

# ECN 710 : Advanced Macroeconomics

## Chapter 1: Introduction to Macroeconomics Data

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January 07, 2025



## 1. Why Study Economic Growth?

- Economic Growth Correlates, Well-being, and Poverty
- The Question of Convergence

## 2. Review of Basic Statistical Calculations

- Growth Rates
- National Accounts and GDP Calculation

## 3. Short Term vs Long Term

- Long-Term Trends and Filtering
- Stylized Facts

# Plan

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# Why Study Economic Growth?

- Material well-being for billions of people is primarily determined by economic growth.
- In advanced economic countries, growth since the Industrial Revolution has allowed almost everyone to live a lifestyle that was once reserved for a privileged few a century ago.
- Growth in sectors like medicine and pharmaceuticals has enabled most people to live longer and healthier lives compared to the 19th century.
- Lack of growth in the world's poorest countries results in difficult living conditions compared to richer nations.
- To understand why humanity has become much wealthier and why this wealth is so unevenly distributed, we need to study the determinants of economic growth.

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# Consumption and Economic Growth

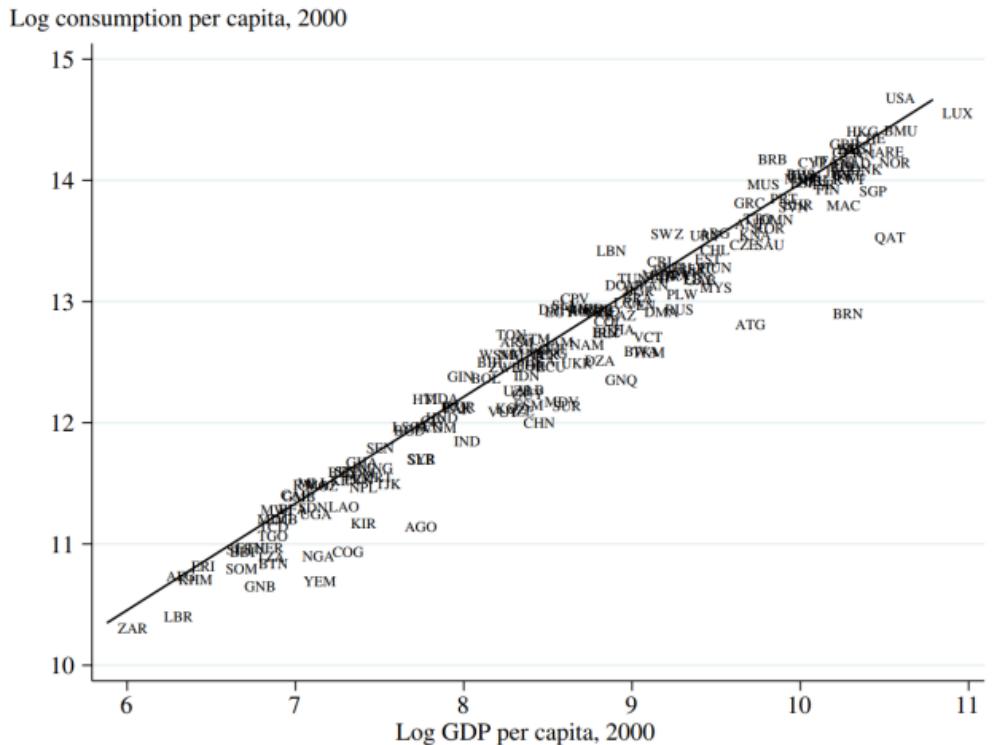


Figure: The association between income per capita and consumption per capita in 2000

# Investment Rate and Economic Growth

Average growth rate of GDP per capita, 1960–2000

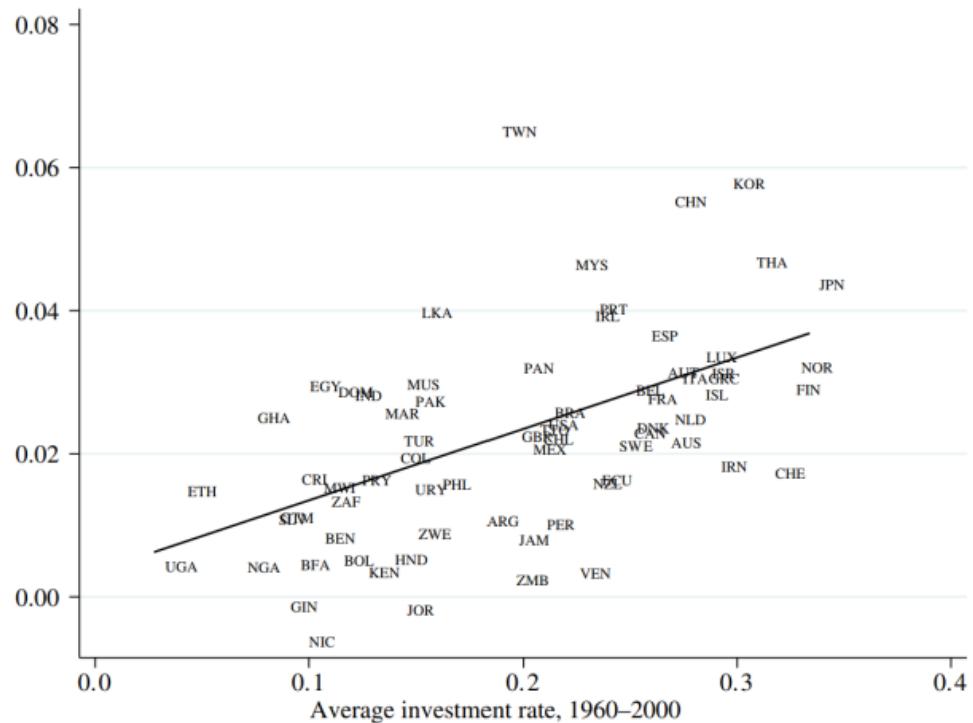


Figure: GDP growth and average growth of investments to GDP ratio, 1960–2000

# Education and Economic Growth

Average growth rate of GDP per capita, 1960–2000

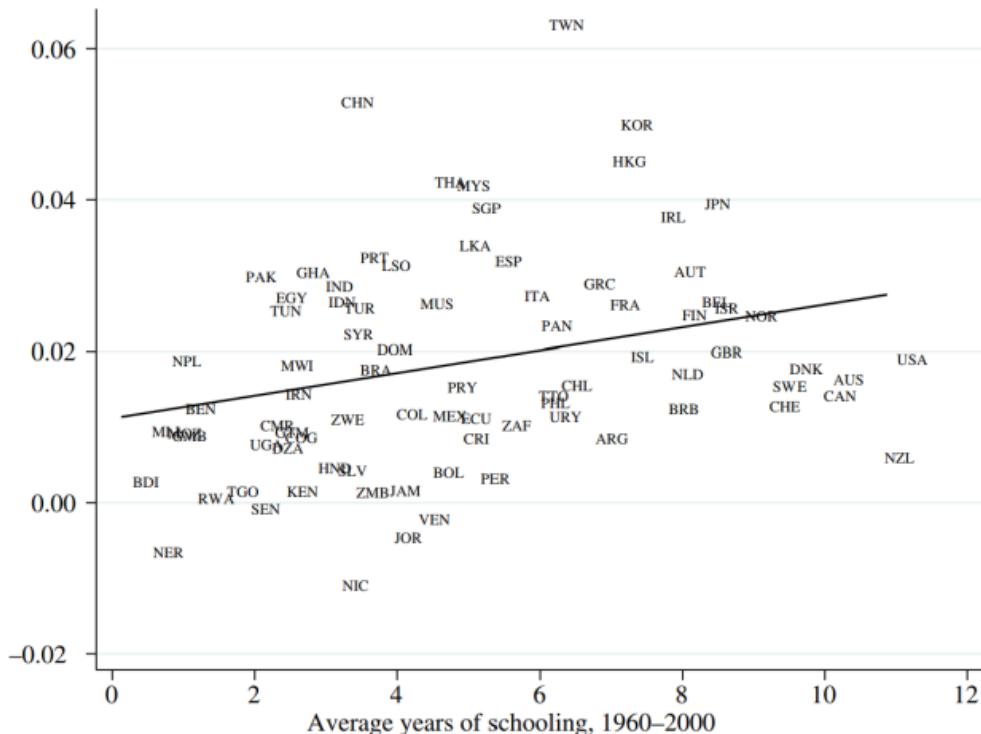
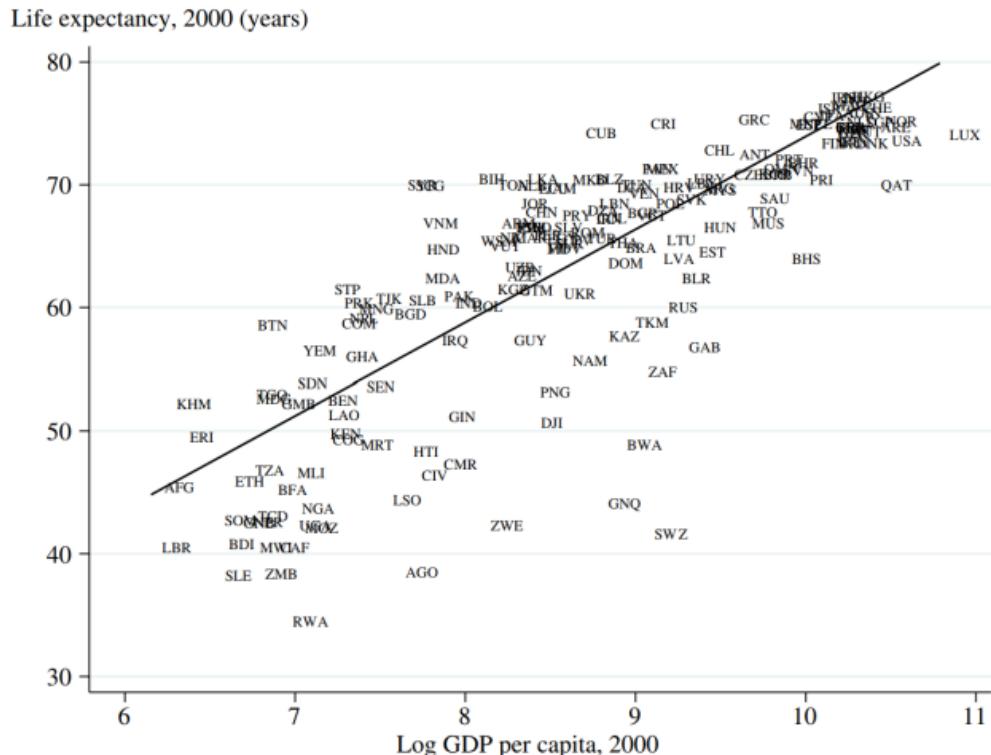


