



The Facts of Economic Growth

Chad Jones

Stanford GSB

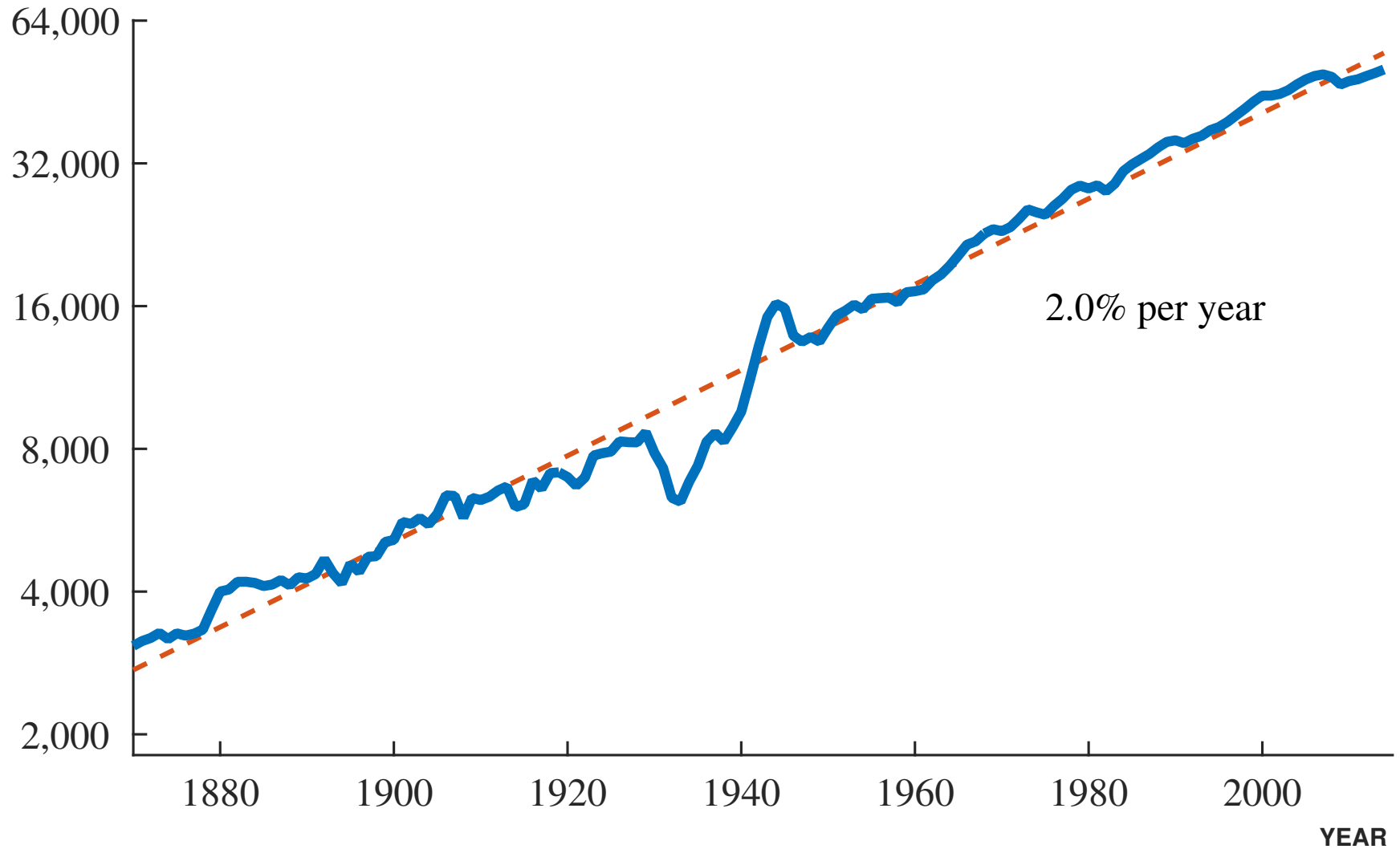
Prepared for the Handbook of Macroeconomics

Outline

- Facts of Frontier Growth (e.g. U.S. or West)
 - Basic facts
 - Growth accounting and components
 - Miscellaneous
- The Spread of Growth
 - Basic facts
 - Development accounting
 - Why such large TFP differences?

GDP per person in the United States

LOG SCALE, CHAINED 2009 DOLLARS

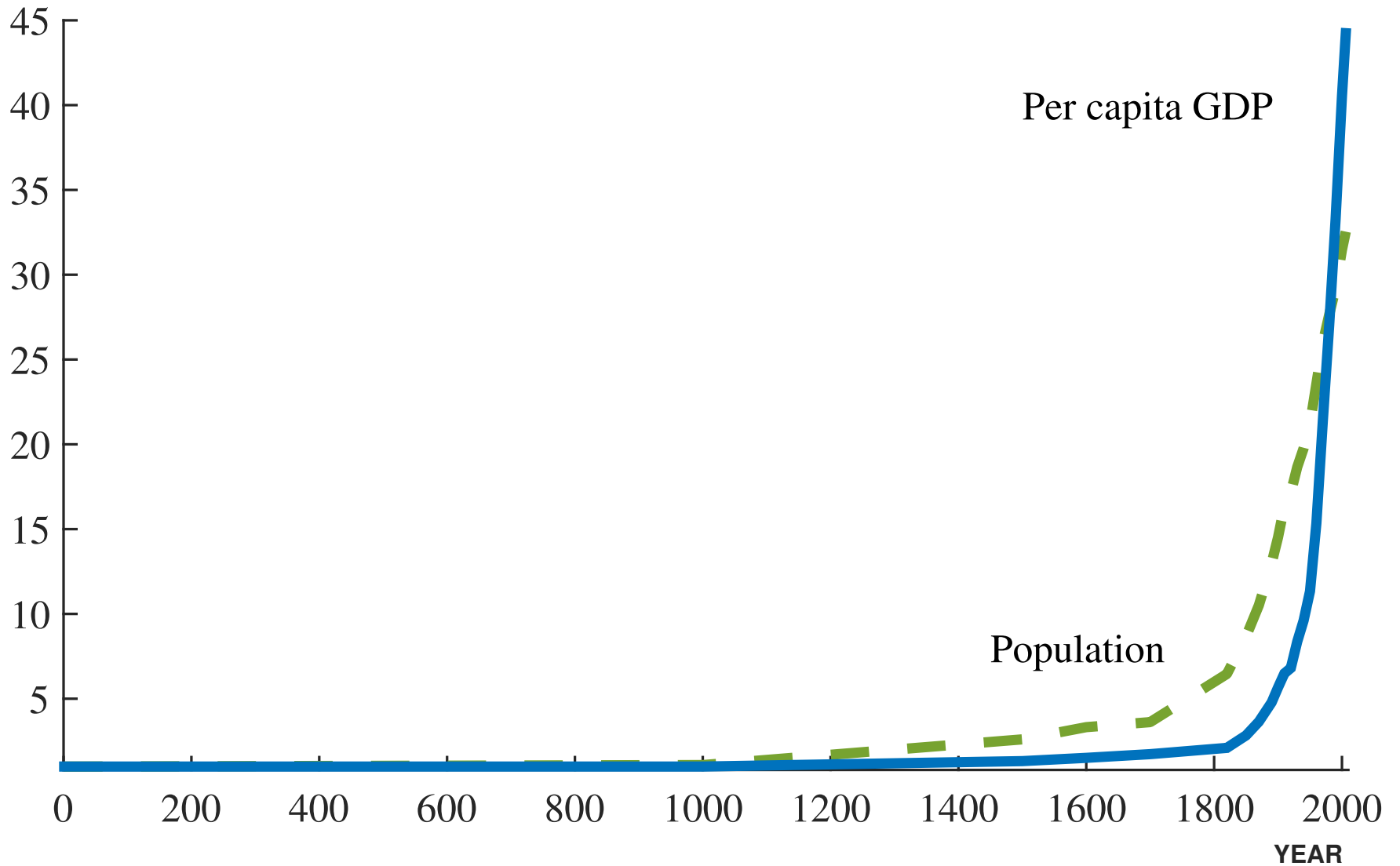


The Stability of U.S. Growth

Period	Growth Rate	Period	Growth Rate
1870–2007	2.03	1973–1995	1.82
1870–1929	1.76	1995–2007	2.13
1929–2007	2.23		
1900–1950	2.06	1995–2001	2.55
1950–2007	2.16	2001–2007	1.72
1950–1973	2.50		
1973–2007	1.93		

Economic Growth over the Very Long Run

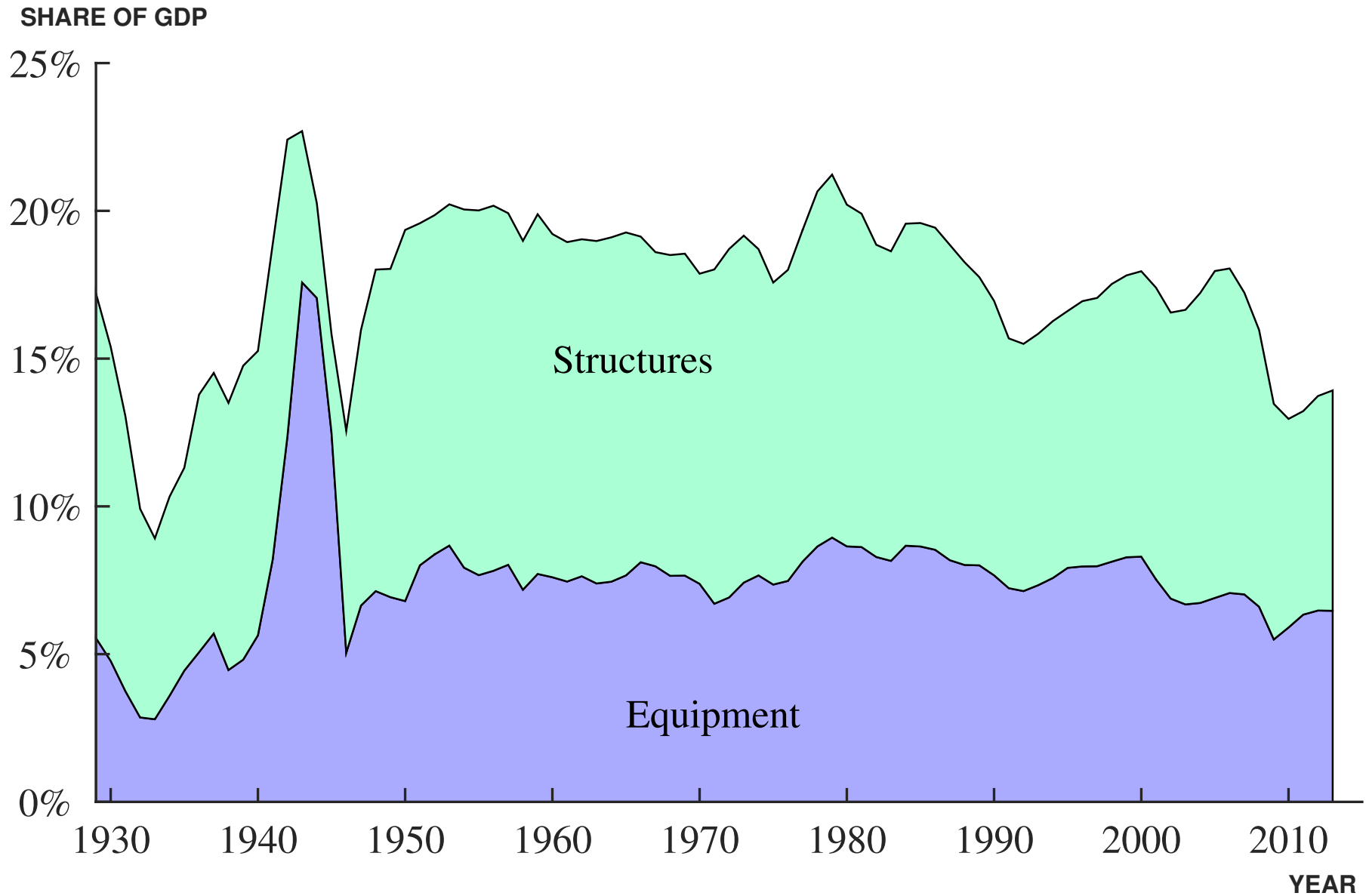
INDEX (1.0 IN INITIAL YEAR)



