

ECON 602 MACROECONOMIC THEORY AND POLICY ADDITIONAL SLIDES

August 31, 2021



Macroeconomics is the study of income

ECONOMIC POLICIES TRY TO HELP COUNTRIES ENJOY STRONG AND STABLE GROWTH IN INCOMES

What is macro about?

- Macroeconomics is the study of income.
 - Why do incomes vary over time?
 - Why do they differ across countries?
 - Why do they differ among people?
- If we try to answer all these questions at the same time, we may not be any to answer any. So, we take it one step at a time.
- First, we ignore variation among people within a country. We pretend that everyone within a country makes the average income of that country.
- Second, we make a distinction between short-run changes in income and long-run changes in income.

Income: Long Run vs. Short Run

- The long-run component of income is called the trend or potential income.
- Fluctuations around the trend or potential are the short-run component of income.
 - When income is above trend, the economy is said to be in the boom phase of the cycle or in an expansion; when income trend, the economy is experiencing a slowdown or a slump.
 - Output gap: the difference between income and its trend (or potential)
 - Negative output gap: income is below trend
 - Positive output gap: income is above trend

Main indicator of interest

Eye of the bird: Real income per person

(a.k.a. real GDP per capita, real output per capita)

Other indicators:

Unemployment rate

Inflation rate

Interest rate

Exchange rate

U.S. real income per person (a.k.a. US real GDP per capita)



7

There are two main components of real GDP (or of real GDP per capita)

- The first is the trend. The trend is generally upward and reflects technological progress and 'factor accumulation'
- The second component is the business cycle (or cyclical fluctuations). This refers to the movements around the trend.
 - When real GDP is above its long-run trend, the economy is said to be in the boom phase of the cycle or in an expansion; when real GDP is below its long-run trend, the economy is experiencing a slowdown or a slump.
 - Output gap (or GDP Gap): the difference between real GDP and its longrun trend
 - When output is about its long-run trend, the GDP gap is positive
 - When output is below its long-run trend, the GDP gap in negative



REVIEW OF BASICS: TREND INCOME













GROWTH PERFORMANCE WITHIN DEVELOPING ECONOMIES



MALAYSIA OVERTAKEN BY KOREA AND TAIWAN PROVINCE OF CHINA ...



... BUT KEEPING UP WITH CHILE



U.S. REAL GDP PER CAPITA (2009 DOLLARS)



Mankiw, Macroeconomics, 10e, © 2019 Worth Publishers

GDP per person, Top 0.1% and Bottom 99.9%





GROWTH ACCOUNTING

	1956 Per Capita GDP (in 2000 PPP \$US)	2003 Per Capita GDP (in 2000 PPP \$US)	Average Per Capita Growth 1962-2003
Ghana	1,874	2,114	0.10%
India	900	2,732	2.54%
Korea	1,347	16,977	6.07%

Table 1: Growth Experiences Compared: Ghana, India, and Korea

THE PRODUCTION FUNCTION: Y = A F(K, L)

- Shows how much output (Y) the economy can produce from K units of capital and L units of labor, for a given level of 'efficiency' A
- Higher the level of A, the greater is the amount of output that can be produced for given amounts of K and L.

Parable of Robinson Crusoe

- When Crusoe is first marooned on the island, his production function is Y = A F (L) and A is low
- As he gets better at catching fish, his A increases, allowing him to spend some time fashioning a net
- His production function becomes Y = A F(K, L), where K is the net (measured in units of fish)





PRODUCTION FUNCTION: OUTPUT DEPENDS ON INPUTS AND TECHNOLOGY

Production Function: Y = A F(K, L) In English: Output (Y) depends on capital input (K) and labor input (L) Note: 'F' is often used by economists instead of writing out "depends on" (= "is a function of").

The extent to which inputs deliver output depends on the level of "technology" (A)—the 'efficiency' with which inputs are used to produce output.