Figure: GDP growth and average years of schooling, 1960-2000

# Life Expectancy and Economic Growth



# World Income Distribution (1/2)

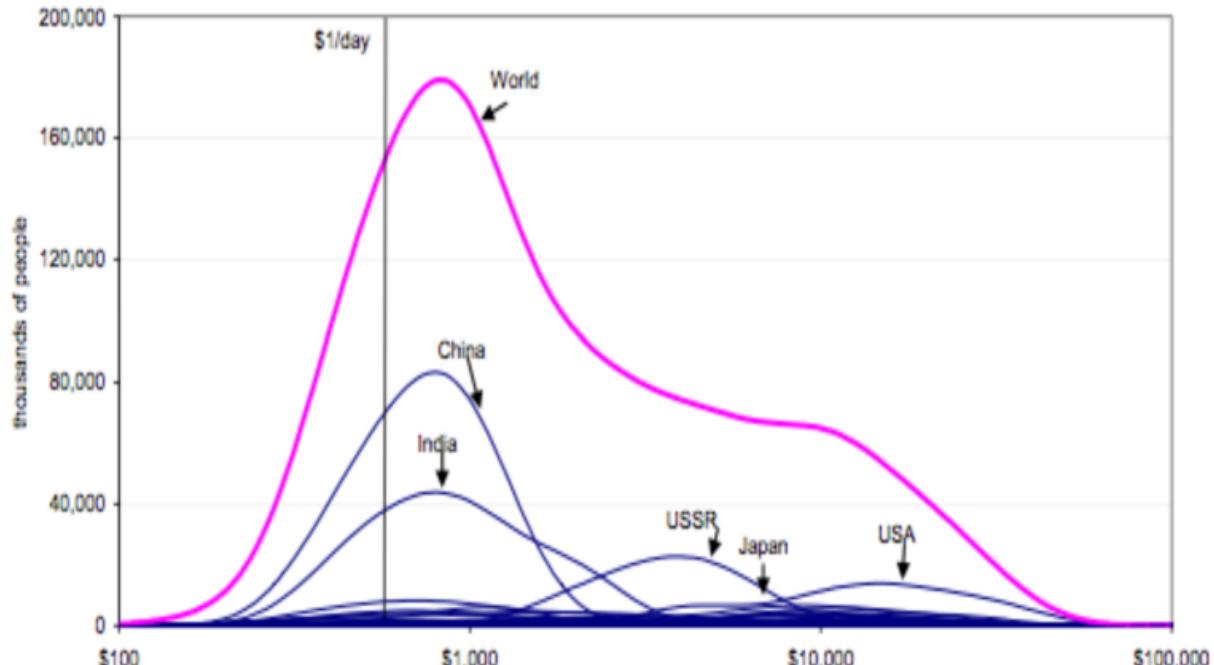


Figure: World income Distribution in 1970

## World Income Distribution (2/2)

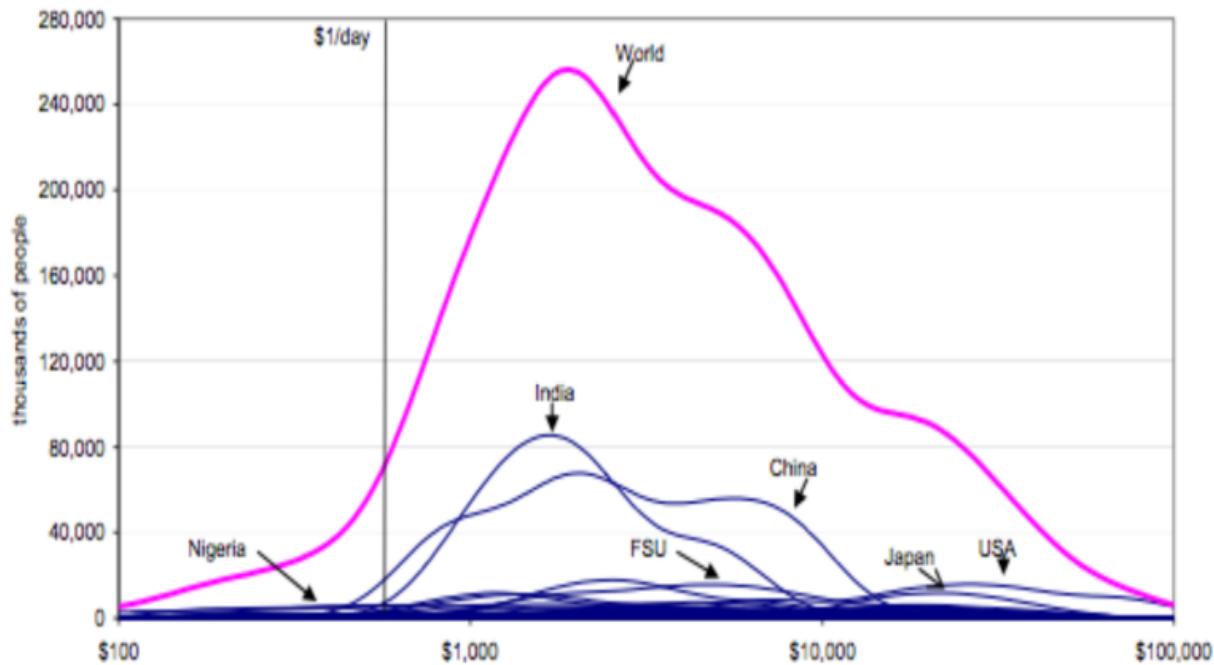


Figure: World income Distribution in **2000**

# Reduction of Poverty in China

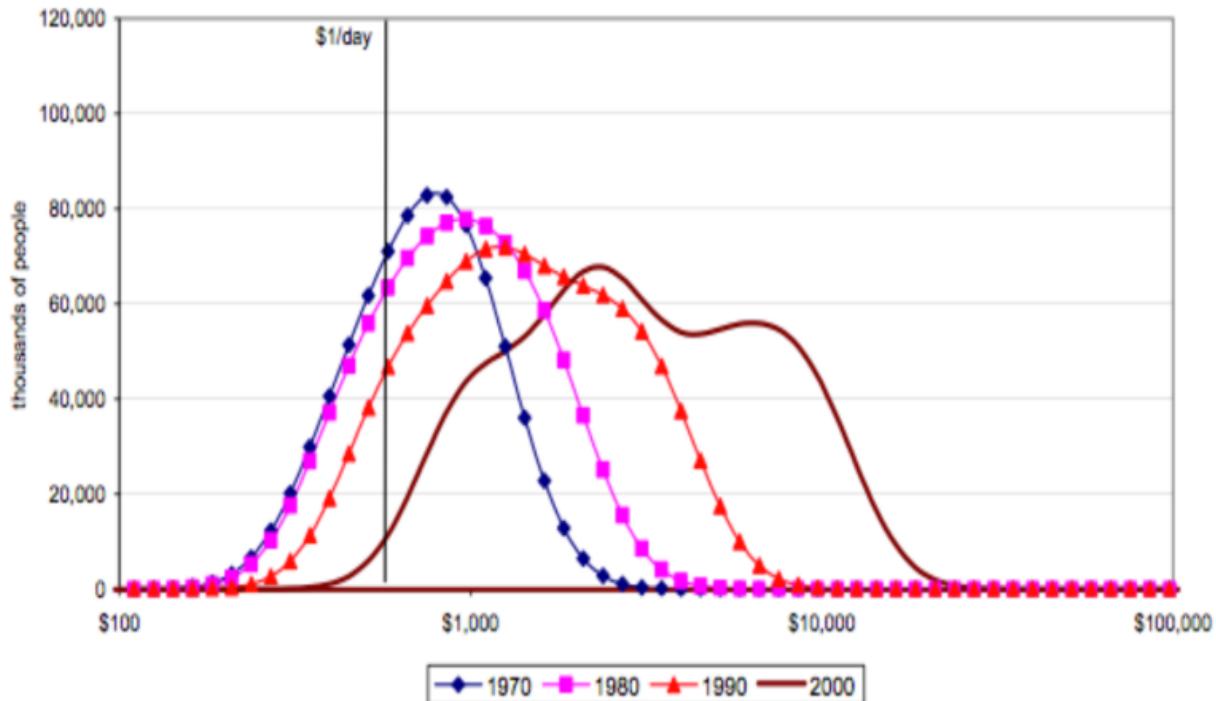