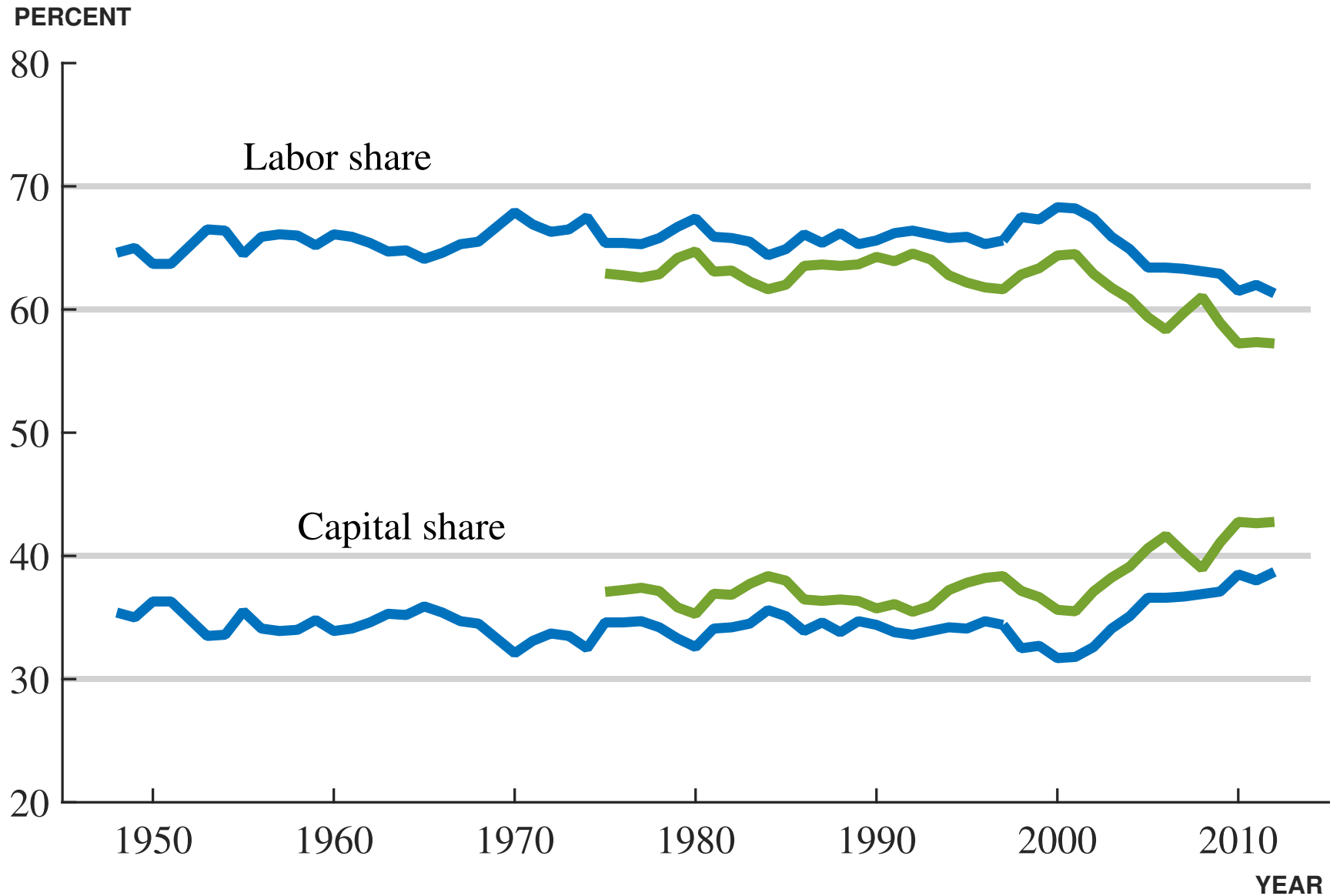
Growth Accounting for the United States

Period	Output per hour	K/Y	Contributions from	
			Labor Composition	Labor-Aug. TFP
1948–2013	2.5	0.1	0.3	2.0
1948–1973	3.3	-0.2	0.3	3.2
1973–1990	1.6	0.5	0.3	0.8
1990–1995	1.6	0.2	0.7	0.7
1995–2000	3.0	0.3	0.3	2.3
2000–2007	2.7	0.2	0.3	2.2
2007–2013	1.7	0.1	0.5	1.1

