5-27-09

- WHY STUDY ECONOMIC GROWTH?
- FACTS / QUESTIONS
- START SOLOW MODEL

BASIC FRAMEWORKS

I NEOCLASSICAL GROWTH MODEL

BENCHMARK: SOLOW MODEL
MANY VERSIONS

LIMITED COVERAGE
II ENDOGENOUS GROWTH MODELS

EXAMPLE: <u>Ak</u> MODEL, OTHERS.

NOT COVERED
III IV
- PRODUCT VARIETY MODEL
- SCHUMPETERIAN MODEL

Why Economic Growth Matters?

Link with: Hunger, Mortality and Poverty

How? These three variables improve as GDP per capita rises

World Bank Data (Ravallion and Chen) (1981- 99, 65 Developing Countries)

	Percentage change in average incomes per year	Percent change in poverty rate per year
Strong contraction	−9.8	23.9
Moderate contraction	−1.9	1.5
Moderate expansion	1.6	−0.6
Strong expansion	8.2	−6.1

I do not see how one can look at figures like these without seeing them as representing *possibilities*. Is there some action a government of India could take that would lead the Indian economy to grow like Indonesia's or Egypt's? If so, *what* exactly? If not, what is it about the "nature of India" that makes it so? The consequences for human welfare involved in questions like these are simply staggering: Once one starts to think about them, it is hard to think about anything else (Lucas 1988, p. 5).

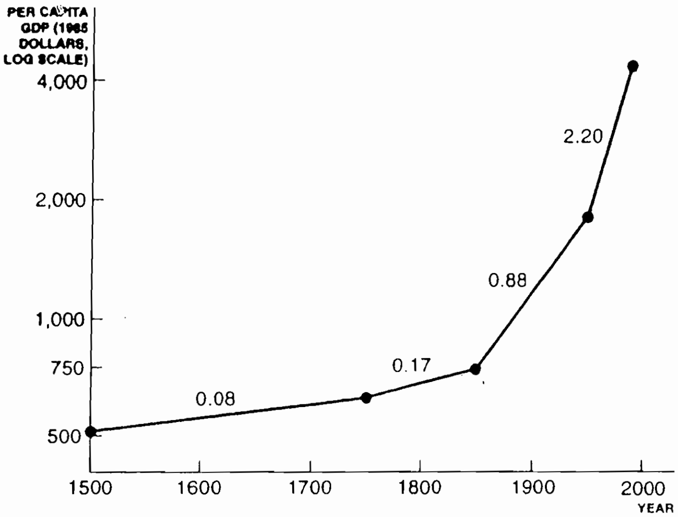
TABLE 1.1 STATISTICS ON GROWTH AND DEVELOPMENT

	GDP per capita, 1997	GDP per worker, 1997	Labor force participation rate, 1997	Average annual growth rate, 1960–97	Years to double
"Rich" countries					
U.S.A.	$20,049	$40,834	0.49	1.4	50
Japan	16,003	25,264	0.63	4.4	16
France	14,650	31,986	0.46	2.3	30
U.K.	14,472	29,295	0.49	1.9	37
Spain	10,685	29,396	0.36	3.5	20
"Poor" countries					
China	2,387	3,946	0.60	3.5	20
India	1,624	4,156	0.39	2.3	30
Zimbabwe	1,242	2,561	0.49	0.4	192
Uganda	697	1,437	0.49	0.5	146
"Growth miracles"					
Hong Kong	18,811	28,918	0.65	5.2	13
Singapore	17,559	36,541	0.48	5.4	13
Taiwan	11,729	26,779	0.44	5.6	12
South Korea	10,131	24,325	0.42	5.9	12
"Growth disasters"					
Venezuela	6,760	19,455	0.35	−0.1	−517
Madagascar	577	1,334	0.43	−1.5	−46
Mali	535	1,115	0.48	−0.8	−85
Chad	392	1,128	0.35	−1.4	−48

SOURCE: Author's calculations using Penn World Tables Mark 5.6, an update of Summers and Heston (1991), and the World Bank's Global Development Network Growth Database, assembled by William Easterly and Hairong Yu.