Figure: Distribution of income in China over time

# Increase in Poverty in Nigeria

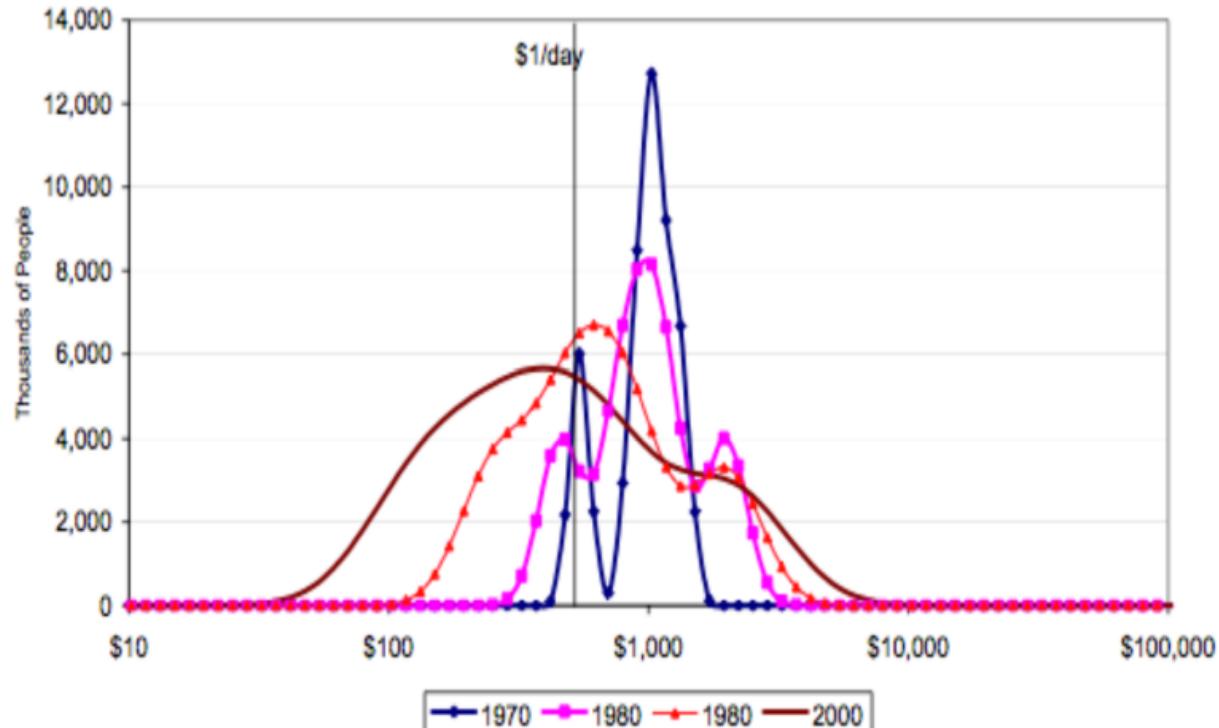


Figure: Distribution of income in Nigeria over time

# Reduction of Poverty in India

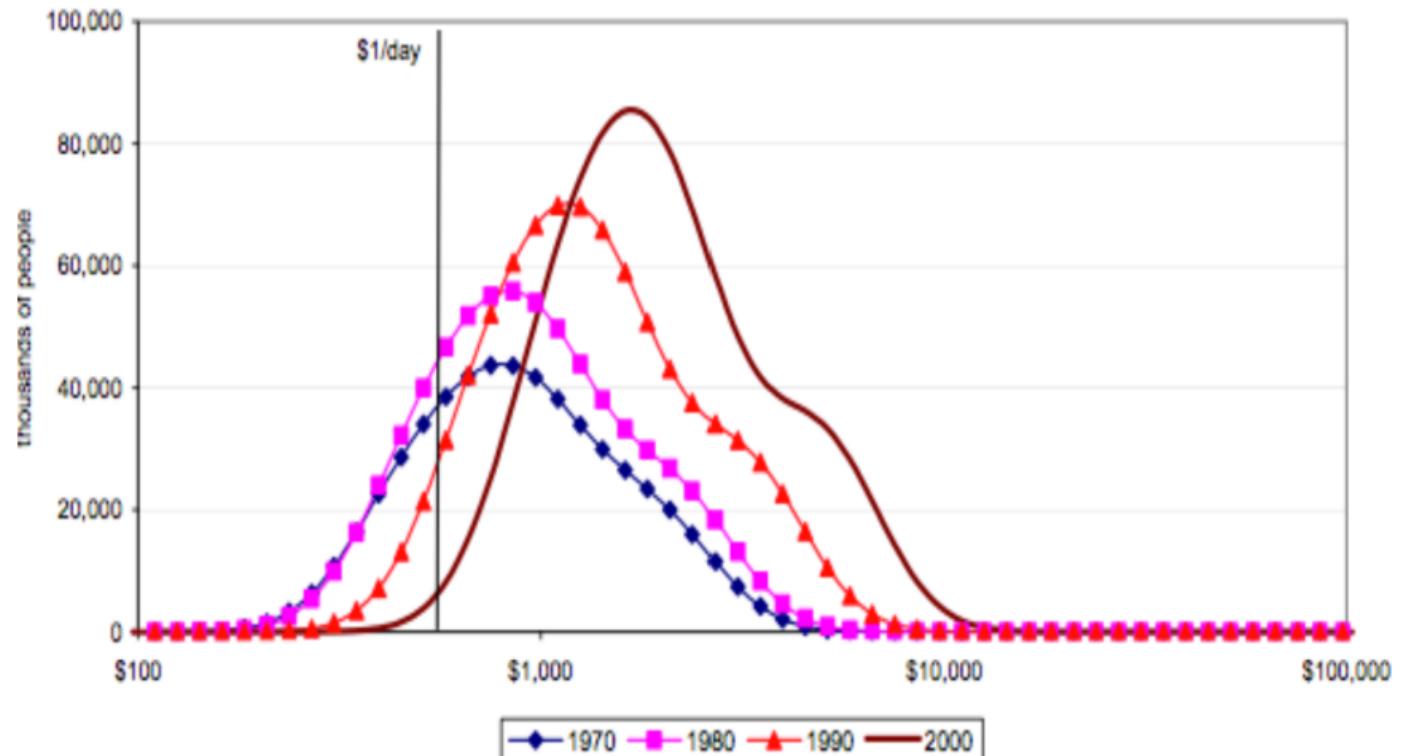


Figure: Distribution of income in India over time

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# Evolution of the Global Distribution of Income per Capita