U.S. Investment in Physical Capital

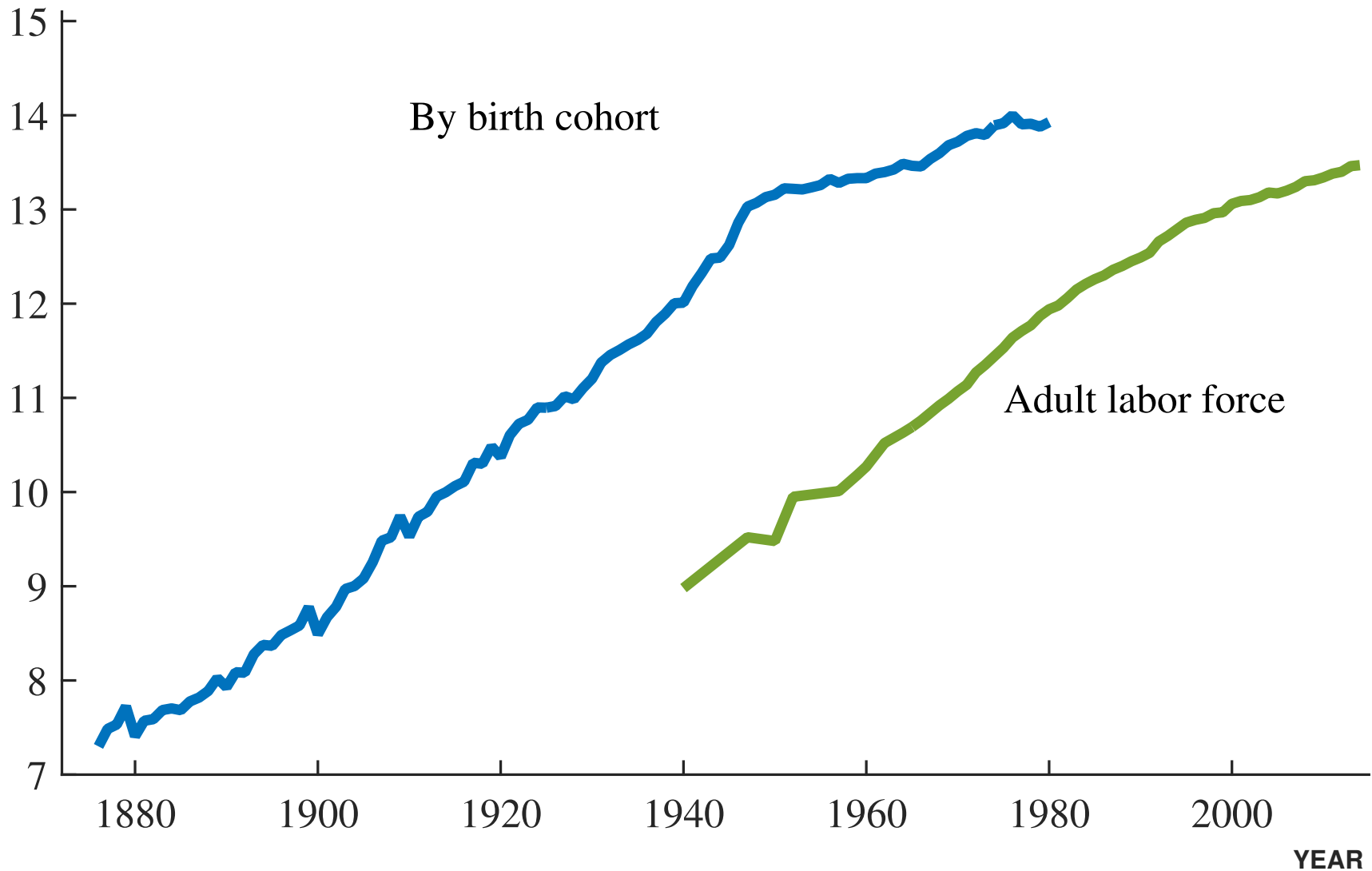


U.S. Capital and Labor Shares of Factor Payments

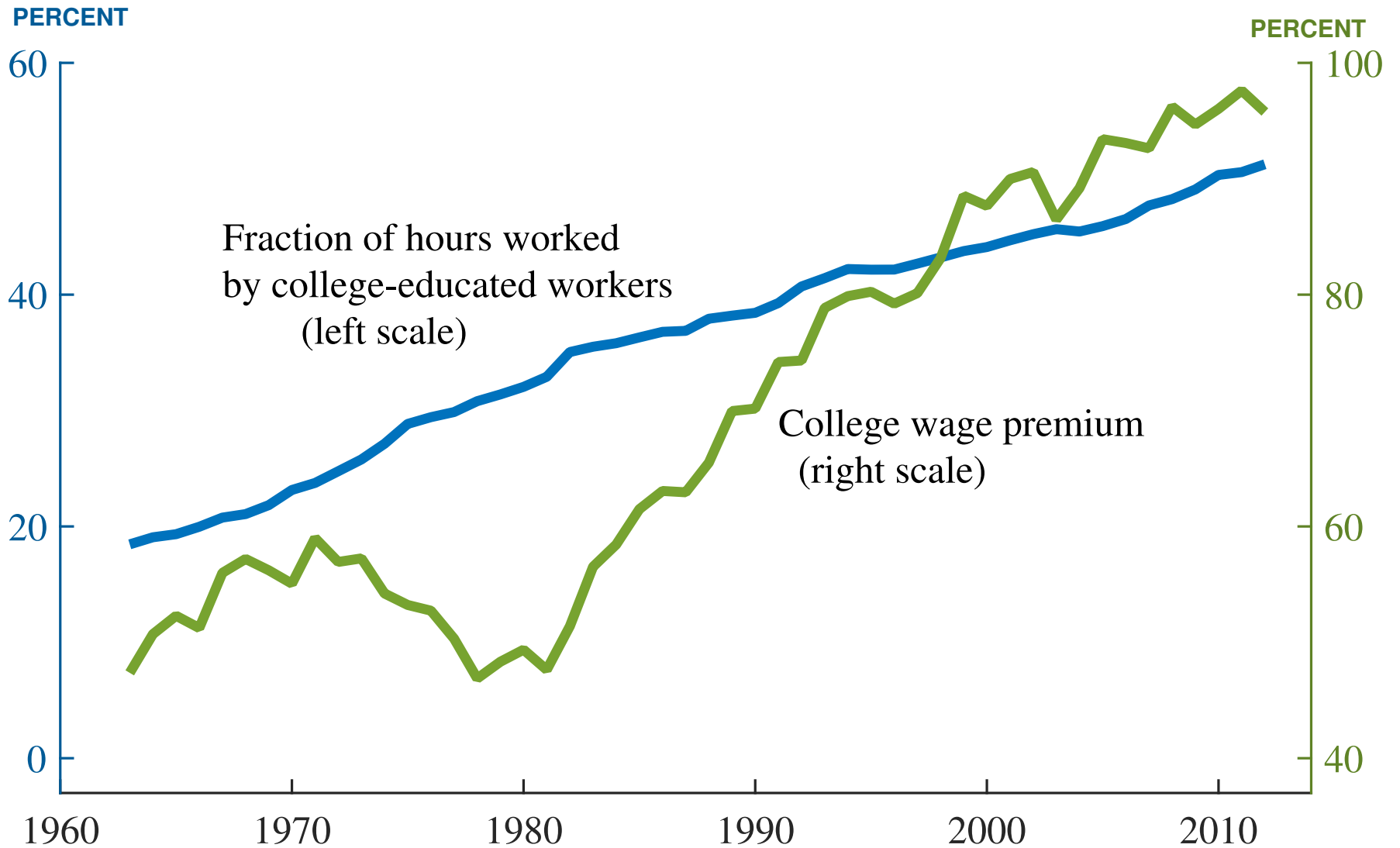


U.S. Educational Attainment

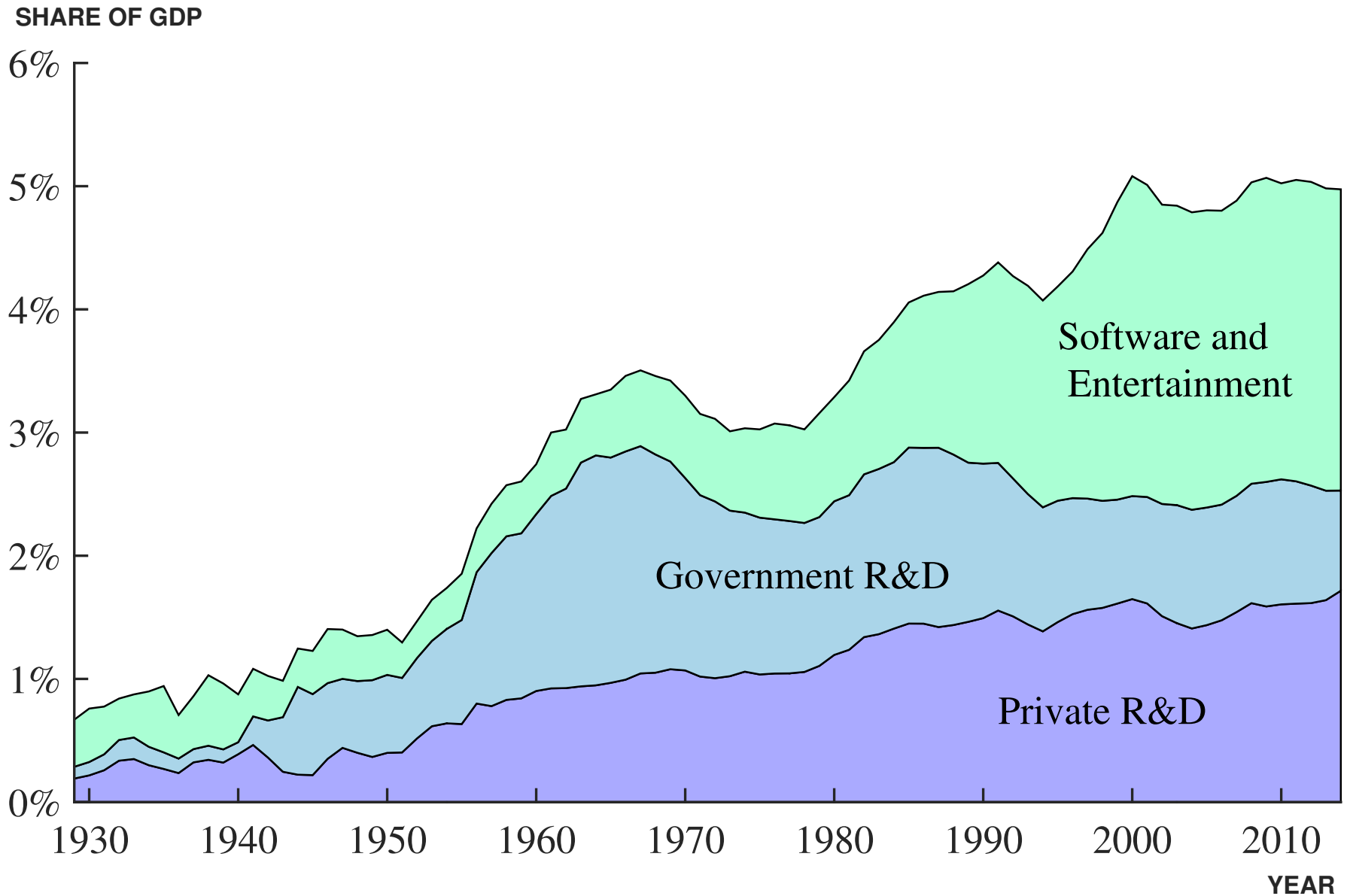
YEARS OF SCHOOLING



College Graduates and the College Wage Premium

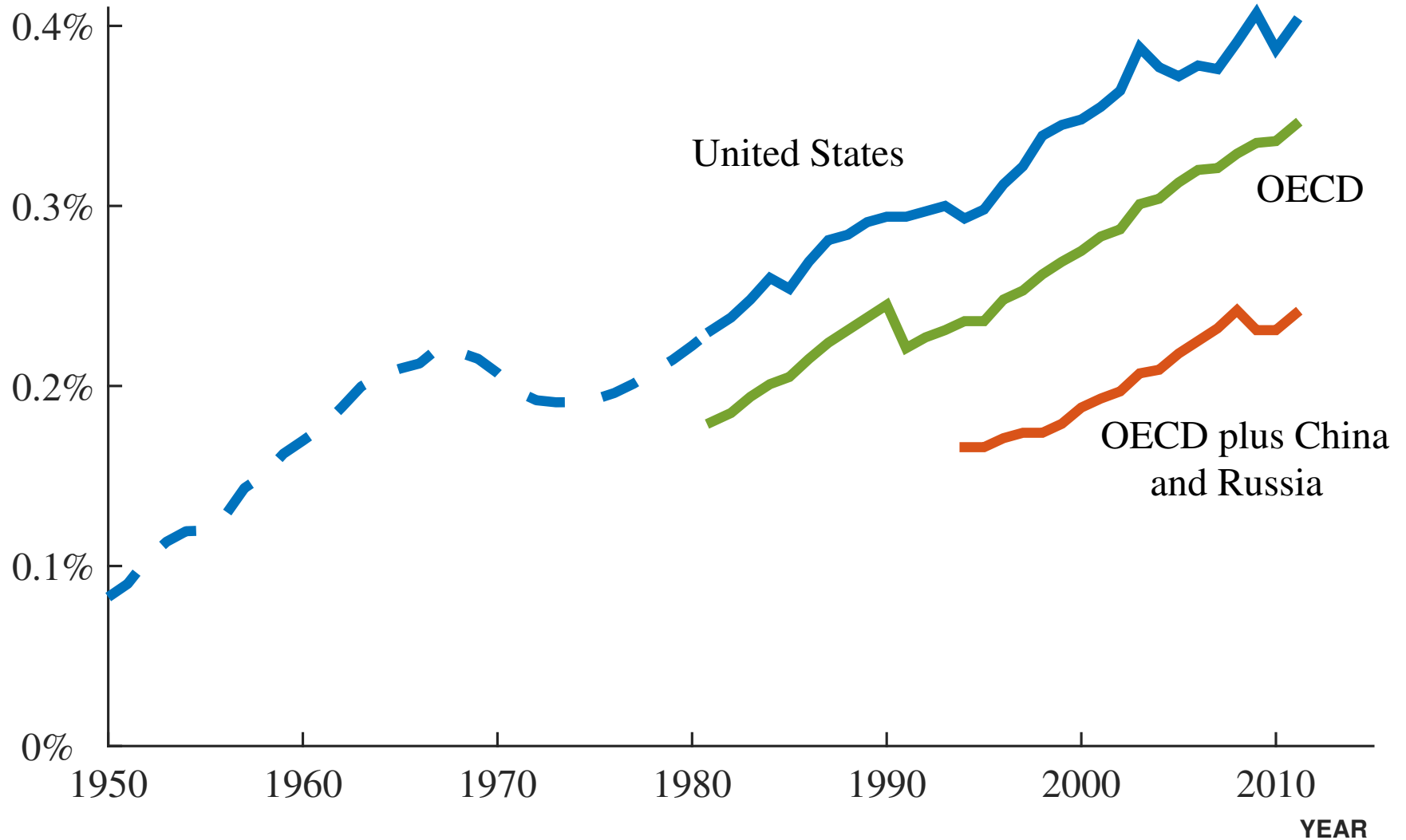


U.S. Research and Development Spending



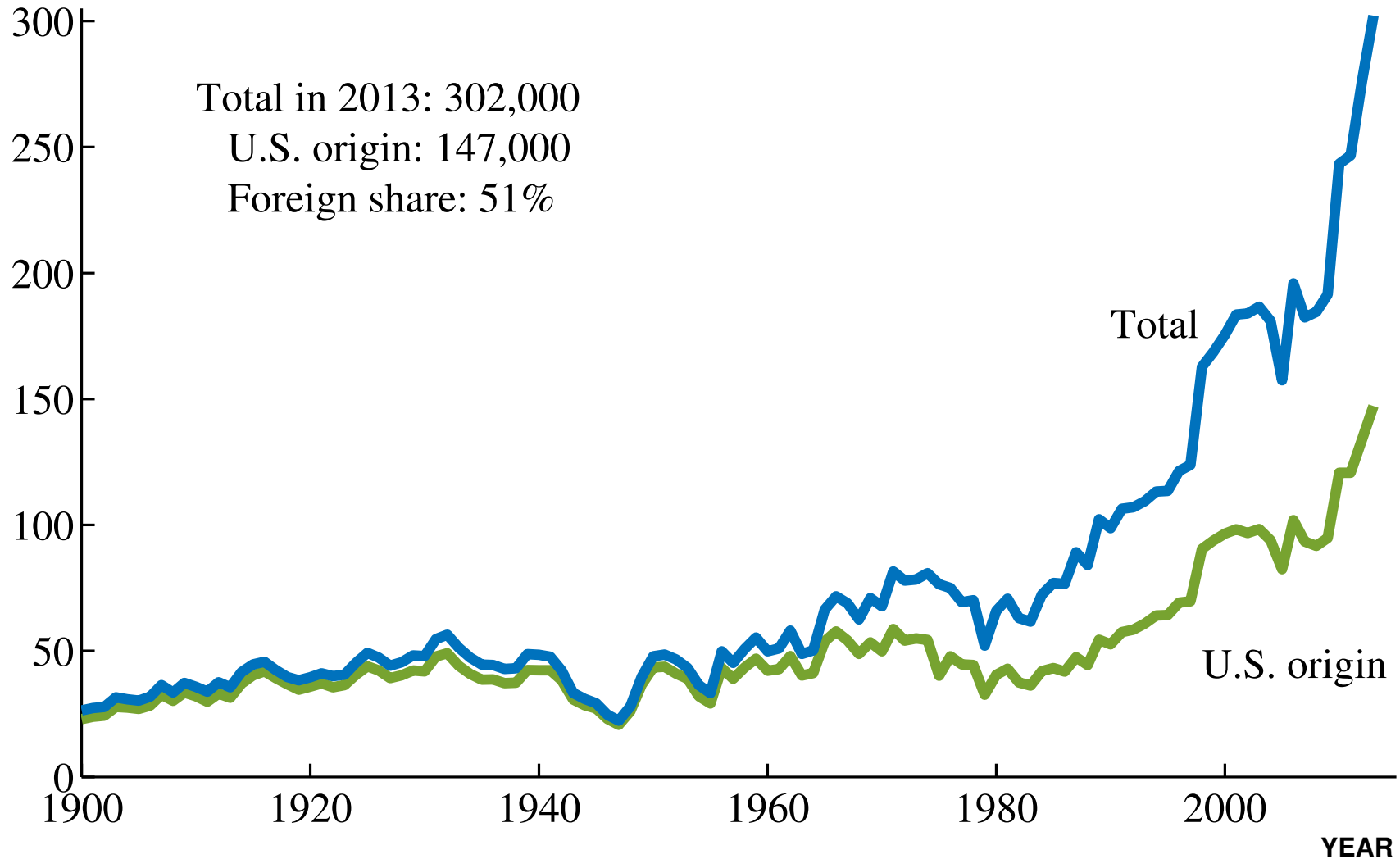
