ECON 385. Intermediate Macroeconomic Theory II. Economic Growth Facts

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Outline

- Measures for standard of living
- The importance of economic growth
- Main long-run growth facts

Readings

- Mankiw and Scarth, Chapter 7
- Charles Jones, Introduction to Economic Growth, Chapter 1 (optional, non-technical, accessible intro into growth issues)
- Acemoglu, Introduction to modern economic growth, Chapter 1 (optional, non-technical, accessible intro into growth issues)

Measures of Living Standards

- Normally, the focus on two statistics of the average person's well-being: GDP per worker (*productivity measure*), and GDP per capita (*welfare measure*).

- They correlate with many other important statistics measuring well-being:
  - infant mortality
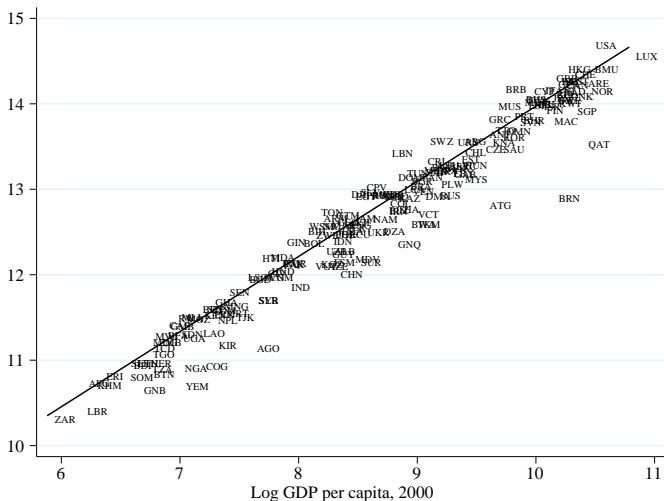 - life expectancy
  - consumption, etc.

FIGURE 1.5 The association between income per capita and consumption per capita in 2000. For a definition of the abbreviations used in this and similar figures in the book, see http://unstats.un.org/unsd/methods/m49/m49alpha.htm.

Source: Acemoglu (2008). Introduction to Modern Economic Growth

FIGURE 1.6 The association between income per capita and life expectancy at birth in 2000.

Source: Acemoglu (2008). Introduction to Modern Economic Growth

What is Economic Growth?

- Standard economists' answer: growth in GDP per capita (or per worker), Y/L

- Does growth in per capita GDP reflect anything important about the improvement of living standards?
  —No consideration, for example, of the distribution of income within the economy (inequality)

Key Questions in Economic Growth

- Why are there countries so rich and others so poor?

- Why do growth rates vary across countries and over time?

- What are the policies that can change growth in the short and long run?

- Why do some countries "take off" while others fall behind

The importance of economic growth

For poor countries, income growth may reduce poverty. Example: Growth and poverty in Indonesia.

	change in income per capita	change in # of pers. living below poverty line
1984–1996	+76%	–25%
1997–1999	–12%	+65%

The importance of economic growth

For rich countries, if government policies or "shocks" have even a small impact on the long-run growth rate, they will have a large impact on the standard of living in the long run

Large effects from small differences

annual growth rate in Y/L	% increase in Y/L after		
	25 years	50 years	100 years
2.0%	64%	169%	625%
2.5%	85%	244%	1,081%

Growth Facts

- **Fact 1**. There is enormous variation in incomes per capita across countries. The poorest countries have per capita incomes less than 5% of per capita incomes in the richest countries. `◂ Table`

- **Fact 2**. Rates of economic growth vary substantially across countries. `◂ Fig`

- **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 20-th century. `◂ Fig`
  The same applies to individual countries. Countries can move from being "poor" to being "rich" (e.g., South Korea), and vice versa (e.g., Argentina). `◂ Fig`

	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

TABLE 1.1 STATISTICS ON GROWTH AND DEVELOPMENT

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 halve."

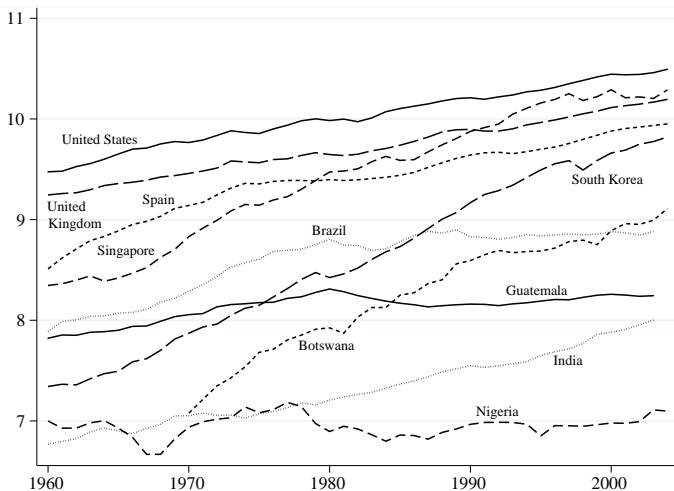Source: Charles Jones. Introduction to Economic Growth.

FIGURE 1.8 The evolution of income per capita in the United States, the United Kingdom, Spain, Singapore, Brazil, Guatemala, South Korea, Botswana, Nigeria, and India, 1960–2000.

