A History of Wealth and Growth

Lecture 4

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What are we trying to explain?

Long-run growth: England, 1300-2000

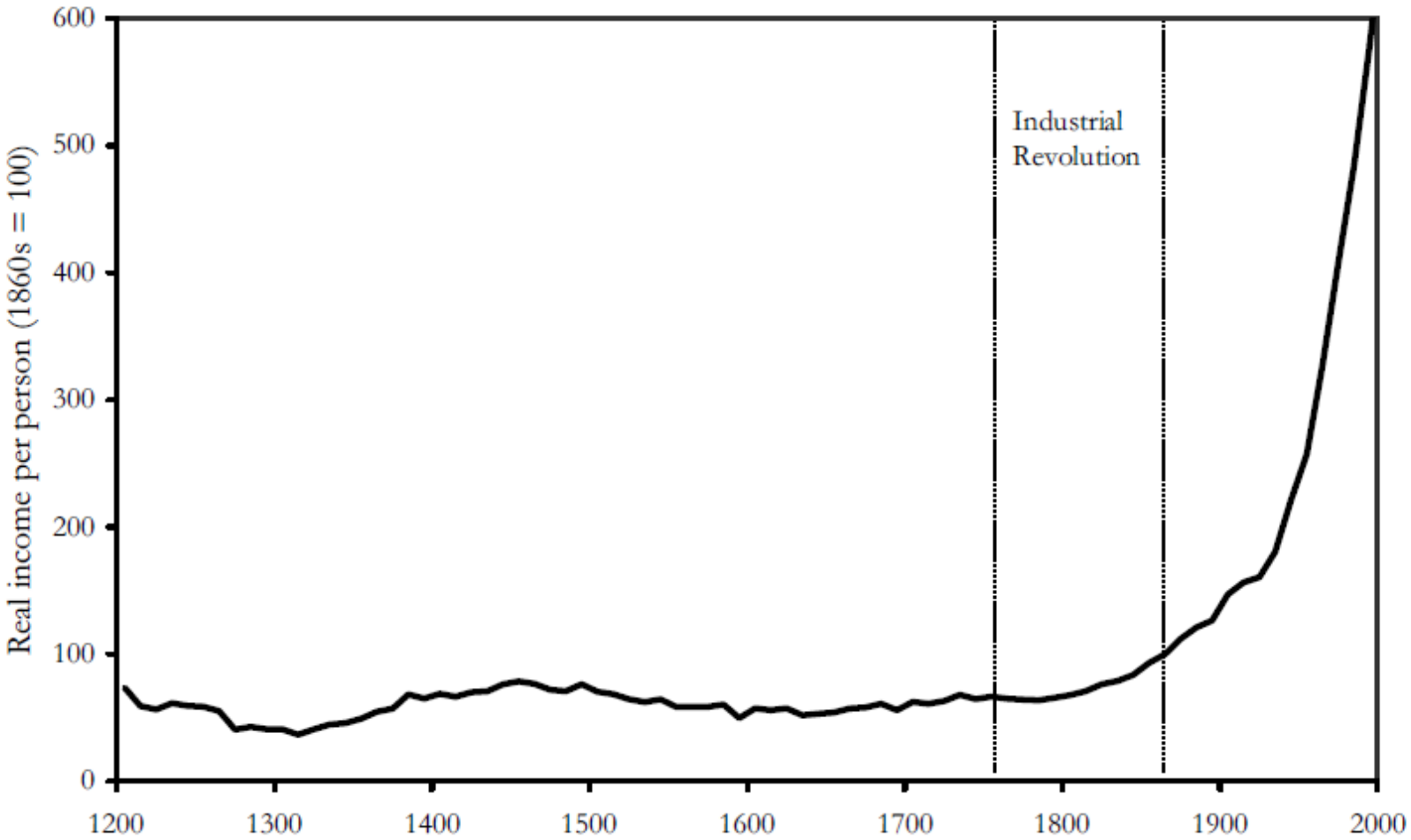


Figure 10.2 Real income per person in England, 1260s–2000s.

What are we trying to explain?