Share of Employment in R&D

SHARE OF THE POPULATION

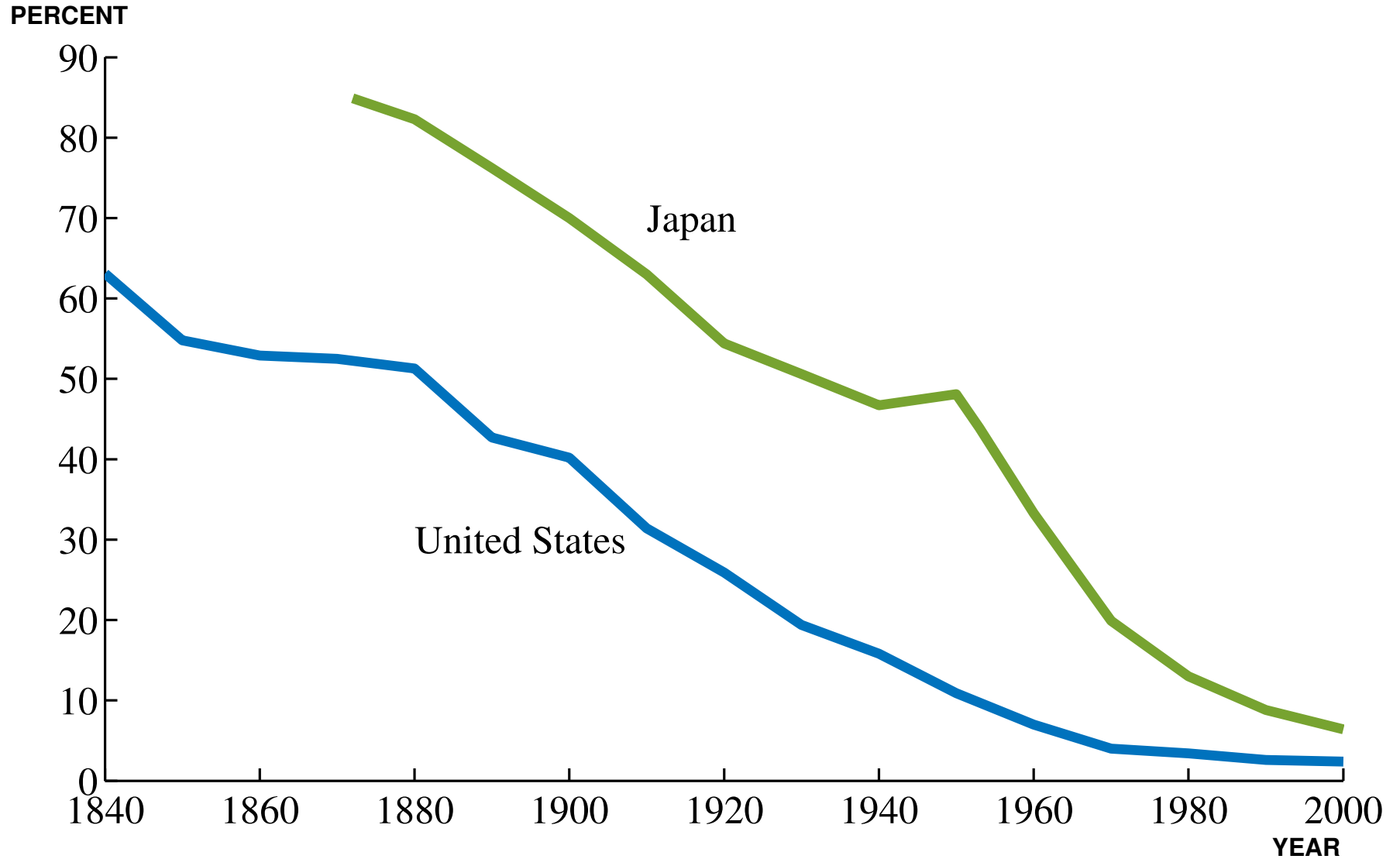


U.S. Patents

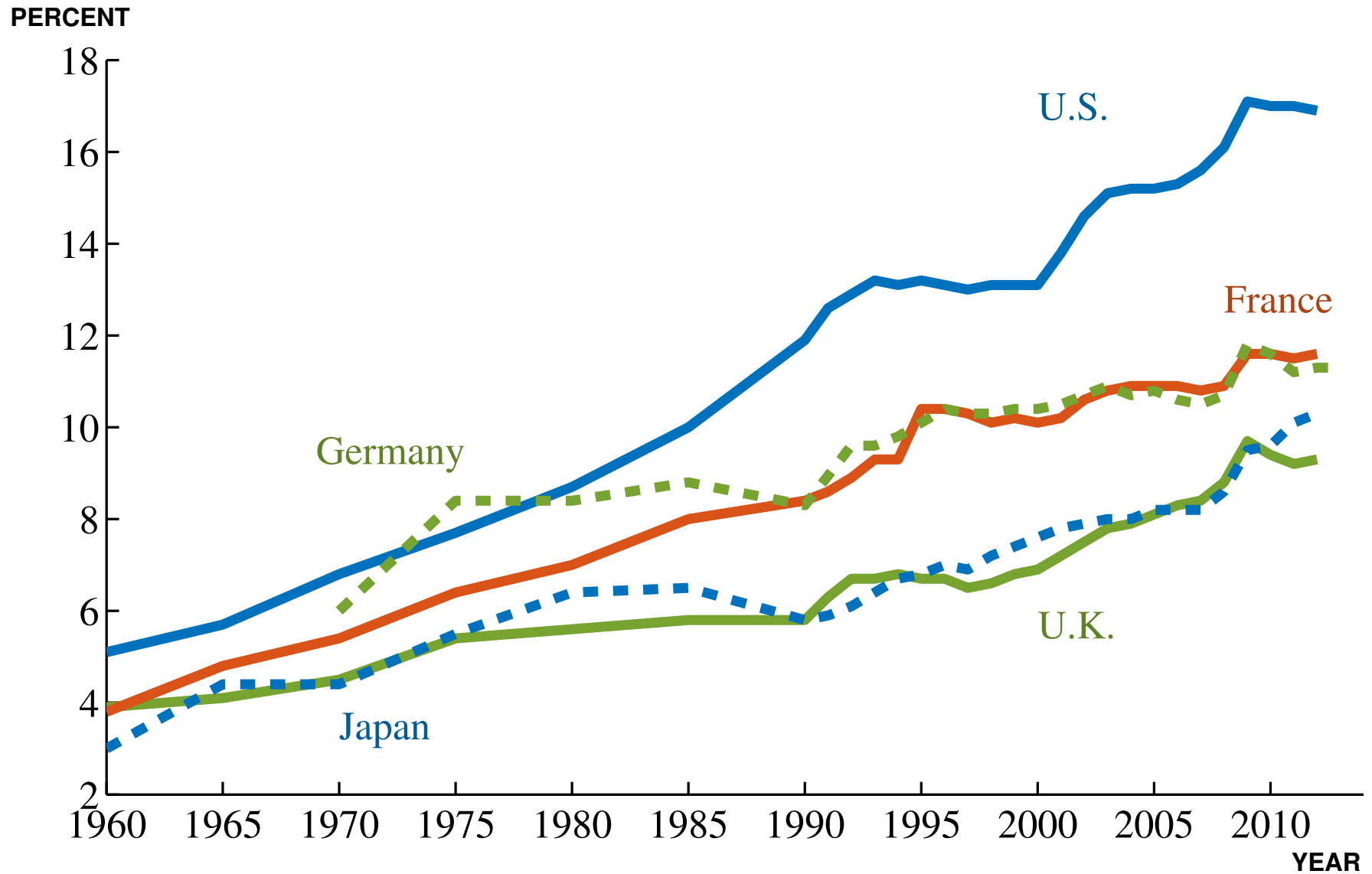
THOUSANDS



Employment in Agriculture

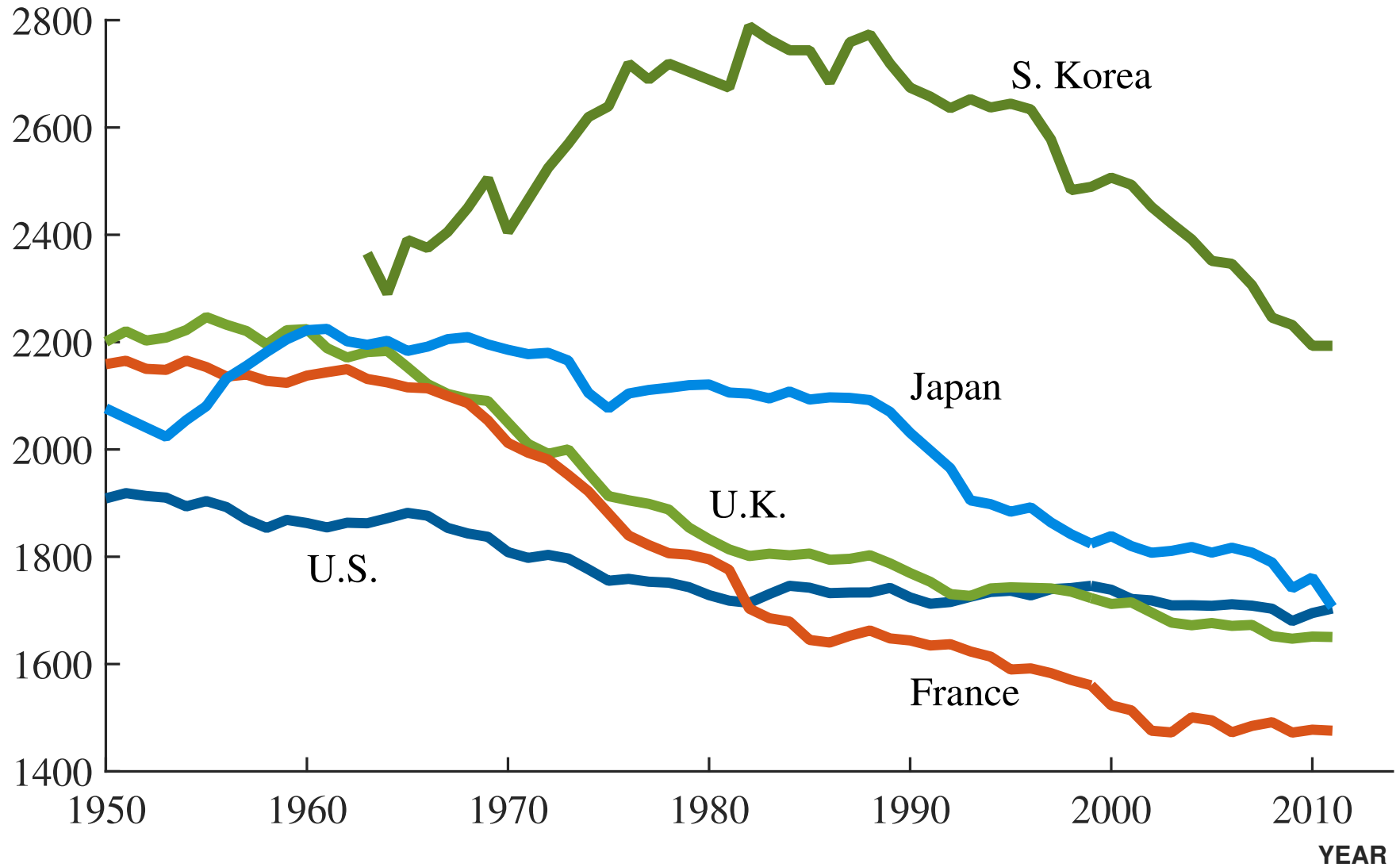


Health Spending as a Share of GDP



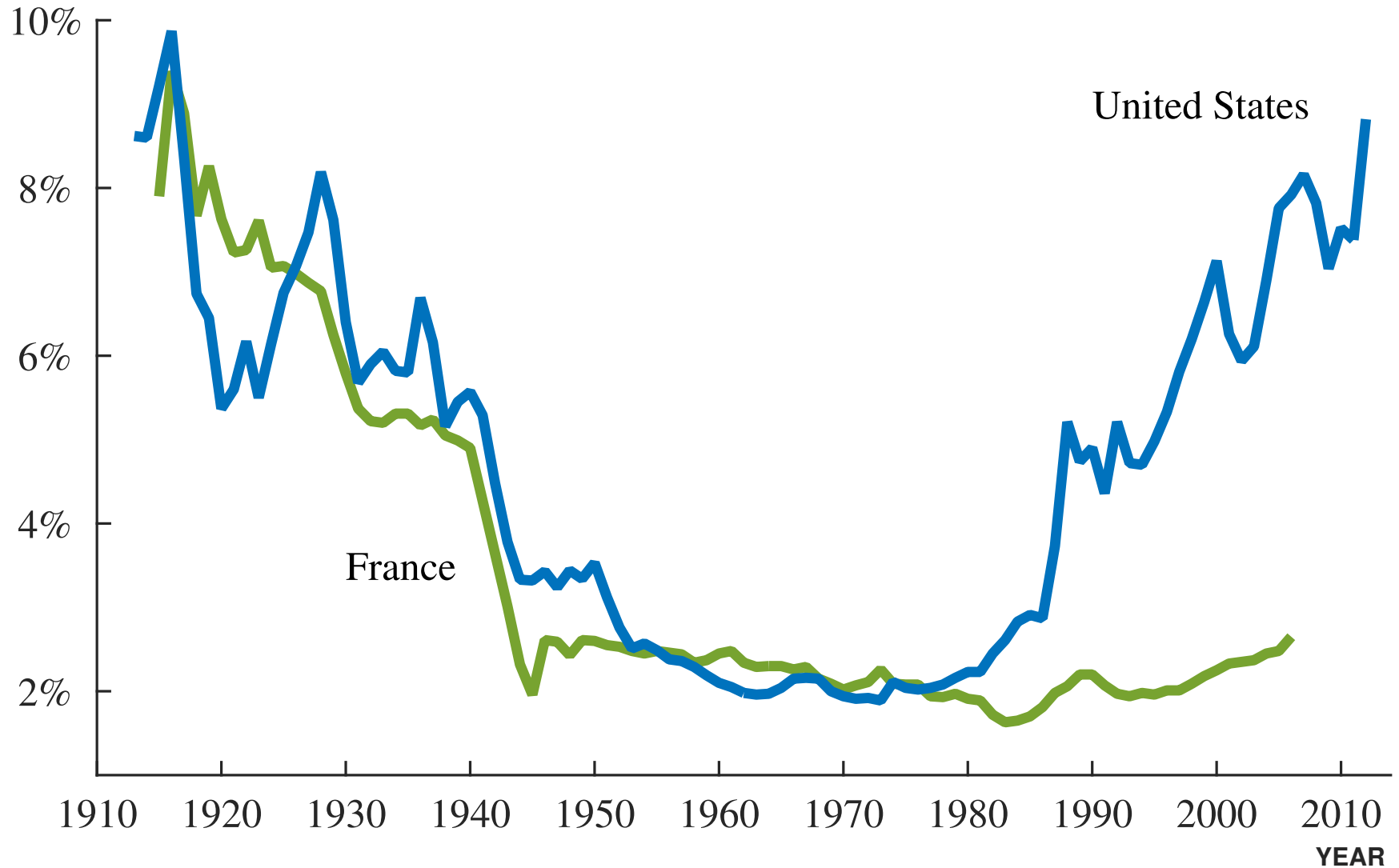
Average Annual Hours Worked

AVERAGE ANNUAL HOURS WORKED



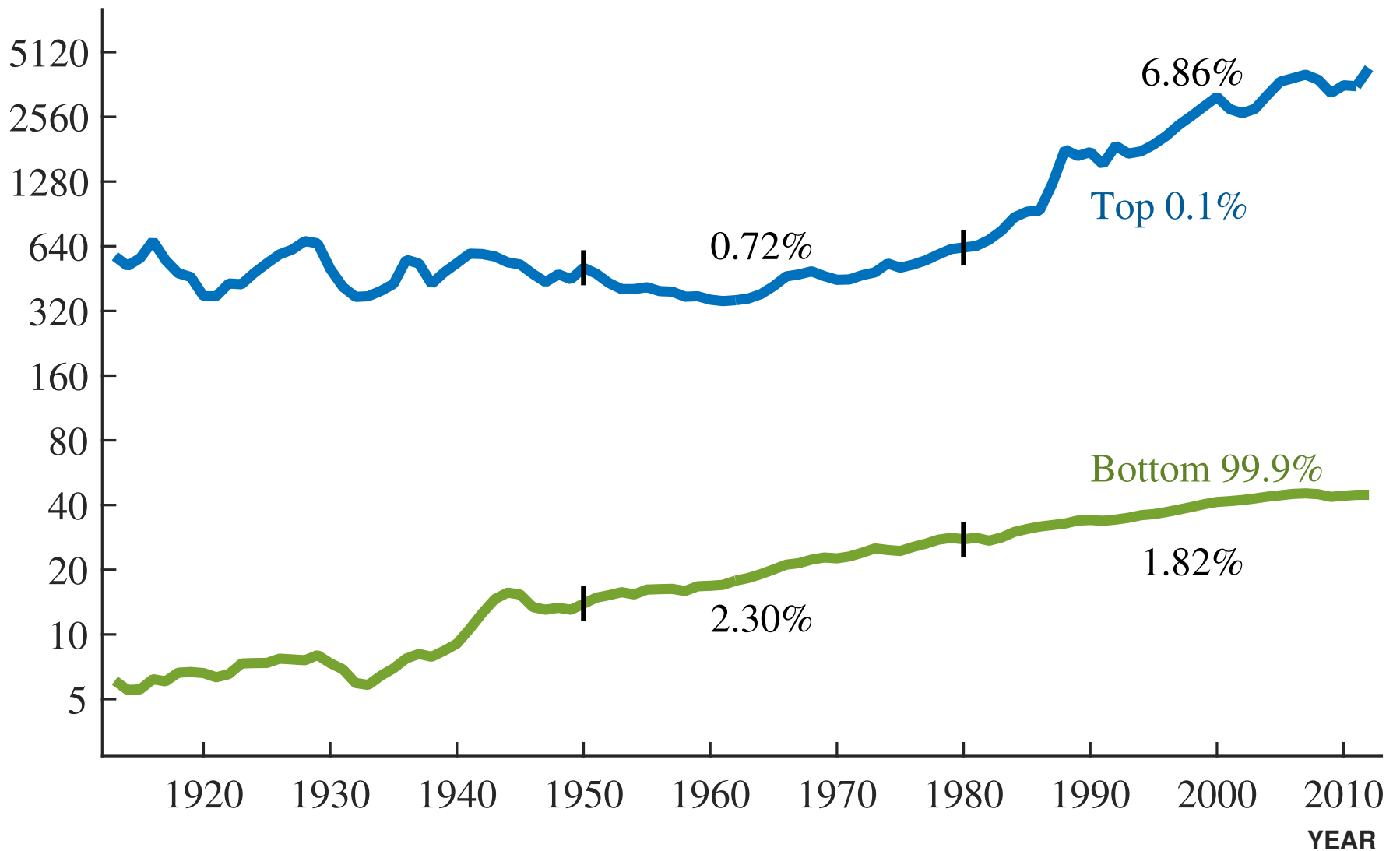
