

**بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ**

**اقتصاد کلان**

**اقتصاد رشد (مقدمه)**

سید علی مدنی زاده

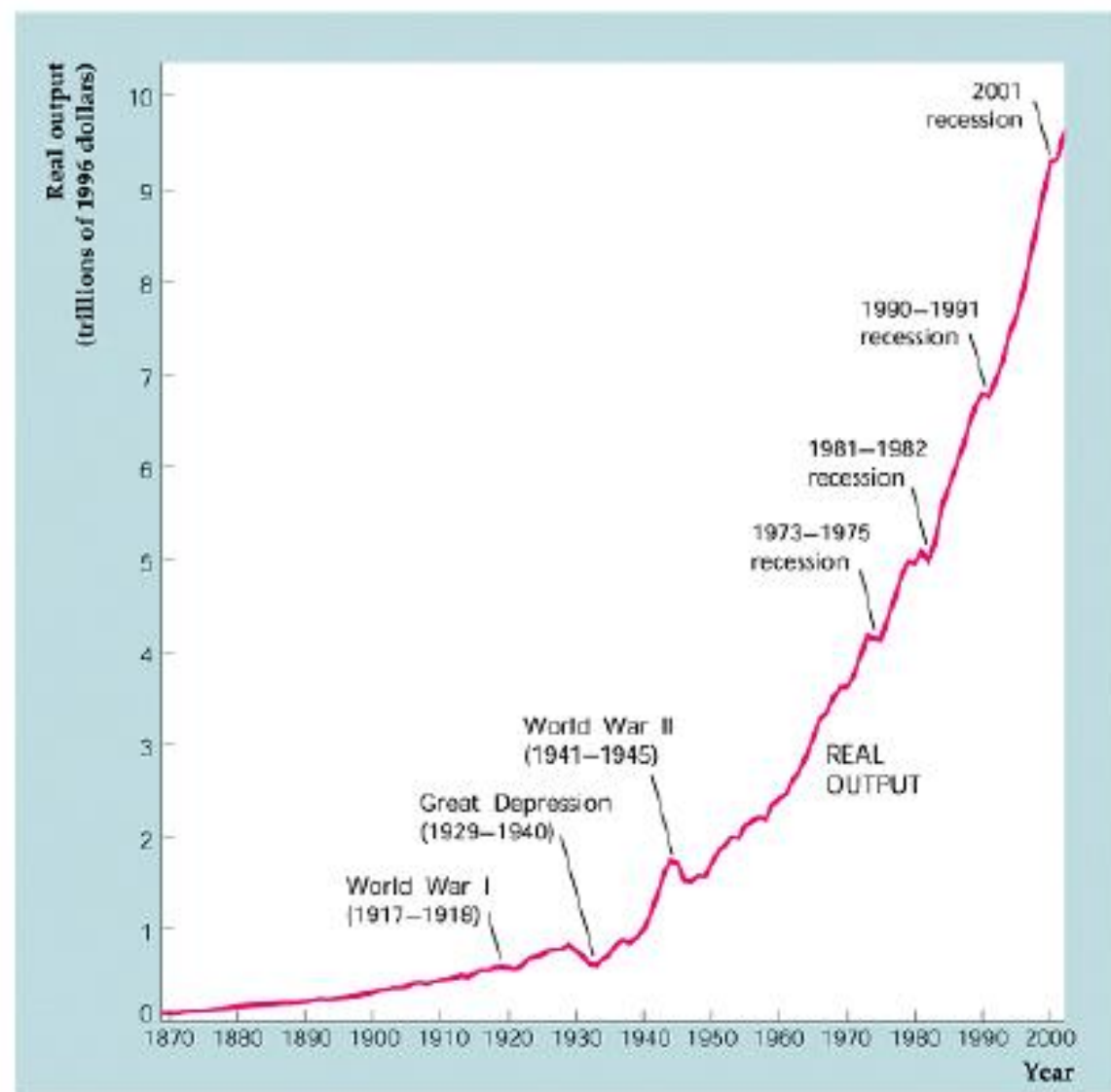
# فهرست

- حقایق آماری رشد اقتصادی
- حقایق آماری نابرابریهای اقتصادی
- رشد اجزای تولید
- برخی تعاریف رشد
- عوامل رشد

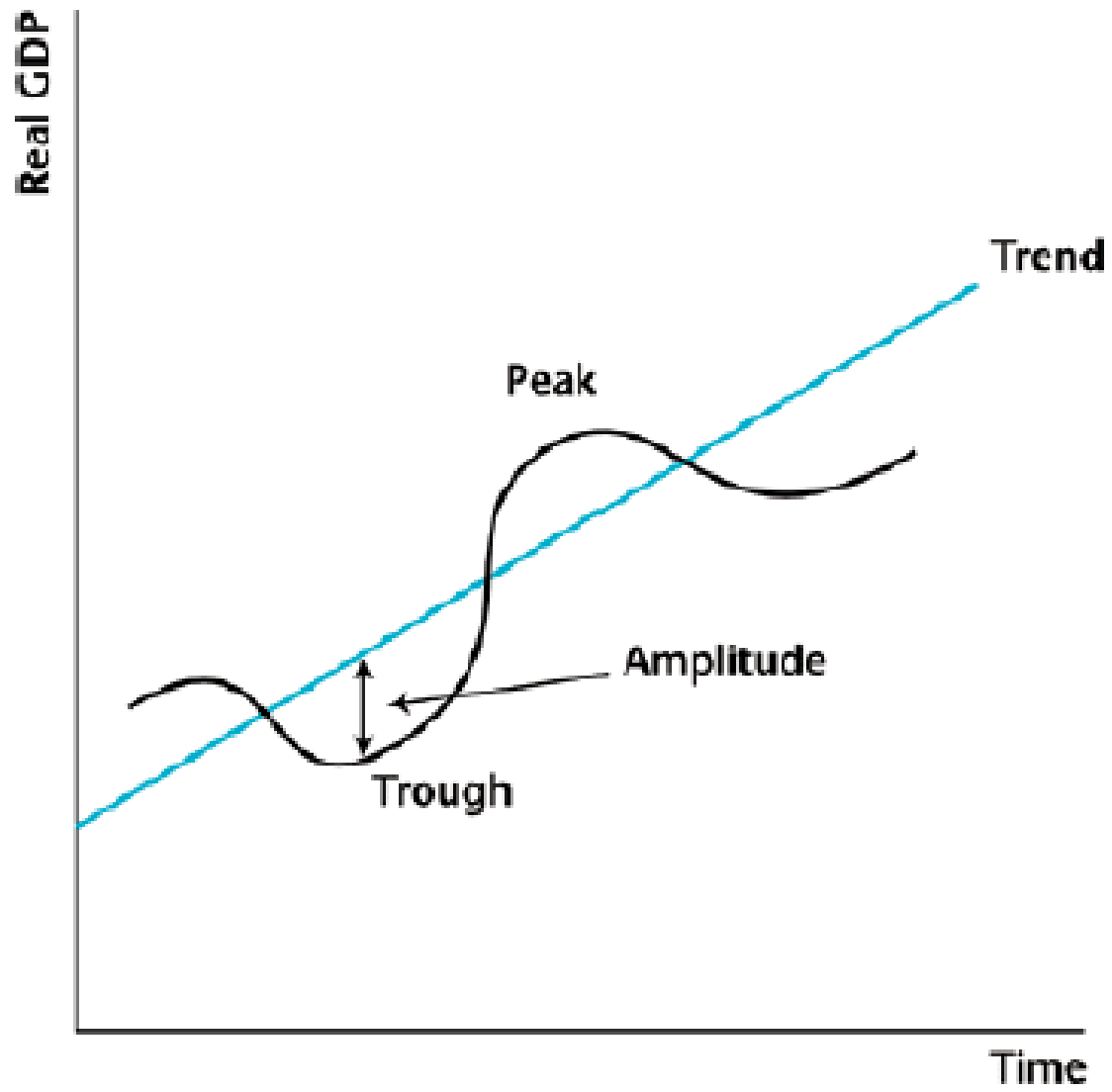
TABLE I  
PRODUCTIVITY CALCULATIONS: RATIOS TO U. S. VALUES

Country	Y/L	Contribution from		
		$(K/Y)^{\alpha/(1-\alpha)}$	H/L	A
United States	1.000	1.000	1.000	1.000
Canada	0.941	1.002	0.908	1.034
Italy	0.834	1.063	0.650	1.207
West Germany	0.818	1.118	0.802	0.912
France	0.818	1.091	0.666	1.126
United Kingdom	0.727	0.891	0.808	1.011
Hong Kong	0.608	0.741	0.735	1.115
Singapore	0.606	1.031	0.545	1.078
Japan	0.587	1.119	0.797	0.658
Mexico	0.433	0.868	0.538	0.926
Argentina	0.418	0.953	0.676	0.648
U.S.S.R.	0.417	1.231	0.724	0.468
India	0.086	0.709	0.454	0.267
China	0.060	0.891	0.632	0.106
Kenya	0.056	0.747	0.457	0.165
Zaire	0.033	0.499	0.408	0.160
Average, 127 countries:	0.296	0.853	0.565	0.516
Standard deviation:	0.268	0.234	0.168	0.325
Correlation with Y/L (logs)	1.000	0.624	0.798	0.889
Correlation with A (logs)	0.889	0.248	0.522	1.000

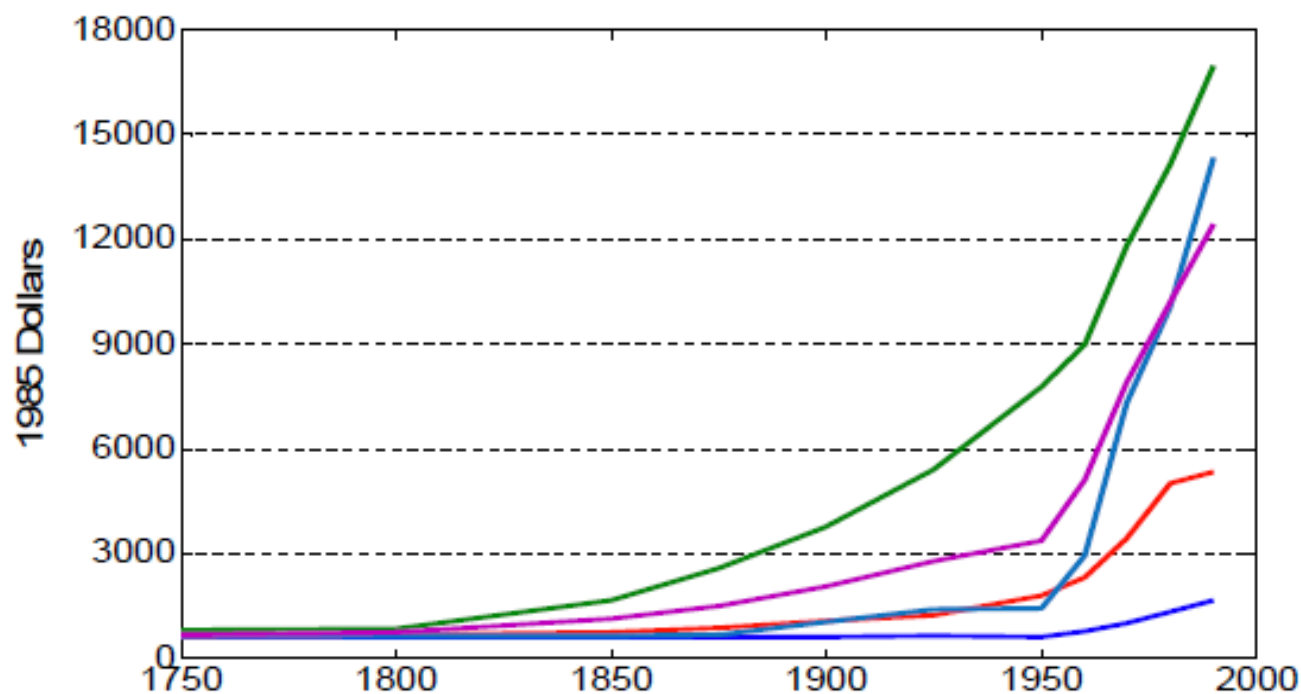
The elements of this table are the empirical counterparts to the components of equation (3), all measured as ratios to the U. S. values. That is, the first column of data is the product of the other three columns.



Source: Abel and Bernanke, Macroeconomics (2005)



# GDP per capita, five regions



1990 Population in millions

UK, USA, Canada, Australia, New Zealand

354

Japan

124

France, Germany, Netherlands, Scandinavia

184

Rest of Western Europe, Eastern Europe, Latin America

986

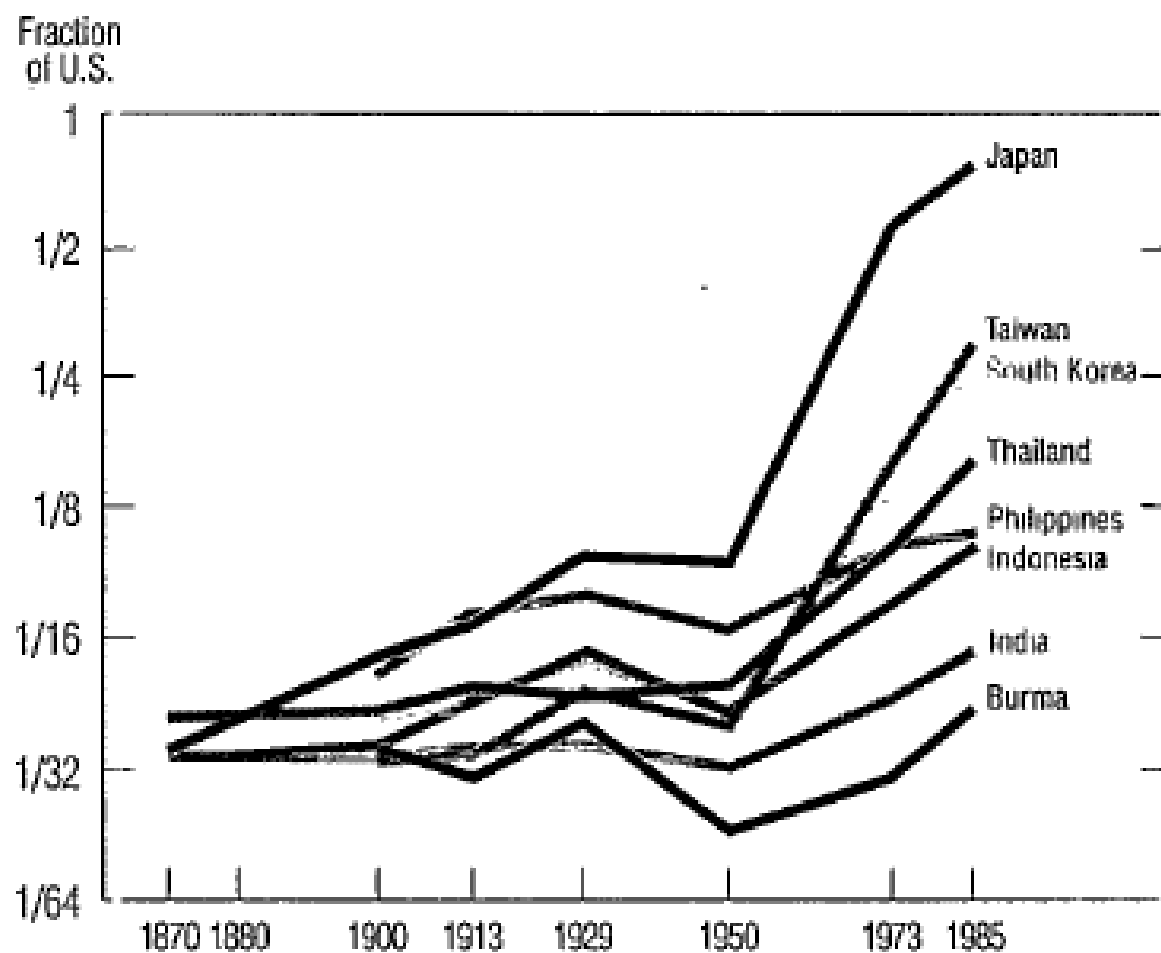
Asia (except Japan), Africa

3590

Chart 5

## Dramatic Divergence in Southeastern Asia

Per-Capita GDP Relative to 1985 U.S. Level  
for 8 Southeastern Asian Countries During 1870–1985