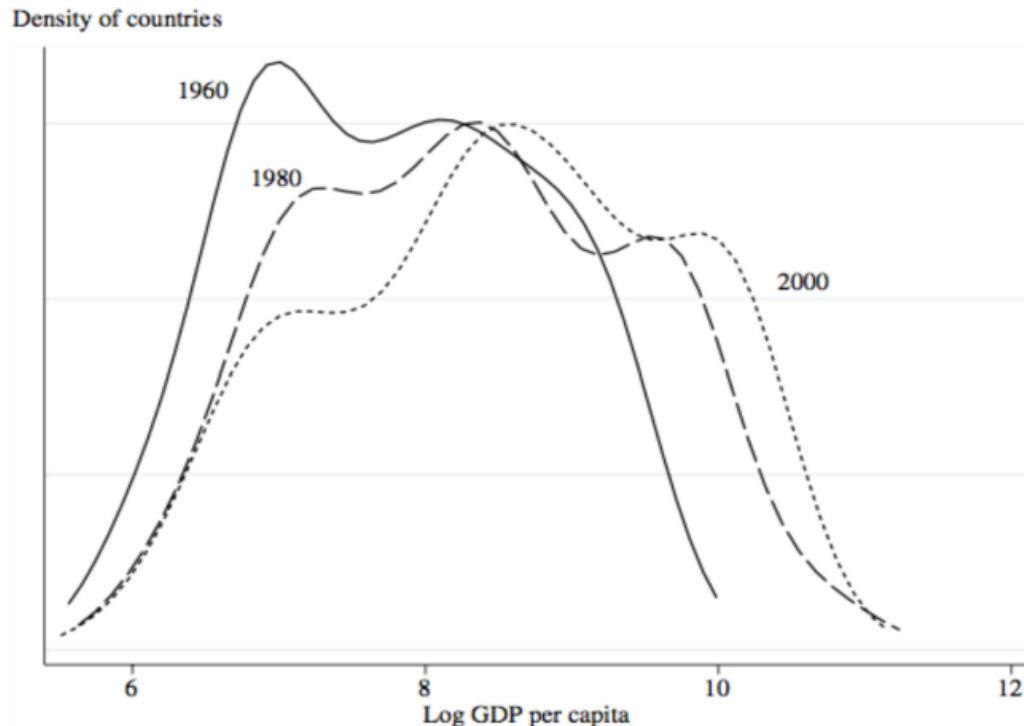
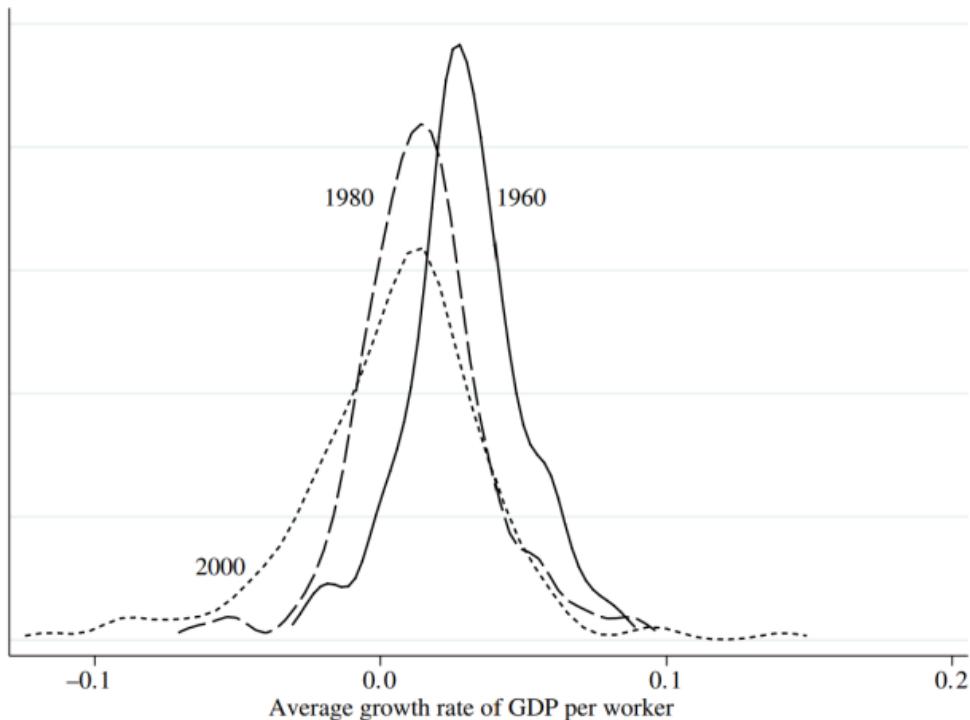


Figure: Growth versus initial income.

# Global Distribution of Growth Rates

Density of countries



**Figure:** Distribution of countries according to the growth rate of GDP per worker

# Absence of Absolute Convergence

### Average growth rate of GDP, 1960–2000

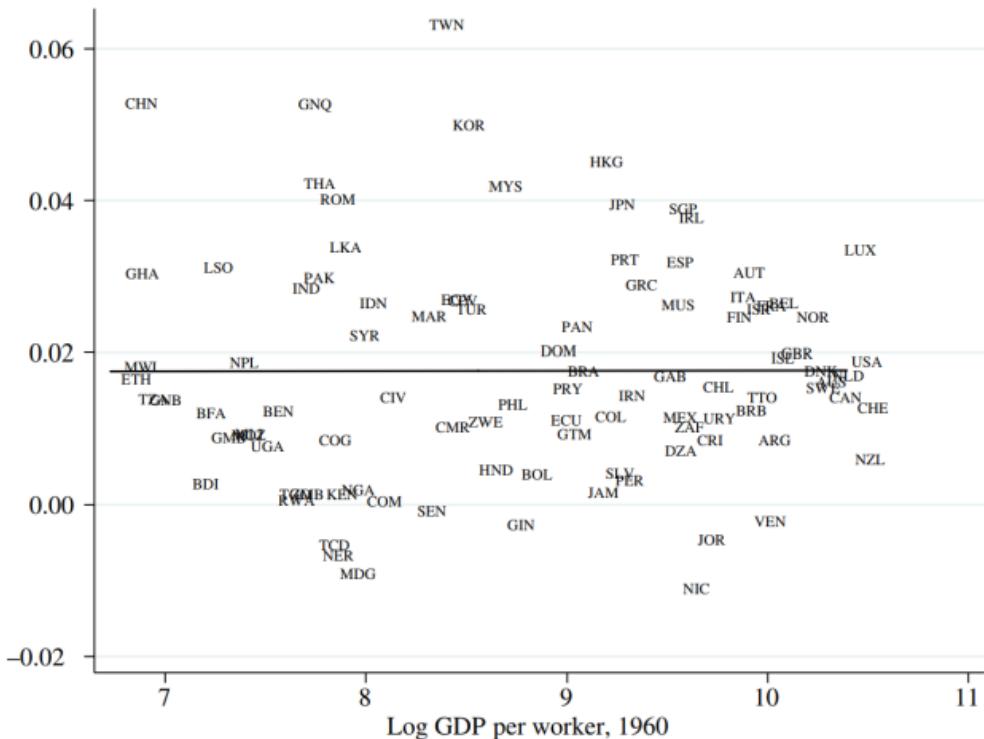


Figure: Growth versus initial income.