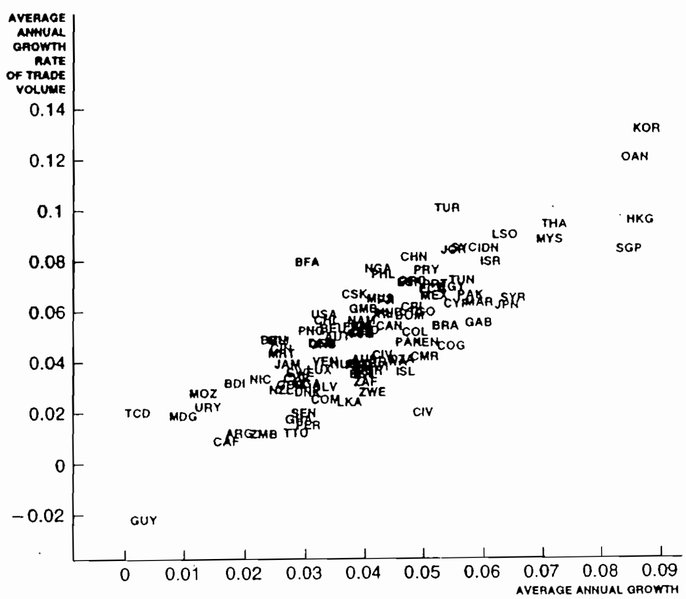
Notes: The GDP data are in 1985 dollars. The growth rate is the average annual change in the log of GDP per worker. A negative number in the "Years to double" column indicates "years to [illegible]."

FIGURE 1.3 **WORLD PER CAPITA GDP AND GROWTH RATES, 1500–1990**



SOURCE: Computed from Lucas (1998) and Maddison (1995).
Note: The numbers above each line segment are average annual growth rates.

FIGURE 1.5 **GROWTH IN TRADE AND GDP, 1960–90**



SOURCE: Penn World Tables Mark 5.6, Summers and Heston (1991).

FACT #5 In the United States over the last century,

1. the real rate of return to capital, r, shows no trend upward or downward;
2. the shares of income devoted to capital, rK/Y, and labor, wL/Y, show no trend; and
3. the average growth rate of output per person has been positive and relatively constant over time — i.e., the United States exhibits steady, sustained per capita income growth.

FACT #1 **There is enormous variation in per capita income across economies. The poorest countries have per capita incomes that are less than 5 percent of per capita incomes in the richest countries.**

FACT #2 Rates of economic growth vary substantially across countries.

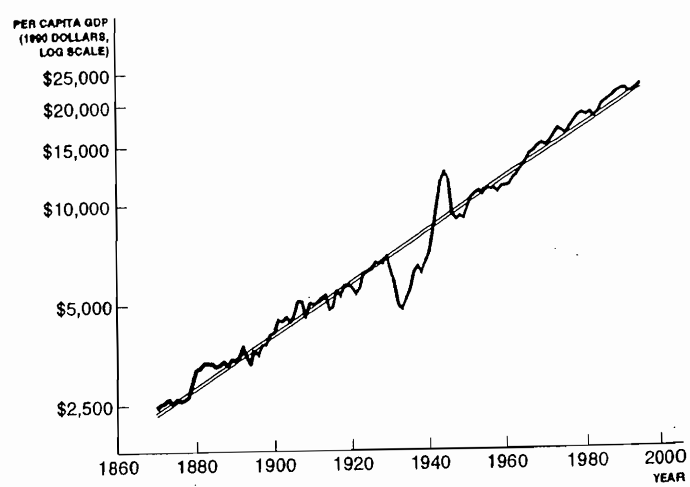
FACT #3 Growth rates are not generally constant over time. For the world as a whole, growth rates were close to zero over most of history but have increased sharply in the twentieth century. For individual countries, growth rates also change over time.

FACT #4 A country's relative position in the world distribution of per capita incomes is not immutable. Countries can move from being "poor" to being "rich," and vice-versa.[10]

FACT #6 Growth in output and growth in the volume of international trade are closely related.

FACT #7 Both skilled and unskilled workers tend to migrate from poor to rich countries or regions.

FIGURE 1.4 **REAL PER CAPITA GDP IN THE UNITED STATES, 1870–1994**



SOURCE: Maddison (1995) and author's calculations.

