

PP5183: 04–05. Growth and Convergence

LKY School of Public Policy

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OUTLINE

1. Growth. Catching up.
2. What Does Economics Say About Growth?
3. Endogenous growth: Technical Progress. Externalities.
4. Intellectual property rights
5. Conclusion

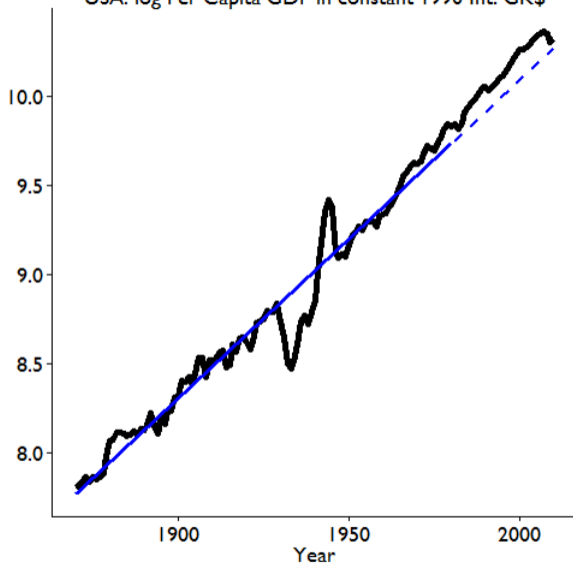
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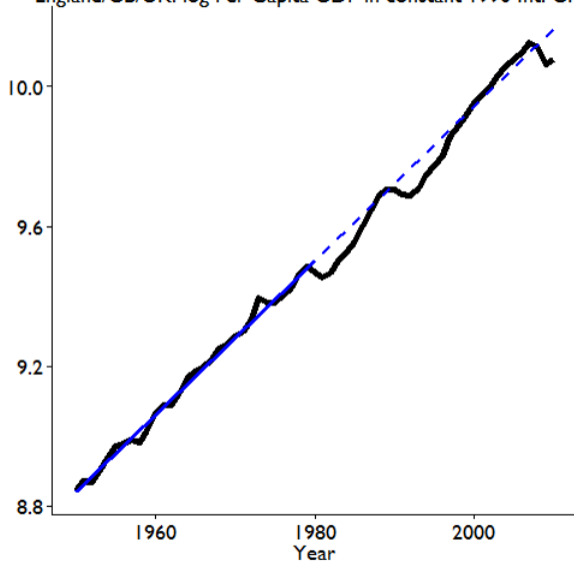
What does growth look like?

1. Poverty declines.
2. Incomes rise.
3. Everything changes.
4. Smooth underlying (exponential) growth trajectory. And convergence towards that growth path

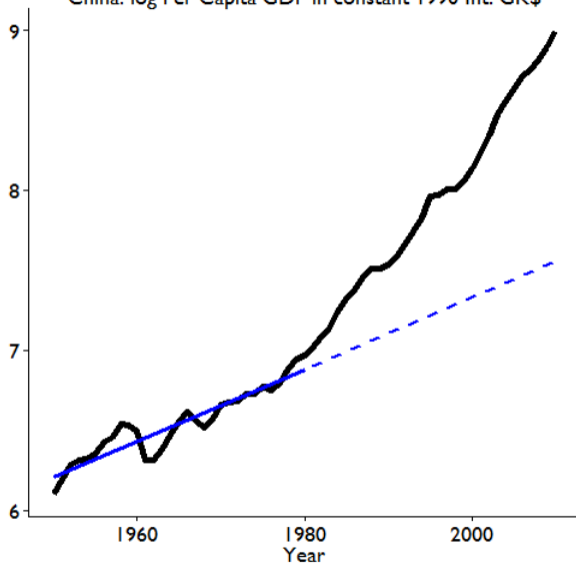
USA: log Per Capita GDP in constant 1990 Int. GK\$