Long-run growth: more than England, 1800-2000

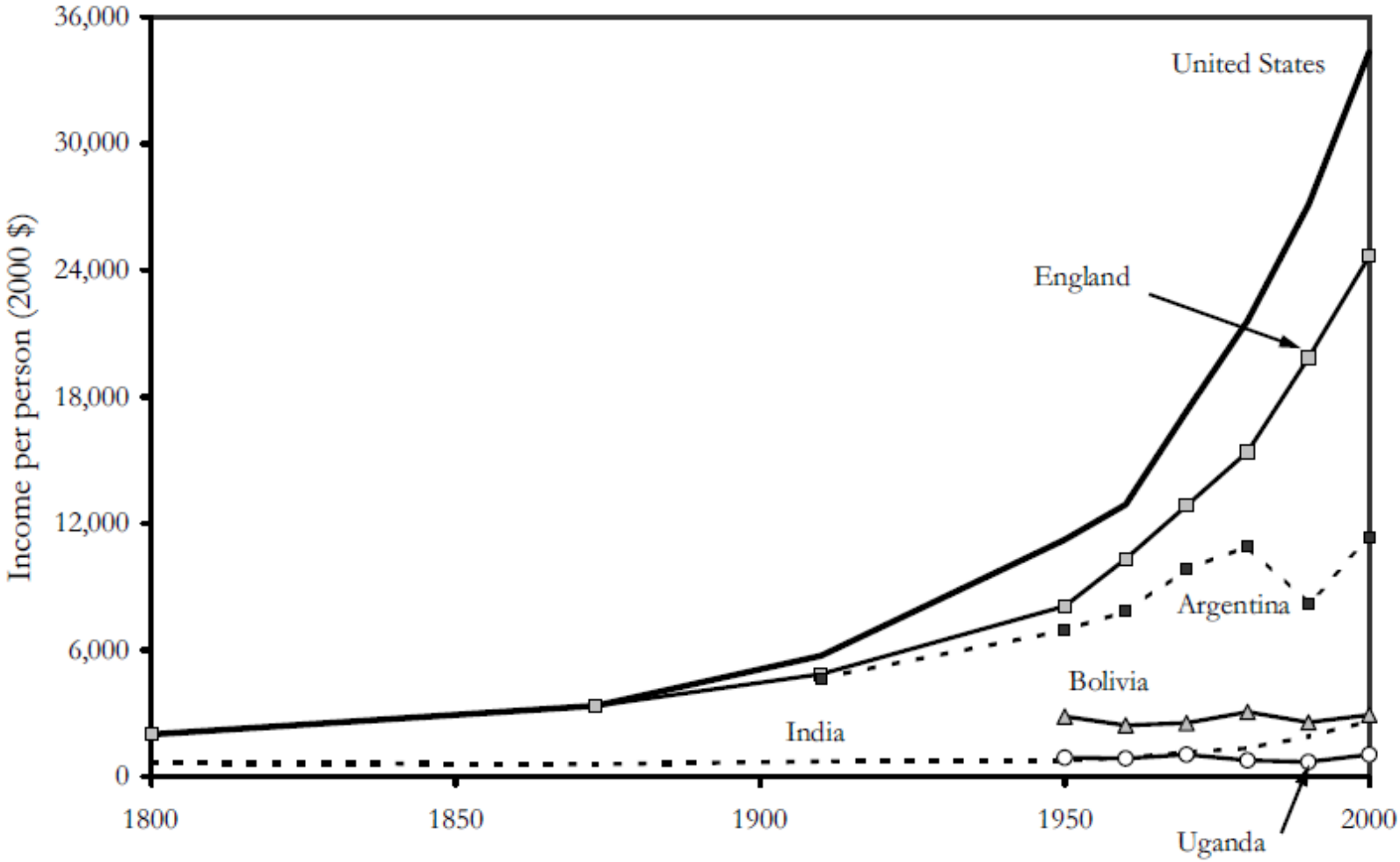


Figure 15.5 Incomes per capita (2000 $). Data from Prados de la Escosura, 2000 (1910) and Heston et al., 2006 (1950–2000).

What are we trying to explain?

Catching up and falling behind: 1960-2000

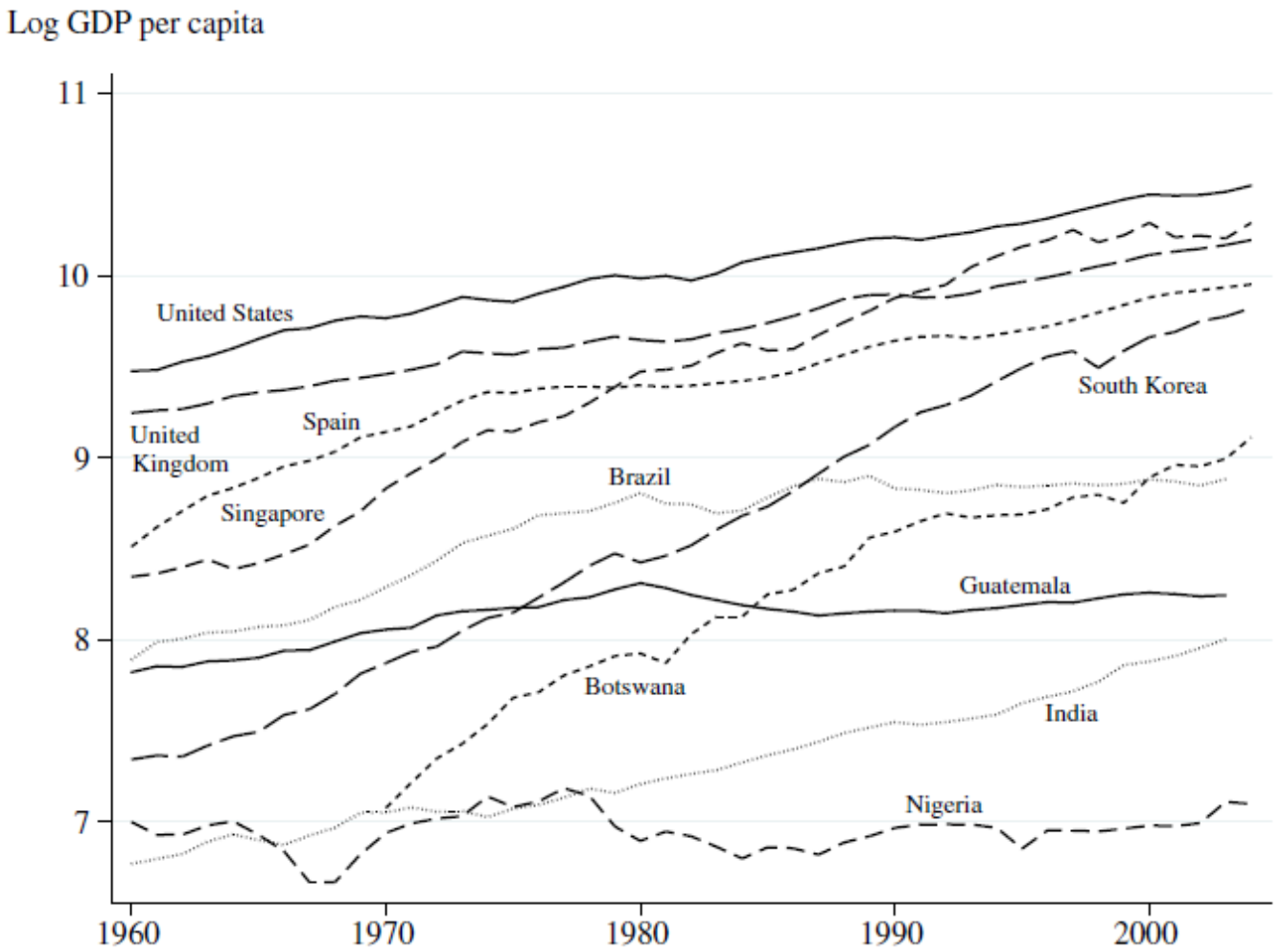


FIGURE 1.8 The evolution of income per capita in the United States, the United Kingdom, Spain, Singapore, Brazil, Guatemala, South Korea, Botswana, Nigeria, and India, 1960–2000.

What are we trying to explain?