Source of basic data: Van der Eng 1992

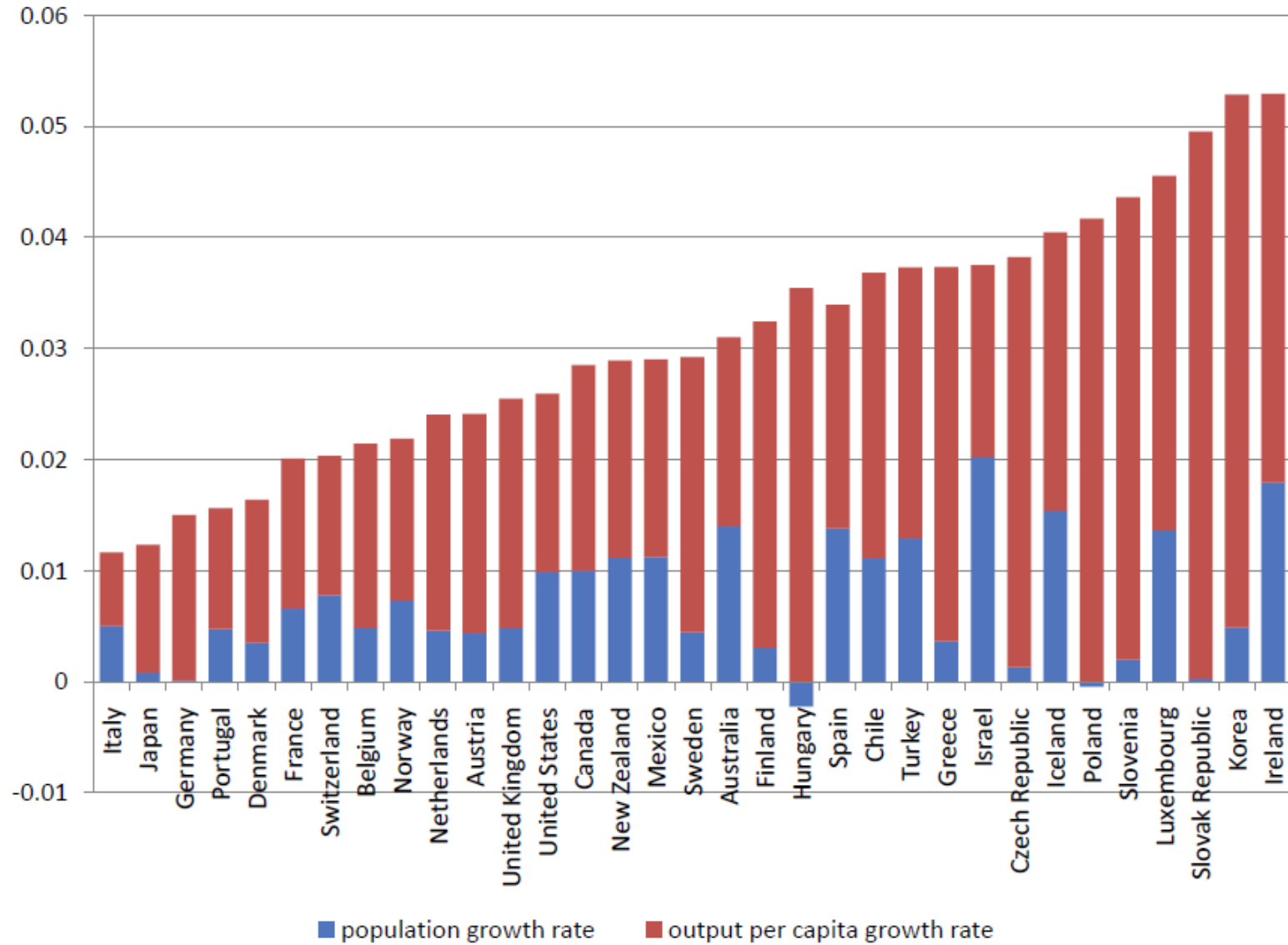




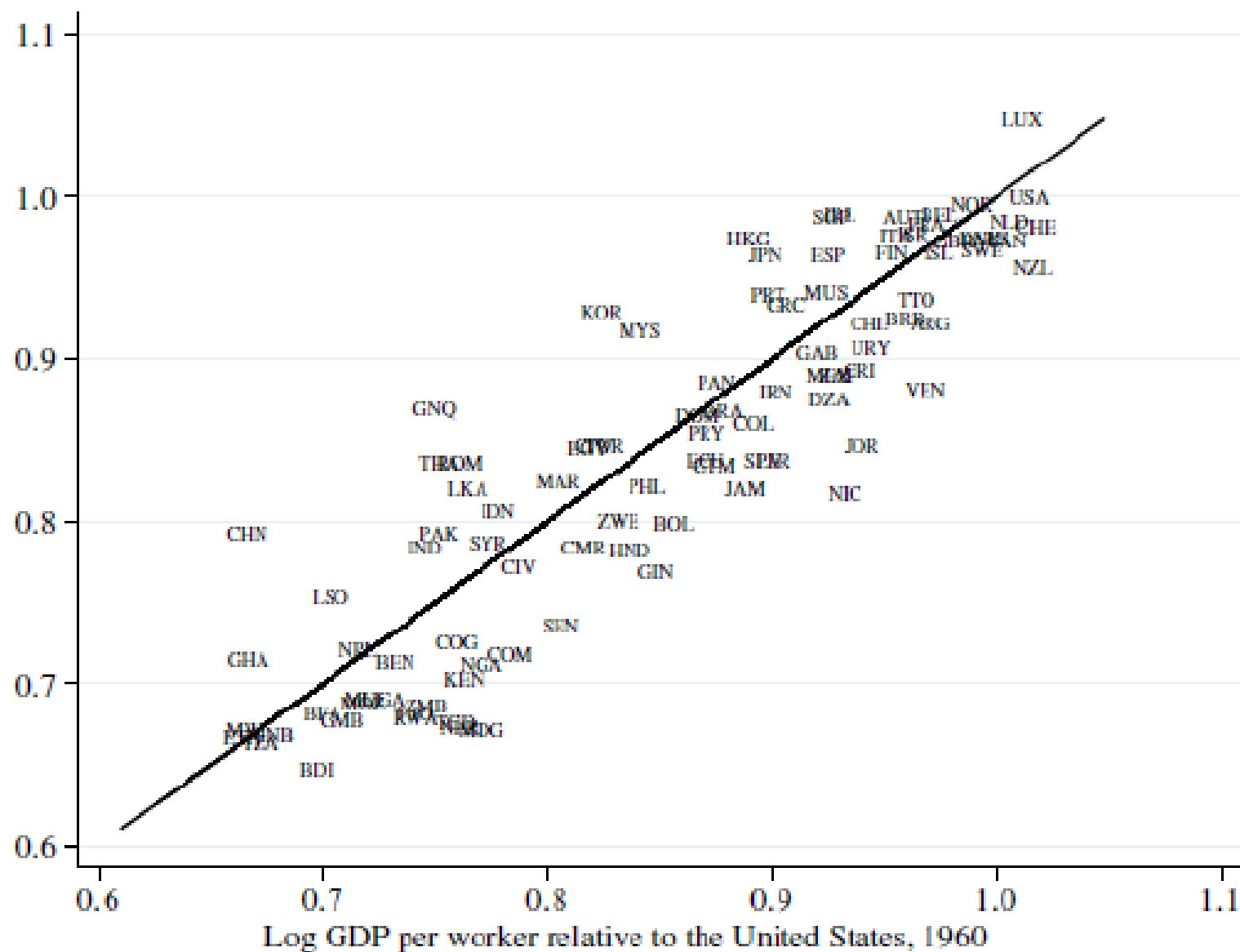
Table 2

**Estimates of the Divergence of Per Capita Incomes Since 1870**

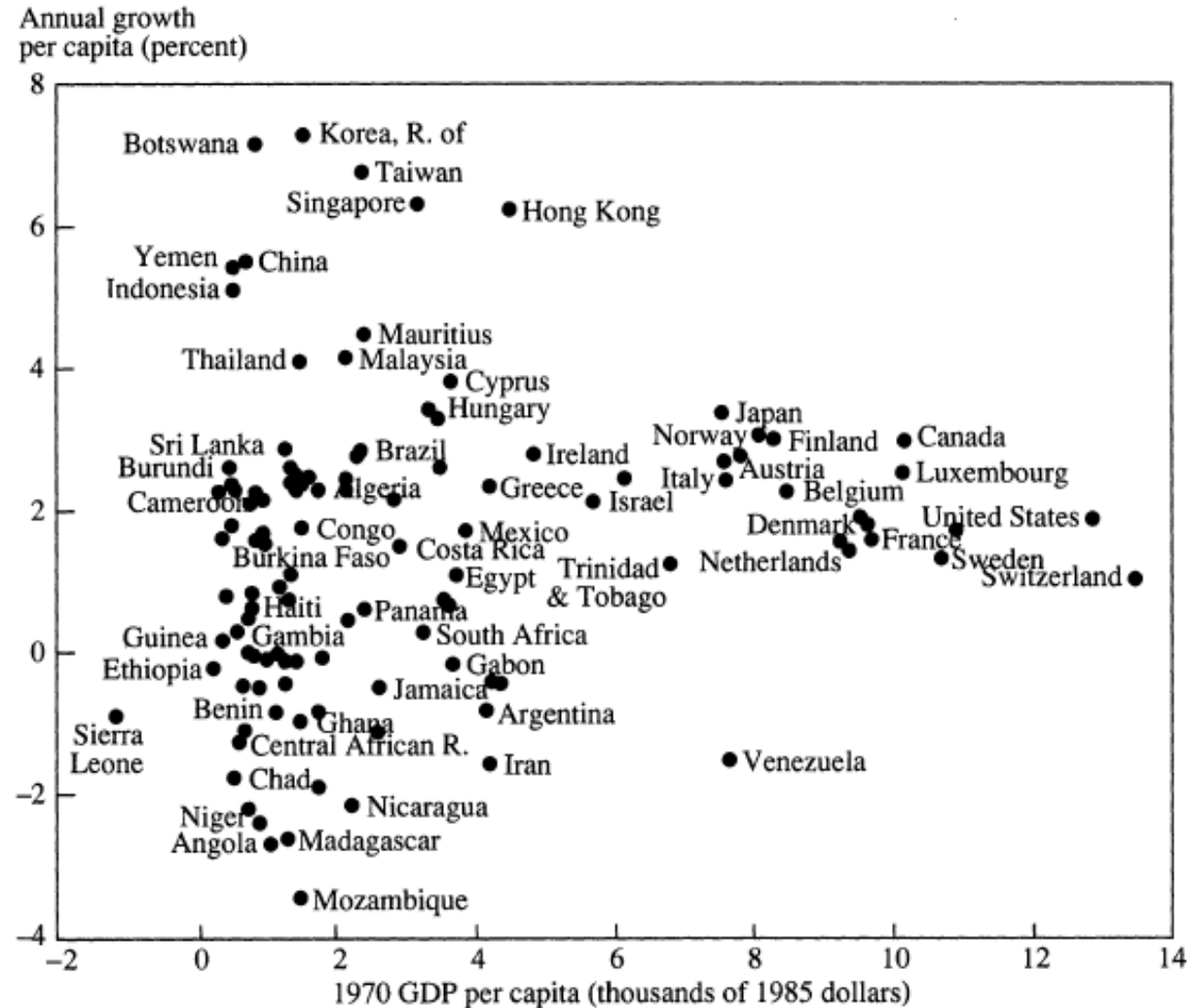
	1870	1960	1990
USA (P\$)	2063	9895	18054
Poorest (P\$)	250	257	399
	(assumption)	(Ethiopia)	(Chad)
Ratio of GDP per capita of richest to poorest country	8.7	38.5	45.2
Average of seventeen "advanced capitalist" countries from Maddison (1995)	1757	6689	14845
Average LDCs from PWT5.6 for 1960, 1990 (imputed for 1870)	740	1579	3296
Average "advanced capitalist" to average of all other countries	2.4	4.2	4.5
Standard deviation of natural log of per capita incomes	.51	.88	1.06
Standard deviation of per capita incomes	P\$459	P\$2,112	P\$3,988
Average absolute income deficit from the leader	P\$1286	P\$7650	P\$12,662

*Notes:* The estimates in the columns for 1870 are based on backcasting GDP per capita for each country using the methods described in the text assuming a minimum of P\$250. If instead of that method, incomes in 1870 are backcast with truncation at P\$250, the 1870 standard deviation is .64 (as reported in Figure 1).

Log GDP per worker relative to the United States, 2000

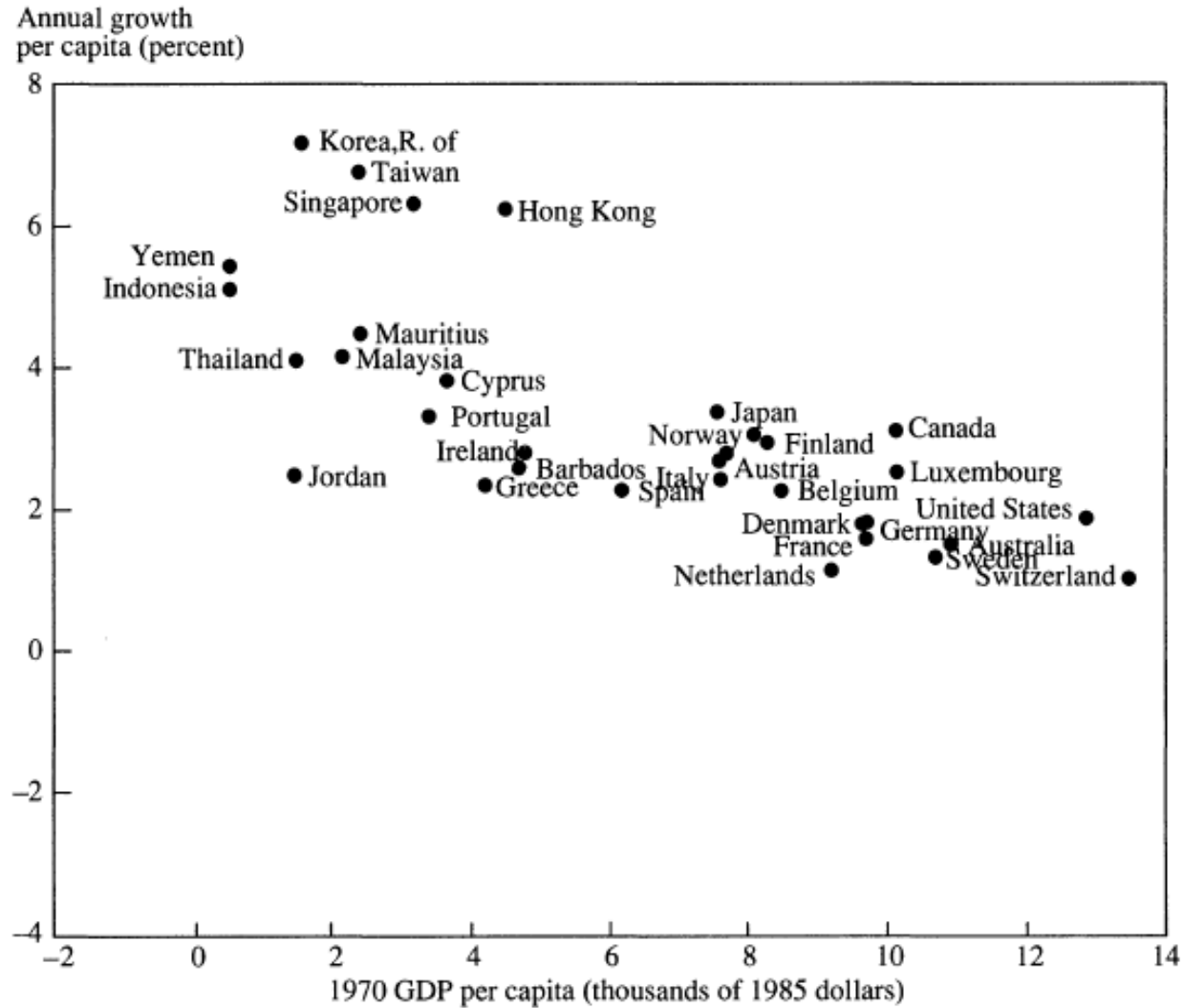


**FIGURE 1.9** Log GDP per worker in 2000 versus log GDP per worker in 1960, together with the 45° line.

**Figure 3. Growth and Initial Income, All Economies, 1970–89**

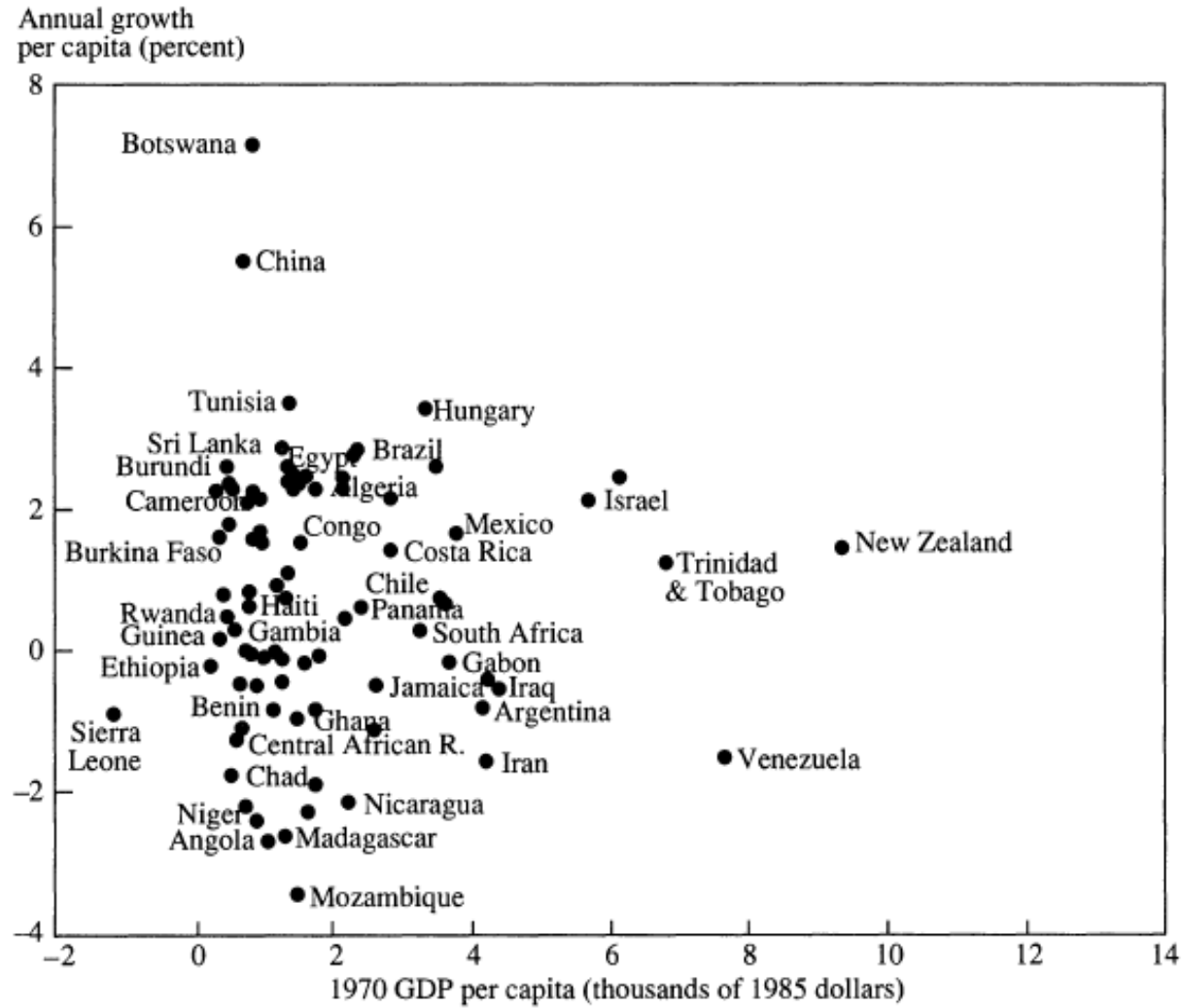
Source: Version 5.5 of the data in Summers and Heston (1991) and World Bank (1994d).