Top Income Inequality

INCOME SHARE OF TOP 0.1 PERCENT



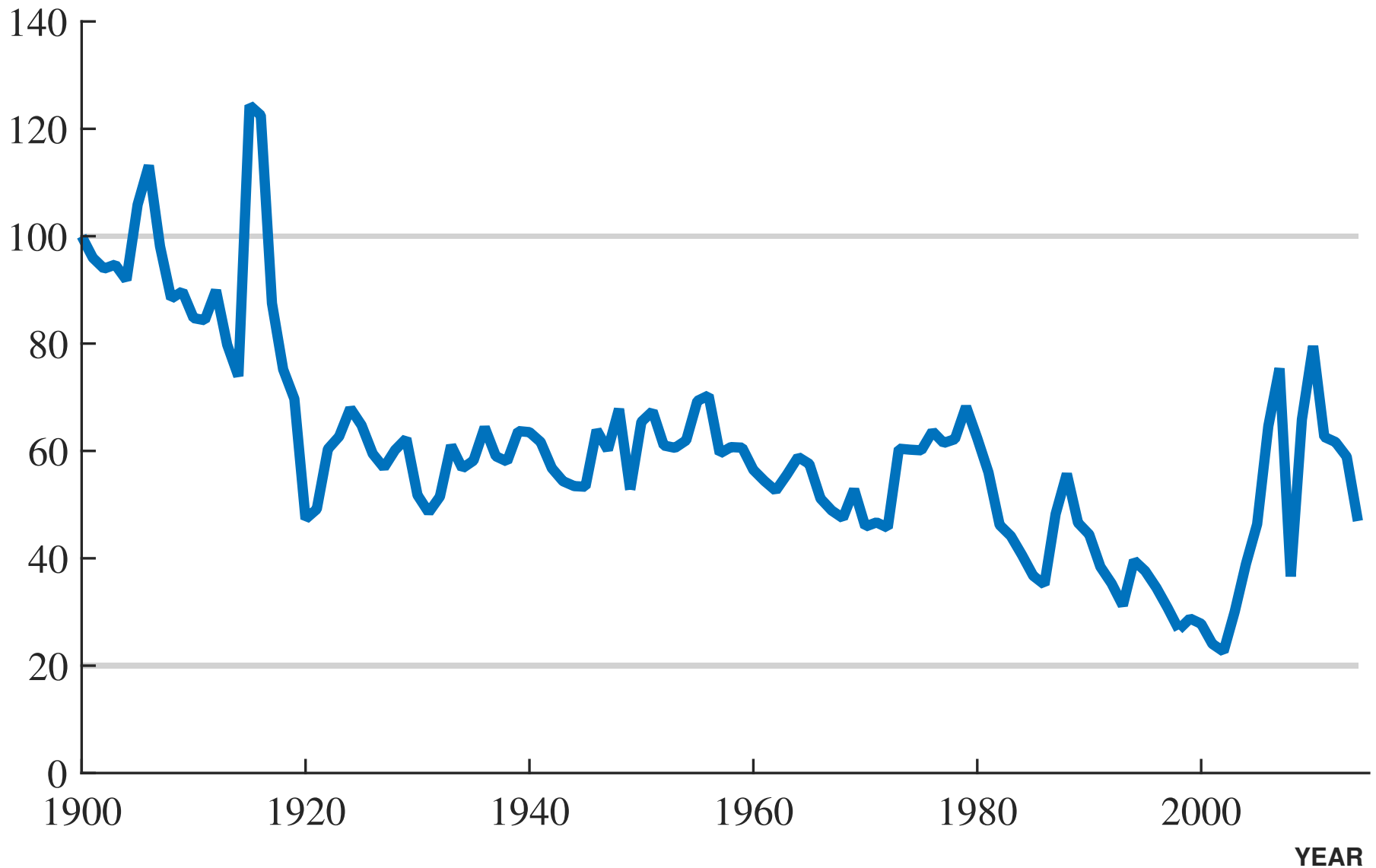
GDP per person, Top 0.1% and Bottom 99.9%

THOUSANDS OF 2009 CHAINED DOLLARS



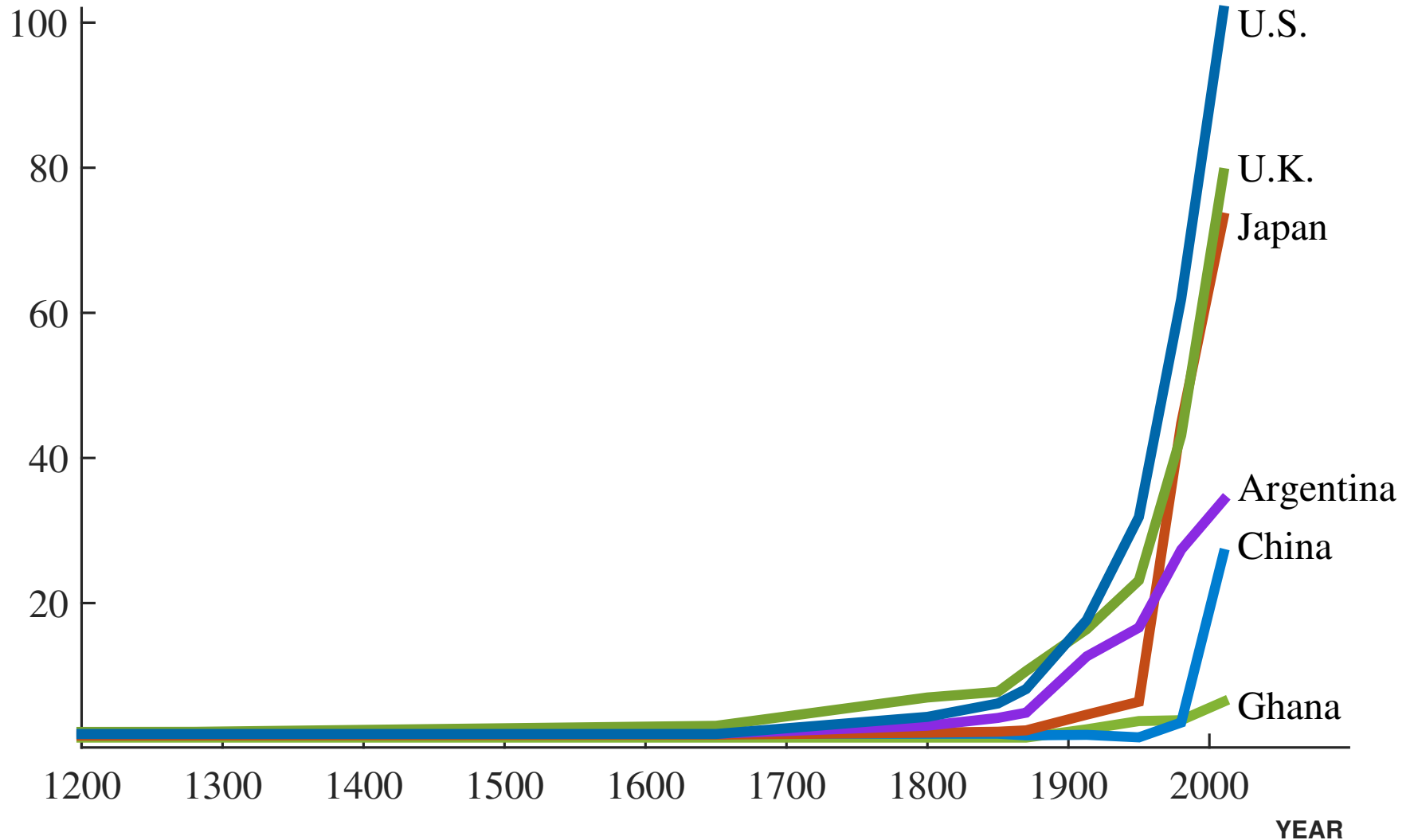
The Real Price of Industrial Commodities

EQUALLY-WEIGHTED PRICE INDEX (INITIAL VALUE IS 100)



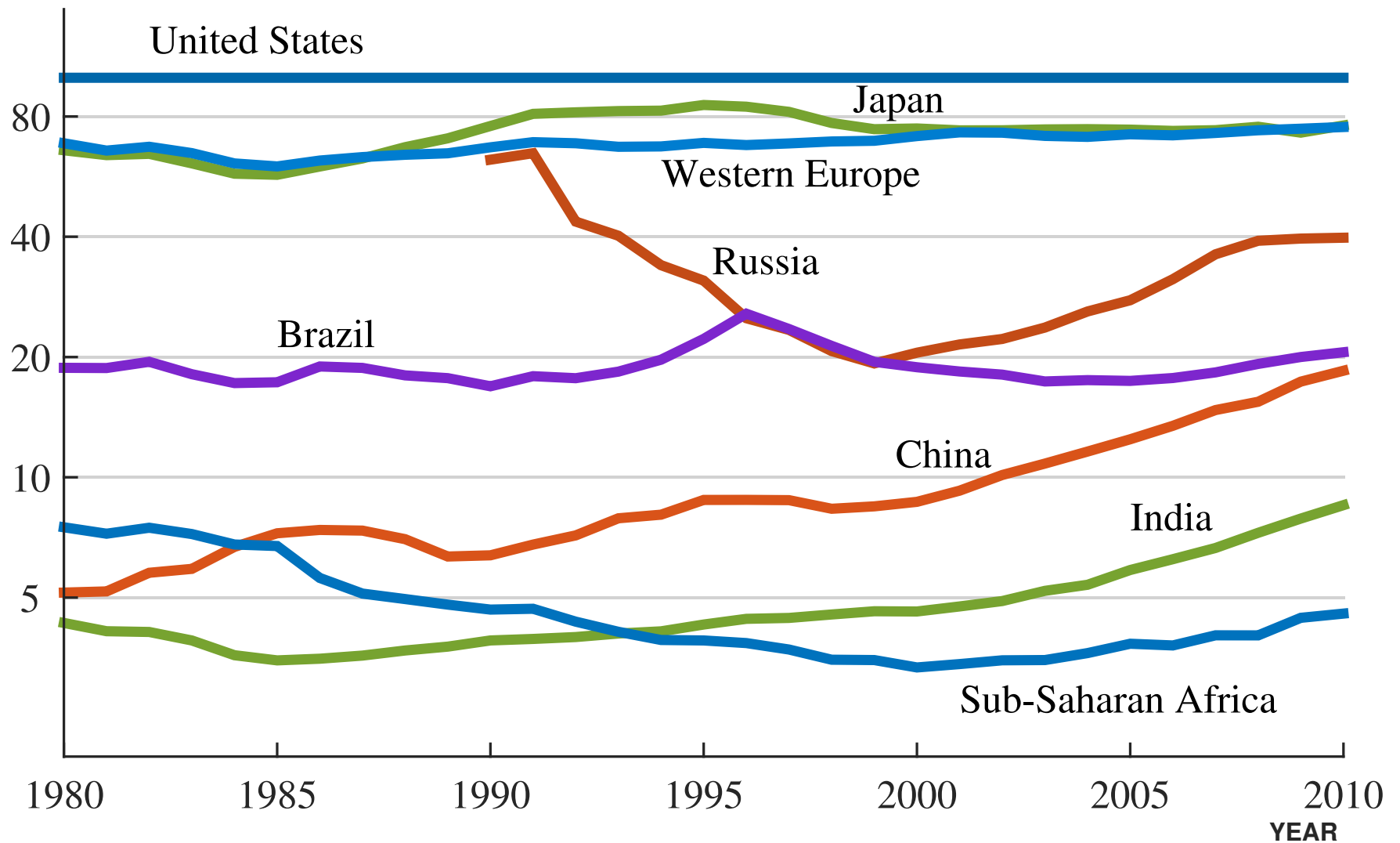
The Great Divergence

GDP PER PERSON (MULTIPLE OF 300 DOLLARS)