Catching up and falling behind: 1820-2000

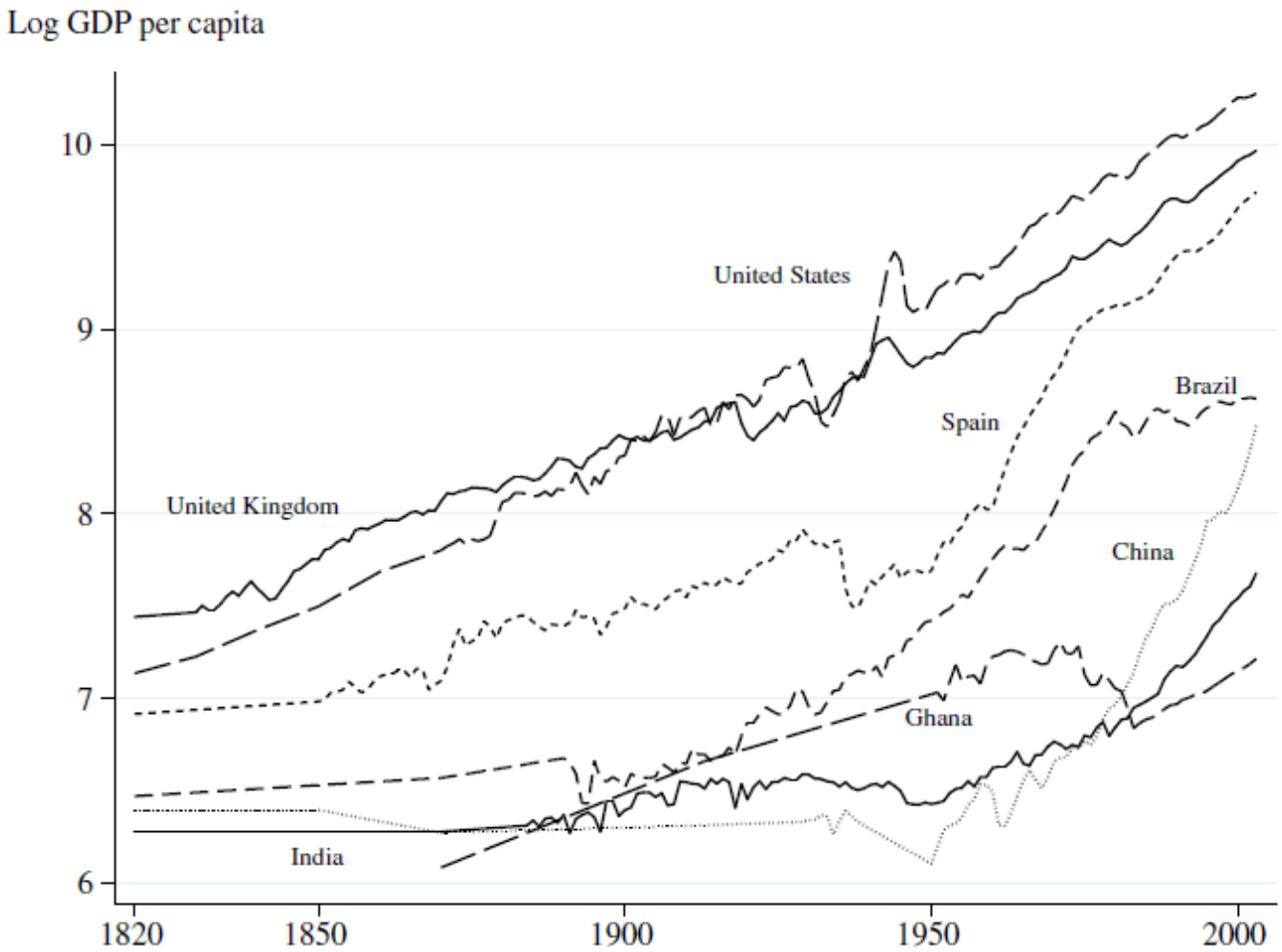
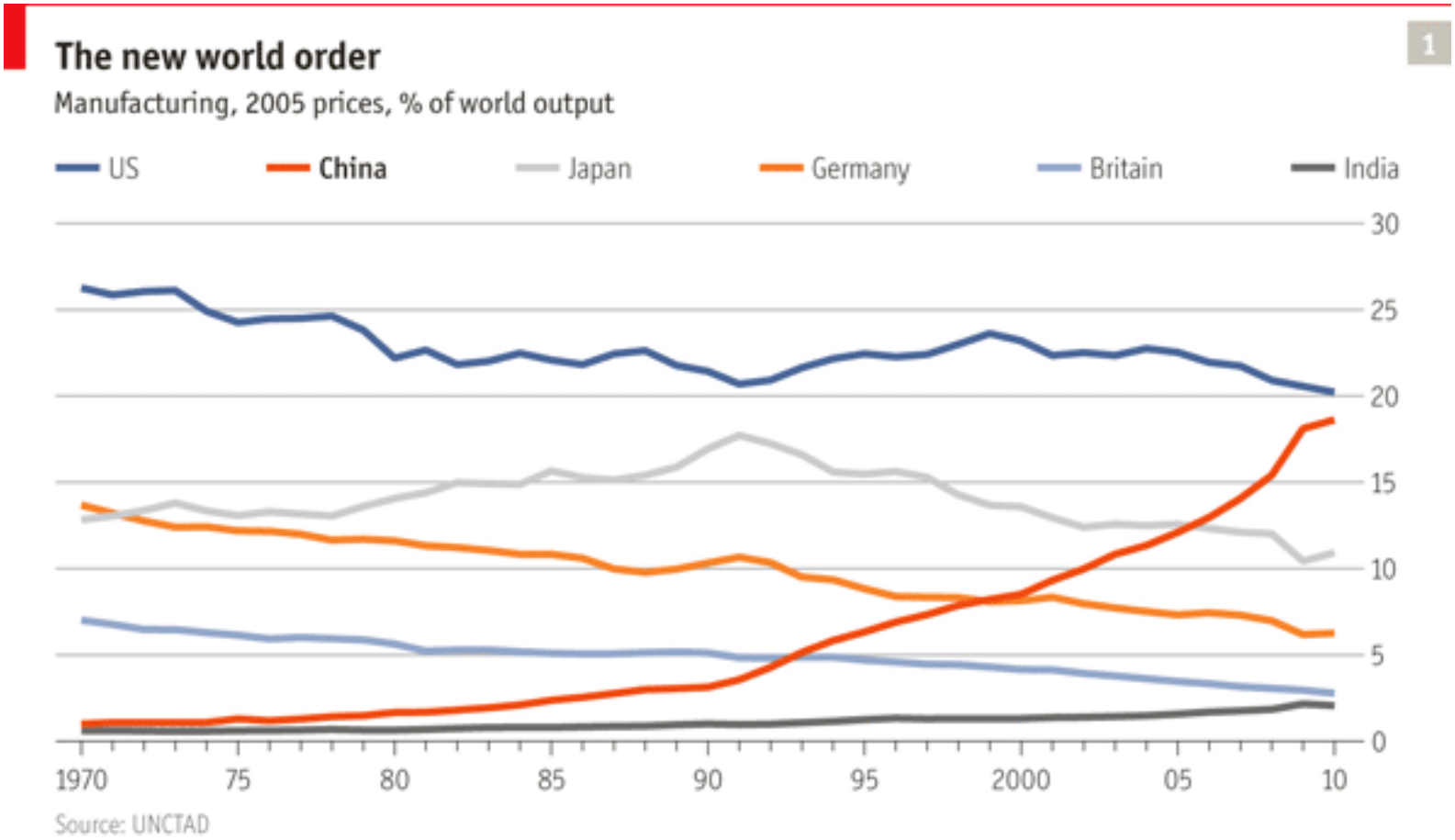