Figure 4. Growth and Initial Income, Open Economies, 1970–89



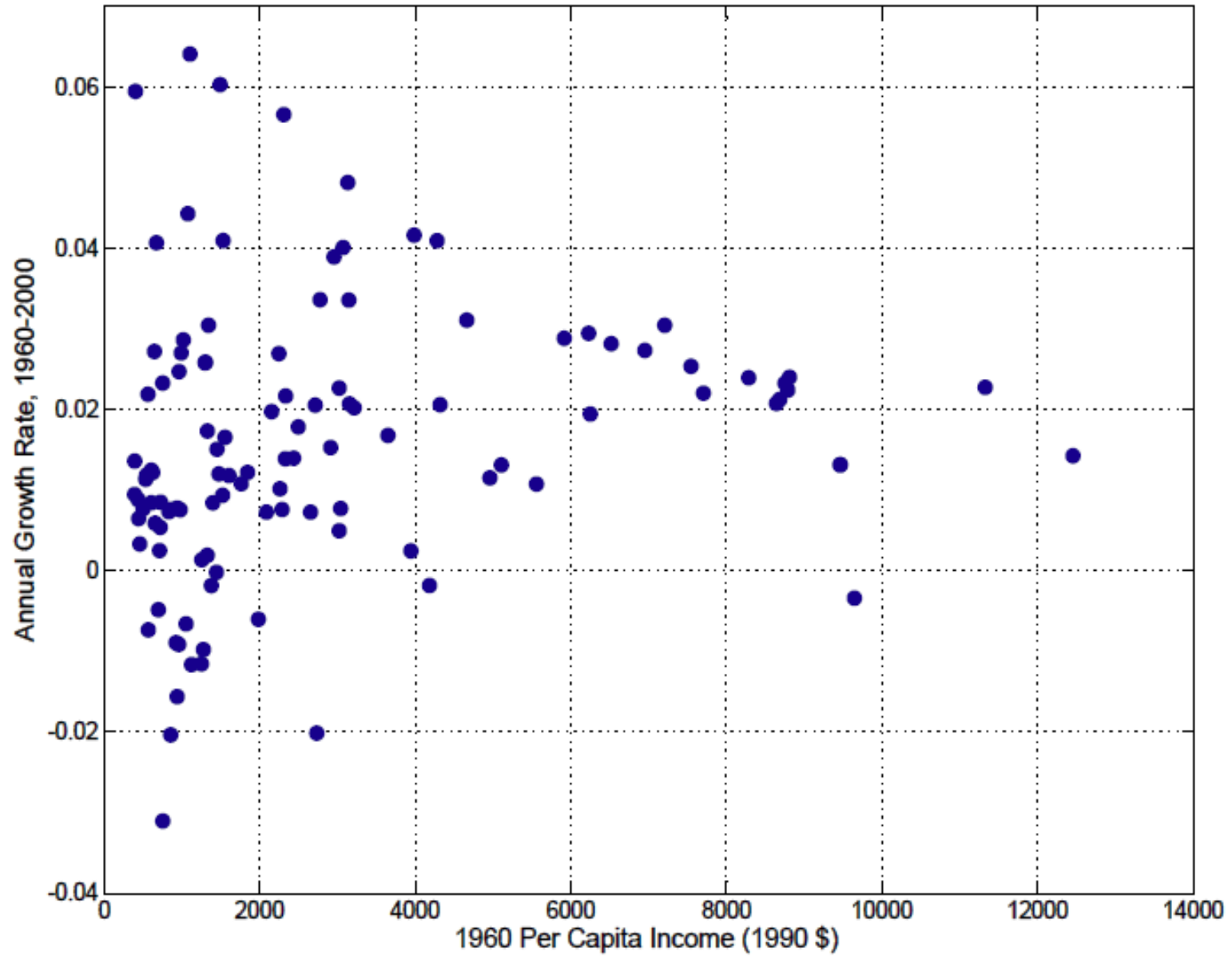
Source: Authors' calculations using version 5.5 of the data in Summers and Heston (1991).

Figure 5. Growth and Initial Income, Closed Economies, 1970–89

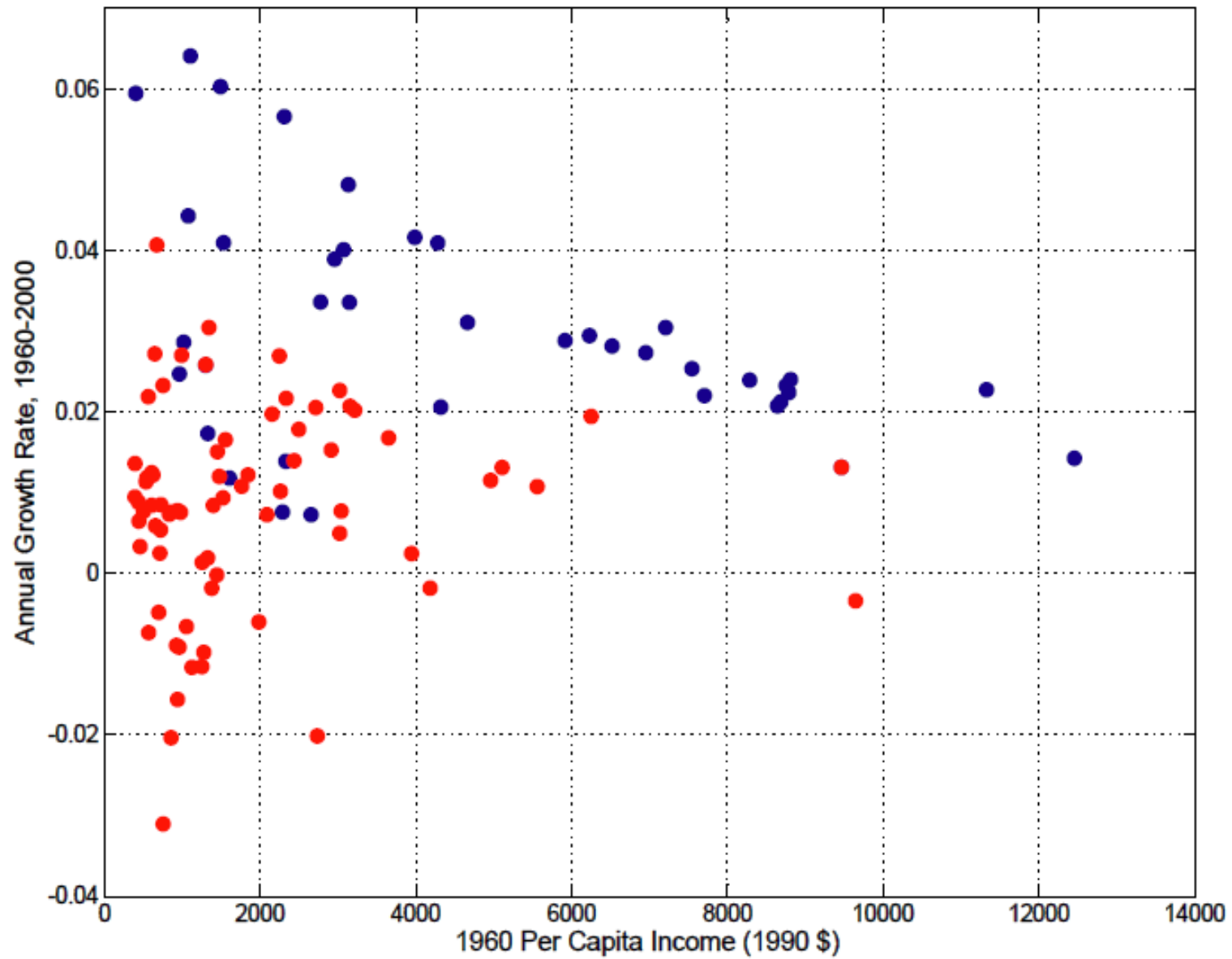


Source: Authors' calculations using version 5.5 of the data in Summers and Heston (1991) and World Bank (1994d).

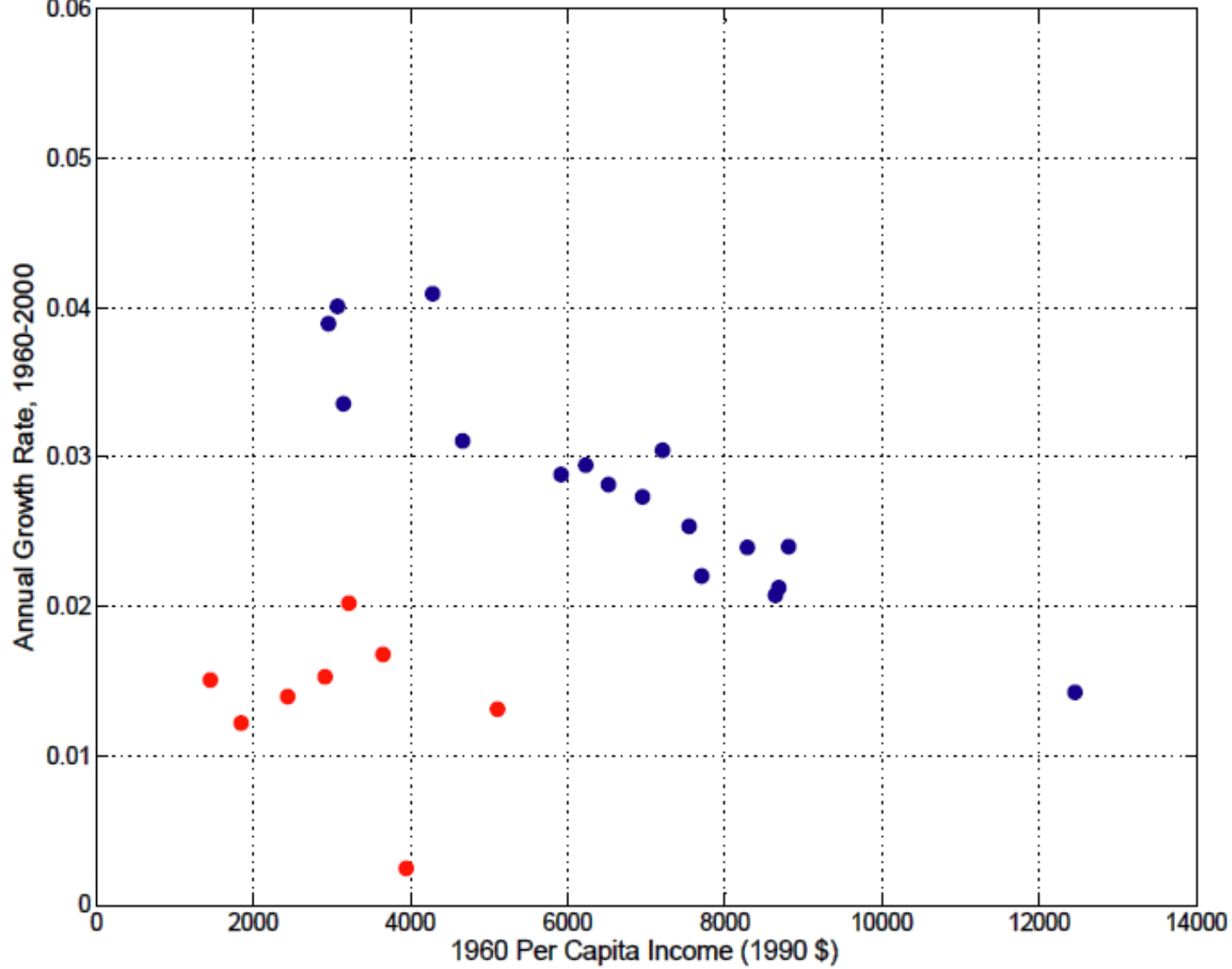
INCOME LEVELS AND GROWTH RATES, 112 COUNTRIES



INCOME LEVELS AND GROWTH RATES, 112 COUNTRIES



INCOME LEVELS AND GROWTH RATES, 25 EUROPEAN COUNTRIES





# INCOME DOUBLING TIMES, 50 COUNTRIES

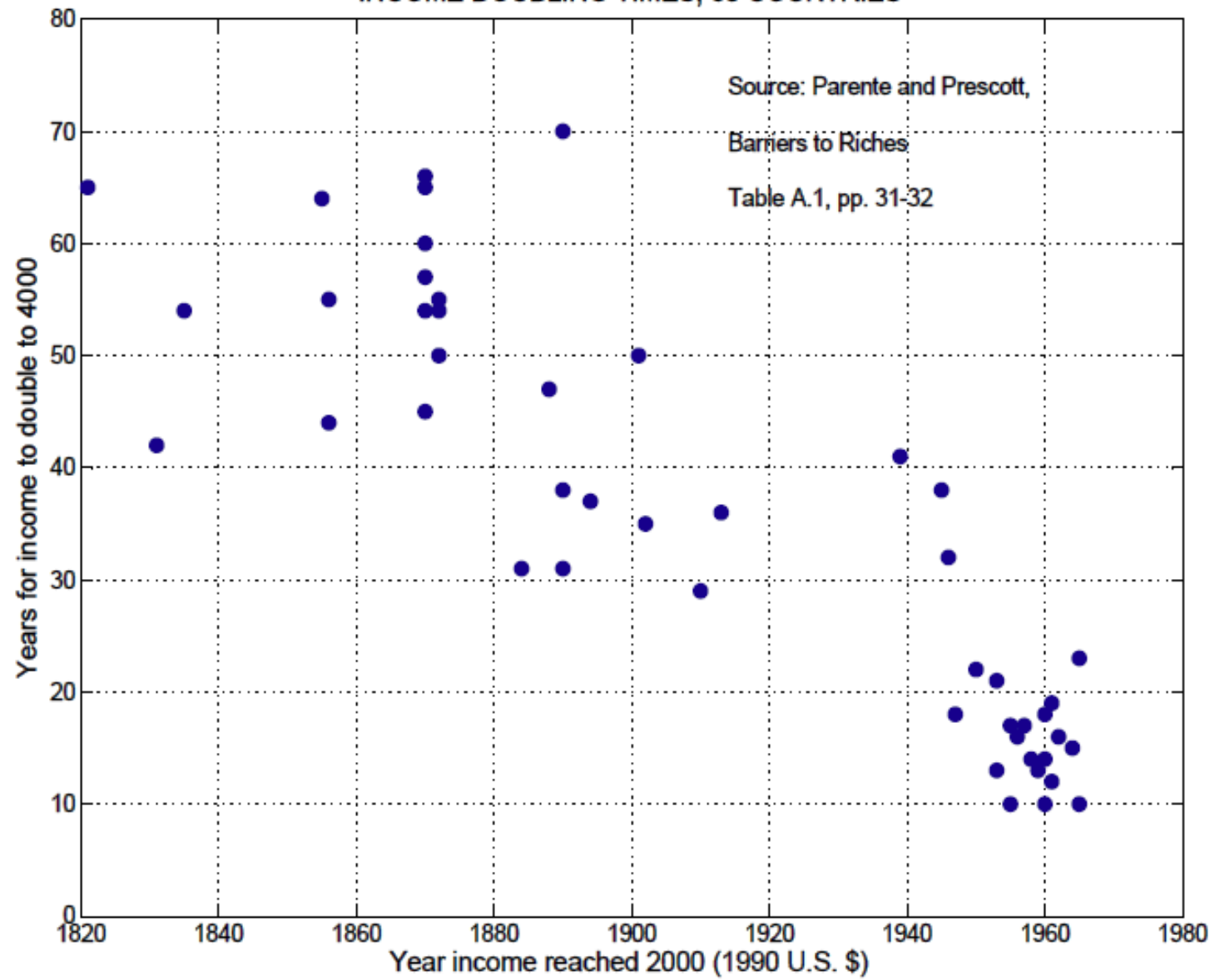
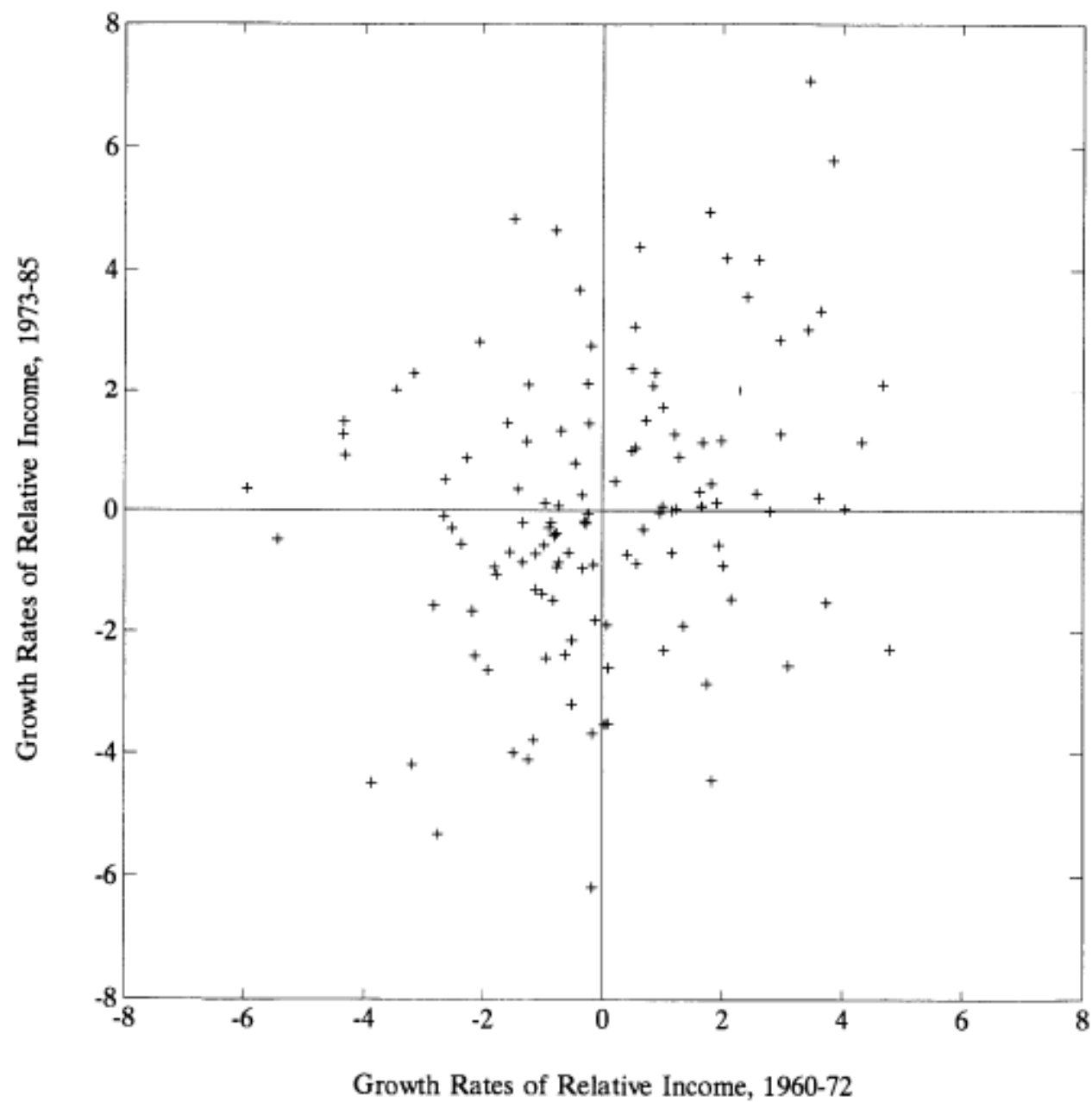