Table I.1
Poverty Reduction in India Headcount Ratios (Percentage)

	Official Methodology			Adjusted Estimates		
	1987–88	1993–94	1999–2000	1987–88	1993–94	1999–2000
Rural	39.4	37.1	26.9	39	33	26.3
Urban	39.1	32.9	24.1	22.5	17.8	12

Official: Consumption data from Planning Commission Sample Survey
Adjusted: Consumption data from improved comparability and price indices

Table I.2
India in Cross Section: Mean of Growth Rate of Output per Worker, 1970–2000

	1970–80	1980–90	1990–2000
Mean of growth rate	0.77	3.91	3.22

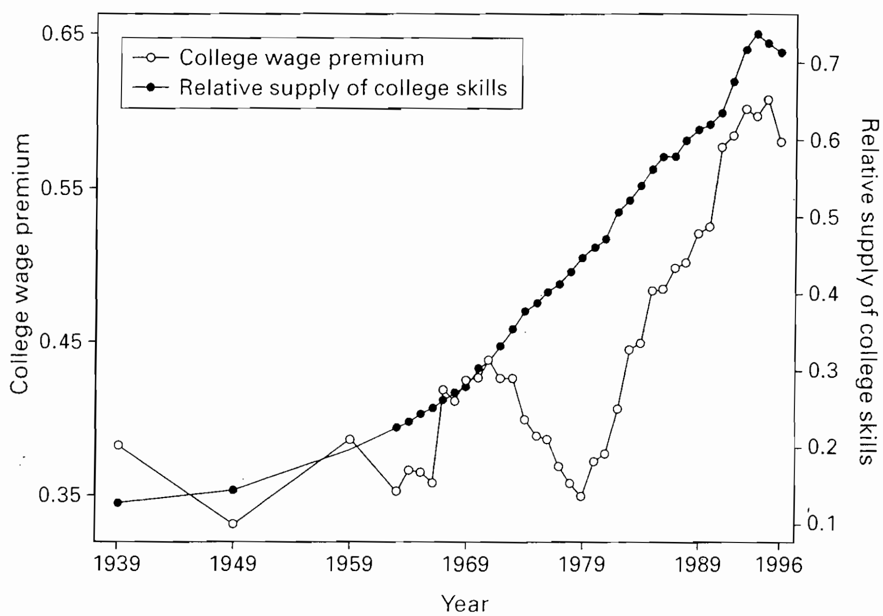


Figure I.2
Relative supply of college skills and college premium

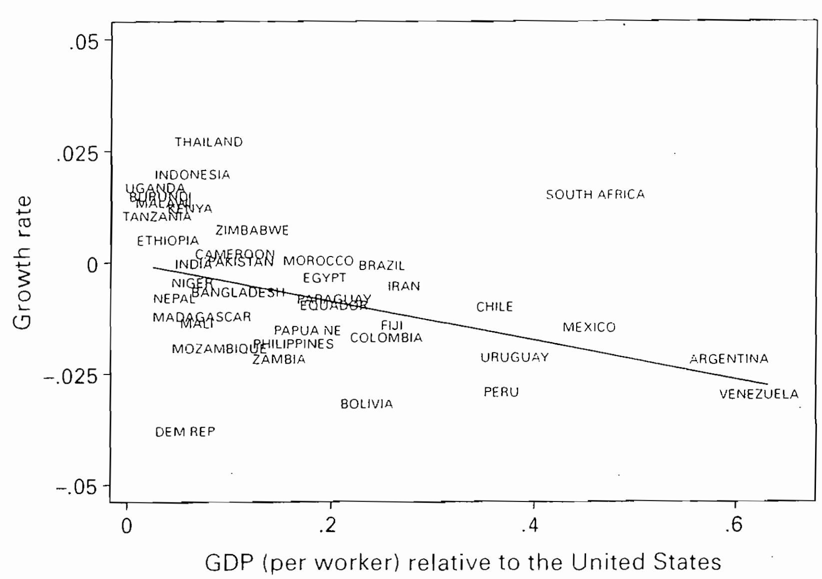


Figure I.1

COMMENTS ABOUT GENERAL EQUILIBRIUM MODELS

(1) COUNTRY:

ENDOWNMENTS (L, k)

TECHNOLOGY

PREFERENCES

(2) SIMPLIFICATIONS:

- SINGLE GOOD
- TRIVIAL PREFERENCES (% OF INCOME IS SPENT IN CURRENT CONSUMPTION)
- IDENTICAL AGENTS / REPRESENTATIVE CONSUMER / SINGLE AGENT.