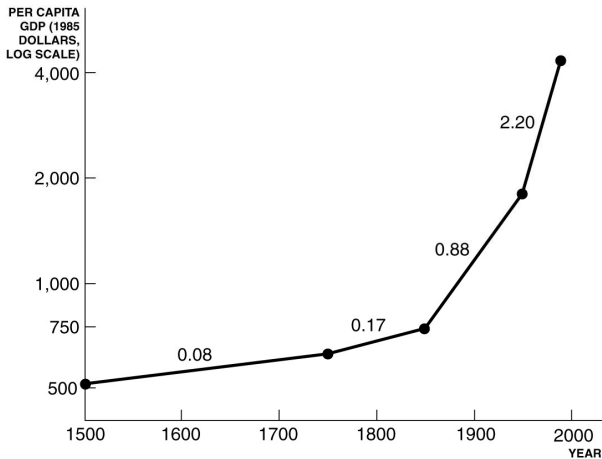Source: Acemoglu. Introduction to Modern Economic Growth.

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

Economic Growth, 2nd Edition
Copyright © 2004 W. W. Norton & Company

Source: Charles Jones. Introduction to Economic Growth.

The Power of Growth Rates

Time to double (rule of 70): Assume that y_t grows at a constant rate g. Then

$y_{t+1} = (1 + g)y_t$

$y_{t+2} = (1 + g)y_{t+1} = (1 + g)(1 + g)y_t = (1 + g)^2 y_t$

$y_{t+3} = (1 + g)y_{t+2} = (1 + g)^3 y_t$

$\qquad \vdots$

$y_{t+k} = (1 + g)^k y_t, k \geq 0$

What is the time needed for y_t to double? Find k^* when

$$y_{t+k^*} = (1 + g)^{k^*} y_t = 2y_t.$$

Time to double

$$(1 + g)^{k^*} y_t = 2y_t.$$

Taking natural logs from both sides gives

$$\ln 2 = \ln(1 + g)k^*, \ \text{or} \ k^* = \frac{\ln 2}{g} \approx \frac{0.7}{g} = \frac{70}{100g},$$

where g is expressed in percentage terms.

The Power of Growth Rates

- Thus, if $g = 0.02$ (e.g., U.S.), GDP per capita will double every 70/2=35 years

- if $g = 0.06$ (e.g., South Korea)$\approx$ every 12 years.

- If, e.g., the difference in age between grandparents and grandchildren is about 48 years, Korean (future) grandchildren of the current newly adult generation will be about $2^4 = 16$ times wealthier than the current generation.

Kaldor Facts

For the U.S. over the last century:

1. The real interest rate shows no trend, up or down. (In the classical model related to MPK $= \alpha \frac{Y}{K}$.)

2. The share of labor and capital costs in income, although fluctuating, have no trend.
   ◂ Fig

3. The average growth rate in output per capita has been relatively constant over time, i.e., the U.S. is on a path of sustained growth of incomes per capita.
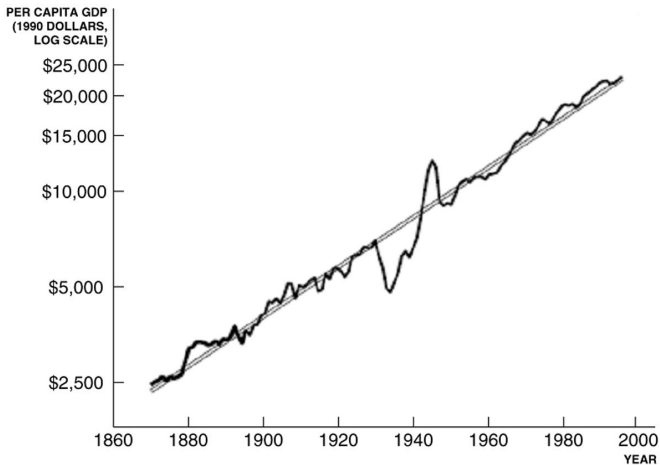   ◂ Fig

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

Economic Growth, 2nd Edition
Copyright © 2004 W. W. Norton & Company

Source: Charles Jones. Introduction to Economic Growth.

Questions About Growth

- What determines growth? In particular,
  –How much capital accumulation accounts for growth? ("growth accounting")
  –How important is technological progress? ("growth accounting")
- Why do countries grow at different rates?
- What causes growth rates to decline?

Acemoglu's questions in relation to Figure 1.8

- "Why is the United States richer in 1960 than other nations and able to grow at a steady pace thereafter?"
- "How did Singapore, South Korea, and Botswana manage to grow at a relatively rapid pace for 40 years?"
- "Why did Spain grow relatively rapidly for about 20 years but then slow down?"
- "Why did Brazil and Guatemala stagnate during the 1980s?"
- "What is responsible for the disastrous growth performance of Nigeria?"

The Lessons of Growth Theory

- understand why poor countries are poor
- design policies that can help them grow
- learn how the growth rates of rich countries are affected by shocks and the governments' policies

Acemoglu. Introduction to Modern Economic Growth.

"Our starting point is the so-called Solow-Swan model named after Robert (Bob) Solow and Trevor Swan, or simply the Solow model, named after the more famous of the two economists. These economists published two pathbreaking articles in the same year, 1956 (Solow, 1956; Swan, 1956) introducing the Solow model. Bob Solow later developed many implications and applications of this model and was awarded the Nobel prize in economics for his contributions. This model has shaped the way we approach not only economic growth but also the entire field of macroeconomics. Consequently, a by-product of our analysis ... is a detailed exposition of a workhorse model of macroeconomics."