FIGURE 1.12 The evolution of income per capita in the United States, the United Kindgom, Spain, Brazil, China, India, and Ghana, 1820–2000.

What are we trying to explain?

Structural shifts within the world economy



Why Do We Care?

Output per worker and consumption per capita

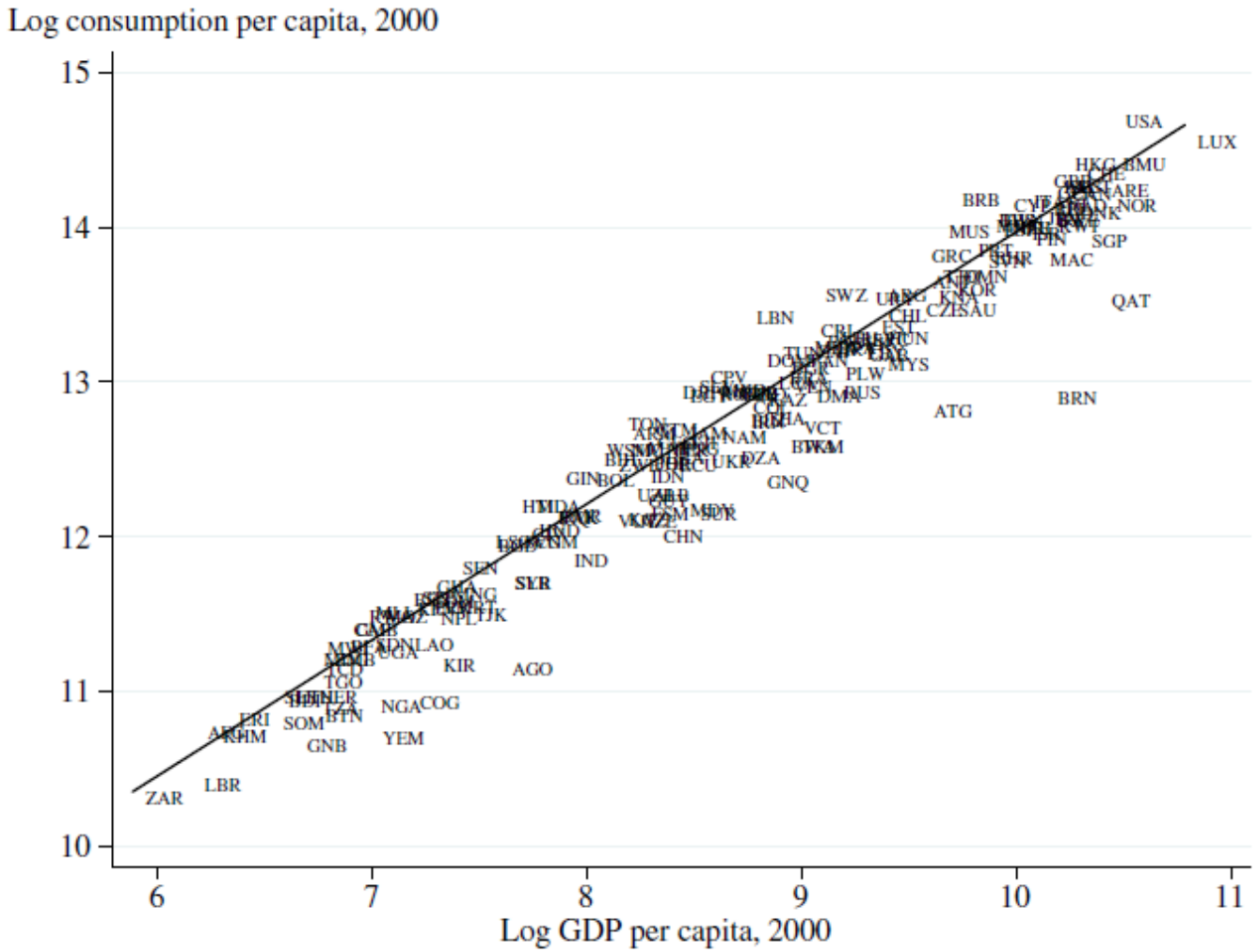


FIGURE 1.5 The association between income per capita and consumption per capita in 2000. For a definition of the abbreviations used in this and similar figures in the book, see http://unstats.un.org/unsd/methods/m49/m49alpha.htm.

The Great Divergence

Why?

The key: economic growth and its acceleration. Suppose you start the economy with 100 units of GDP. What would it be in 100 years with slightly varying economic growth rates?

Initial GDP	Growth rate	GDP multiple	Final GDP
100	1%	2.705	270.5
100	2%	7.245	724.5
100	3%	19.219	1921.9
100	3.4%	28.317	2831.9
100	4%	50.505	5050.5
100	4.1%	55.599	5559.9
100	6%	339.302	33930.2

How to calculate the GDP multiple:

$$(1+g)^t$$

How does GDP grow?