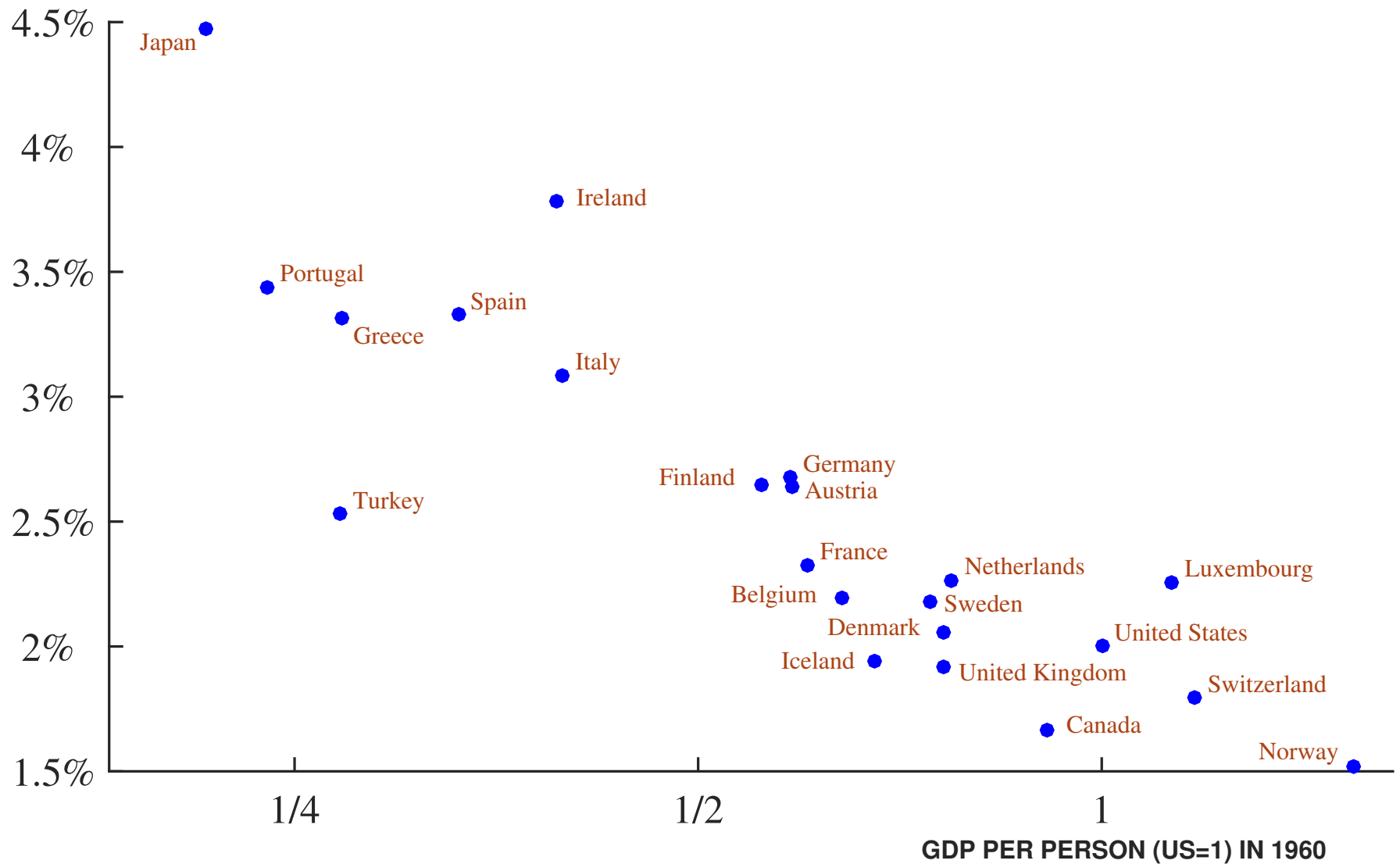
The Spread of Economic Growth since 1980

GDP PER PERSON (US=100)