SOLOW MODEL

BASIC → POPULATION GROWTH
→ NO TECHNOLOGICAL CHANGE

CHARACTERISTICS

- SINGLE GOOD → CONSUMPTION, → INVESTMENT
- LABOR FORCE PARTICIPATION CONSTANT (ASSUME POPULATION IS EQUAL TO WORKFORCE)
- ASSUME EQUILIBRIUM / FEASIBILITY CONDITION

OBJECTIVE:

CHARACTERIZE MODEL BEHAVIOR TO GET POLICY IMPLICATIONS.

STEPS:

I LOOK / CHARACTERIZE THE BALANCED GROWTH PATH

(i) LOOK AT GROWTH RATES OF VARIABLES
(ii) LOOK AT LEVELS OF CERTAIN VARIABLES.

II LOOK OUTSIDE BGP

(i) GROWTH RATES

(ii) ADJUSTMENTS AFTER DISTURBANCES.

BASIC MODEL

(1) $Y = F(K, L) = K^{\alpha} L^{1-\alpha}$ $\quad 0 < \alpha < 1$

REMARK: ALL VARIABLES ARE FUNCTIONS OF TIME t

(2) $S = s \cdot Y$ $\quad 0 < s < 1$

s: SAVINGS RATE

CONSUMPTION/SAVINGS DECISION

REMARK: $Y = C + S \Rightarrow \boxed{C = (1-s) Y}$ (3)

POPULATION = # OF WORKERS = L

(4) $\hat{L} = n$ WHERE $n \geq 0$

LAW OF MOTION OF CAPITAL STOCK

(5) $\dot{K} = I - \delta K$ $\quad 0 < \delta < 1$

δ: DEPRECIATION RATE

EQUILIBRIUM / FEASIBILITY :

(6) $I = S$

USING (5) & (6) USING (2)

(7) $\boxed{\dot{k}} = S - \delta k = \boxed{\text{s} \cdot Y - \delta k}$

SINCE $\hat{k} = \dot{k}/k$ WE CAN DIVIDE BOTH SIDES OF (7) BY k

(8) $\boxed{\hat{k}} = \dfrac{\dot{k}}{k} = \boxed{\text{s} \cdot \dfrac{Y}{k} - \delta}$

BGP OF THE SYSTEM

DEF: ALONG A BGP VARIABLES GROW AT CONSTANT RATES, i.e.: $\hat{Y}$, $\hat{k}$, $\hat{L}$ CONSTANT (CAN BE DIFFERENT CONSTANTS)

FIRST STEP : CALCULATE GROWTH RATE OF TOTAL OUTPUT Y

USING HAT ALGEBRA ON (1)

$\hat{Y} = \widehat{k^{\alpha}} + \widehat{L^{1-\alpha}} = \alpha \hat{k} + (1-\alpha)\hat{L}$

USING (4)

$$\boxed{\hat{Y} = \alpha \hat{k} + (1-\alpha) n} \quad (*)$$

ALONG BGP, $\hat{k}$ IS CONSTANT

THEN (8) $\Longrightarrow \dfrac{Y}{k}$ CONSTANT

$$\Longrightarrow \boxed{\hat{Y} = \hat{k}} \quad (**)$$

USING (**) INTO (*)

$$\hat{Y} = \alpha \hat{Y} + (1-\alpha) n$$

$$\Longrightarrow \cancel{(1-\alpha)} \hat{Y} = \cancel{(1-\alpha)} n$$

$$\Longrightarrow \boxed{\hat{Y} = n}$$

THEN WE CAN CONCLUDE THAT ALONG A BGP OUTPUT, CAPITAL AND LABOR GROW AT THE SAME RATE EQUAL TO POPULATION GROWTH: $\boxed{\hat{Y} = \hat{k} = \hat{L} = n}$