The role of L

TABLE 18.2 Employment, Labor Force, and Population Growth, 1947–2004

	CIVILIAN NONINSTITUTIONAL POPULATION OVER 16 YEARS OLD (MILLIONS)	CIVILIAN LABOR FORCE		EMPLOYMENT (MILLIONS)
		Number (Millions)	Percentage of Population	
1947	101.8	59.4	58.3	57.0
1960	117.3	69.6	59.3	65.8
1970	137.1	82.8	60.4	78.7
1980	167.7	106.9	63.7	99.3
1990	189.2	125.8	66.5	118.8
2000	212.6	142.6	67.1	136.9
2004	223.4	147.4	66.0	139.3
Percentage change, 1947 – 2004	+119.4%	+148.1%		+144.4%
Annual rate	+1.4%	+1.6%		+1.6%

Source: Economic Report of the President, 2005, Table B-35.

How does GDP grow?

The role of K

TABLE 18.4 Fixed Private Nonresidential Net Capital Stock, 1960–2003 (Billions of 2000 Dollars)

	EQUIPMENT	STRUCTURES
1960	645.7	2,273.3
1970	1,108.5	3,094.8
1980	1,910.0	4,047.7
1990	2,613.3	5,304.5
2000	4,138.5	6,287.6
2003	4,523.3	6,525.8
Percentage change, 1960 – 2003	+600.59%	+187.1%
Annual rate	+4.6%	+ 2.5%

Source: Survey of Current Business, September 2004, Table 15, p. 42 and author's estimates.

How does GDP grow?

Notice the K/L

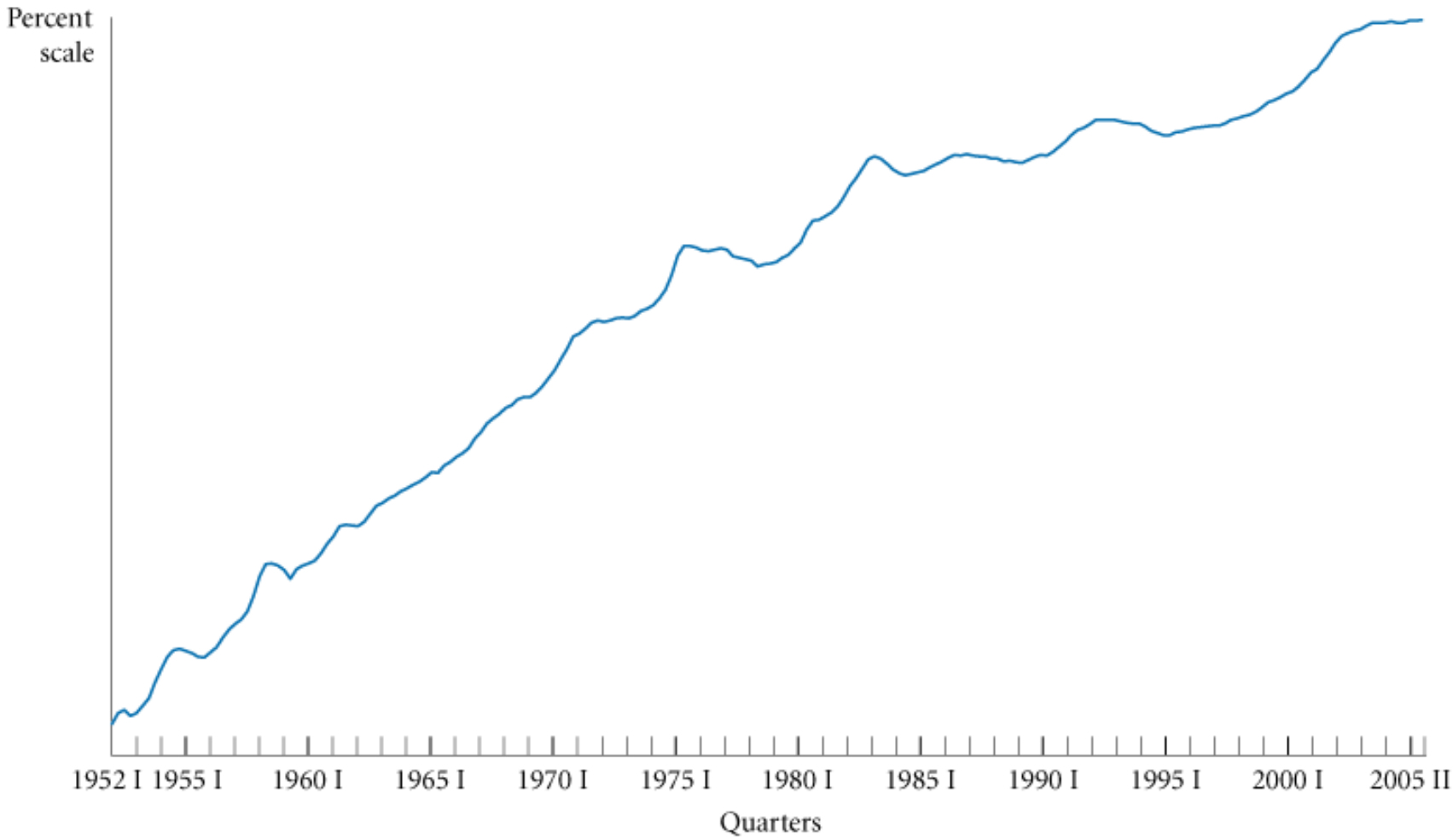


FIGURE 7.2 Capital per Worker, 1952 I–2005 II

INCREASES IN HUMAN CAPITAL

TABLE 18.5 Years of School Completed by People Over 25 Years Old, 1940–2003

	PERCENTAGE WITH LESS THAN 5 YEARS OF SCHOOL	PERCENTAGE WITH 4 YEARS OF HIGH SCHOOL OR MORE	PERCENTAGE WITH 4 YEARS OF COLLEGE OR MORE
1940	13.7	24.5	4.6
1950	11.1	34.3	6.2
1960	8.3	41.1	7.7
1970	5.5	52.3	10.7
1980	3.6	66.5	16.2
1990	NA	77.6	21.3
2000	NA	84.1	25.6
2003	NA	84.6	27.2