Figure 4: Persistence of Growth Rates



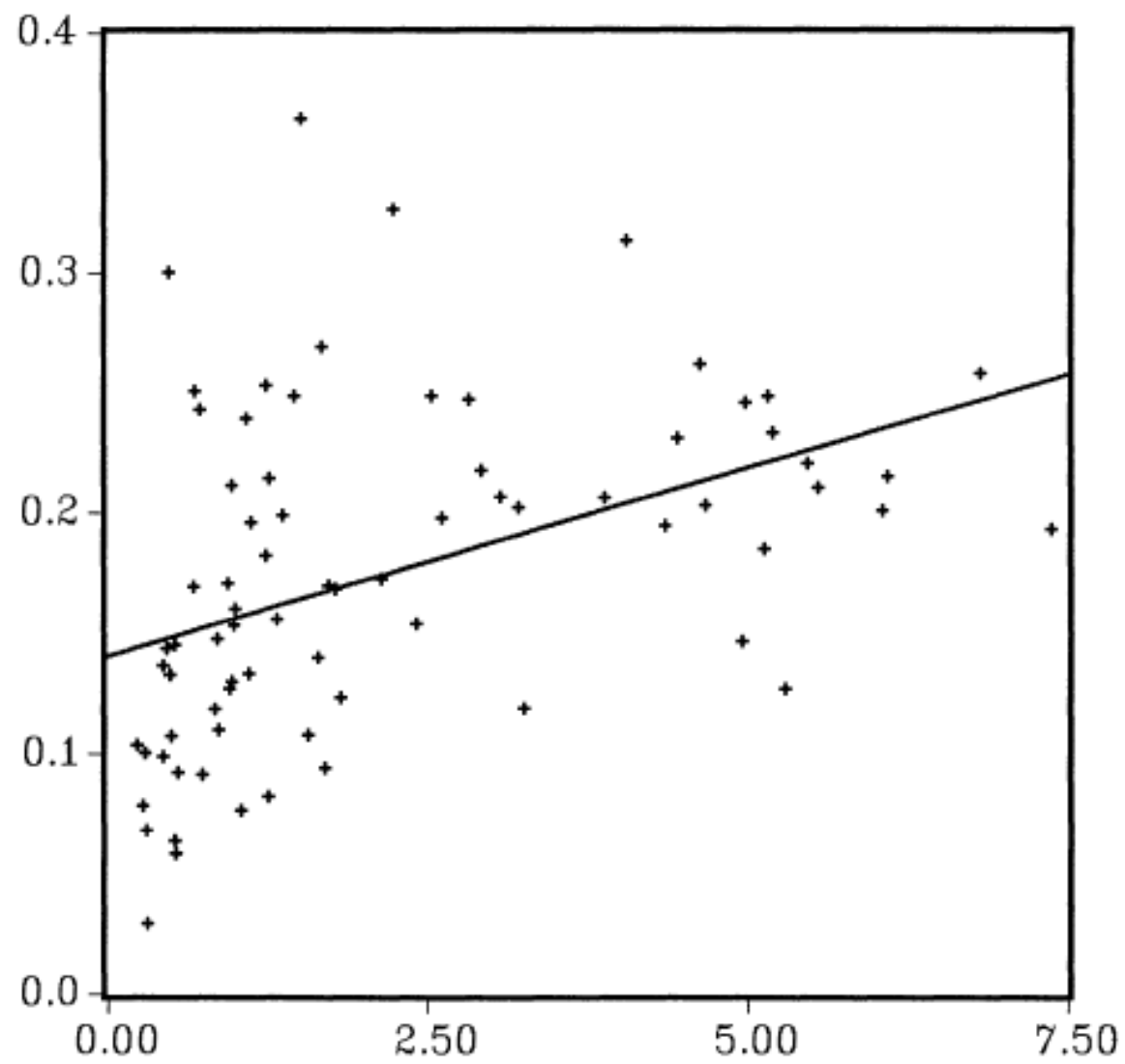


FIGURE VII  
Ratio of Private Investment to GDP Versus 1960 GDP per Capita

Average growth rate of GDP per capita, 1960–2000

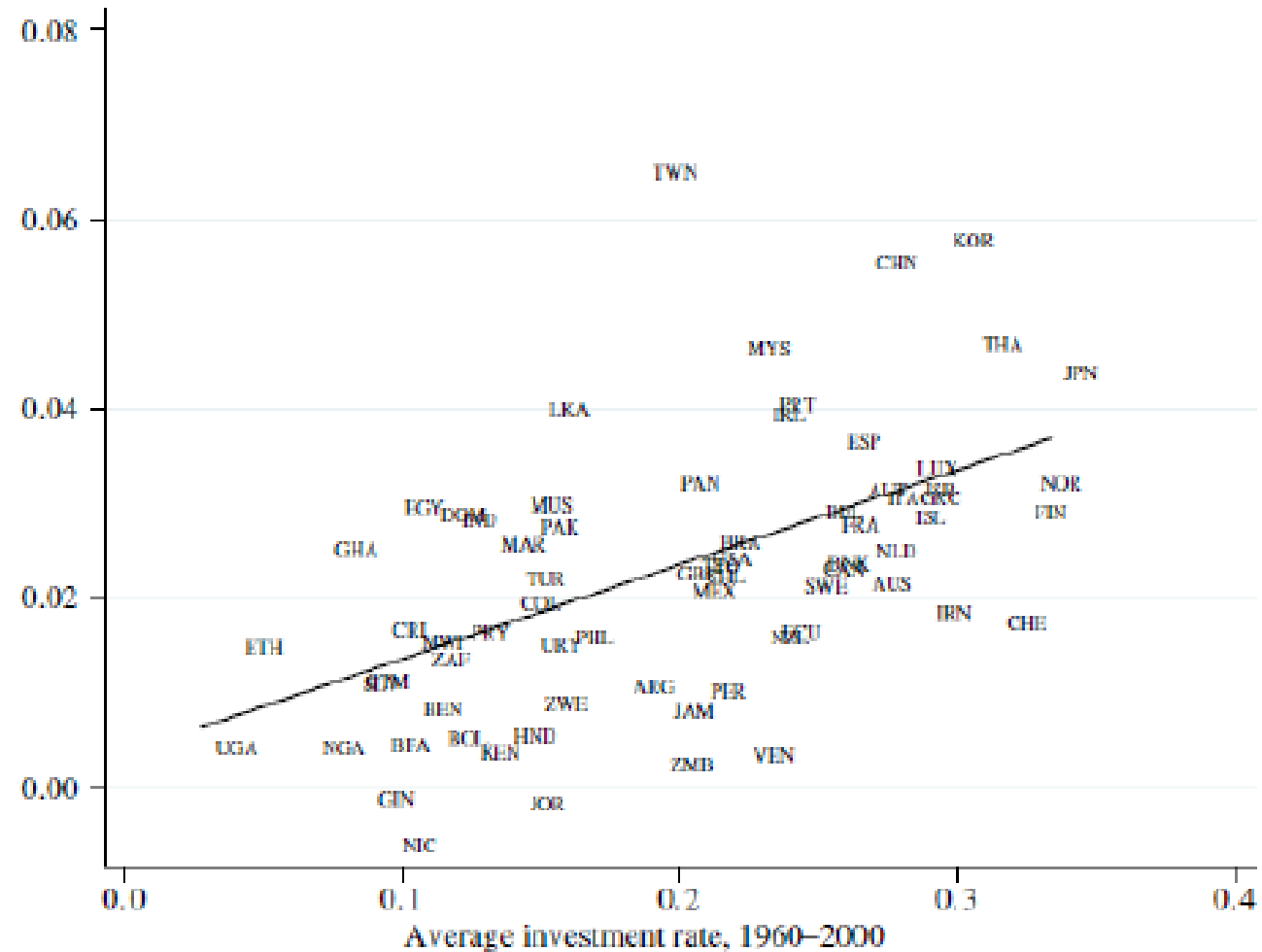


FIGURE 1.15 The relationship between average growth of GDP per capita and average growth of investments to GDP ratio, 1960–2000.

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

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## Development Miracles and Disasters

Countries in the 102-Country Data Set With Largest Changes  
in Relative Wealth During 1960–85 (Expressed as Factor Changes)

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Increases		Decreases	
Country	Factor Change	Country	Factor Change
Saudi Arabia	3.32	Zambia	2.63
Lesotho	3.19	Mozambique	2.63
Taiwan	2.60	Madagascar	2.50
Hong Kong	2.59	Angola	2.38
South Korea	2.40	Chad	2.13
Egypt	2.38	Liberia	2.04
Congo	2.18	Ghana	2.00
Japan	2.10	Zaire	1.96
Singapore	2.09	Nicaragua	1.85
Syria	1.89	Afghanistan	1.75

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Source of basic data: Summers and Heston 1991

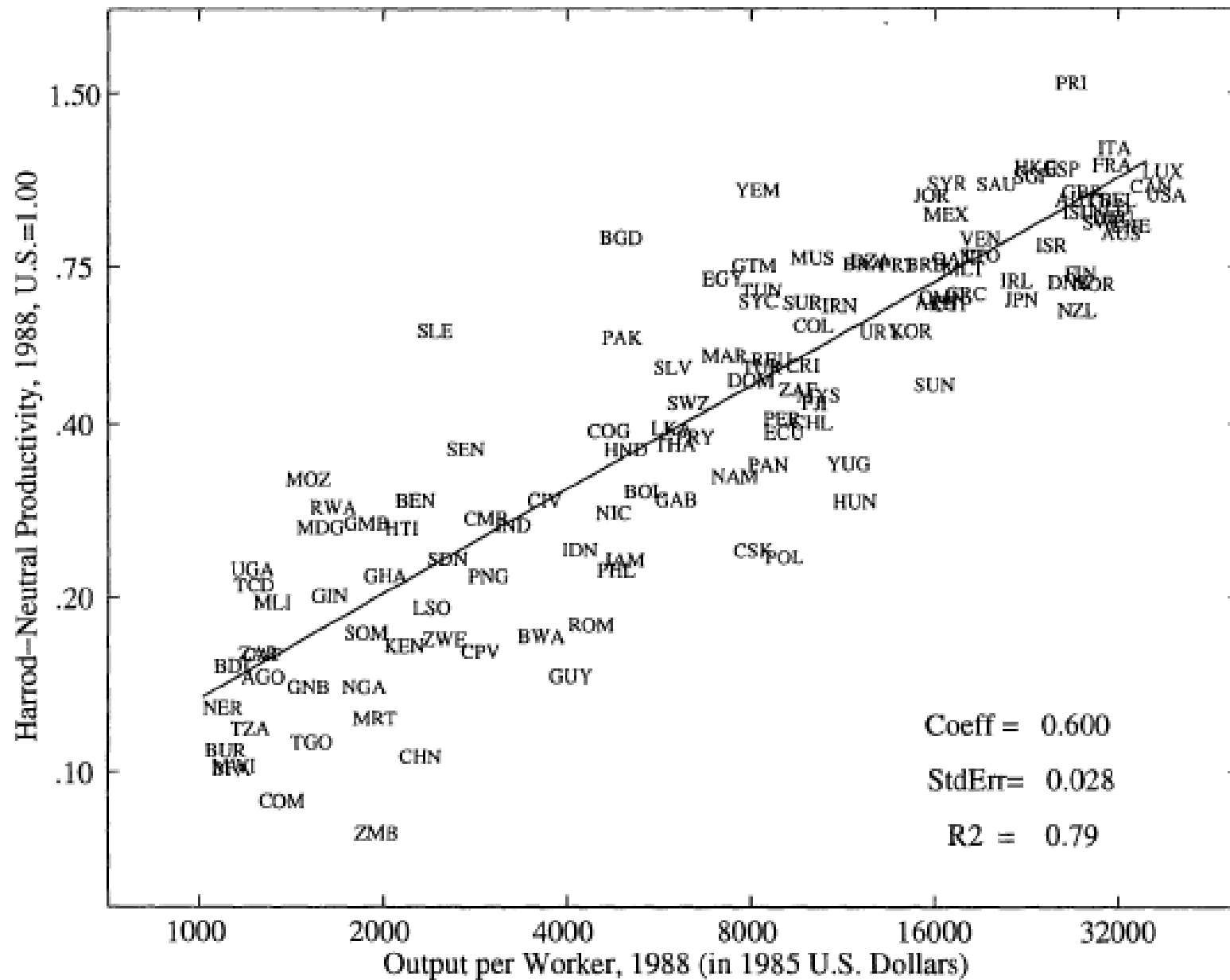
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Statistics for the Miracles (1960-85)

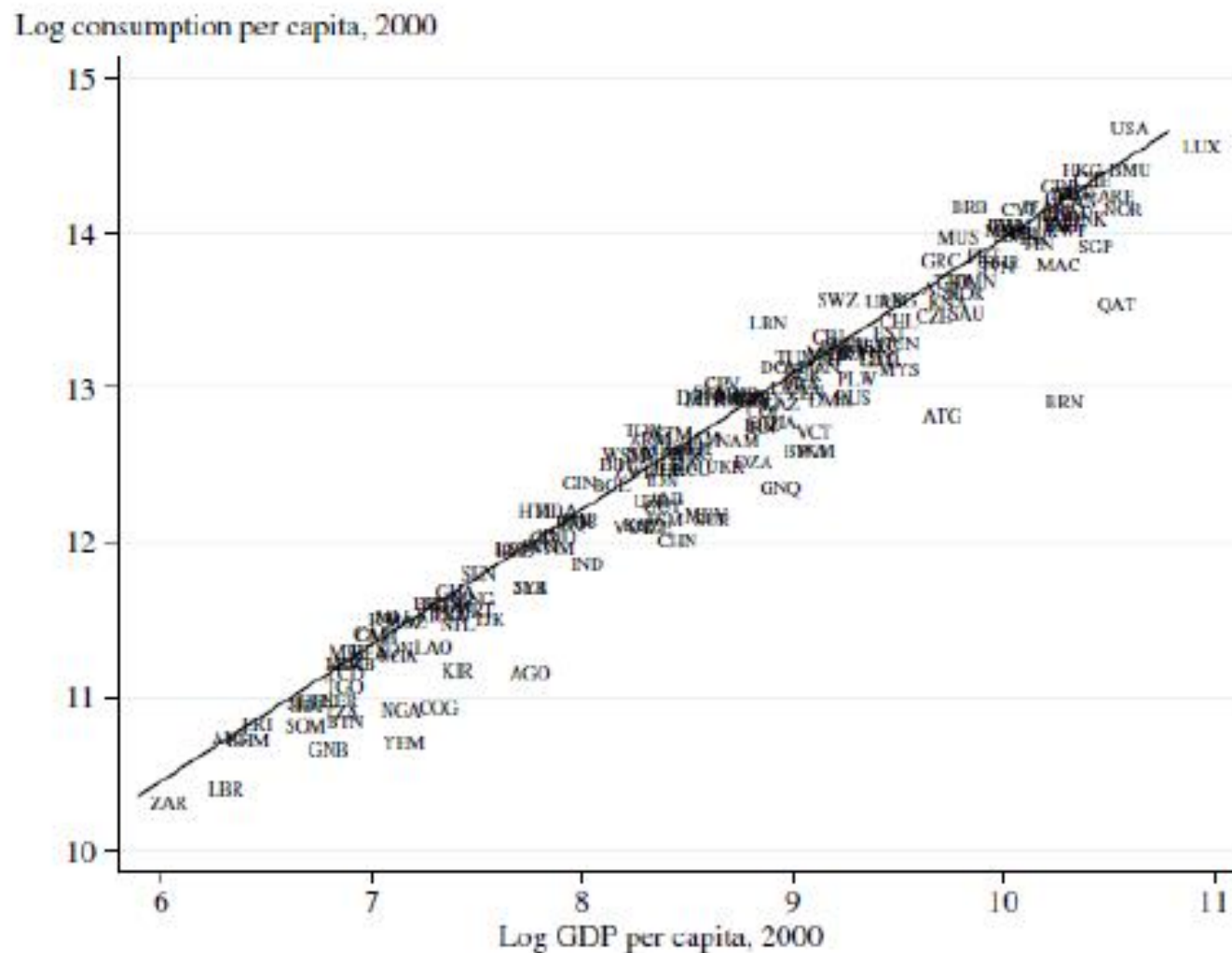
	Average Growth of Relative Income	Average I/Y	Relative Income in 1960
Botswana	4.9	19.8	.33
Romania	4.7	20.7	.20
Hong Kong	3.4	20.3	1.11
Korean Republic	3.3	21.4	.72
Japan	3.3	33.9	1.33
Taiwan	3.3	21.8	.90
Singapore	3.1	30.7	1.34
Lesotho	3.0	9.4	.15
Jordan	2.9	14.1	1.20
Malta	2.6	23.7	1.27
Miracle Average	3.4	21.2	.68
World Average	0	14.1	1.00