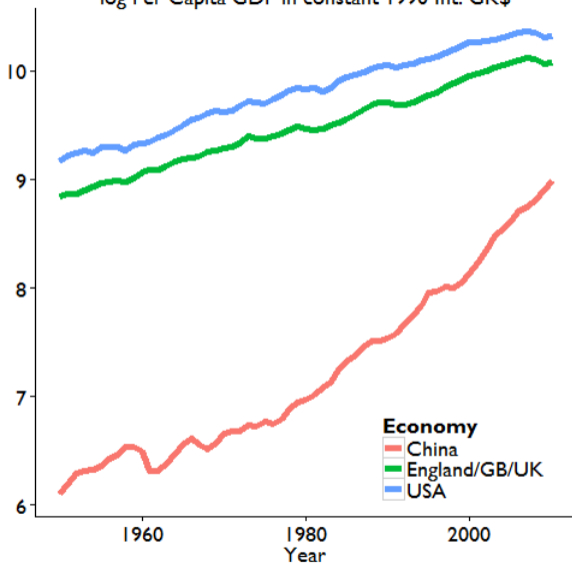
England/GB/UK: log Per Capita GDP in constant 1990 Int. GK\$



China: log Per Capita GDP in constant 1990 Int. GK\$

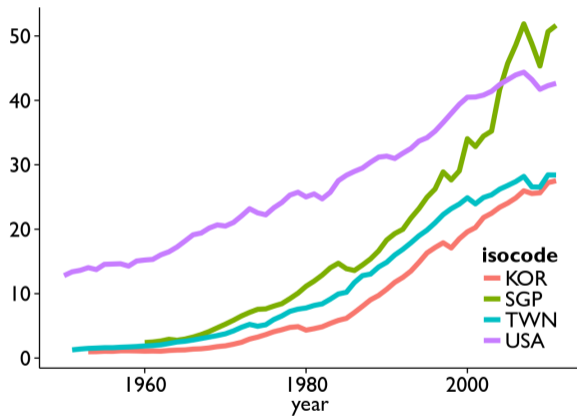


log Per Capita GDP in constant 1990 Int. GK\$



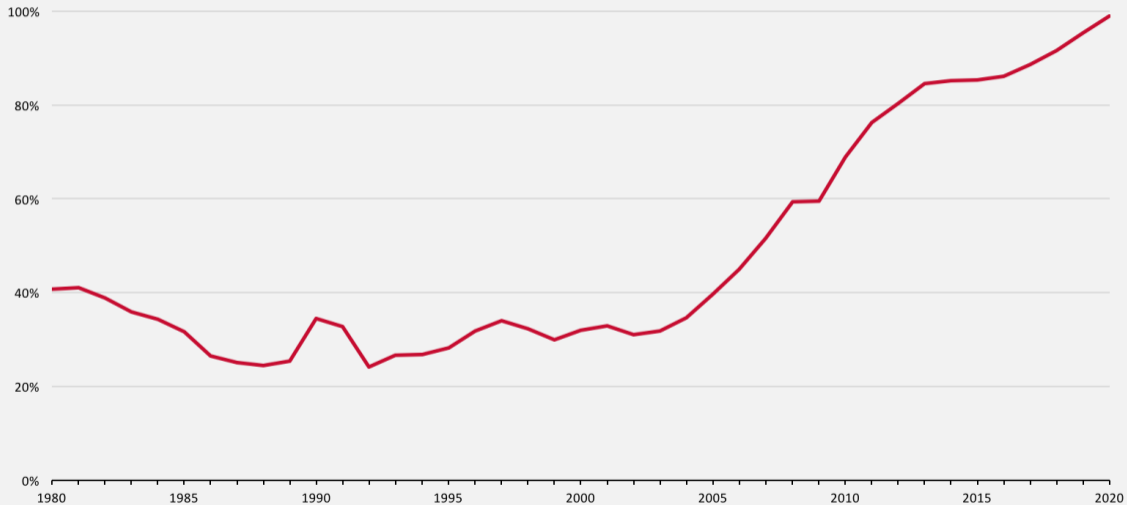
Empirical Lessons

1. Fitted trends tend artificially to induce cyclicity. But the out-of-sample extrapolation does give useful information.
2. US, UK trend fit vs China's out-of-sample growth
3. Cross comparison informs on relative cross-section performance, not just in contrast to own history. A different, arguably more important, meaning of convergence



The Globalization Lift

Emerging countries' combined GDP as a share of G7 GDP



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Growth Accounting

$$Y = F(K, NA)$$

K physical capital

N labour

A technology (labour-augmenting)