NA = not available.
Source: Statistical Abstract of the United States, 1990, Table 215; and *2005*, Table 212.

$$Y = A \cdot L^{\alpha} K^{\beta} H^{\gamma} L_d^{\delta},$$

where:

1. L is the labor
2. K is the physical capital
3. H is the human capital
4. L_d is the land
5. A is the level of technology
6. $\alpha, \beta, \gamma, \delta$ are the shares (contributions) of each factor (source) of growth

The Declining Role of Land: L_d

Note how $\delta \to 0$

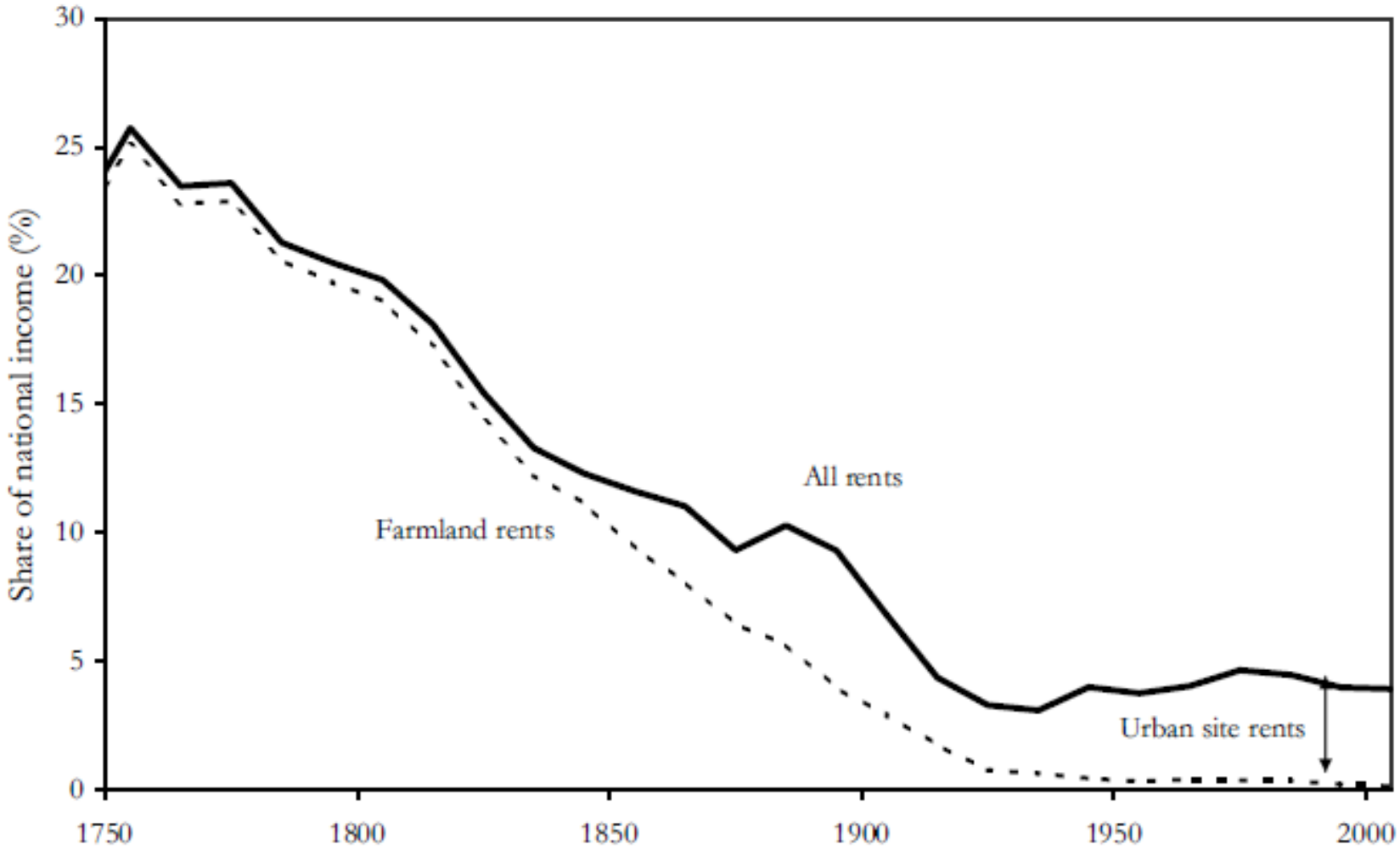


Figure 10.3 Land rents as a share of income in England, 1750s–2000s. Income from Clark,

From GDP to GDP/capita (Y/L)

Deriving growth

Start with how the economy produces GDP:

$Y = A \cdot L^{\alpha} K^{\beta} H^{\gamma} \mid : L = L^{\alpha} L^{\beta} L^{\gamma}, \alpha + \beta + \gamma = 1$

From GDP to GDP/capita (Y/L)

Deriving growth

Start with how the economy produces GDP:

$$Y = A \cdot L^{\alpha} K^{\beta} H^{\gamma} \mid : L = L^{\alpha} L^{\beta} L^{\gamma}, \alpha + \beta + \gamma = 1$$

$$\frac{Y}{L} = A \cdot \frac{L^{\alpha}}{L^{\alpha}} \frac{K^{\beta}}{L^{\beta}} \frac{H^{\gamma}}{L^{\gamma}}$$

From GDP to GDP/capita (Y/L)

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Denote $\frac{Y}{L} = y$, $\frac{K}{L} = k$, $\frac{H}{L} = h$.

$\Rightarrow y = A \cdot k^{\beta} h^{\gamma} \mid \log()$

From GDP to GDP/capita (Y/L)

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$\Rightarrow logy_t = logA_t + \beta logk_t + \gamma logh_t$

-

$logy_{t-1} = logA_{t-1} + \beta logk_{t-1} + \gamma logh_{t-1}$

From GDP to GDP/capita (Y/L)

Deriving growth

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$\Rightarrow ...$

$\Rightarrow g_{yt} = g_{at} + \beta g_{kt} + \gamma g_{ht}$

From GDP to GDP/capita (Y/L)

Deriving growth

Start with how the economy produces GDP:

$Y = A \cdot L^{\alpha} K^{\beta} H^{\gamma} \mid : L = L^{\alpha} L^{\beta} L^{\gamma}, \alpha + \beta + \gamma = 1$

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The fundamental equation of growth

The growth of output per capita(worker) depends on the growth rate of technology (efficiency), and on the growth rates of capital per capita(worker) and the human capital per capita(worker).