Statistics for the Disasters (1960-85)

	Average Growth of Relative Income	Average I/Y	Relative Income in 1960
Chad	-4.3	2.1	.51
Guyana	-4.0	24.8	1.50
Madagascar	-3.5	1.3	.62
Mozambique	-3.4	1.9	.51
Somalia	-3.0	8.5	.51
Venezuela	-2.6	18.6	5.46
Angola	-2.6	3.6	.52
Zambia	-2.6	24.3	.71
Burundi	-2.5	4.4	.28
Uganda	-2.1	2.6	.32
Disaster Average	-3.1	5.4	.68
World Average	0	14.1	1.00



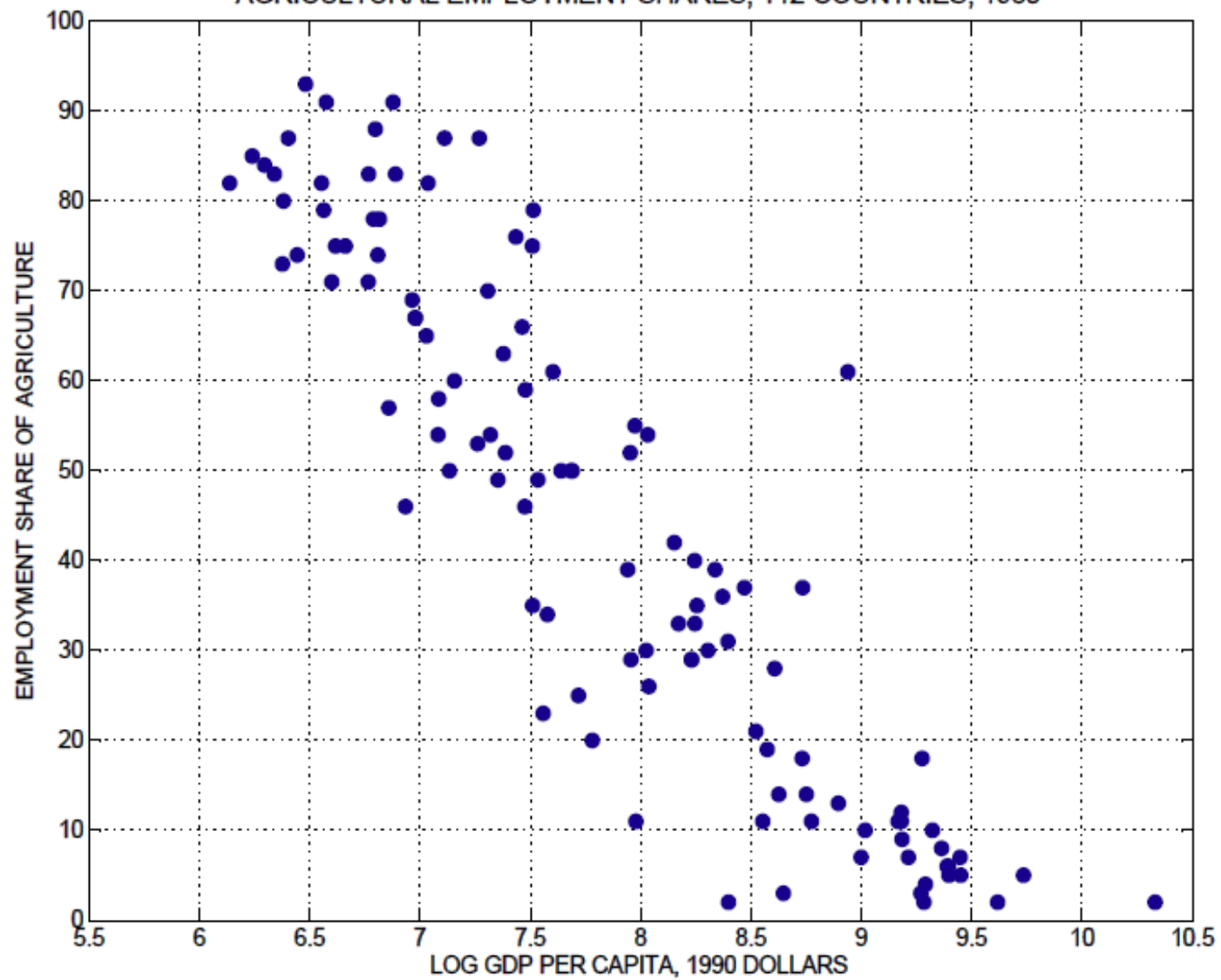




**FIGURE 1.5** The association between income per capita and consumption per capita in 2000. For a definition of the abbreviations used in this and similar figures in the book, see <http://unstats.un.org/unsd/methods/m49/m49alpha.htm>.

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

AGRICULTURAL EMPLOYMENT SHARES, 112 COUNTRIES, 1980



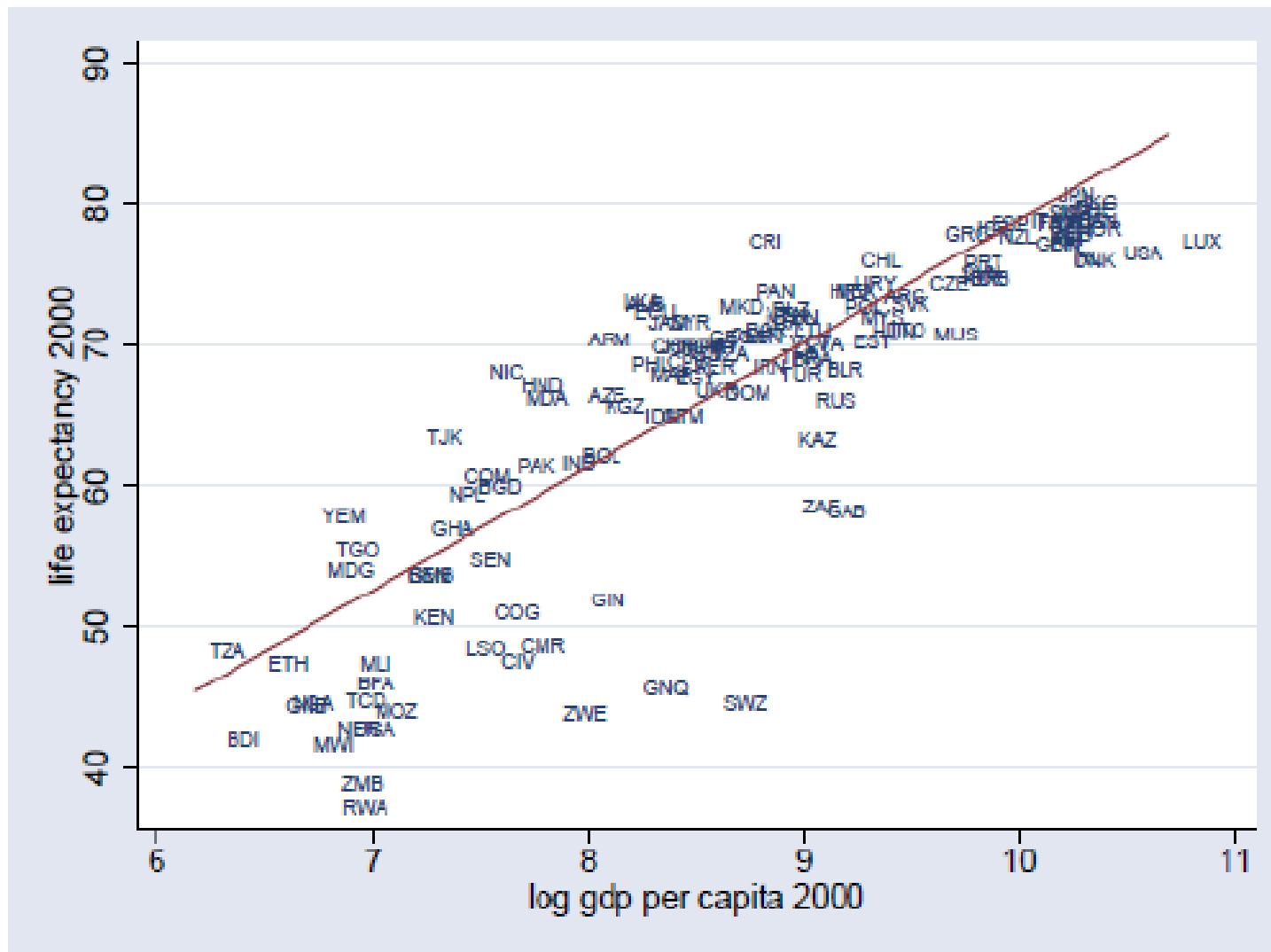


FIGURE 1.6. The association between income per capita and life expectancy at birth in 2000.

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

Average growth rate of GDP per capita, 1960–2000

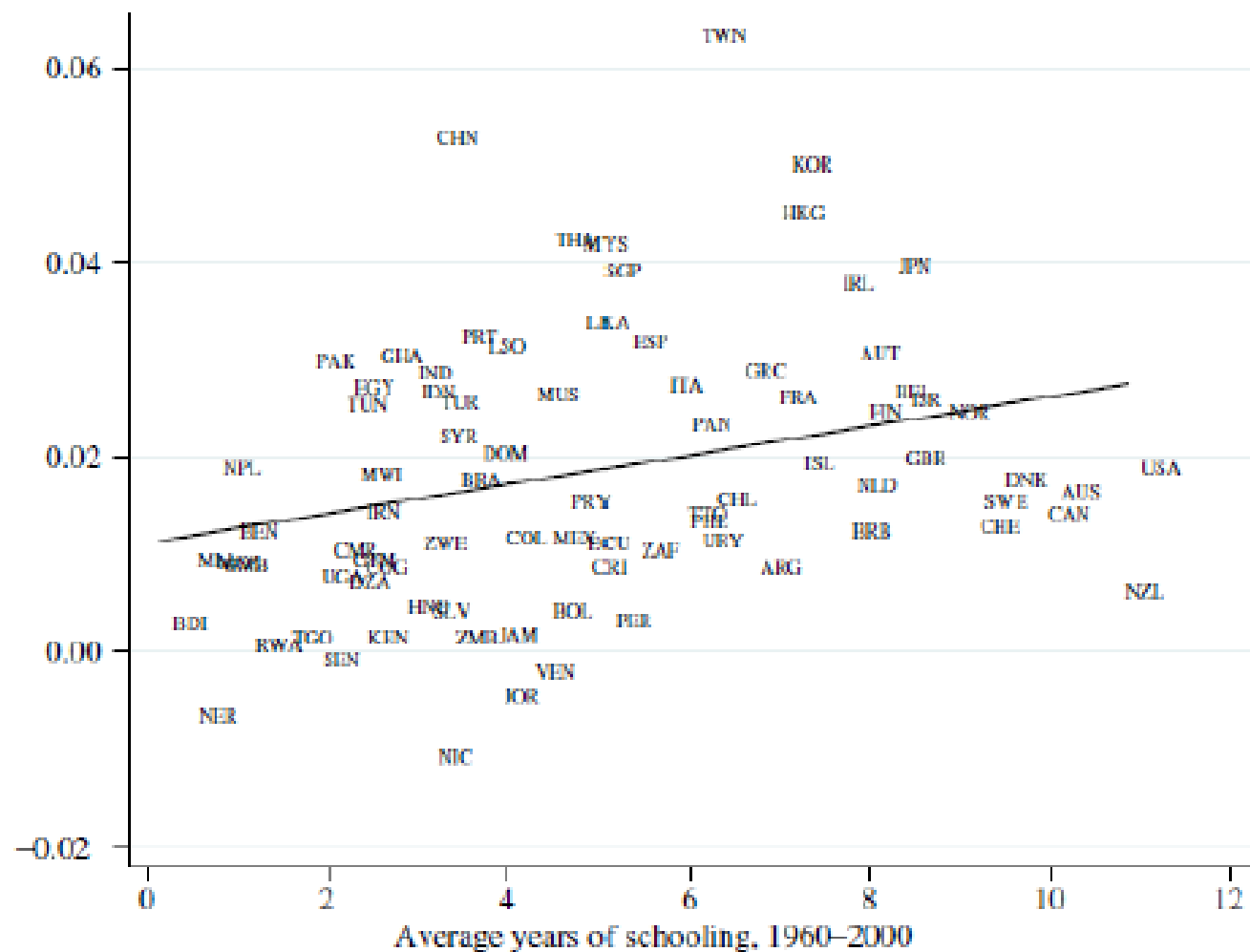


FIGURE 1.16 The relationship between average growth of GDP per capita and average years of schooling, 1960–2000.

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

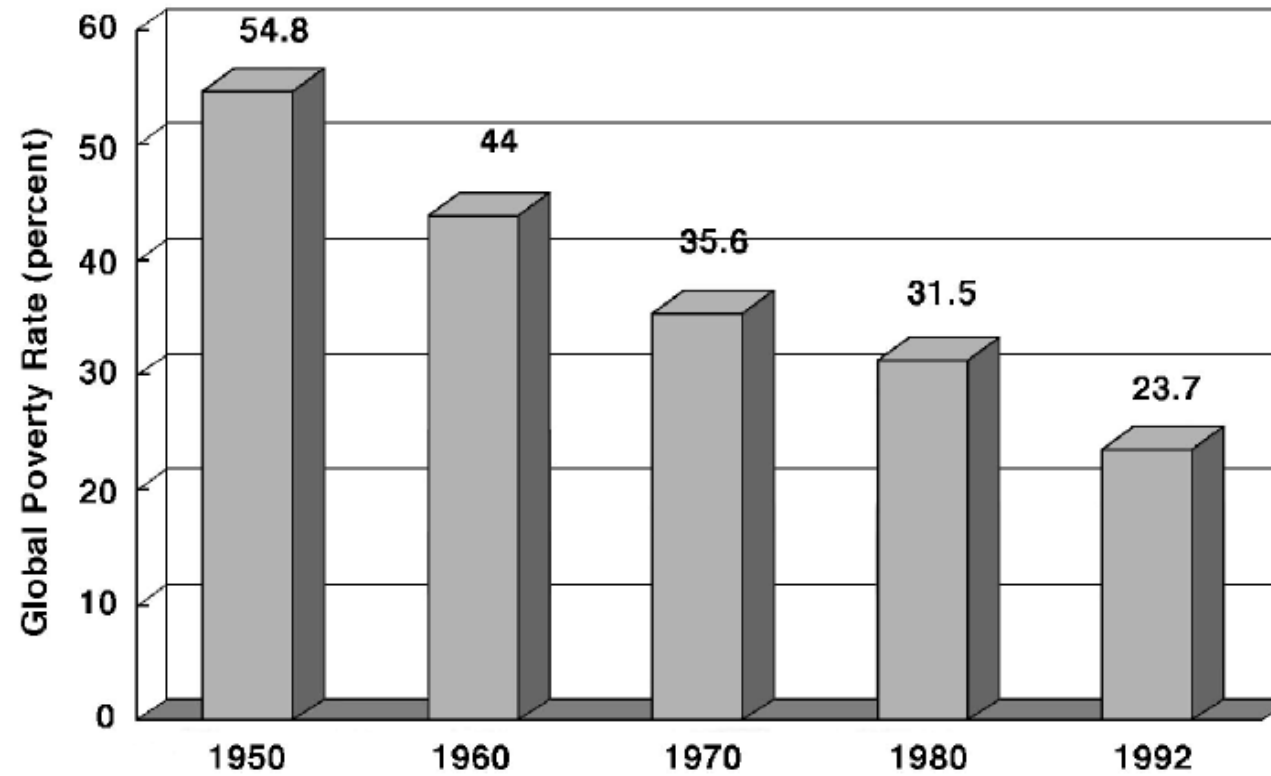
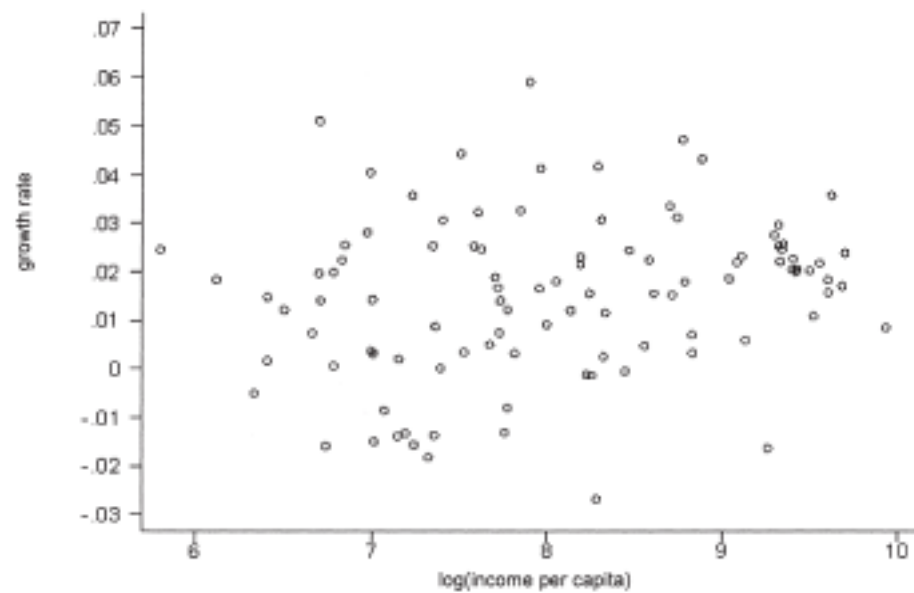


FIGURE 1. GLOBAL POVERTY RATES: PERCENTAGE OF PEOPLE LIVING ON LESS THAN \$1 PER DAY

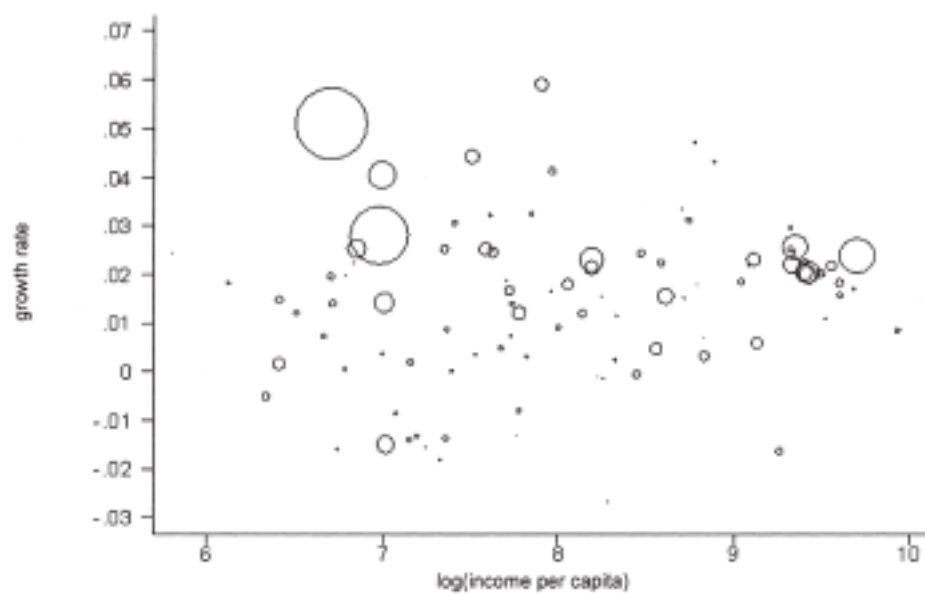
Source: Bourguignon and Morrisson (2002).