Jargon alert: Economists refer to 'A' as 'total factor productivity' (and sometimes as the 'Solow residual')

Growth in Output =

Growth in total factor productivity

+ (share of capital * growth of capital)

+ (share of labor * growth of labor)

AVERAGE INCOME (OR INCOME PER CAPITA)

Taking the production function: Y = A F(K, L) and dividing through by L gives average incomes as:

Y/L = (A/L) f(K/L)

Growth in average incomes =

growth in TFP per worker

+ growth in capital per worker (also called "capital deepening")

PRODUCTION FUNCTION & ROLE OF TFP



IMPORTANT IMPLICATION OF DIMINISHING MARGINAL RETURNS

Definition of diminishing marginal returns

- As one input is increased (holding other inputs constant), its marginal product falls.
 - If *L* increases while holding *K* fixed, machines per worker falls, worker productivity falls.

Implication:

- If one factor is relatively fixed, increasing the other can contribute to output, but eventually the additional contribution to output will stagnate
- Increasing output over the long run thus requires not just an increase in inputs but an increase in A (the efficiency in transforming inputs into outputs)

AN ILLUSTRATION: THE COBB-DOUGLAS PRODUCTION FUNCTION

$$Y_{t} = A_{t} \times (K_{t})^{\alpha} (L_{t})^{1-\alpha}$$

$$\frac{\Delta Y}{Y_{t}} = \alpha \frac{\Delta K}{K_{t}} + (1 - \alpha) \frac{\Delta L}{L_{t}} + \frac{\Delta A}{A_{t}}$$

The second line is the growth accounting -- for growth in incomes

The third line is growth accounting – for growth in average incomes

$$\frac{\Delta Y}{Y_t} - \frac{\Delta L}{L_t} = \alpha \left(\frac{\Delta K}{K_t} - \frac{\Delta L}{L_t} \right) + \frac{\Delta A}{A_t}$$

GROWTH ACCOUNTING FOR THE U.S., 1948-2000

	Annual Growth Rate of Y	Annual Growth Rate of Y/L	Contribution of K/L	Annual Growth Rate of A
1948-1973	4.0%	3.0%	1.2%	1.8%
1973-1995	2.7%	0.9%	0.8%	0.1%
1995-2000	4.2%	3.0%	1.1%	1.9%
		$(\alpha = 0.4)$		



GROWTH: GOING BEYOND ACCOUNTING

A GENERAL VIEW OF GROWTH

Y = F (Policies, Institutions, Geography, Shocks or Something Else)

Policies

Macroeconomic Policies

Openness to trade

Institutions

• Extent of Rule of Law; Protection of Property Rights; Quality of Bureaucracy

Geography;

Sachs: the "bad latitude" problem; Jared Diamond's "guns, germs and steel"

'Shocks' (negative and positive)

- Terms of trade shocks
- Political conflict
- Financial crises

Something Else

- Foreign Aid?
- Resource Curse?
- Expectations/Motivation?

The Growth Report Strategies for Sustained Growth and Inclusive Development

COMMISSION ON GROWTH AND DEVELOPMENT

COMMISSION ON GROWTH AND DEVELOPMENT

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European Affairs, Minister for European Integration and Deputy Minister for Foreign Affairs, Minister–Head of the Chancellery of the President of the Republic of Poland, Deputy Minister for Trade and Industry
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Zhou Xiaochuan, Governor, People's Bank of China

Table 1 13 Success Stories of Sustained, High Growth					
Economy	Period of high growth**	Per capita in beginning a	ncome at the and 2005***		
Botswana	1960-2005	210	3,800		
Brazil	1950–1980	960	4,000		
China	1961-2005	105	1,400		
Hong Kong, China*	1960–1997	3,100	29,900		
Indonesia	1966–1997	200	900		
Japan*	1950–1983	3,500	39,600		
Korea, Rep. of*	1960-2001	1,100	13,200		
Malaysia	1967–1997	790	4,400		
Malta*	1963–1994	1,100	9,600		
Oman	1960–1999	950	9,000		
Singapore*	1967-2002	2,200	25,400		
Taiwan, China*	1965-2002	1,500	16,400		
Thailand	1960–1997	330	2,400		

Source: World Bank, World Development Indicators.

*Economies that have reached industrialized countries' per capita income levels.

