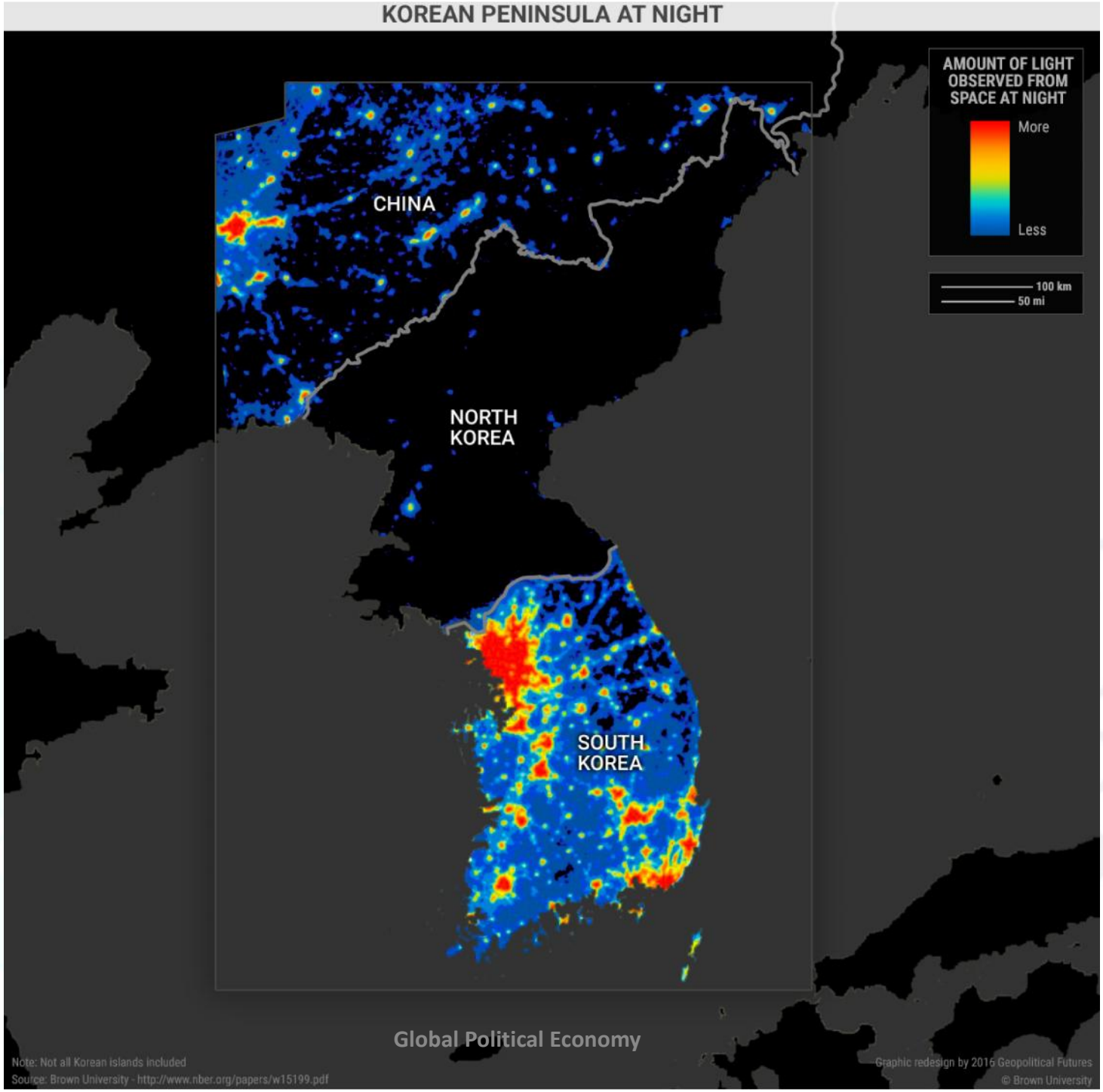
- **Communist** country since 1949
- **Until 1958** China was '**open**' to the rest of the **communist block**, while from **1958** it remained **almost isolated** (**Great Leap Forward** of Mao to plan the development of the Chinese industry)
- **Famine** of 1960-1961 (milion people died)

China

- After Mao died, **Deng Xiaoping** promoted a **radical economic reform** (from **1979**)
  - More room for **markets**
  - **Openness** to **FDI** and **trade**
- Openness induced a **rapid growth** of **capital** accumulation and **technology** advances

Korea (North and South)

- **Korea** was a rather **homogeneous** united country **before** the **Korea War** (1950-1953)
- After the war, the country split in **two countries**
  - **South Korea**
    - **Open** to foreign markets and FDI, **market** economy
  - **North Korea**
    - **Autharchy** and **communist**
- Now **North Korea** is a **very poor** country, while **South Korea** is very **rich** and **technologically** advanced