	GDP per capita	Fraction of population in extreme poverty	Fraction of high-school age children in school	Probability of surviving to age 65	
				Men	Women
U.K.	\$27,650	Almost zero	95%	0.83	0.89
Mexico	\$8,950	25%	60%	0.71	0.82
Mali	\$960	> 50%	< 10%	0.37	0.41

United States per capita GDP		Country at this level in 2004
Year	Level (2004 \$)	
1800	1,195	Kenya
1850	1,700	Bangladesh
1900	4,391	Morocco
1910	5,408	China
1916	6,189	Algeria
1920	6,180	Ukraine
1930	7,002	Namibia
1940	8,539	Romania
1950	12,783	Argentina
1960	15,099	Hungary
1970	20,065	South Korea
1980	24,729	Spain
1990	31,016	UK
2000	37,814	Ireland (almost)
2005	40,718	US, Norway



**FIGURE 1a**  
Growth Versus Initial Income (Unweighted)



**FIGURE 1b**  
Growth Versus Initial Income (Population-Weighted)



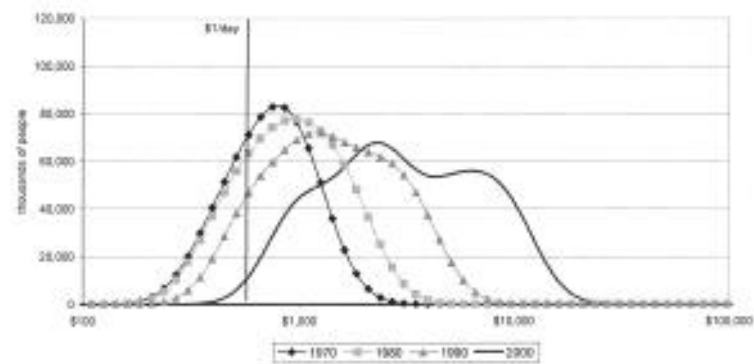


FIGURE IIa  
Distribution of Income in China

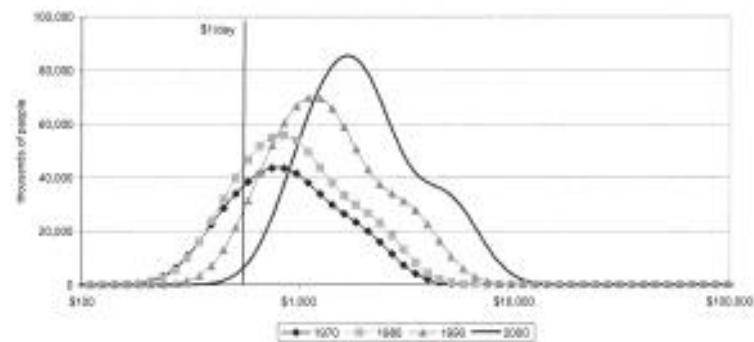


FIGURE IIb  
Distribution of Income in India

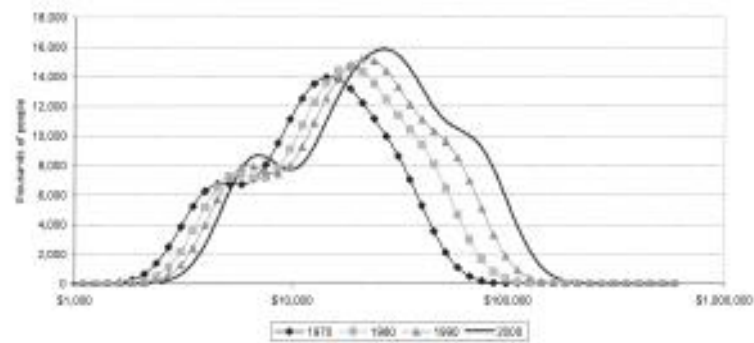
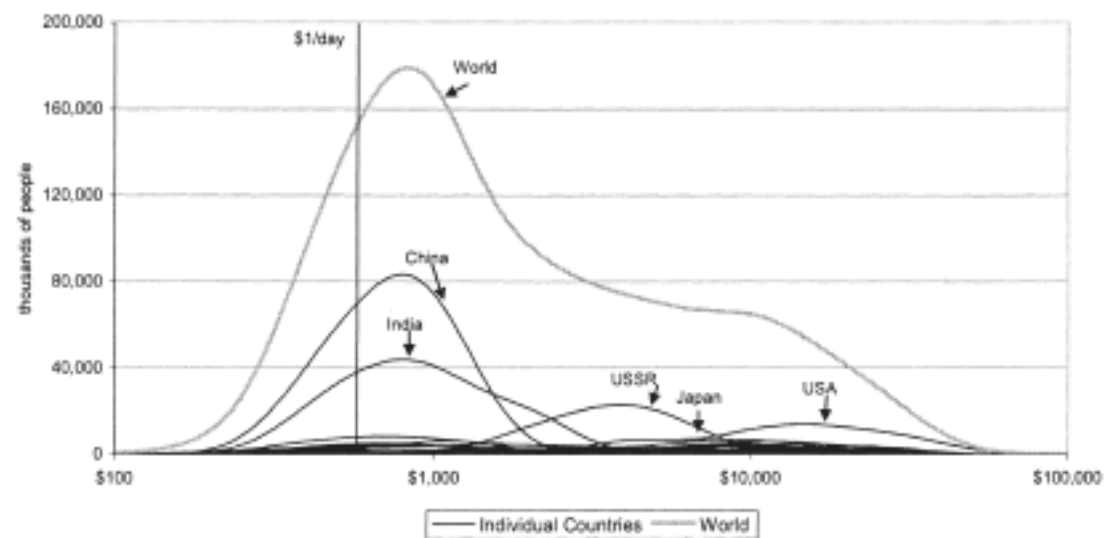
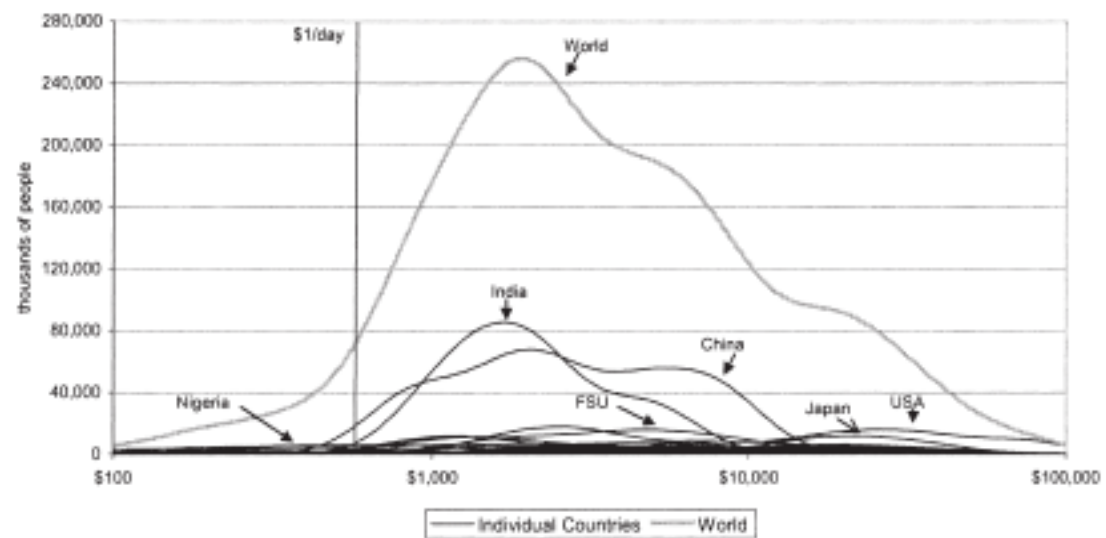


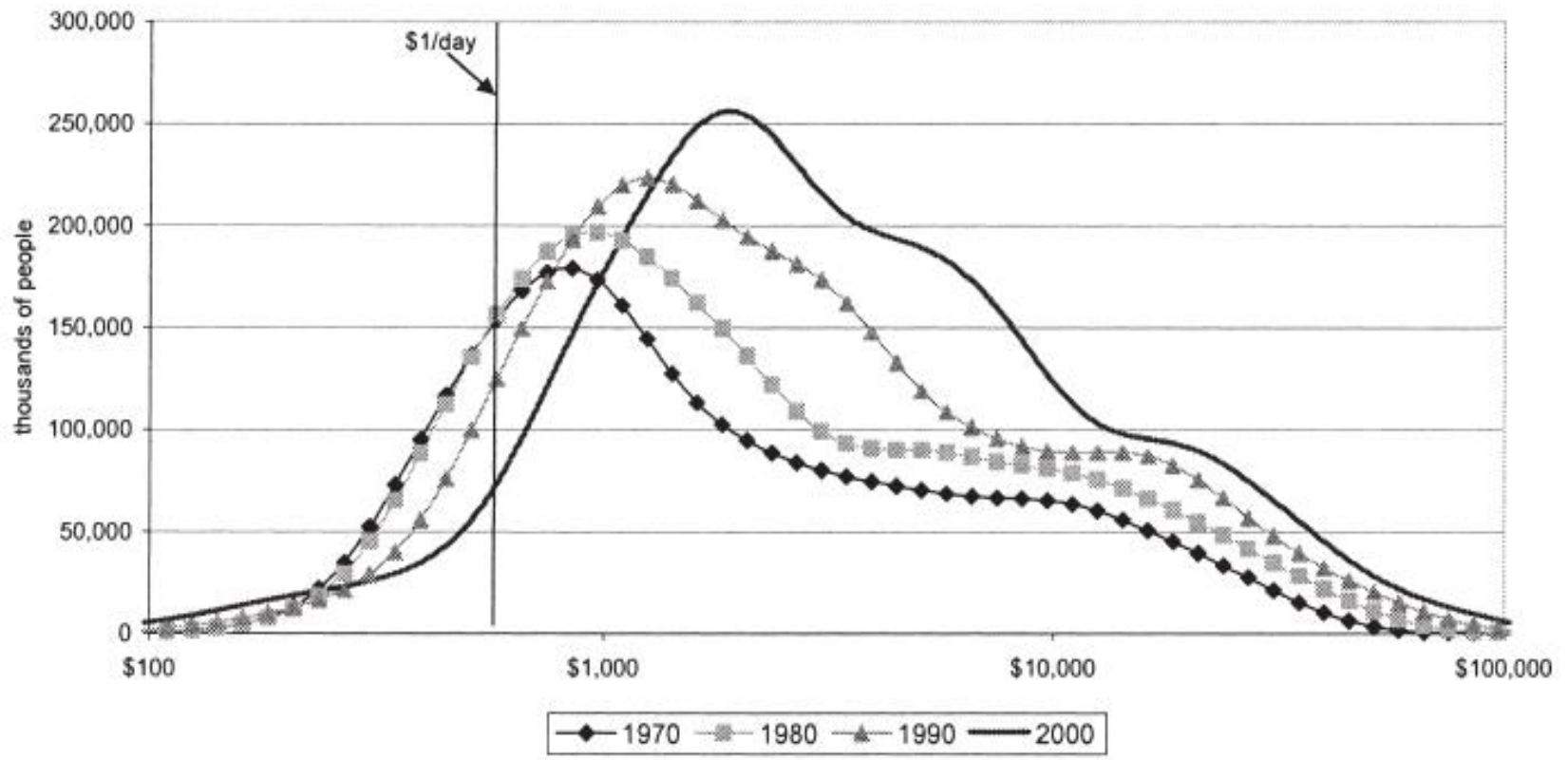
FIGURE IIc  
Distribution of Income in the United States