# Conditional Convergence

Average growth rate of GDP, 1960–2000

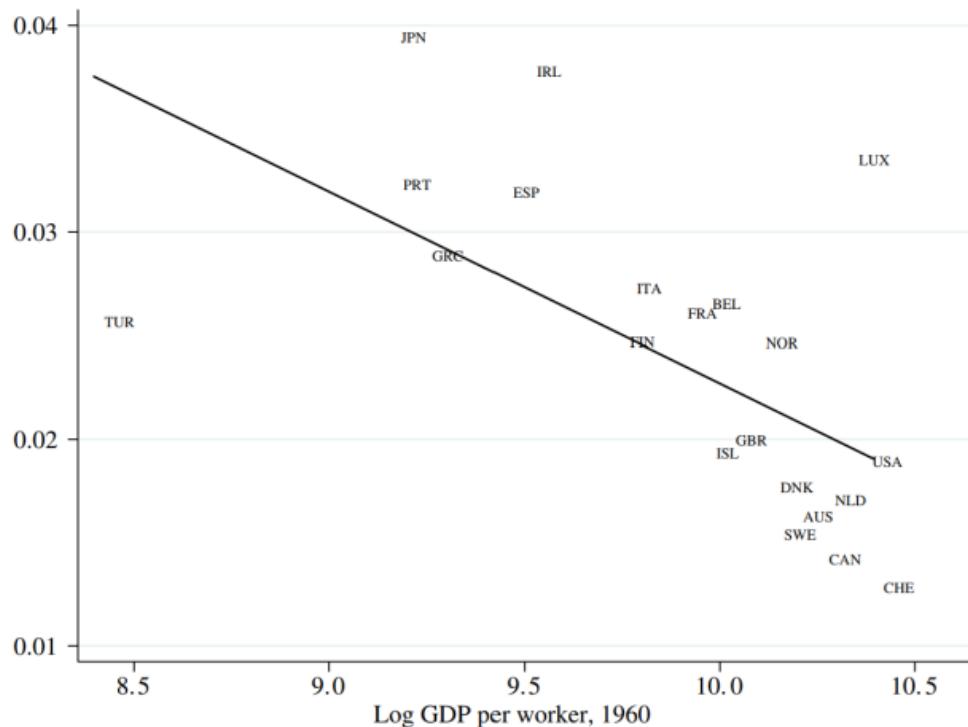


Figure: Convergence between OECD countries

# Converging to Convergence

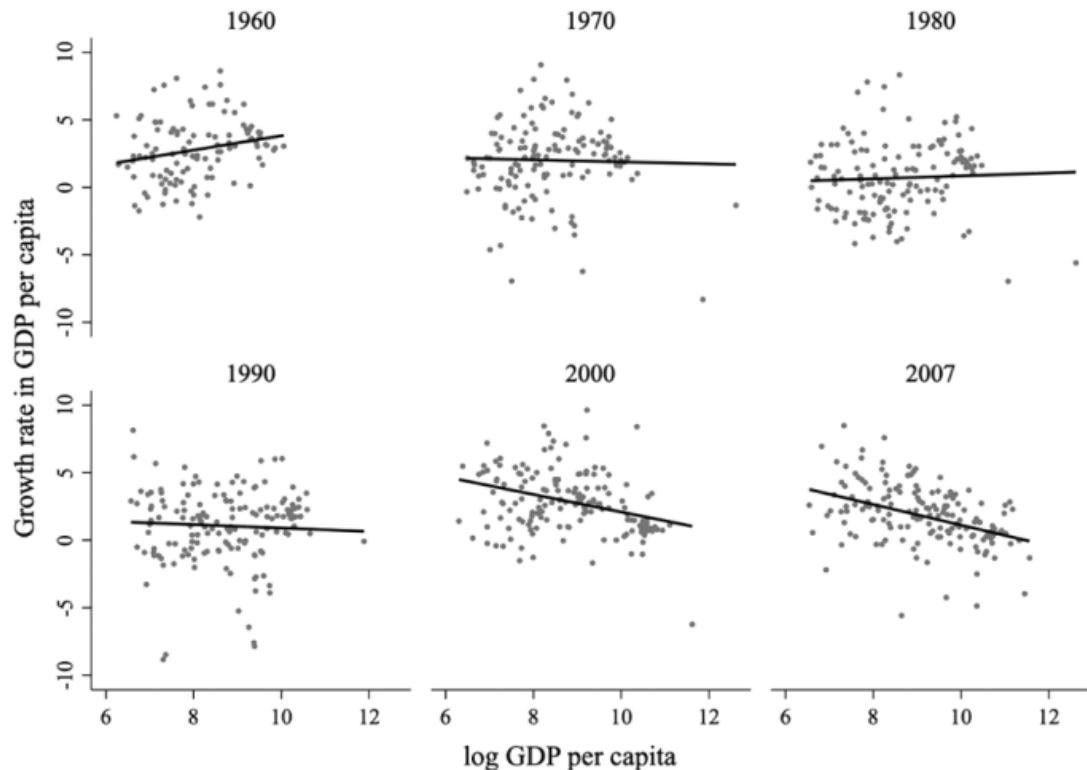


Figure: Income convergence by decade.

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## 1. Growth Rate:

The growth rate of a variable  $X$  over a period from  $t = 0$  to  $t = T$  is given by:

$$G_{0,T} = \frac{X_T - X_0}{X_0}$$

where  $X_T$  and  $X_0$  are the values of  $X$  at times  $T$  and 0, respectively.

## 2. Annual Average Growth Rate:

Assuming a constant annual growth rate  $g$ , it is defined as:

$$g = \left( \frac{X_T}{X_0} \right)^{1/T} - 1$$

where  $T$  is the number of years.

## Growth Rate Concepts (2/2)

### 3. Growth of the Product of Two Variables:

If  $Z = X \cdot Y$ , then the growth rate of  $Z$  is given by:

$$1 + G_Z = (1 + G_X) \cdot (1 + G_Y) \quad (1)$$

or

$$G_Z \approx G_X + G_Y$$

where  $G_X$  and  $G_Y$  are the growth rates of  $X$  and  $Y$ , respectively.

#### Proof.

For small values of  $G_X$  and  $G_Y$ , taking the log of equation (1) and using  $\ln(1 + \varepsilon) \approx \varepsilon$  for small  $\varepsilon$ , one gets:

$$G_Z \approx G_X + G_Y$$



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► **Value-Added Approach:**

- GDP is the sum of the value-added generated by firms within the economy.

► **Income Approach:**

- GDP is the total income distributed in the economy over a specific period.

► **Expenditure Approach:**

- GDP is the total value of final goods and services consumed in the economy.

## ► Value-Added Approach:

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## Accounting Identity:

- In a closed economy:  $Y = C + I + G$ , where  $Y$  is GDP,  $C$  is consumption,  $I$  is investment, and  $G$  is government expenditure.
- National Savings:  $S = (Y - C - G)$ .

## Example from Statistics Canada

Let us consider an economy composed of three businesses: an agricultural business (the farmer) that grows wheat, an industrial business that produces flour (the miller), and a business that produces bread sold to households (the baker).

- **Farmer:** The farmer imports seeds worth \$15 and pays wages to employees amounting to \$115. He sells part of his production to the miller for \$100 and exports the remaining part for \$50.
- **Miller:** The miller buys wheat from the farmer for \$100 and sells part of his flour to households for \$35 and another part to the baker for \$130. The miller pays wages to employees amounting to \$45.
- **Baker:** The baker buys flour from the miller for \$130 and produces bread, which he sells entirely to households for \$200. He pays wages to his employees amounting to \$60.

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- **Baker:** The baker buys flour from the miller for \$130 and produces bread, which he sells entirely to households for \$200. He pays wages to his employees amounting to \$60.
- Total GDP: \$270.

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The distinction between long-term and short-term macroeconomics is, fundamentally, a distinction between the phenomena being studied.

- **The purpose of long-term macroeconomic analysis is to:**

- Understand the trends in major variables such as GDP, consumption, investment, and unemployment.
- Explain long-term income levels, economic growth, and structural unemployment.

- **On the other hand, the purpose of short-term macroeconomic analysis is to:**

- Understand annual or quarterly fluctuations around the trends of these macroeconomic variables.
- Explain business cycles.

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- We aim to express a macroeconomic time series  $y_t$  as follows:

$$y_t = y_t^X + y_t^C \quad (2)$$

where  $y_t^X$  represents the long-term component and  $y_t^C$  the cyclical component.

- A filter is applied to  $y_t$  to separate these two components.
  - A filter is an operator that extracts movements from the series occurring at specific frequency ranges.
  - In macroeconomics, frequencies typically range between 6 and 32 quarters.

- The cyclical component of  $y_t$  can be measured by calculating its first difference.
- This corresponds to:

$$y_t^c = \Delta y_t = y_t - y_{t-1}, \quad \text{and} \quad y_t^x = y_{t-1} \quad (3)$$

- If  $y_t$  grows at a constant rate  $g_y$ , then

$$y_t = (1 + g_y) y_{t-1} \iff y_t - y_{t-1} = g_y \cdot y_{t-1}$$

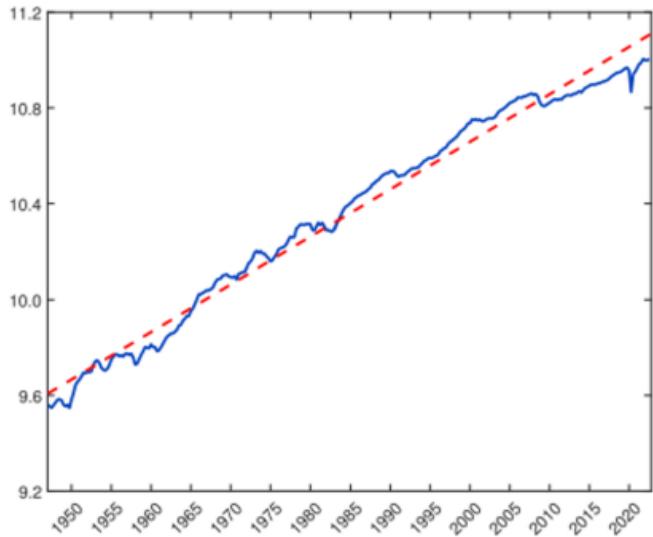
- Using the earlier expressions for the trend and cycle, we derive:

- $y_t^c = g_y \cdot y_t^x$ , which implies  $g_y = \frac{\mathbb{E}(y_t^c)}{\mathbb{E}(y_t^x)}$ .