KOREAN PENINSULA AT NIGHT
AMOUNT OF LIGHT OBSERVED FROM SPACE AT NIGHT
More
Less
100 km
50 mi
CHINA
NORTH KOREA
SOUTH KOREA
Note: Not all Korean islands included
Source: Brown University - http://www.nber.org/papers/w15199.pdf
Graphic redesign by 2016 Geopolitical Futures
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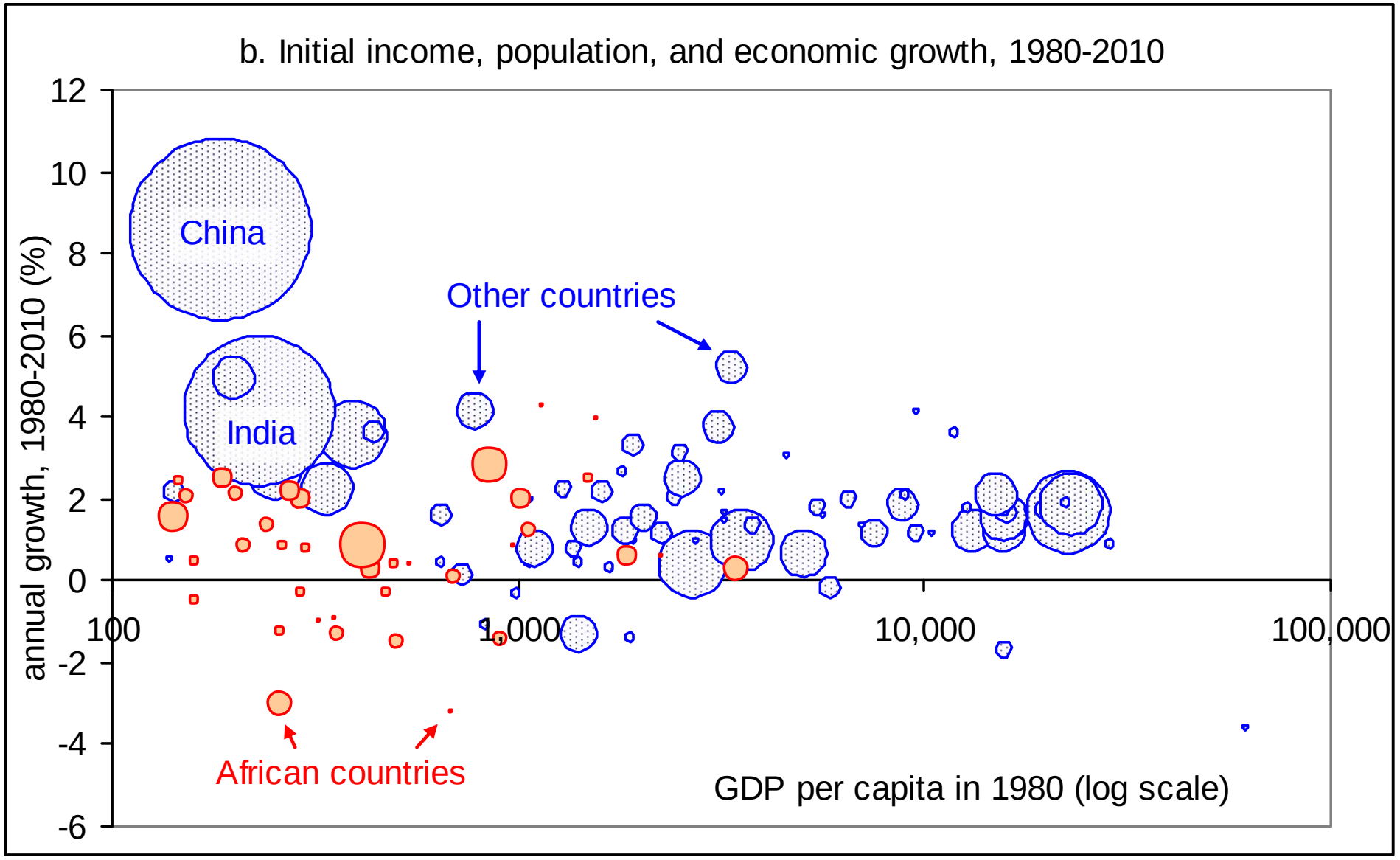
Growth and openness

- **Sachs and Warner (1995)** distinguish **countries** according to their **degree of openness**
  - Non-tariff barriers
  - Tariffs
  - Black market for currency
  - Socialist economic system
  - State monopoly on export
- Almost all '**closed**' economies are located in **Sub-Saharan Africa**

Figure 14.1 Income levels, growth rates and population, 1980–2010



Data source: World Development Indicators online; GDP per capita in constant 2000 US $; size of bubble in panel b is proportional to population size in 1980; information for 143 countries depicted, 131 with 1980-2010 information plus 12 countries above 10 million people in 1980 with different time frame (as long as possible); together these countries account for 96 percent of the world population in 1980.

Openness and growth

- **Wacziarg and Welch (2008)**
  - Countries that **openned** their economy to international trade had a **growth 1.5 percent above** the **pre-openness** period

- **Van Marrewijk and Berden (2007)**
  - **Asymmetric** impact of **openness**
  - The **positive** impact on economic growth of going **from closed to open** is much **larger** than the **negative** impact on economic growth of going **from open to closed**