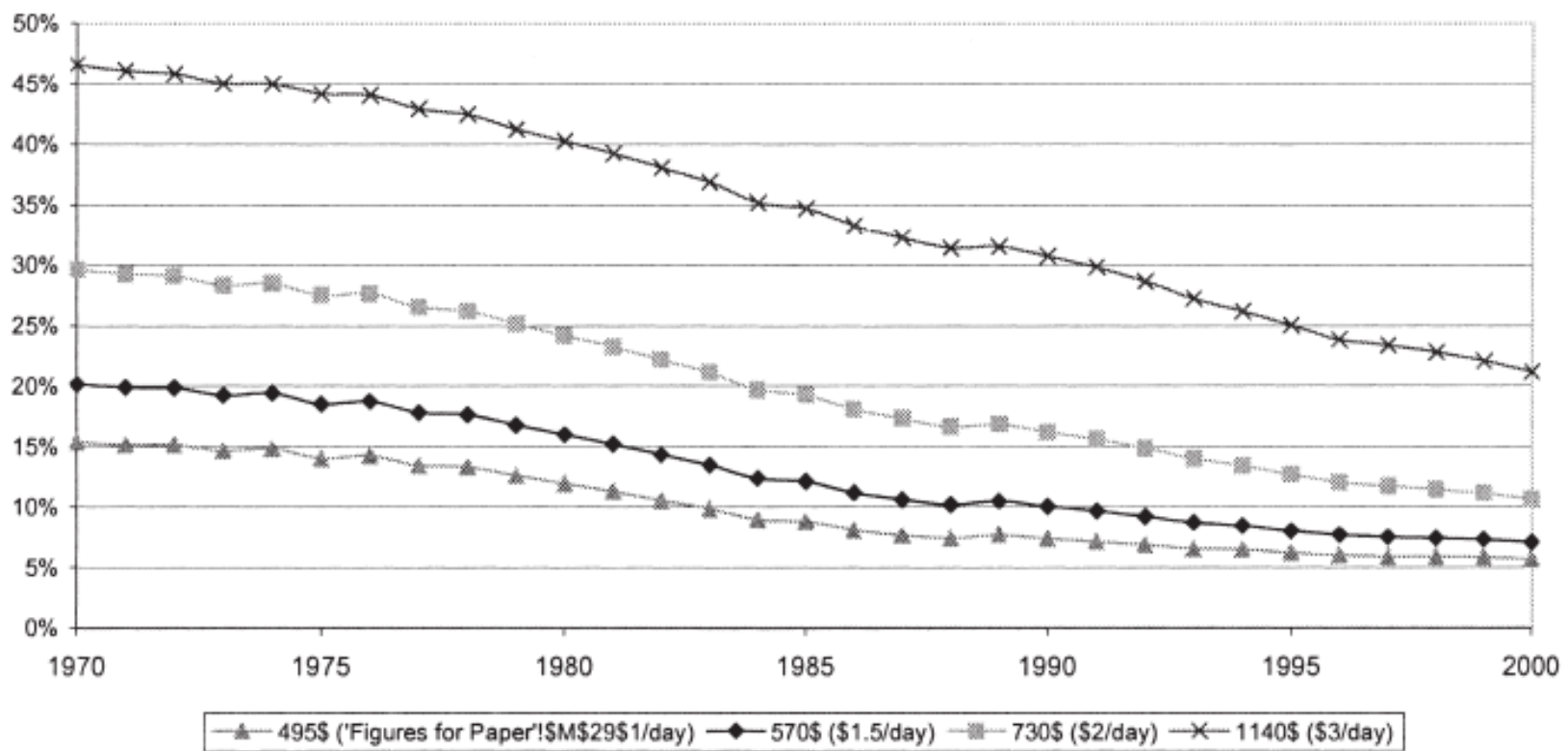


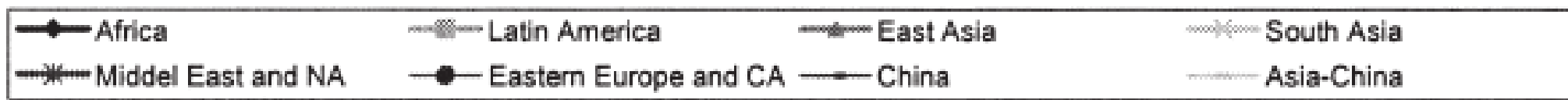
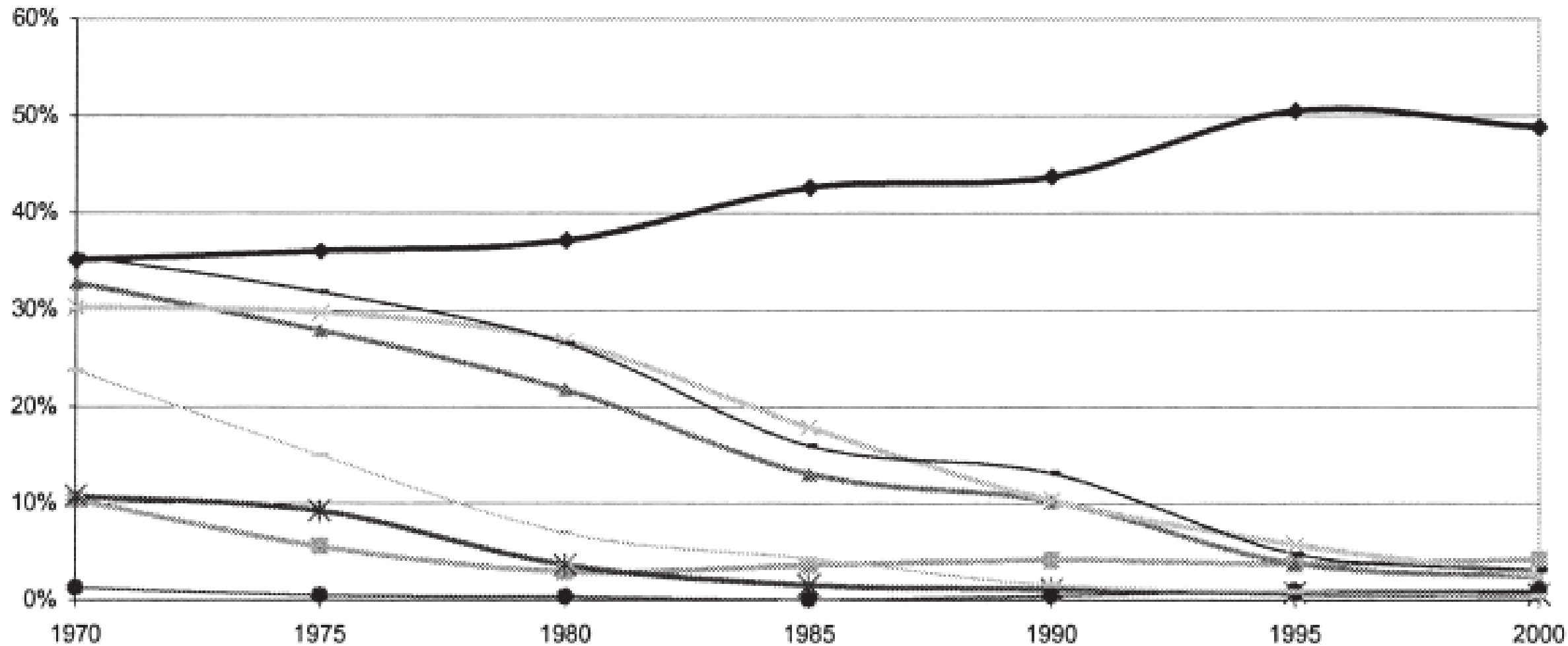
**FIGURE IIIa**  
The WDI and Individual Country Distributions in 1970



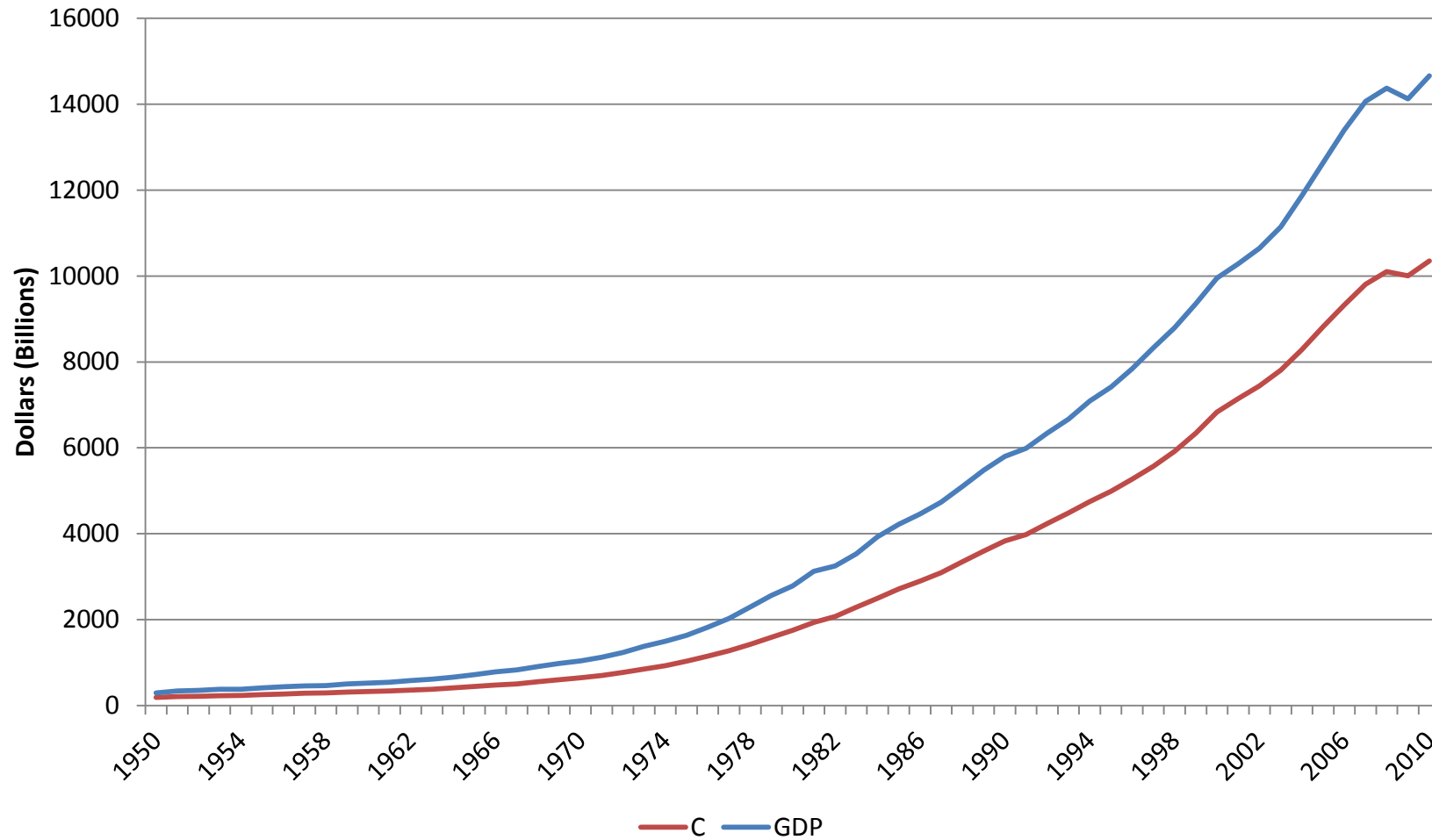
**FIGURE IIIb**  
The WDI and Individual Country Distributions in 2000





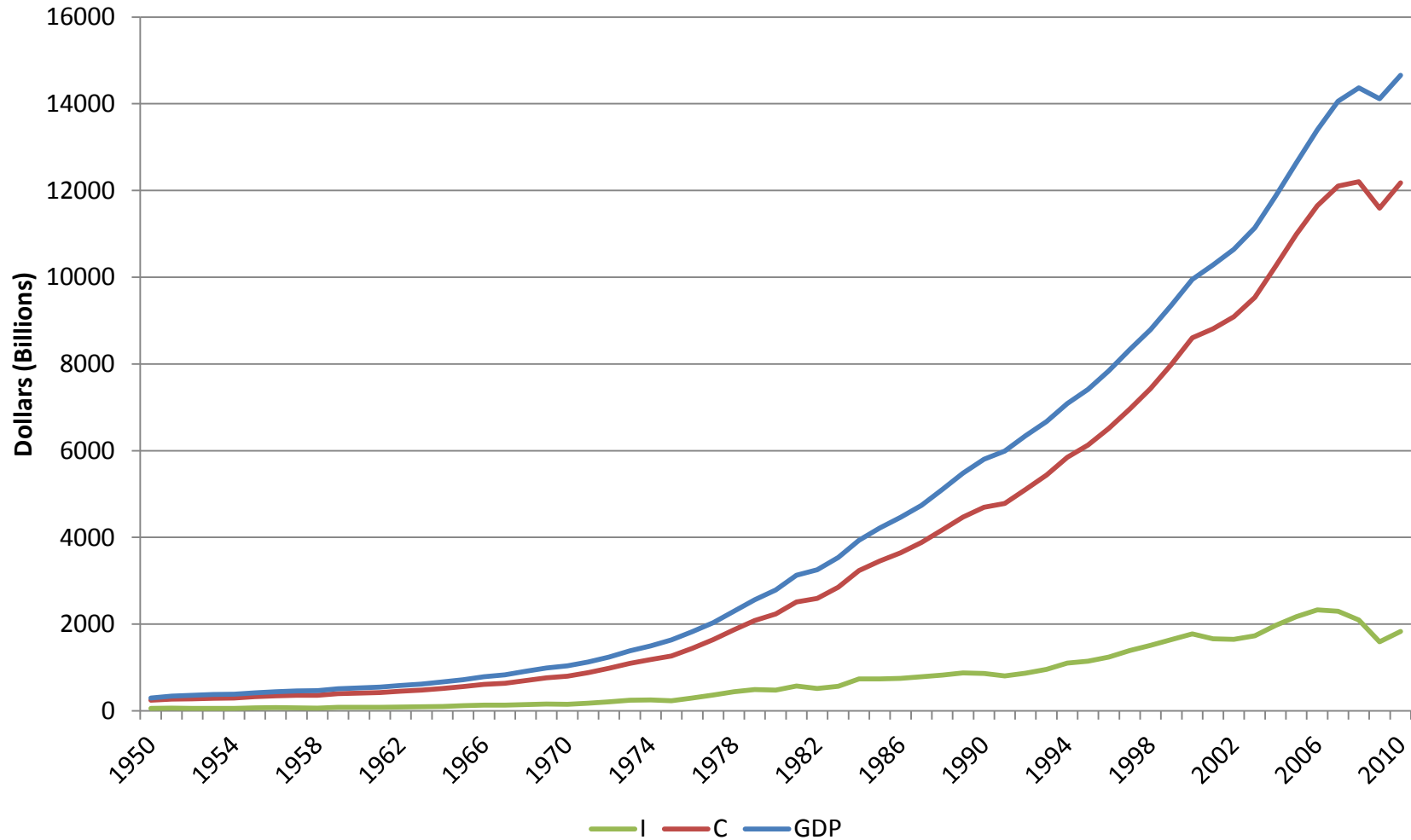


# Consumption and GDP



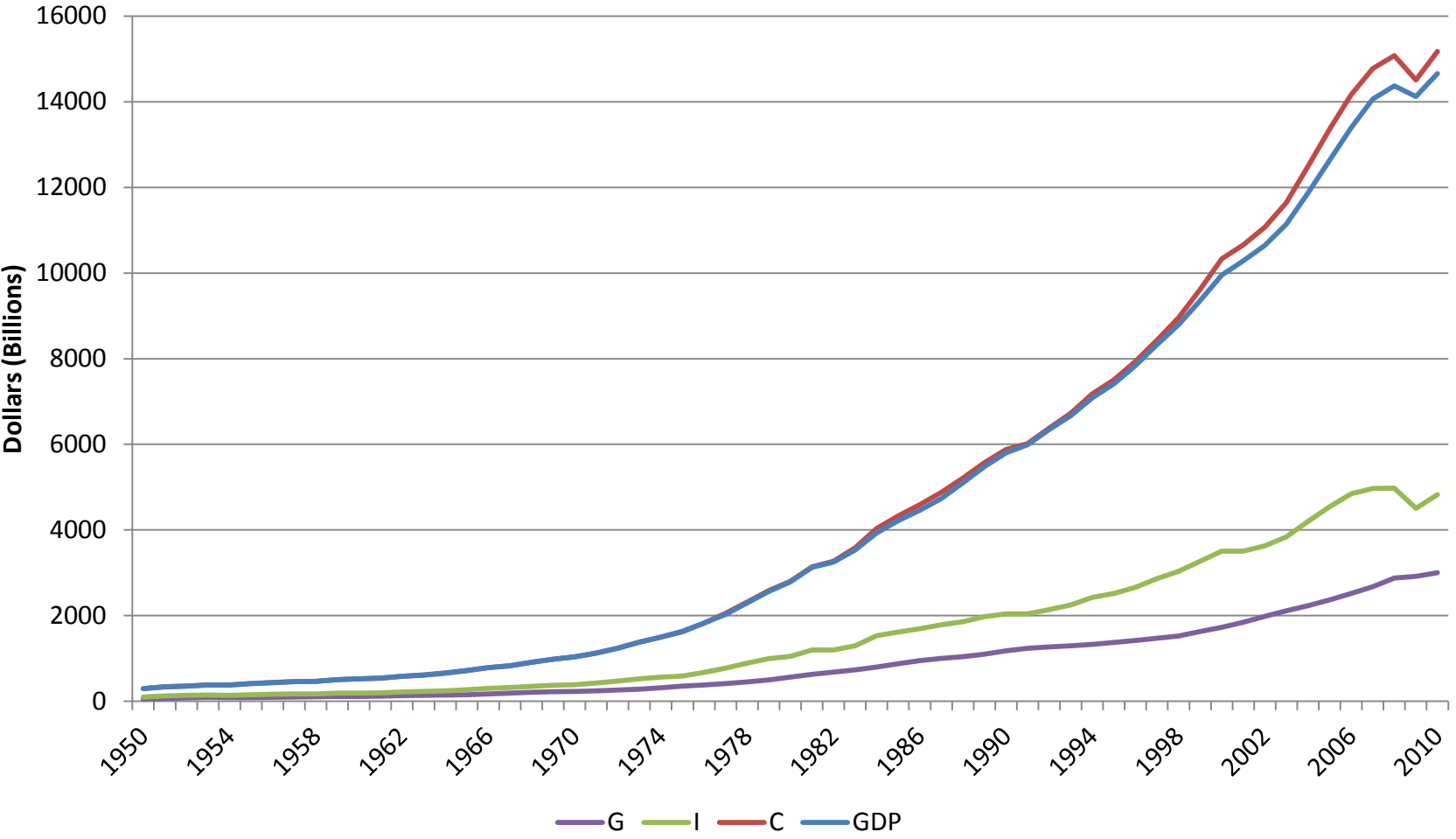
Source: The Bureau of Economic Analysis

# Consumption, Investment and GDP



Source: The Bureau of Economic Analysis

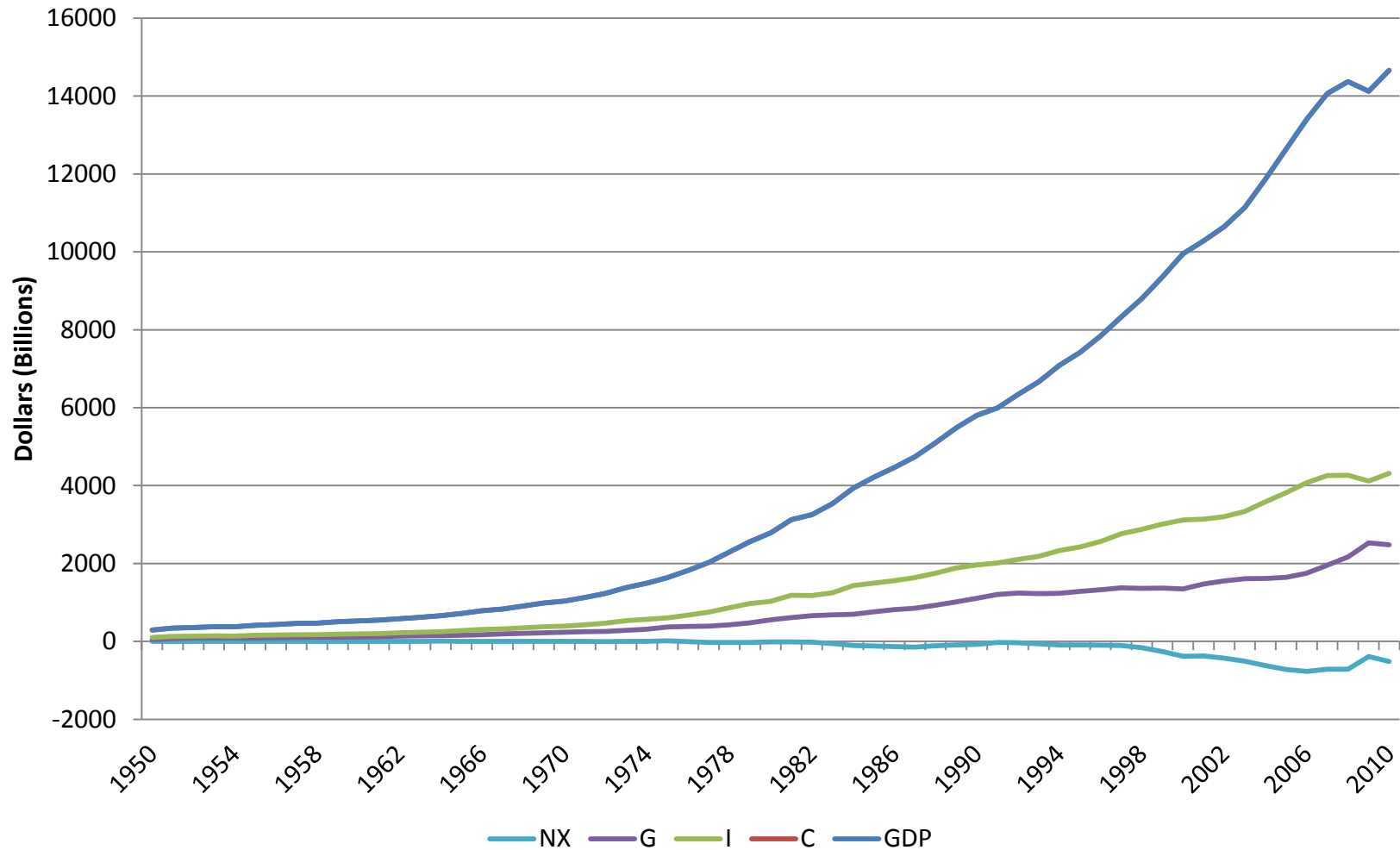
# Consumption, Investment, Government Expenditures and GDP



