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Technology and Long-run Economic Growth in Asia

Economic Performance and Technology

- The Case of Japan -

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1

2.Problem Setting

Krugman: The Myth of Asian Miracles (94)

- Rapid Growth in Asia will not last long as it depends mostly on resource mobilization (RM) instead of productivity growth (PG).
- Example: Stalinist Regime of Soviet Russia.

4

1. Introduction

- Japan's Economic Growth Rate Varied widely across the decade in the latter half of the last century.
 - *Growth was rapid in the 60's (10%)
 - *Moderate in the 70's &80's(4-5%)
 - *Low in the 90's (90-98: 1.5%)
- How Technology was related with this vicissitude?

2

Criticism against Krugman

- *Too much dependence on Alwyn Young's study of Singapore.
- *Maddison's data suggest low or negative TFP growth may not be so uncommon.
- *RM is efficient if idly utilized resources were endowed.
- * Shift from RM to PG is possible particularly when the market works efficiently.

5

Table 1 :Growth A/C :Japan (%)

	GDP	Capital Share	Capital Stock	Labor Force	Residual
1960's *	11.1	0.338	12.0	1.3	6.2
1970's	4.8	0.279	8.5	0.9	1.7
1980's	4.1	0.263	7.1	1.2	1.3
1990's (-98)	1.5	0.237	4.5	0.6	0

Estimated by Ito; At price of mid decade except

3

Table 2 :TFP Growth (%)

	1820-1870	1870-1913	1913-1950	1950-1973	1973-1992
USA	- 0.15	+ 0.33	+ 1.59	+ 1.72	+ 0.18
UK	+ 0.15	+ 0.31	+ 0.81	+ 1.48	+ 0.69
Japan *	N. A.	- 0.31	+ 0.36	+ 5.08	+ 1.38

Maddison Estimate; * 1890-1913

6

Criticism against Krugman (2)

H'sieh, Factor Accumulation and Factor Prices (1999, 2002)

*Capital accumulation will lower MP of capital or the rate of profit unless supported by PG.

*Korea and Singapore Compared.

*National Accounts and Market Statistics

7

Table 3 : Growth per capita

	actual	Steady state	Transi-tion	Speed	Gap
1960's	9.7 *	9.4	0.4	9.8	0.96
1970's	3.8	2.4	1.6	5.9	0.76
1980's	2.8	1.8	1.0	5.7	0.84
1990's	0.9	0.7	-0.1	3.5	0.81

Estimated by Ito; at price of mid decade except *

10

Transition Dynamics

• Mankiw, Romer, Weil; Jones, Barro etc.

(a) TD may help to explain why Japan which had its capital wiped out by WWII has grown more rapidly than US over the last 50 years.

(b) Explanation by TD may work well for such economies as Korea, Singapore, or Taiwan which have increased investment dramatically. (Jones, 1988)

8

Table 4 : Determinants of Steady State

	n	g	d	s	alpha
1960's	1.3	9.4	4.1	16.1	0.338
1970's	0.9	2.4	4.8	17.0	0.279
1980's	1.2	1.8	4.7	16.5	0.263
1990's	0.6	-0.1	4.1	16.5	0.237

Estimated by Ito; at price of mid- decade except *

11

Equations of Transition Dynamics

- Production Function: $Y = AK^\alpha L^{1-\alpha}$ or $y = Ak^\alpha$.
- Output per effective units of labor $x = y/A$
- Steady state $k^*(t) = A(t)(s/(n+g+d))^{1/(1-\alpha)}$

$$y^*(t) = A(t)(s/(n+g+d))^{\alpha/(1-\alpha)}$$

$$X^*(t) = (s/(n+g+d))^{\alpha/(1-\alpha)}$$

Growth Rate = steady state growth + Transitional growth

$$= g - \beta \ln(x(t)/x^*(t))$$

$$\text{where } \beta = (1-\alpha)(n+g+d)$$

9

Problems Posed

- Are Prognoses by Krugman, Jones, and Hsieh applicable to Japan
 - (a) in the High Growth Era
 - and/or
 - (b) after?

12

3. High Growth Era

- Decade before 1960
 - * Jones' prognosis may well appear to apply Japan after the war, but not necessarily.
 - * Japan's War Economy collapsed by stoppage of import of raw materials rather than by destruction of capital stock.
 - * destruction of capital stock centered on ocean transport vessels(80%), houses in the cities (1/3), and consumer goods industries (due to enforced scrap). Damage of producer goods industries was relatively smaller.

13

Table 5 : Payment for Import of Technology (\$million)

	Japan	US	UK	France	Germany
1961	111.9	80.0	n.a.	105.8	154.8
1964	155.7	127.0	98.6	191.0	174.5
1967	239.0	n.a.	141.1	230.0	222.0

Source: Science & Technology Indicators, 1970

16

Continued

- *GDP fell more sharply (50%) than capital stock.
- *However deficient and obsolete the stock of capital was, capacity to invest was also lacking in Japan at that time, due to low saving rate, to weak financial position of the industries, etc.
- *As a nation, the balance of payment was in deficit. Aid from Us was mainly for urgent supply of foodstuff.

14

Table 6 : Share of the Technology Imported Products (%)

	Computer	Ethylene	polyethylene	Synth. Rubber	Synth. Fiber	Drug
1960	15	100	100	100	70	59
1965	59	100	100	95	73	54
1970	41	100	92.0	87	79	30

Whitepaper on Science & Technology, 1970

17

Technology led Growth?

- The 1960's; technology led growth.
- *Contribution of the residual was larger than that of RM (Table1). Relative Distance from steady state was smaller than in succeeding decades (Table 3)
- *catching up with the most advanced level of technology in modern industries.
- *Import of Foreign Technology
- *RM & Increased Return with Technical Progress.

15

4. After the High Growth

- Decline of Productivity Growth.
- Double Effects of productivity growth on economic growth.
 - * Increased (decreased) productivity growth raises (lowers) steady state growth, while lowering (raising) transitional growth.
 - * Japan relied relatively on RM after 1970. K/Y increased more rapidly after 1970 as I/Y remained high in spite of lowered PG. (Table 1)

18

Continued

- Hsieh's conjecture seems to be able to explain Japan's falling rate of profit.
 - Profit rate estimated by National Accounts Nonfinancial Corporation's Profits/Net fixed Asset in nominal terms:
 - 11.6% in the 60's
 - 6.4% in the 70's
 - 6.3% in the 80's
 - 4.4% in the 90's.
- **Some Remaining Puzzles: Depreciation, Scrap, Relative share, Intermediate Inputs.

19

5. Aftermath of Stagnation

- Restructuring of industries.
- Place of Researchers in Industries.
- Changing Government Policies
 - *Deregulation, Privatization, and Reorganization
 - * Changes in Science & Technology Policy
 - Budget, Administration, University Reform, etc.

20