**Period in which GDP growth was 7 percent per year or more.

***In constant US\$ of 2000.

- 1. They fully exploited the world economy
- 2. They maintained macroeconomic stability
- 3. They mustered high rates of saving and investment
- 4. They let markets allocate resources
- 5. They had committed, credible, and capable governments

CONVERGENCE: RECENT PAPER IN JEL (JOURNAL OF ECONOMIC LITERATURE)

JOHNSON AND PAPAGEORGIOU ON CONVERGENCE

Journal of Economic Literature 2020, 58(1), 129–175 https://doi.org/10.1257/jel.20181207

What Remains of Cross-Country Convergence?⁺

PAUL JOHNSON AND CHRIS PAPAGEORGIOU*

We examine the record of cross-country growth over the past fifty years and ask if developing countries have made progress on closing the income gap between their per capita incomes and those in the advanced economies. We conclude that, as a group, they have not and then survey the literature on absolute convergence with particular emphasis on that from the last decade or so. That literature supports our conclusion of a lack of progress in closing the income gap between countries. We close with a brief examination of the recent literature on cross-individual distribution of income, which finds that despite the lack of progress on cross country convergence, global inequality has tended to fall since 2000. (JEL E01, E13, O11, O47, F41, F62)

EVOLUTION OF AVERAGE INCOME

INCOME GROWTH BY DECADE AND REGION

TABLE 1 Decadal Average per Capita GDP Growth (%) by Geographical Region						
Geographical Region	1960s	1970s	1980s	1990s	2000s	
East Asia and Pacific	3.9	3.3	3.2	3.0	3.6	
Europe and Central Asia	4.7	3.5	1.8	0.5	3.6	
Latin America and Caribbean	2.2	2.7	-0.6	1.5	2.2	
Middle East and North Africa	3.7	2.7	-0.9	2.0	2.0	
North America	3.1	2.5	1.9	1.8	0.9	
South Asia	1.6	1.4	2.1	0.5	4.5	
Sub-Saharan Africa	1.8	1.3	-0.2	-0.4	1.8	
World	2.8	2.4	0.6	0.9	2.7	

WHO'S WINNING THE RACE?

Source: Penn World Tables version 7.1 based on balanced sample of countries. Countries with population below 1 million were dropped from the sample.

STILL FAR APART?

	1960s	1970s	1980s	1990s	2000
Income Group			1.0	100	
HIC	4.7	3.3	2.4	2.1	1.7
MIC	2.8	3.4	0.4	1.4	3.4
LIC (all)	1.4	0.7	-0.2	-0.5	2.4
LIC (fragile)	1.7	0.7	-0.5	-1.5	1.3
LIC (non-fragile)	1.1	0.7	0.2	0.6	3.6
Exporter Group					
Commodity Exporters	2.1	2.0	-0.8	-0.4	3.0
Others	3.0	2.5	1.1	1.3	2.7
World	2.8	2.4	0.6	0.9	2.7

Figure 3. Income Levels Relative to the United States (1960–2010)

Notes: Income definition based on PPP converted GDP per capita (chain series), at 2005 constant prices. Countries with incomplete data were dropped out from calculations. Countries with population less than 1 million were dropped out from sample.

BETA-CONVERGENCE, BY INCOME GROUP

Figure 4. Growth Against Initial Income

Notes: Income definition based on PPP converted GDP per capita (chain series), at 2005 constant prices. Fitted values are shown for each group.

CROSS-COUNTRY INCOME DISTRIBUTION

Figure 5. Cross-country Income Distribution against log per Capita GPD (1960, 2010)

Notes: Income definition based on PPP converted GDP per capita (chain series), at 2005 constant prices. Vertical lines denote median of values for respective year. Sample of countries constant across years. The densities shown are standard kernel density estimators calculated using the Epanechnikov kernel.

SIGMA-CONVERGENCE

Figure 6. Cross-country Income Dispersion (1960-2010)

Notes: Income definition based on PPP converted GDP per capita (chain series), at 2005 constant prices. Sample of countries constant across years.