Source: The Bureau of Economic Analysis

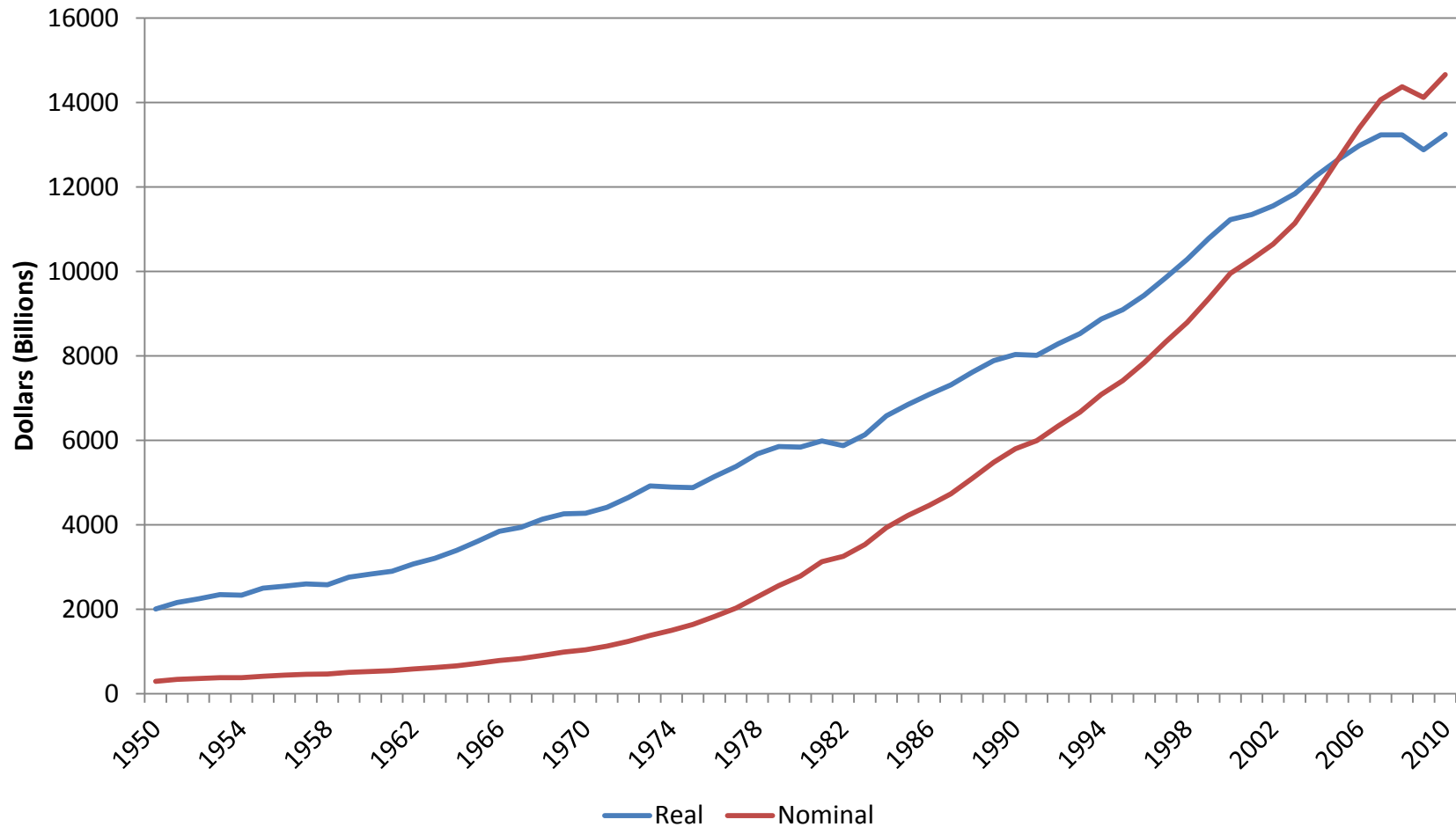


# Consumption, Investment, Government Expenditure, Net Export and GDP



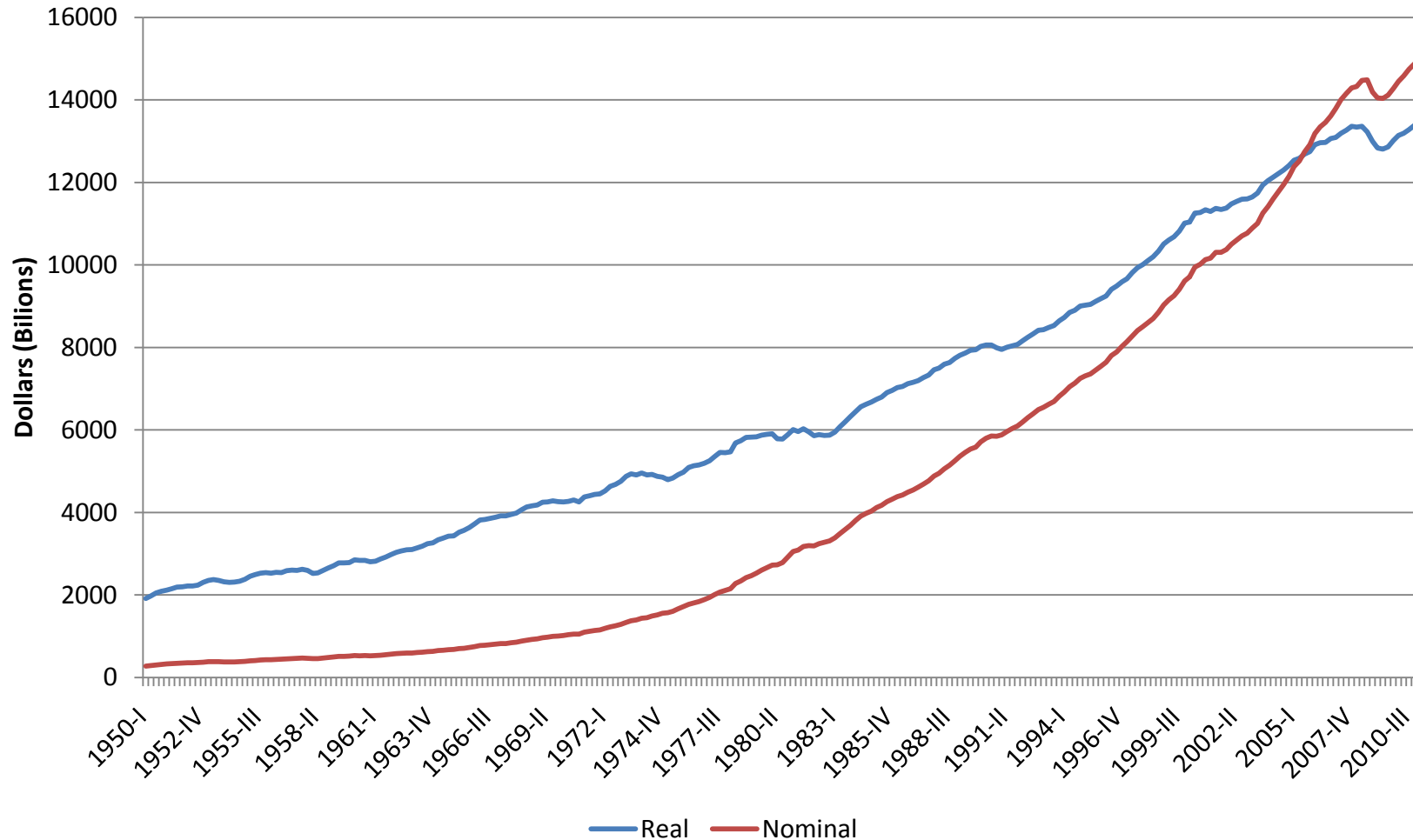
Source: The Bureau of Economic Analysis

# Annual Real and Nominal GDP



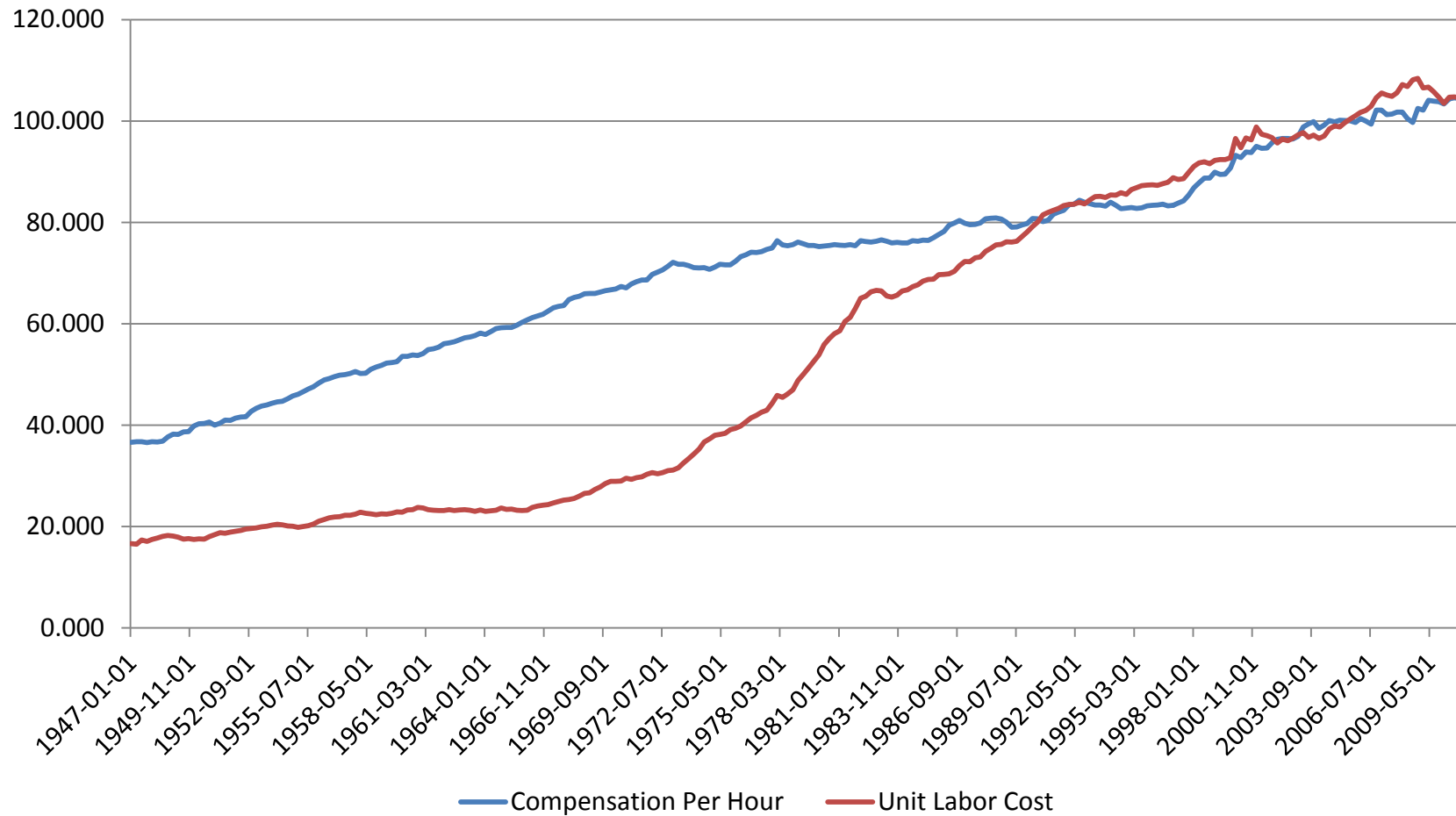
Source: The Bureau of Economic Analysis

# Quarterly Real and Nominal GDP



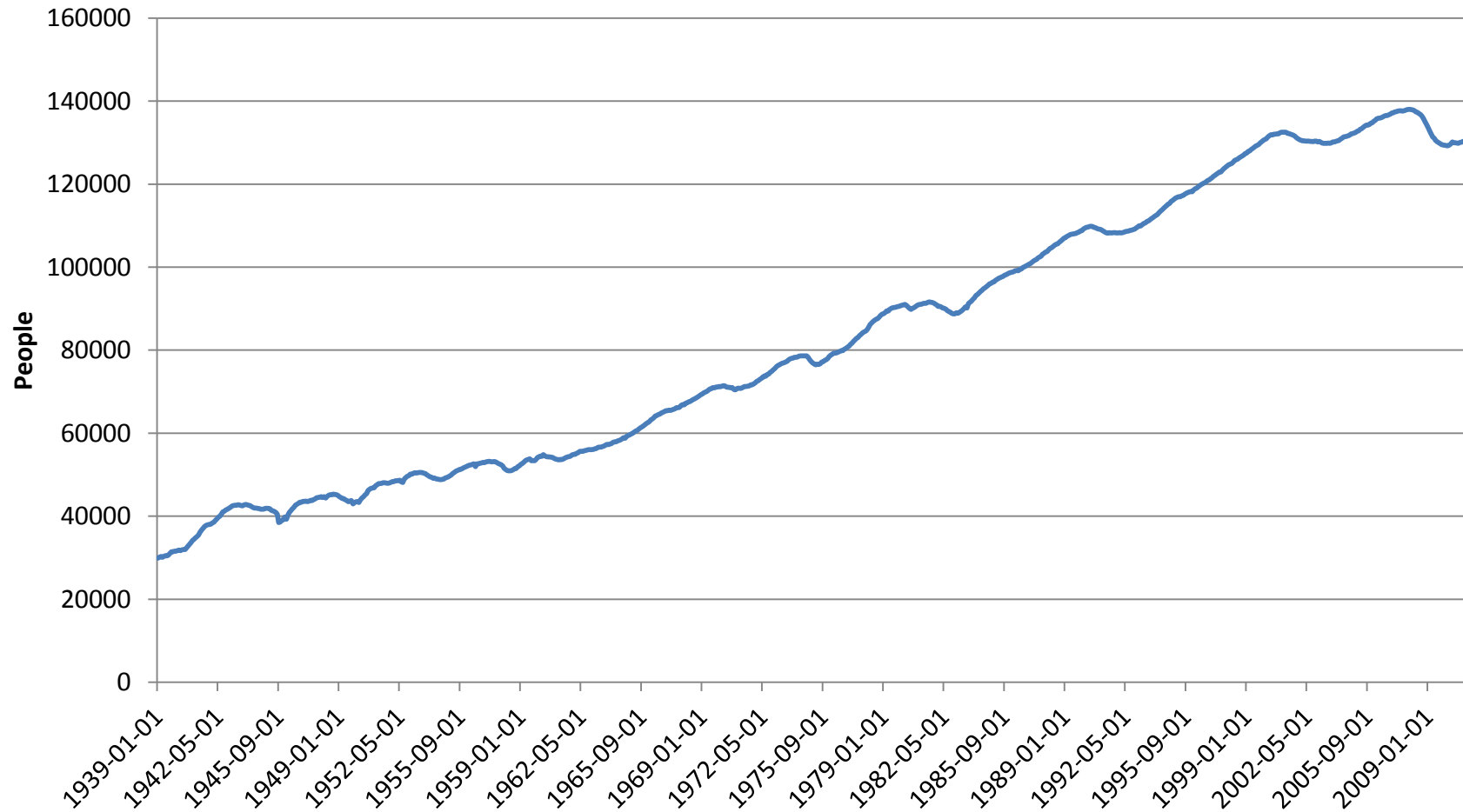
Source: The Bureau of Economic Analysis

# Wages



Source: The Federal Reserve

# Non-Farm Employees



Source: The Federal Reserve

- Growth theory is about the LONG RUN.
  - 50, 100, 1000 years!
- Business cycles is about the SHORT RUN.
  - 5 years.
- Our main question is then: what determines the growth rate of different economies?

- A useful approximation:  $\log(1 + g) \approx g$  if  $g$  is close to 0
- Define:  $g_t$  is the growth rate of GDP from  $t$  to  $t + 1$ 
  - $Y_{t+1} = (1 + g_t)Y_t$
  - $\log Y_{t+1} - \log Y_t = \log(1 + g_t) \approx g_t$
- Example: Suppose  $g$  is constant:
  - Using the growth definition we obtain

$$Y_1 = (1 + g) Y_0$$

$$Y_2 = (1 + g) Y_1$$

$$= (1 + g)^2 Y_0$$

$$Y_t = (1 + g)^t Y_0$$

- $\log Y_t = tg + \log Y_0$

**Table 3.1** | Economic Growth and China's Real GDP per Person in 2020\*

Growth Rate of Real GDP per Person from 2000 to 2020	Real GDP per Person in 2020 (in 2000 dollars)
2% per year	5,820
5% per year	10,600
10% per year	28,800

\*China starts with real per capita GDP of \$3,900 in 2000. We calculate the level of real GDP per person in 2020 as follows. Start with the natural logarithm of real GDP per person in 2000:  $\ln(3,900) = 8.269$ . Then multiply the number of years, 20, by the growth rate—for example, 0.02 if the growth rate is 2% per year:  $20 \times 0.02 = 0.40$ . Add this to 8.269 to get 8.669. Then take the exponential of 8.669 to get the answer, 5,820.

person in 2020 would be only \$5,800, 17% of the U.S. level in 2000. Thus, differences in rates of economic growth, when sustained for 20 years or more, make an enormous difference in standards.

Source: Barro, Macroeconomics (2007)



# Determinants of Growth

*“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 of anything else.”*

R.E. Lucas, Jr. (1988), On the Mechanics of Economic Development, Journal of Monetary Economics. 12970 citations on Google Scholar!

# Determinants of Growth

- Physical Capital:
  - Machines, Buildings, Infrastructure.
- Human Resources:
  - Labor supply, education, motivation, human capital.
- Technology:
  - Science, engineering, management technique
- Natural Resources:
  - Land, oil, minerals, quality of the environment.
- Institutions:
  - Property rights, legal system, patent and copyright law.
- Culture:
  - Social capital, entrepreneurial energy, the protestant work ethic and the spirit of capitalism (Max Weber)

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