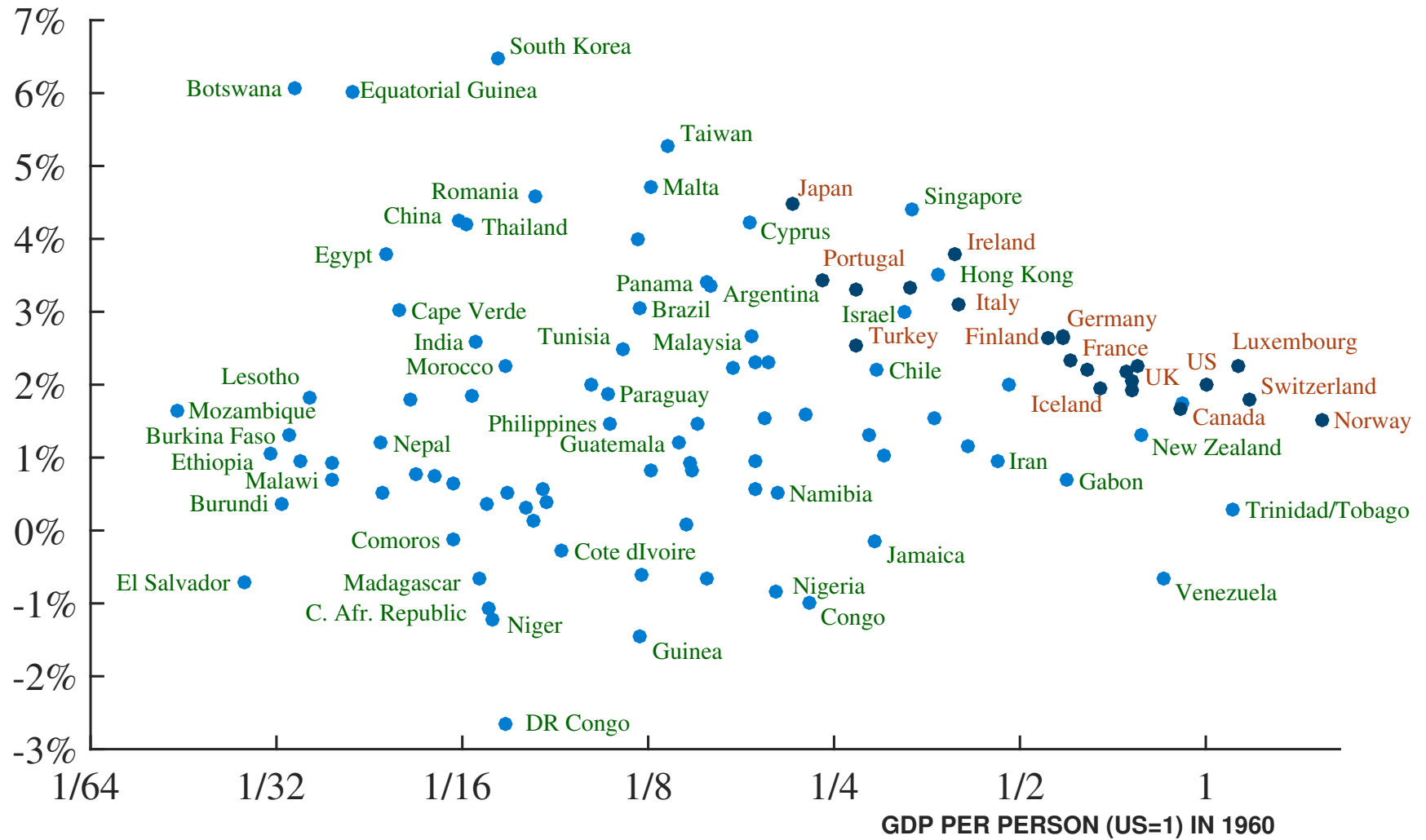
Convergence in the OECD

GROWTH RATE, 1960 - 2011

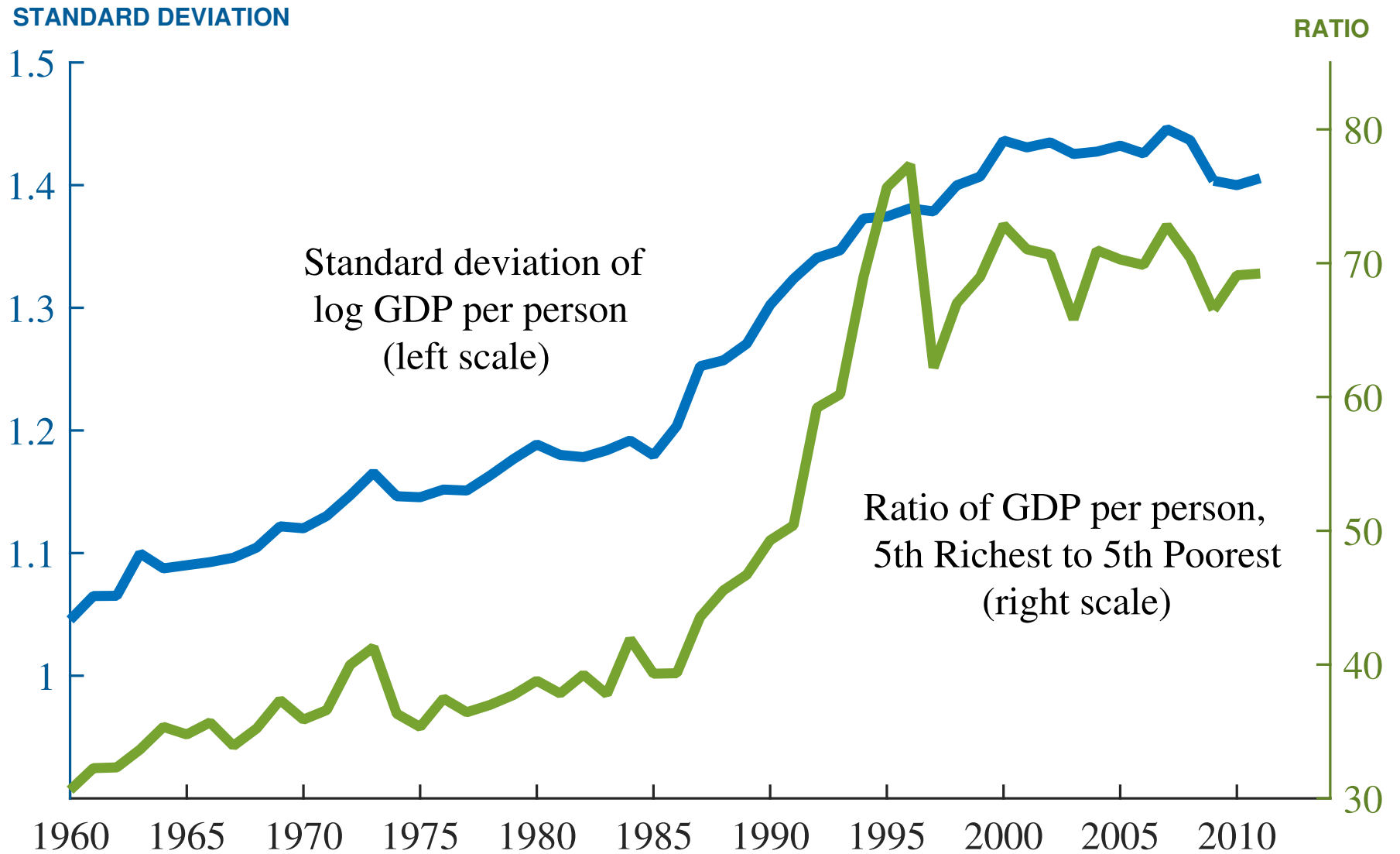


The Lack of Convergence Worldwide

GROWTH RATE, 1960 - 2011



Divergence since 1960

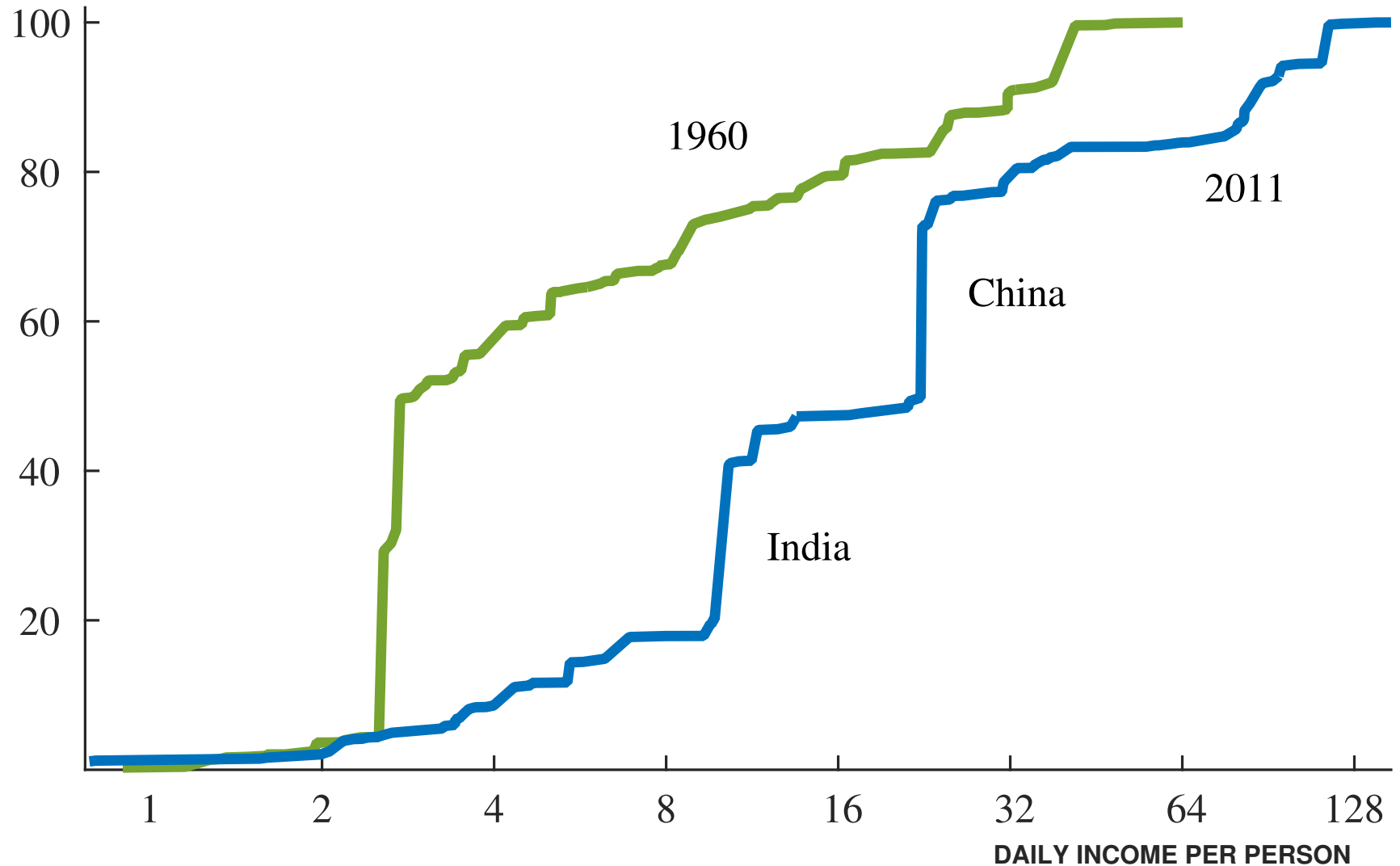


The Very Long-Run Distribution

“Bin”	— Distribution —			Years to “Shuffle”
	1960	2010	Long-Run	
Less than 5 percent	14	29	27	1470
Between 5 and 10 percent	21	12	9	1360
Between 10 and 20 percent	25	13	8	1040
Between 20 and 40 percent	18	16	8	1120
Between 40 and 80 percent	14	18	28	1450
More than 80 percent	7	12	20	1500

The Distribution of World Income by Population

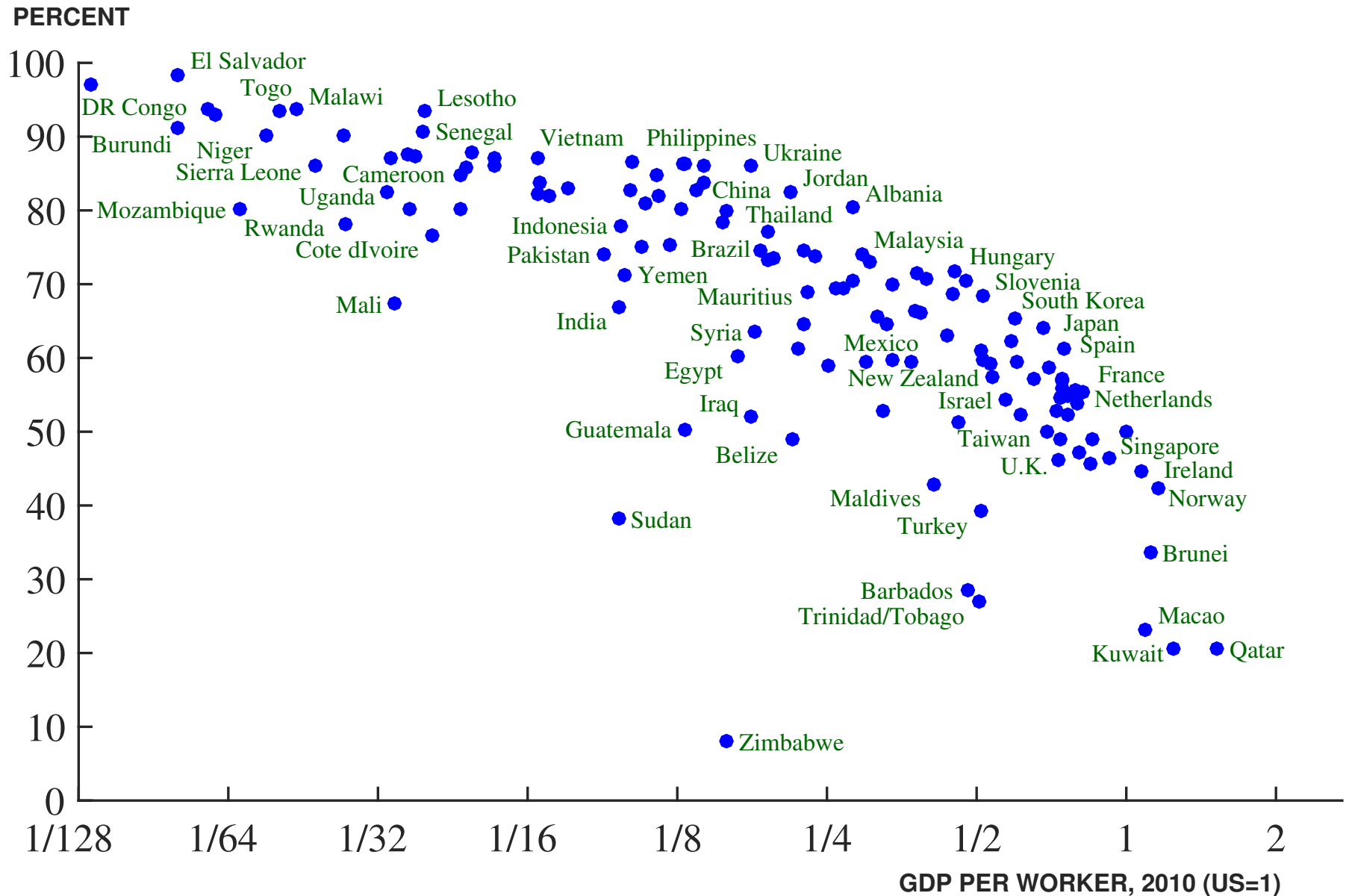
SHARE OF WORLD POPULATION (PERCENT)



Development Accounting

	GDP per worker, y	$(K/Y)^{\frac{\alpha}{1-\alpha}}$	Human capital, h	TFP	Share to TFP
U.S.	1.000	1.000	1.000	1.000	...
France	0.790	1.184	0.840	0.795	55.6%
U.K.	0.733	1.015	0.780	0.925	46.1%
Japan	0.683	1.218	0.903	0.620	63.9%
Argentina	0.376	1.109	0.779	0.435	66.5%
China	0.136	1.137	0.713	0.168	82.9%
India	0.096	0.827	0.533	0.217	67.0%
Malawi	0.021	1.107	0.507	0.038	93.6%
Average	0.194	0.978	0.694	0.286	64.3%
1/Average	5.146	1.022	1.440	3.496	70.4%