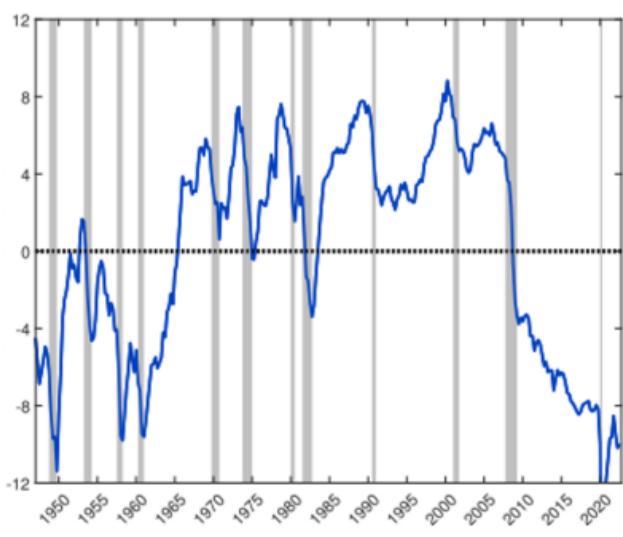
# Method 3: Deterministic Trend

This involves specifying the order of the polynomial and estimating the coefficients using OLS:

$$y_t = a_0 + \sum_{j=1}^J a_j t^j + y_t^c, \quad \text{Corr}(y_t^x, y_t^c) = 0. \quad (4)$$



(a) Long-term Trend



(b) Cyclical Component

Figure: Decomposition of Canada real GDP per capita

- ▶ This is one of **the most commonly used** methods in macroeconomics.
- ▶ The trend of the series is obtained by solving the following problem:

$$\min_{y_t^x} \left\{ \sum_{t=1}^T (y_t - y_t^x)^2 + \lambda \sum_{t=2}^{T-1} [(y_{t+1}^x - y_t^x) - (y_t^x - y_{t-1}^x)]^2 \right\} \quad (5)$$

- $\lambda$  is a smoothing parameter.
- Common choices are  $\lambda = 100$  for annual data,  $\lambda = 1600$  for quarterly data, and  $\lambda = 14400$  for monthly data.
- Occasionally, different  $\lambda$  values are used for specific data types (e.g., quarterly unemployment rates).

## Method 3: Hodrick-Prescott (HP) Filter (2/2)

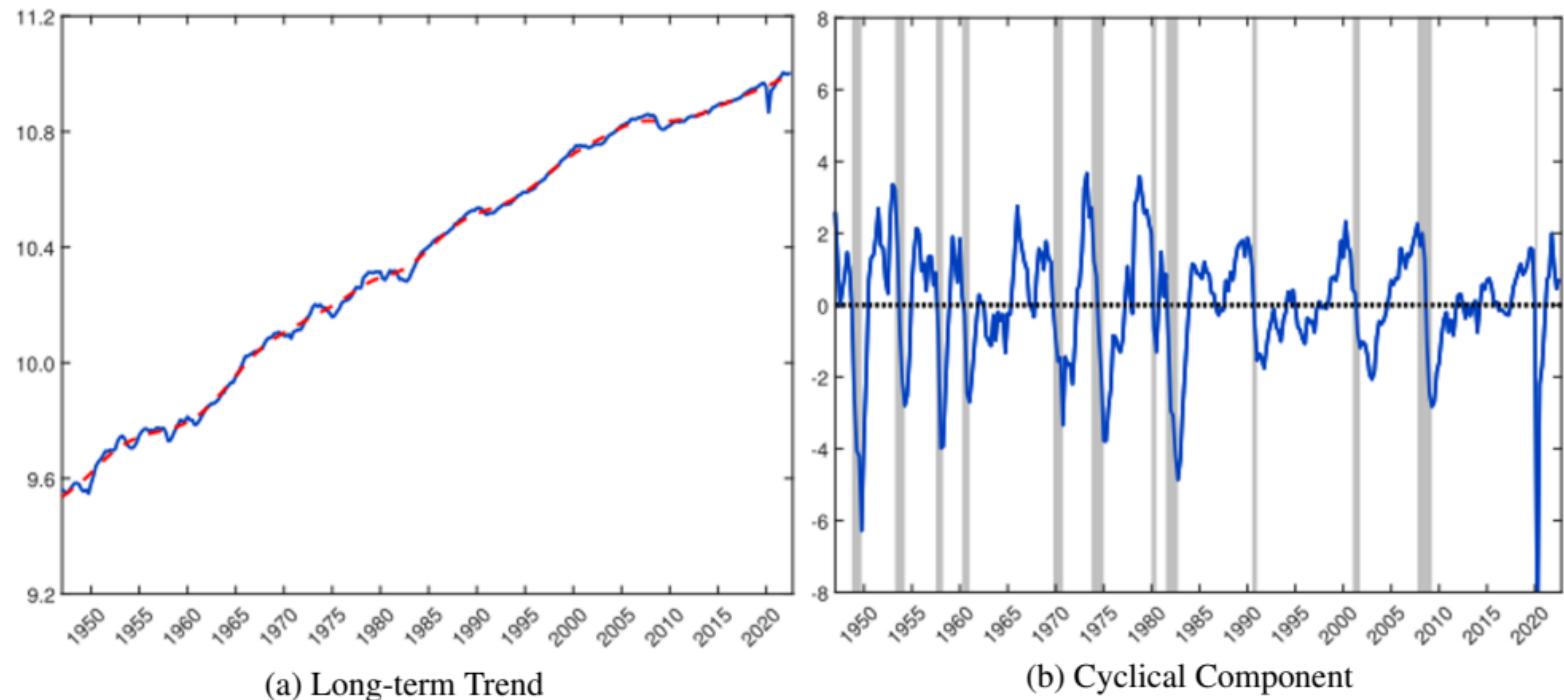


Figure: Trend and Cyclical Component: HP Filter

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The stylized facts of growth highlighted by [Kaldor \(1957\)](#)

- The shares of capital and labor income are constant in the long term. These are approximately 0.33 and 0.67, respectively.
- The growth rate of capital per capita is constant in the long term.
- The growth rate of output per worker is constant in the long term.
- The capital/output ratio is constant in the long term.
- The rate of return on investment is constant in the long term.
- There are notable variations (between 2% and 5%) in the growth rates of labor productivity and total output across countries.

## Stylized Facts (2/2)

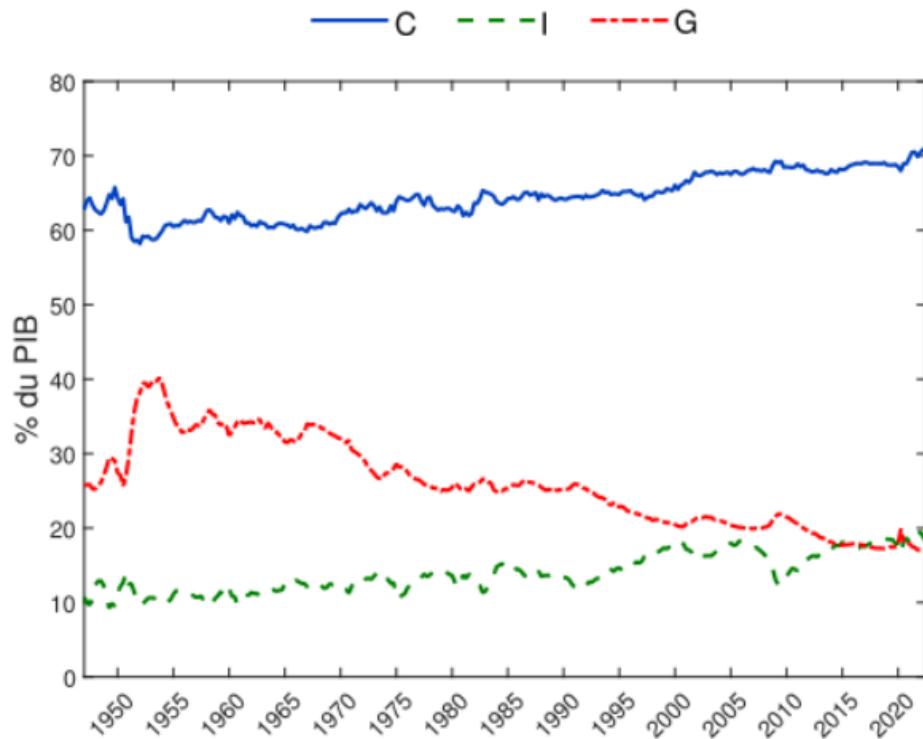


Figure: Components of Gross Domestic Product in Relative Shares

Generally, three indicators are used to study the business cycle.

- Volatility (absolute and relative): the standard deviation of the variable in level terms, or relative to the standard deviation of GDP.