The Role of Capital per Worker: k

Correlation across countries

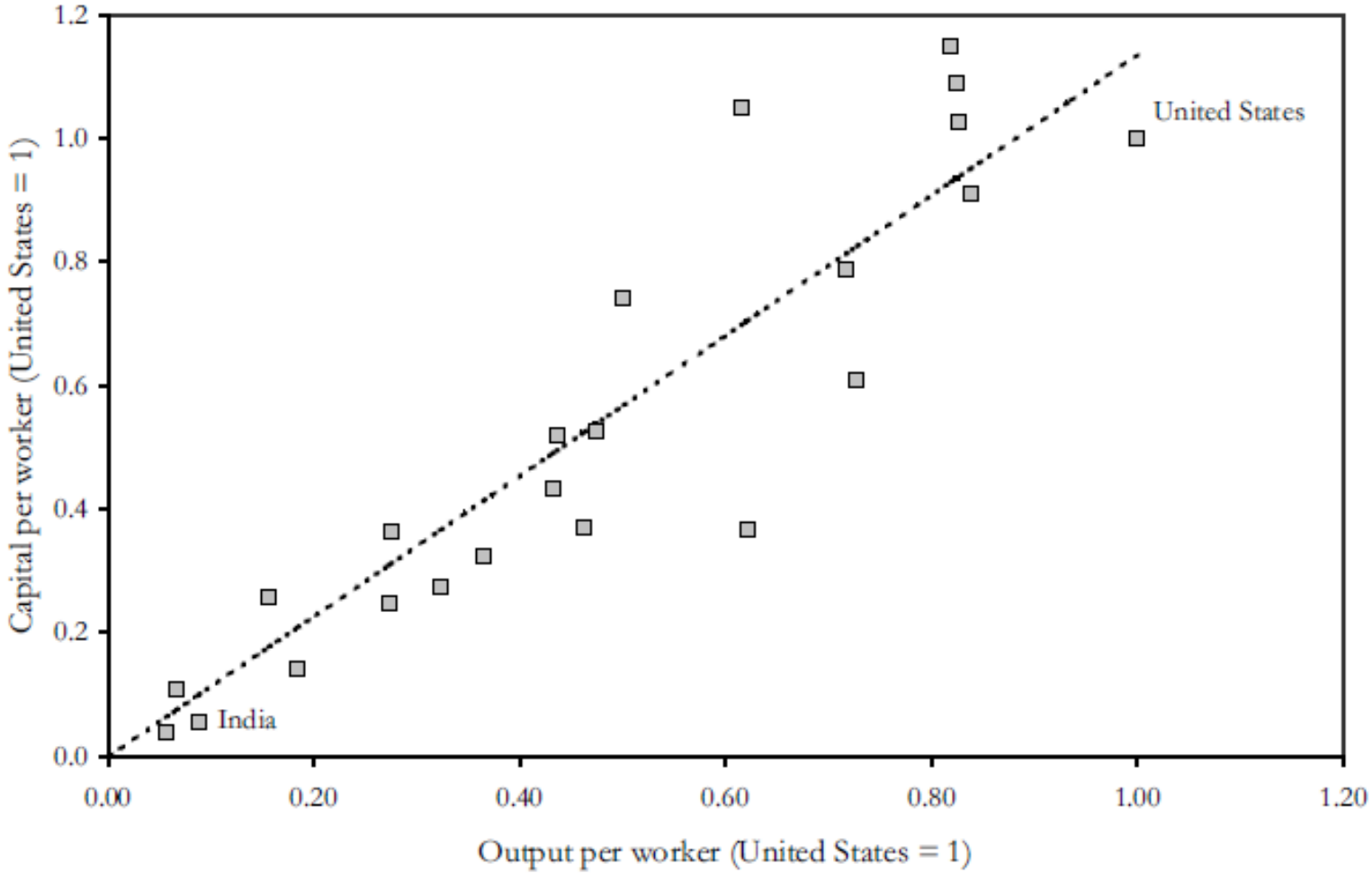


Figure 16.4 Capital per worker versus output per worker, 1990. Data from Penn World Tables, 5.6.