The Share of TFP in Development Accounting

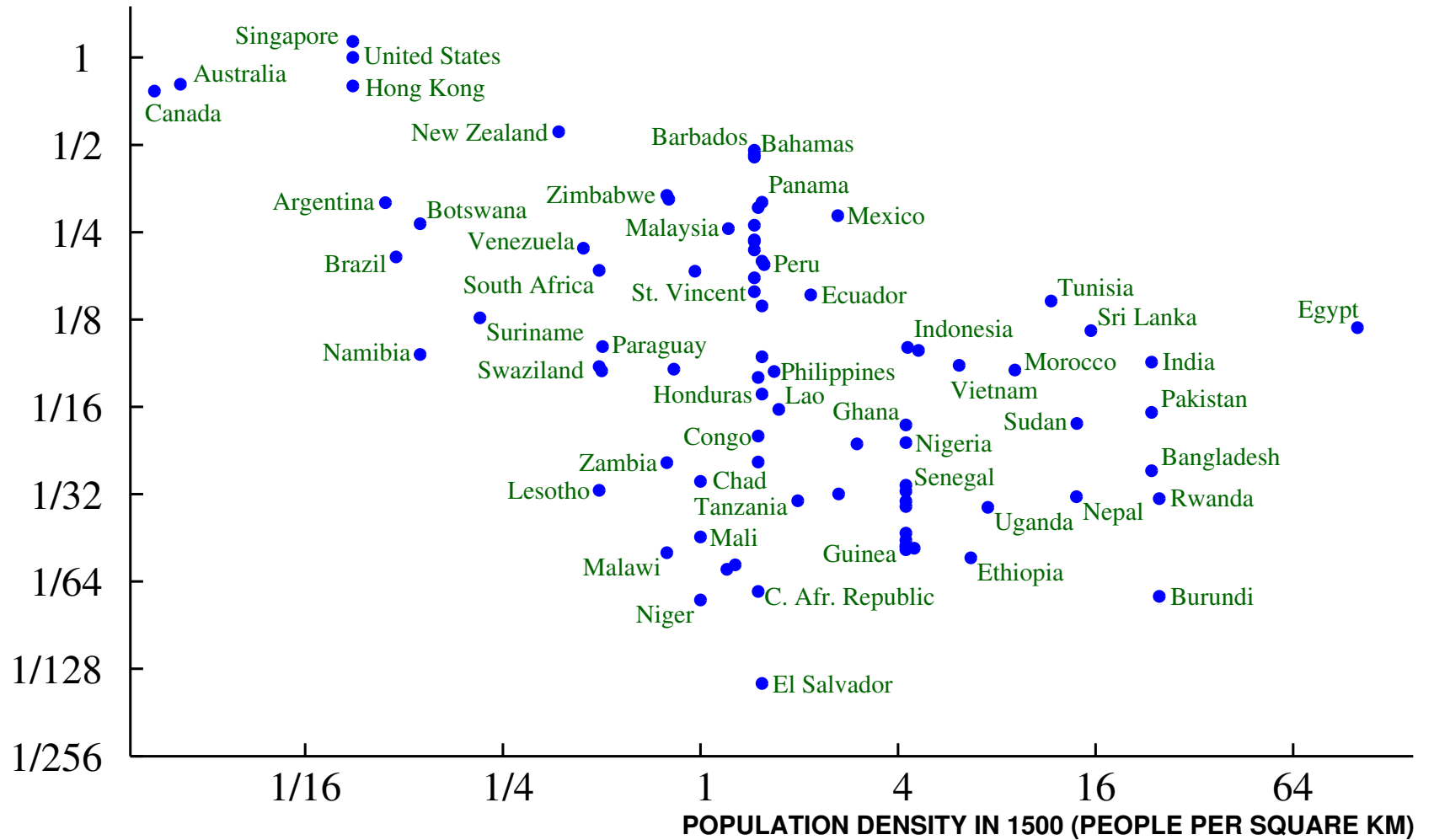


Korea at Night



The Reversal of Fortune

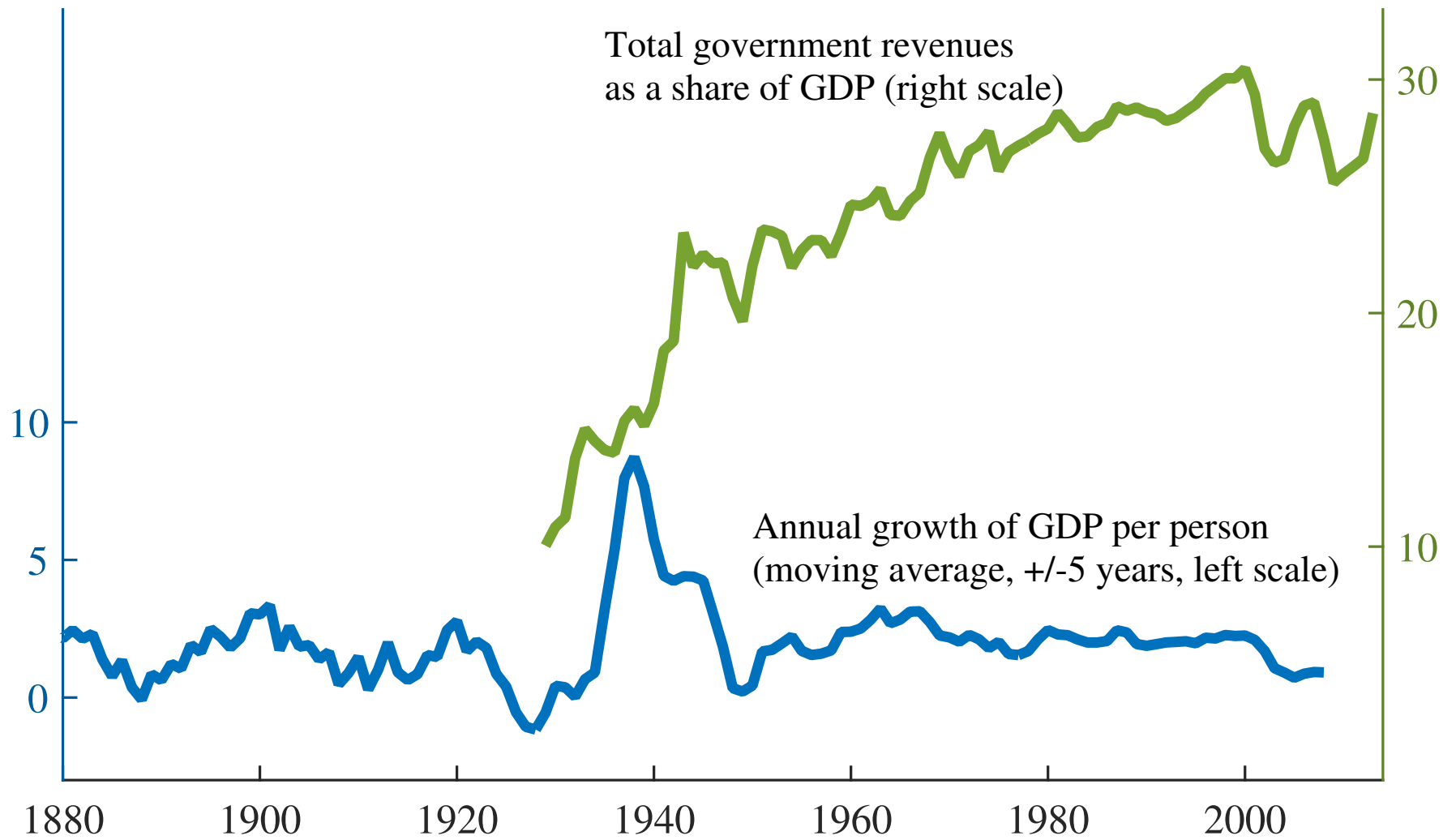
GDP PER PERSON (US=1) IN 2011



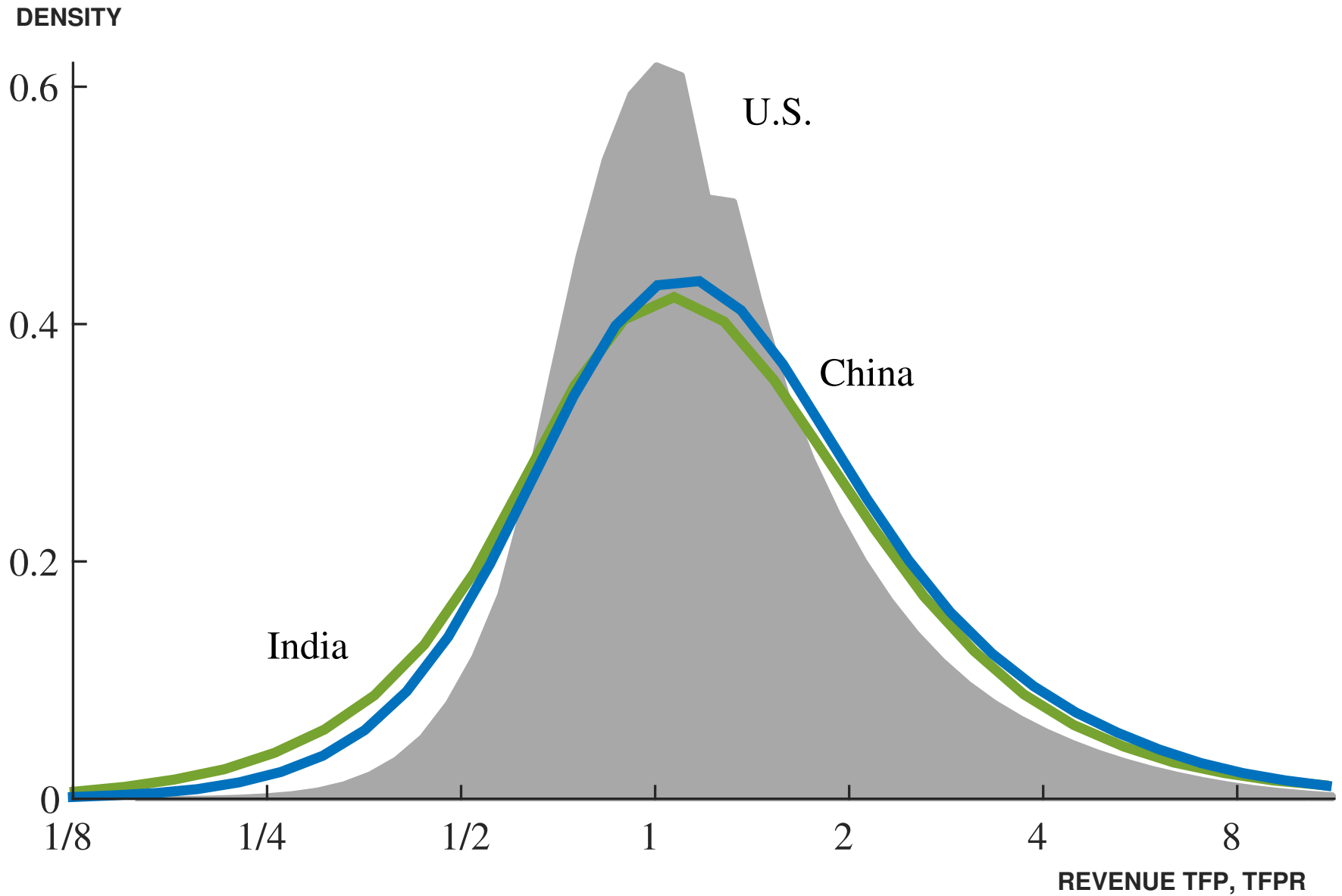
Taxes and Growth in the United States

GROWTH RATE (PERCENT)

TAX SHARE (PERCENT)

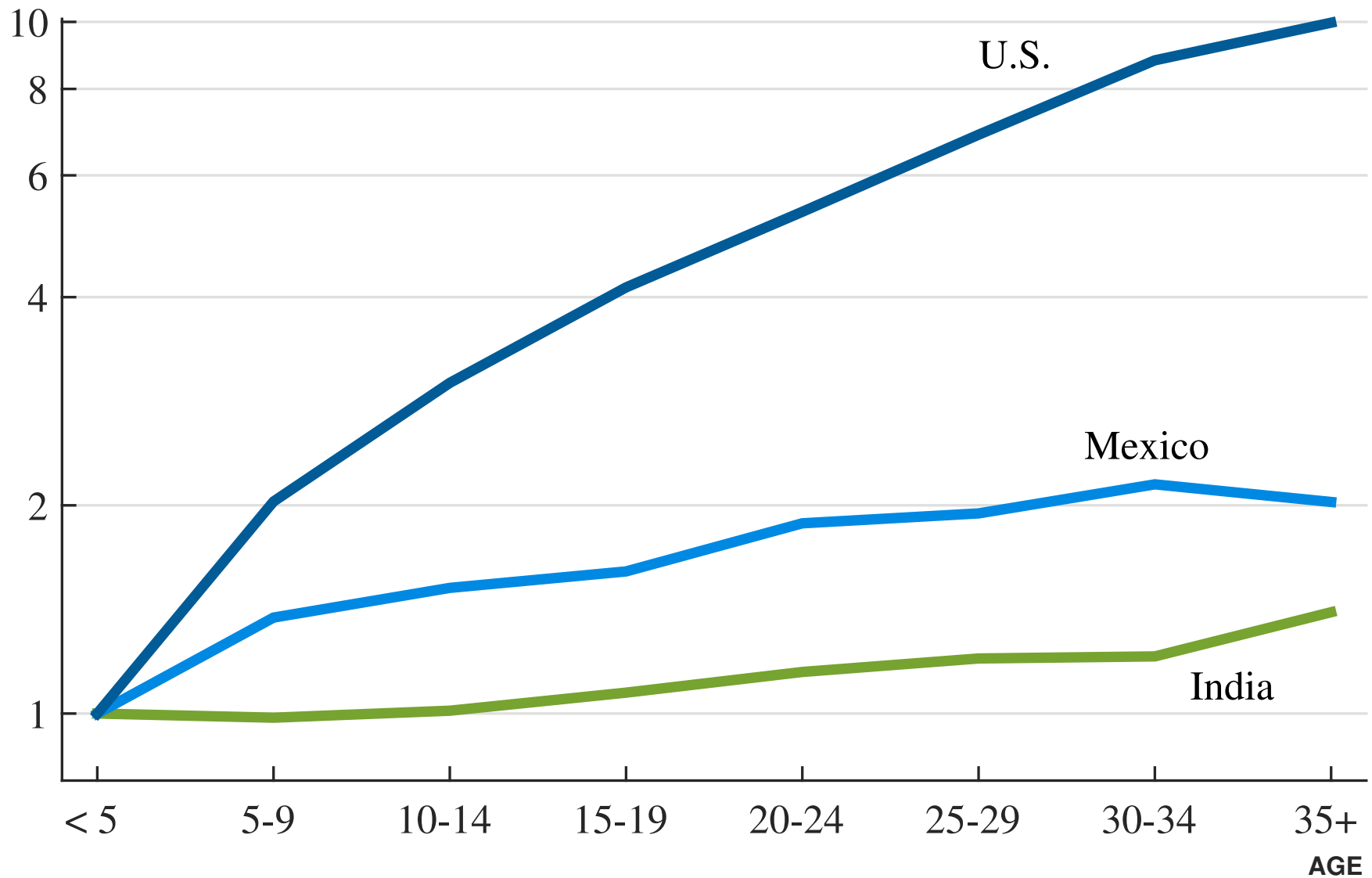


The Distribution of TFPR in 4-digit Manufacturing



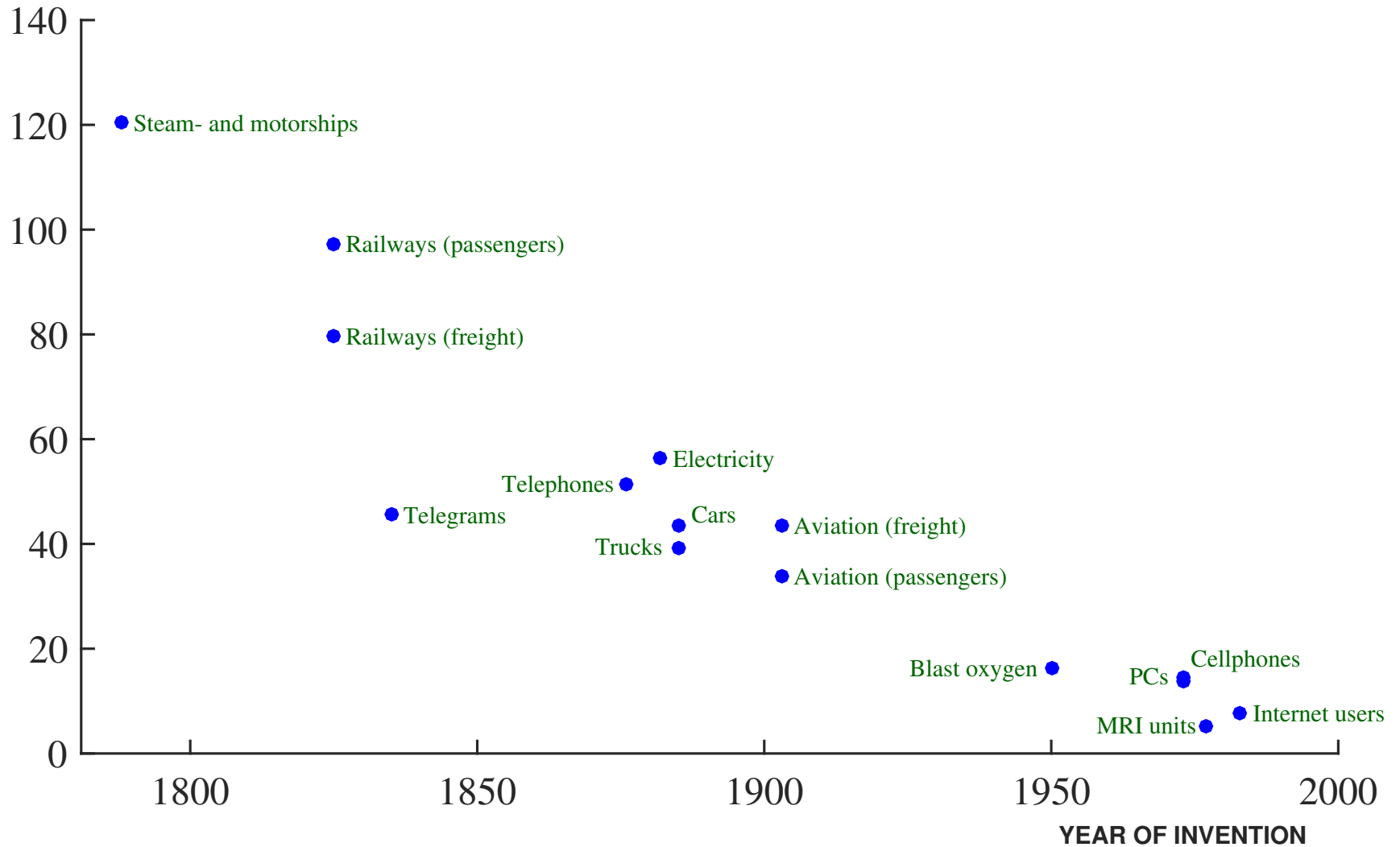
Average Employment over the Life Cycle

AVERAGE EMPLOYMENT (AGE<5 = 1, LOG SCALE)



Technology Adoption is Speeding Up Over Time

ADOPTION LAG (YEARS)



Conclusion: Missing facts?

- Trade and growth
 - Something like Sachs-Warner — open economies grow faster for awhile?
- Spread of growth feeds the frontier
 - PhD's in science/engineering in China
- Other
 - Hsieh-Moretti misallocation of population across space
 - Karabarbounis-Neiman factor shares for other countries