Write

$k = K/N$ per capita stock of physical capital

$\tilde{k} = K/(NA)$ technology-adjusted k

Growth Dynamics

Then (under “constant returns to scale”)

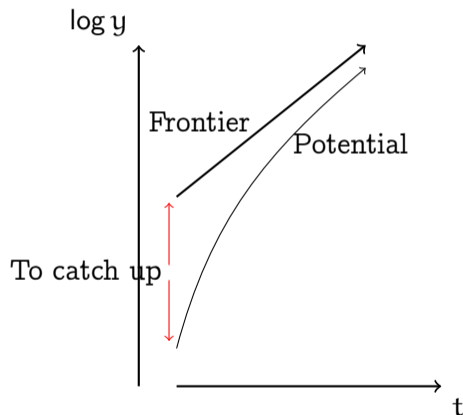
$$y = Y/N = F(K/NA, 1) \times A = f(\tilde{k}) \times A.$$

Per capita GDP grows from the accumulation of k (physical capital) and progress in A (technology).

$$\log y = \log f(\tilde{k}) + \log A.$$

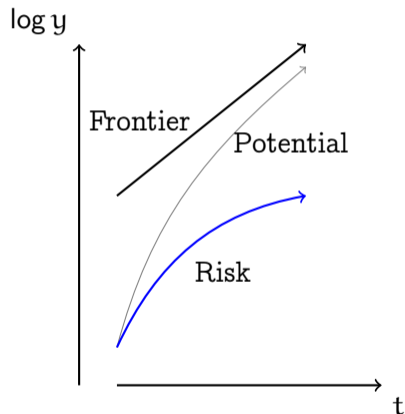
1. Economic growth comes from investment to build machines and from investment to accumulate knowledge and advance technology.
2. Limits to growth from just accumulating capital: Declining marginal returns in production function
3. R&D and other knowledge-based activity drive A — **Total Factor Productivity (TFP)**.

Growth and Convergence



1. Frontier describes $\log A$ increasing from technological progress.
2. Catch-up represents accumulation in physical capital.
3. Fast growth occurs when an economy is poorer.

Convergence and the Middle-Income Trap



But a slowdown might happen before the economy reaches maximum potential: Middle-Income Trap. Unsustainable rapid growth.

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Challenges

But even without the Middle-Income Trap, there's only so much policy can do for long-run growth. Hence, the need to make long-run growth *endogenous*:

1. Externalities. Spillovers: No longer diminishing marginal returns to accumulated factors.
2. Technical progress. TFP—Total Factor Productivity

Alwyn Young's calculations for East Asia

	(%)	Annual growth (%)			(%)	Growth (%)
	TFP/Output	Y	K	N	Labor share	TFP
HK	32%	7.3	8.0	3.2	62.8	2.3
Sg	2%	8.7	11.5	5.7	50.9	0.2
SKorea	17%	10.3	13.7	6.4	70.3	1.7
Tw	28%	9.4	12.3	4.9	74.3	2.6
Cn	%					1.4

Table: TFP in East Asia. Source: Young (1995, 2003).

“The Myth of Asia’s Miracle”

“From the perspective of year 2010, current projections of Asian supremacy extrapolated from recent trends may well look almost as silly as 1960s-vintage forecasts of Soviet industrial supremacy did from the perspective of the Brezhnev years.”

(Krugman 1994)

East Asia—Productivity

Alternative interest rates	Annual growth rates	
	Primal TFP	Dual TFP
Equity returns 1971–1990	-0.69	1.52
Average lending rate 1968–1990	-0.22	2.16
E-P ratio 1973–1990	-0.66	1.61

Table: TFP in Singapore. Source: Hsieh 2002, also using Young 1995.

What Makes for Endogenous Technical Progress?

1. Endogenous technology
 - 1.1 Accumulation of knowledge
 - 1.2 What is special about knowledge?
2. Consistency with neoclassical model but endogenised growth
3. Policy implications:
 - 3.1 Imperfect competition to support price on ideas
 - 3.2 R+D: social efficiency
 - 3.3 IPRs: ex ante versus ex post incentives

Knowledge Is The Basis For Technical Progress

Externality

An **externality** arises when an action by someone affects the well-being of another, without an immediate system for compensation.