- Co-movements: cross-correlations (or lags), i.e.

$$\text{Corr}(y_t^c, z_{t-j}^c) \text{ with } j = -5, -4, \dots, 0, \dots, +4, +5.$$

- Persistence, measured by autocorrelation coefficients, i.e.

$$\text{Corr}(z_t^c, z_{t-j}^c) \text{ with } j = 1, 2, \dots$$

For more stylized facts on the business cycle, see [King and Rebelo \(1999\)](#) and [Stock and Watson \(1999\)](#).

## ① Consumption

- Consumption of non-durable goods and services is less volatile than output.
- Durable goods consumption is much more volatile than output.
- Since durable goods account for only a small portion of household consumption, total consumption is less volatile than output.
- Public consumption expenditures are less volatile than output.

## ② Investment

- Investment is much more volatile than output. All categories of investment are more volatile than output.
- Residential investment is the most volatile component.

## ④ Hours Worked, Productivity, and Wages

- Volatility in total hours worked is comparable to output volatility.
- Volatility in total hours worked is mainly due to employment volatility (extensive margin), not hours per worker (intensive margin).
- Labor productivity is about half as variable as output.
- Real wages are also less variable than output.

## Stylized Facts About Co-Movements (3/4)

- ① Most macroeconomic variables ( $C_t$ ,  $I_t$ ,  $M_t$ ,  $X_t$ , etc.) exhibit pro-cyclical behavior, i.e., positive contemporary correlation with the cyclical component of output.
- ② Public consumption expenditures are acyclical (or counter-cyclical for some public spending components).
- ③ The correlation between output and hours worked is strongly positive.
- ④ Real wages went from counter-cyclical between the wars to pro-cyclical after World War II.

- ① Most macroeconomic variables are highly persistent, i.e., the first-order autocorrelation of the cyclical component is strongly positive.

This fact holds regardless of the method used to calculate the cyclical component.

- ② Growth rates of most macroeconomic variables are highly persistent.
- ④ Macroeconomic variables ( $Y_t$ ,  $C_t$ ,  $I_t$ ,  $H_t$ ) appear less persistent when measured by the autocorrelation of differenced series. The aggregate price index is an exception to this rule.

# Description of the Business Cycle (1/6)

Figure: Description of the Business Cycle according to Stock and Watson (1999)

Table 2  
Descriptive statistics for cyclical components of series, 1953–1996

Series	Std dev.	Cross correlations with output ( $\text{corr}(x_t, y_{t+k})$ )												
		-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
Gross Domestic Product	1.66	-0.29	-0.18	0.03	0.33	0.66	0.91	1.00	0.91	0.66	0.33	0.03	-0.18	-0.29
<i>Sectoral employment</i>														
1. Contract and construction employment	3.75	0.02	0.20	0.39	0.58	0.73	0.80	0.77	0.65	0.44	0.19	-0.04	-0.23	-0.35
2. Manufacturing employment	2.61	-0.06	0.14	0.40	0.67	0.87	0.94	0.84	0.59	0.26	-0.06	-0.30	-0.43	-0.45
3. Finance, insurance and real estate employment	1.01	0.25	0.35	0.43	0.49	0.50	0.46	0.38	0.28	0.15	0.02	-0.10	-0.20	-0.28
4. Mining employment	3.79	0.13	0.19	0.25	0.28	0.25	0.16	-0.00	-0.20	-0.40	-0.53	-0.58	-0.55	-0.45
5. Government employment	0.82	0.51	0.53	0.49	0.43	0.35	0.29	0.23	0.15	0.04	-0.08	-0.21	-0.31	-0.37
6. Service employment	0.83	0.20	0.33	0.49	0.63	0.71	0.69	0.55	0.34	0.08	-0.15	-0.33	-0.44	-0.50
7. Wholesale and retail trade employment	1.20	-0.01	0.21	0.45	0.68	0.83	0.87	0.79	0.60	0.35	0.10	-0.10	-0.24	-0.32
8. Transportation and public utility employment	1.54	0.23	0.42	0.61	0.77	0.83	0.76	0.56	0.26	-0.06	-0.33	-0.49	-0.53	-0.50

# Description of the Business Cycle (2/6)

Figure: Description of the Business Cycle according to Stock and Watson (1999)

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Gross Domestic Product	1.66	-0.29	-0.18	0.03	0.33	0.66	0.91	1.00	0.91	0.66	0.33	0.03	-0.18	-0.29
<i>NIPA components</i>														
9. Consumption (total)	1.26	-0.39	-0.28	-0.07	0.21	0.51	0.76	0.90	0.89	0.75	0.53	0.29	0.09	-0.06
10. Consumption (nondurables)	1.11	-0.36	-0.24	-0.02	0.25	0.52	0.74	0.83	0.80	0.65	0.43	0.21	0.02	-0.12
11. Consumption (services)	0.64	-0.13	-0.00	0.14	0.31	0.49	0.66	0.78	0.80	0.70	0.51	0.27	0.05	-0.12
12. Consumption (nondurables + services)	0.78	-0.28	-0.15	0.05	0.29	0.55	0.75	0.87	0.85	0.71	0.49	0.25	0.03	-0.13
13. Consumption (durables)	4.66	-0.46	-0.38	-0.19	0.09	0.42	0.70	0.85	0.86	0.73	0.53	0.32	0.15	0.03
14. Investment (total fixed)	4.97	-0.34	-0.19	0.04	0.32	0.61	0.82	0.89	0.83	0.65	0.41	0.18	-0.00	-0.13
15. Investment (equipment)	5.25	-0.06	0.16	0.41	0.65	0.84	0.92	0.88	0.73	0.49	0.23	-0.01	-0.20	-0.31
16. Investment (nonresidential structures)	4.67	0.20	0.40	0.58	0.70	0.74	0.67	0.52	0.30	0.07	-0.14	-0.30	-0.40	-0.44
17. Investment (residential structures)	10.04	-0.49	-0.48	-0.37	-0.18	0.09	0.38	0.62	0.77	0.78	0.69	0.53	0.36	0.20
18. Change in bus. inventories (rel. to trend GDP)	0.38	-0.58	-0.50	-0.32	-0.04	0.28	0.57	0.73	0.72	0.56	0.32	0.08	-0.08	-0.15
19. Exports	4.76	0.33	0.42	0.47	0.50	0.48	0.40	0.27	0.09	-0.11	-0.29	-0.43	-0.50	-0.51
20. Imports	4.42	-0.45	-0.28	-0.03	0.27	0.54	0.72	0.78	0.70	0.53	0.34	0.17	0.05	-0.02
21. Trade balance (relative to trend GDP)	0.38	0.54	0.45	0.30	0.10	-0.11	-0.29	-0.42	-0.48	-0.49	-0.48	-0.45	-0.41	-0.35
22. Government purchases	2.49	0.30	0.25	0.22	0.21	0.21	0.19	0.15	0.03	-0.10	-0.20	-0.23	-0.19	-0.09
23. Government purchases (defense)	4.66	0.21	0.18	0.15	0.14	0.12	0.09	0.05	-0.06	-0.18	-0.26	-0.27	-0.20	-0.08
24. Government purchases (non-defense)	1.35	0.21	0.12	0.07	0.08	0.13	0.19	0.22	0.23	0.21	0.18	0.13	0.08	0.01

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		-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
<i>Aggregate employment, productivity and utilization</i>														
25. Employment (total employees)	1.39	0.07	0.26	0.49	0.72	0.89	0.92	0.81	0.57	0.24	-0.07	-0.31	-0.44	-0.49
26. Employment (total hours)	1.61	-0.06	0.13	0.37	0.63	0.85	0.94	0.88	0.67	0.36	0.03	-0.23	-0.39	-0.45
27. Employment (average weekly hours)	0.37	-0.51	-0.44	-0.24	0.05	0.38	0.66	0.82	0.80	0.64	0.40	0.16	-0.03	-0.15
28. Unemployment rate	0.76	0.13	-0.03	-0.27	-0.55	-0.80	-0.93	-0.89	-0.69	-0.39	-0.07	0.19	0.33	0.37
29. Vacancies (Help Wanted index)	14.52	-0.25	-0.09	0.15	0.43	0.71	0.89	0.93	0.80	0.54	0.23	-0.06	-0.26	-0.38
30. New Unemployment claims	13.19	0.47	0.43	0.27	-0.00	-0.35	-0.67	-0.86	-0.87	-0.71	-0.43	-0.14	0.08	0.21
31. Capacity utilization	3.07	-0.37	-0.23	0.01	0.31	0.63	0.86	0.93	0.83	0.59	0.29	0.02	-0.16	-0.25
32. Total factor productivity	2.29	-0.54	-0.46	-0.29	-0.03	0.27	0.56	0.77	0.86	0.82	0.68	0.50	0.31	0.16
33. Average labor productivity	1.05	-0.49	-0.60	-0.58	-0.41	-0.11	0.24	0.53	0.70	0.72	0.62	0.47	0.32	0.21