WINNERS AND LOSERS

Decade	Rank		Country (Decade avg. GDP per capita) growth (%)	Rank	Country	Decade avg. GDP (per capita) growth (%	
1960s	1	Japan		8.98	93	China	-0.32	
	2	Ma	uritania	8.16 7.75		Rwanda	-0.74	
	3	Gr	eece			Algeria	-0.79	
	4	4 Romania 5 Morocco 6 Hong Kong 7 Spain		7.73 7.68 7.48		Mauritius	$-0.96 \\ -1.51 \\ -1.58$	
	5					Haiti		
	6					Guinea		
	7			6.92	99	Senegal	-1.76	
	8	Ira	n	6.51	100	Nigeria	-2.13	
	9	Cy	prus	6.47	101	Bangladesh	-2.14	
	10	Pot	rtugal	5.92	102	Mali	-2.25	
1980)s	1	China	7.34	116	Togo	-3.27	
		2	Botswana	6.93	117	Venezuela	-3.33	
		3	Korea	6.54	118	Irad	-4.17	
		4	Egypt	5.61	119	Nigeria	-4 19	
		5	Hong Kong	5.25	120	Libva	_4.38	
		6	Thailand	5 11	101	Debrain	-4.00	
		7	C	0.11	121	Danran	-4.0	
		-	Cyprus	4.01	122	Niger	-4.72	
		8	Singapore	4.55	123	Iran	-5.11	
		9	Kuwait	4.22	124	Lebanon	-5.13	
		10	Lao	4.08	125	Trinidad and Tobago	-5.16	
2000	0s	1	Azerbaijan	13.19	139	Guinea	-0.35	
		2	Kazakhstan	9.2	140	Congo, Republic	-0.45	
		3	China	9.13	141	Madagascar	-1.09	
		4	Armenia	8.26	142	Togo	-1.14	
		5	Trinidad and Tobas	o 8.25	143	Gabon	-1.48	
		6	Afghanistan	8.08	144	Central Africa	-1.53	
		7	Belarus	7.81	145	Timor-Leste	-1.73	
		8	Angola	7.65	146	Cote d'Ivoire	-1.82	
		9	Albania	7.22	147	Zimbabwe	-3.4	
		10	Lao	6.59	148	Eritrea	-4.62	

Number of Years Required for Selected Lo ^o Income Countries to Achieve Middle-Incom Status		
Country	Year	
Vietnam	2.5	
Lao	3.7	
Moldova	6.5	
Sudan	7.6	
Cambodia	9.5	
Ghana	13.1	
Kyrgyzstan	14.4	
Papua New Guinea	14.8	
Tajikistan	18.1	
Nigeria	20.0	
Nicaragua	22.0	
Bangladesh	24.9	
Mauritania	27.2	
Liberia	28.7	
Rwanda	33.9	
Uganda	36.5	
Nepal	43.0	
Senegal	46.2	
Cameroon	47.7	
Mali	50.9	
Burkina Faso	51.7	
Malawi	86.8	
Gambia	90.0	
Congo	95.6	
Benin	118.0	
Sierra Leone	120.1	
Haiti	149.5	
Guinea	228.9	
Niger	734.3	

Note: Future growth projections are based on the average per capita GDP growth over the period 1995–2010. Countries with negative growth rates 1995–2010 are not reported.

Source: Penn World Tables version 7.1.

CORRELATION OF INCOME GROWTH BETWEEN DECADES

Figure 7a. Correlations of per Capita GDP Growth in Consecutive Decades (All Countries)

Notes: Income definition based on PPP converted GDP per capita (chain series), at 2005 constant prices. First decade growth rate showed on x axis.

Source: Penn World Tables 7.1.

Figure 7b. Correlations of per Capita GDP Growth in Consecutive Decades (LICs)

Notes: Income definition based on PPP converted GDP per capita (chain series), at 2005 constant prices. First decade growth rate shown on x axis. Coefficient of correlation (Pearson): 1960s vs. 1970s (0.011); 1970s vs. 1980s (-0.118); 1980s vs. 1990s (0.025); 1990s vs. 2000s (-0.212).