Rivalry

A good is **nonrival** when its consumption or use by someone does not reduce its consumption opportunities to others. Otherwise, that good is rival. [Older language: infinitely expansible (Thomas Jefferson, 1813)]

Excludability

A good is **excludable** when the benefits from its consumption or use can be kept from others in society.

Rivalry and Excludability

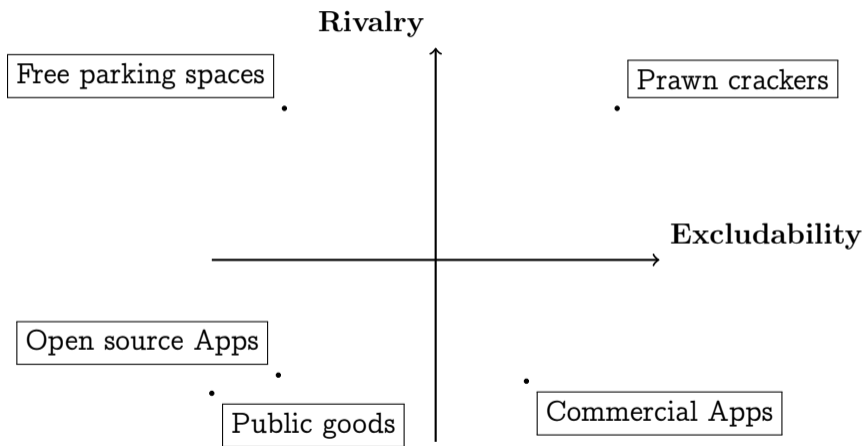
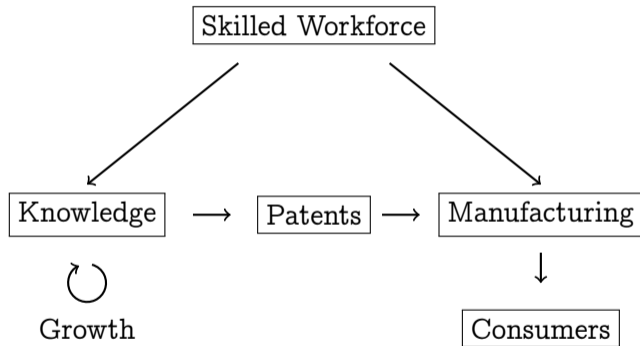


Figure: Rivalry and excludability are different

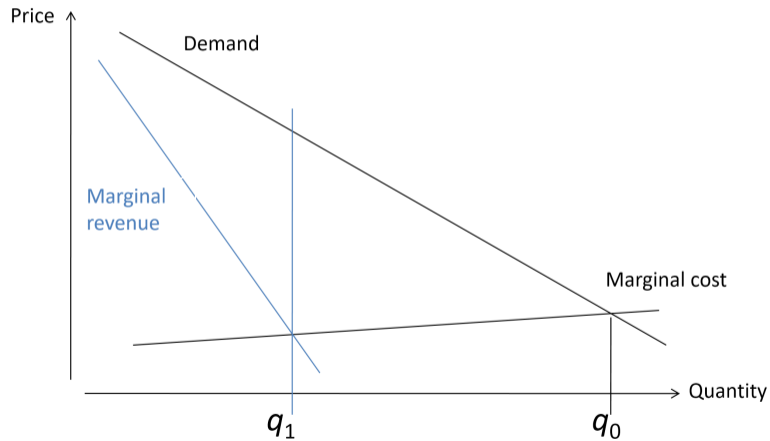
Knowledge, Technology, and Growth



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Overpriced Under-Provision



International IPRs

(based on Chaudhuri, Goldberg, and Gia 2006)

- India 1972.04-2003.05 pharma process patents only
- World's largest producer by volume, one of the world's largest for bulk drugs.
Major exporter
- Quinolone molecules for bacterial infection
- Welfare loss US\$715mn a year (120% of total sales) versus domestic producer profits gain US\$50mn a year, multinationals US\$57mn

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Concepts to remember and use

1. Growth and Convergence. Stability. And Not.
2. Endogenous growth. Externalities and Technological Progress
3. Intellectual Property Rights