# Description of the Business Cycle (4/6)

Figure: Description of the Business Cycle according to Stock and Watson (1999)

Series	Std dev.	Cross correlations with output ( $\text{corr}(x_t, y_{t+k})$ )												
		-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
<i>Prices and wages</i>														
34. Consumer price index (level)	1.35	0.34	0.24	0.12	-0.04	-0.21	-0.38	-0.51	-0.62	-0.68	-0.67	-0.59	-0.48	-0.34
35. Producer price index (level)	2.26	0.36	0.33	0.27	0.18	0.05	-0.09	-0.24	-0.37	-0.47	-0.54	-0.56	-0.55	-0.50
36. Oil prices	11.12	0.22	0.16	0.09	0.01	-0.08	-0.17	-0.26	-0.35	-0.41	-0.44	-0.42	-0.36	-0.28
37. GDP price deflator (level)	0.91	0.23	0.12	-0.02	-0.18	-0.33	-0.46	-0.54	-0.60	-0.61	-0.59	-0.52	-0.42	-0.30
38. Commodity price index (level)	7.43	0.18	0.28	0.36	0.41	0.41	0.38	0.30	0.18	0.04	-0.11	-0.26	-0.36	-0.43
39. Consumer price index (inflation rate)	1.44	0.34	0.47	0.58	0.64	0.62	0.52	0.35	0.14	-0.08	-0.27	-0.40	-0.48	-0.51
40. Producer price index (inflation rate)	2.64	0.10	0.21	0.33	0.43	0.49	0.49	0.43	0.34	0.21	0.07	-0.05	-0.17	-0.27
41. GDP price deflator (inflation rate)	0.96	0.45	0.55	0.61	0.58	0.48	0.32	0.15	-0.01	-0.14	-0.25	-0.34	-0.41	-0.47
42. Commodity price index (inflation rate)	10.55	-0.28	-0.23	-0.15	-0.03	0.09	0.22	0.33	0.41	0.44	0.39	0.28	0.14	-0.01
43. Nominal wage rate (level)	0.94	0.22	0.13	0.02	-0.09	-0.21	-0.34	-0.45	-0.56	-0.62	-0.62	-0.54	-0.42	-0.27
44. Real wage rate (level)	0.64	-0.16	-0.13	-0.07	0.00	0.08	0.14	0.16	0.14	0.10	0.07	0.05	0.05	0.07
45. Nominal wage rate (rate of change)	1.14	0.31	0.35	0.38	0.41	0.42	0.38	0.29	0.14	-0.05	-0.24	-0.39	-0.47	-0.49
46. Real wage rate (rate of change)	1.10	-0.05	-0.13	-0.18	-0.18	-0.13	-0.05	0.04	0.08	0.08	0.04	-0.00	-0.04	-0.05

# Description of the Business Cycle (5/6)

Figure: Description of the Business Cycle according to Stock and Watson (1999)

Series	Std dev.	Cross correlations with output ( $\text{corr}(x_t, y_{t+k})$ )												
		-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
<i>Interest rates and stock prices</i>														
47. Federal funds rate	1.47	0.26	0.38	0.50	0.60	0.63	0.56	0.38	0.13	-0.16	-0.41	-0.60	-0.69	-0.71
48. Treasury Bill rate (3 month)	1.09	0.20	0.29	0.40	0.50	0.57	0.54	0.41	0.18	-0.10	-0.38	-0.58	-0.69	-0.71
49. Treasury Bond rate (10 year)	0.71	0.03	0.03	0.07	0.13	0.17	0.16	0.08	-0.07	-0.24	-0.39	-0.49	-0.52	-0.48
50. Real Treasury Bill rate (3 month)	0.71	-0.02	-0.04	-0.05	-0.07	-0.12	-0.19	-0.28	-0.35	-0.38	-0.36	-0.29	-0.20	-0.11
51. Yield curve spread (long-short)	0.76	-0.29	-0.40	-0.52	-0.61	-0.66	-0.64	-0.52	-0.32	-0.07	0.17	0.38	0.52	0.59
52. Commercial paper/Treasury Bill spread	0.32	0.44	0.58	0.66	0.65	0.54	0.33	0.06	-0.20	-0.41	-0.53	-0.54	-0.49	-0.40
53. Stock prices	8.28	-0.23	-0.32	-0.35	-0.28	-0.12	0.10	0.34	0.51	0.57	0.49	0.32	0.11	-0.08
<i>Money</i>														
54. Money stock (M2, nominal level)	1.48	-0.39	-0.35	-0.27	-0.15	0.03	0.22	0.39	0.53	0.59	0.58	0.51	0.40	0.27
55. Monetary base (nominal level)	1.12	-0.06	-0.05	-0.03	0.01	0.07	0.13	0.18	0.19	0.18	0.16	0.13	0.10	0.07
56. Money stock (M2, real level)	2.00	-0.39	-0.30	-0.17	0.00	0.20	0.40	0.57	0.69	0.73	0.71	0.62	0.49	0.33
57. Monetary base (real level)	1.53	-0.18	-0.11	-0.01	0.12	0.25	0.36	0.45	0.49	0.50	0.46	0.40	0.32	0.23
58. Money stock (M2, nominal rate of change)	2.07	-0.08	-0.22	-0.36	-0.48	-0.54	-0.50	-0.38	-0.19	0.01	0.19	0.31	0.37	0.38
59. Monetary base (nominal rate of change)	1.38	-0.01	-0.07	-0.14	-0.18	-0.19	-0.16	-0.08	-0.01	0.05	0.10	0.14	0.17	0.18
60. Consumer credit	3.29	0.30	0.50	0.67	0.75	0.74	0.63	0.46	0.25	0.06	-0.08	-0.15	-0.18	-0.18

# Description of the Business Cycle (6/6)

Figure: Description of the Business Cycle according to Stock and Watson (1999)

Series	Std dev.	Cross correlations with output ( $\text{corr}(x_t, y_{t+k})$ )												
		-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
<i>Miscellaneous leading indicators</i>														
61. Consumer expectations	9.15	-0.61	-0.64	-0.59	-0.46	-0.25	0.00	0.25	0.44	0.54	0.53	0.44	0.32	0.20
62. Building permits	16.19	-0.51	-0.54	-0.51	-0.41	-0.21	0.07	0.36	0.60	0.74	0.75	0.67	0.52	0.36
63. Vendor performance	10.87	-0.40	-0.40	-0.32	-0.14	0.09	0.34	0.53	0.61	0.58	0.43	0.23	0.04	-0.11
64. Mfrs' unfilled orders, durable goods industry	6.73	0.48	0.60	0.69	0.72	0.70	0.61	0.47	0.28	0.06	-0.15	-0.32	-0.45	-0.50
65. Mfrs' new orders, non-defense capital goods	8.11	-0.09	0.09	0.30	0.53	0.72	0.83	0.83	0.71	0.51	0.26	0.02	-0.16	-0.27
<i>International output</i>														
66. Industrial production – Canada	3.43	-0.19	-0.03	0.19	0.45	0.68	0.84	0.87	0.77	0.56	0.29	0.04	-0.17	-0.30
67. Industrial production – France	2.58	0.03	0.20	0.35	0.44	0.46	0.39	0.26	0.12	-0.01	-0.11	-0.18	-0.21	-0.22
68. Industrial production – Japan	4.46	0.09	0.23	0.37	0.49	0.53	0.49	0.35	0.15	-0.06	-0.23	-0.33	-0.36	-0.33
69. Industrial production – UK	2.60	-0.04	0.11	0.27	0.42	0.51	0.53	0.47	0.39	0.28	0.18	0.10	0.03	-0.02
70. Industrial production – Germany	3.19	0.01	0.08	0.18	0.29	0.38	0.40	0.35	0.24	0.09	-0.07	-0.19	-0.27	-0.31

## 1. Determinants of Economic Growth

- **Long-run drivers:** Capital accumulation, technological progress, and institutional frameworks.
- **Short-run influences:** Demand-side factors, policy interventions, and external shocks.

## 2. Short-run vs. Long-run Dynamics

- **Short-run differences:** Characterized by business cycle fluctuations around the long-run trend.
- **Long-run perspective:** Focuses on steady-state growth and structural determinants.

## Looking Ahead

- Explore theoretical models to explain growth and fluctuations.
- Dive into empirical tools for analyzing macroeconomic data.
- Bridge the gap between short-term stabilization and long-term growth policies.

*“Macroeconomics is not just about studying the economy—it’s about uncovering patterns and principles that guide economic stability and progress.”*