The Growth of Capital: Investment

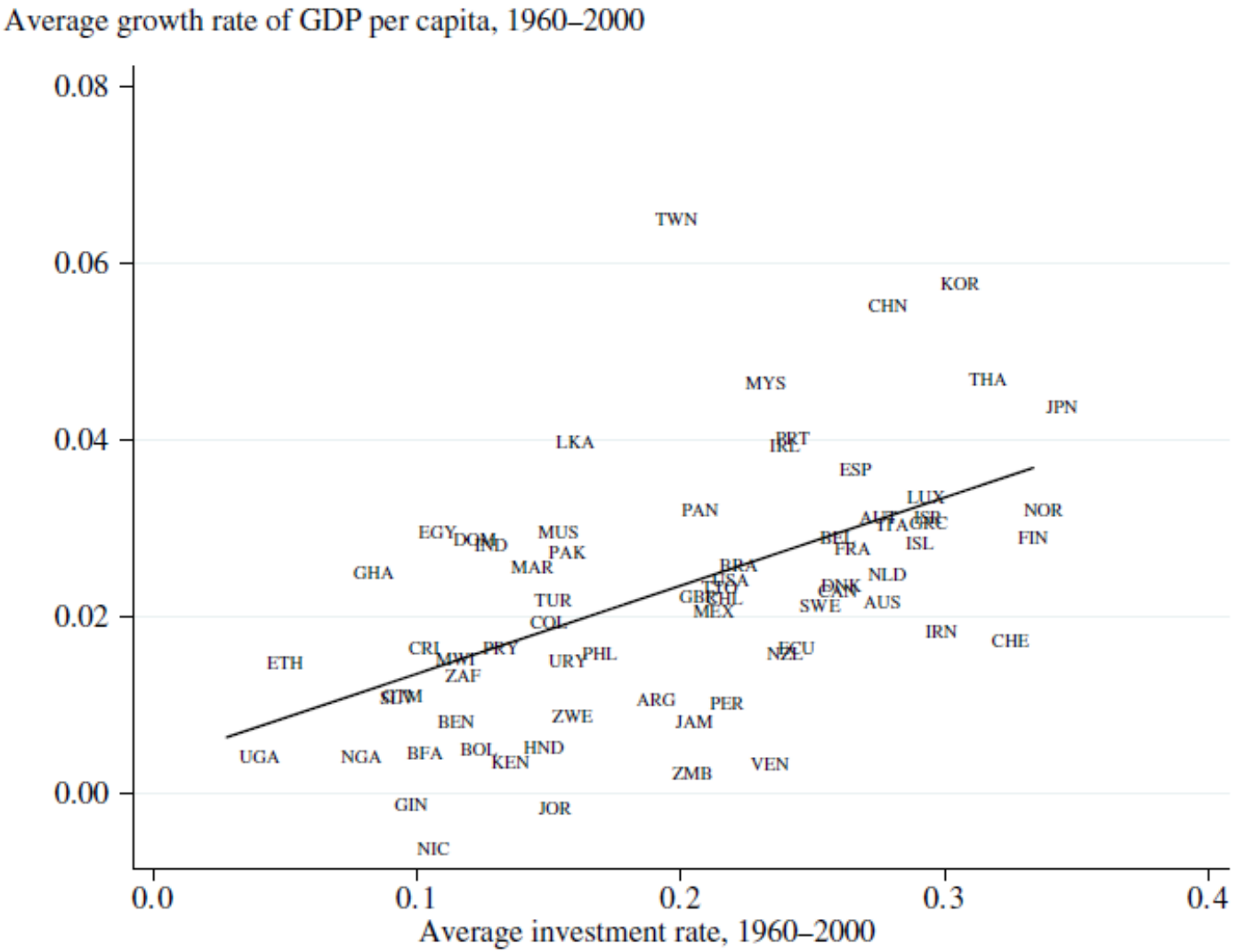


FIGURE 1.15 The relationship between average growth of GDP per capita and average growth of investments to GDP ratio, 1960–2000.

The Role of Human Capital

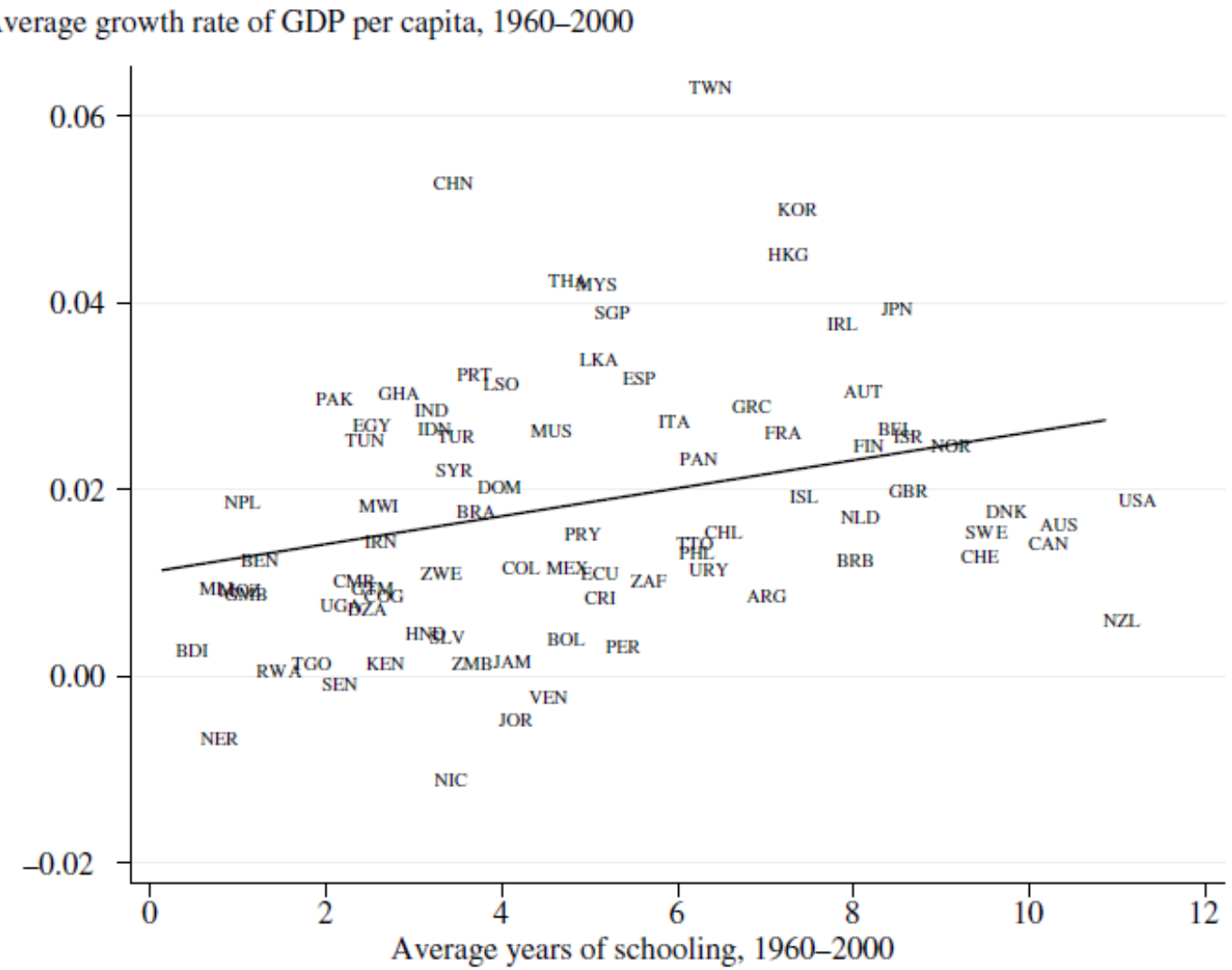


FIGURE 1.16 The relationship between average growth of GDP per capita and average years of schooling, 1960–2000.

The Role of Efficiency: A

Correlation across countries

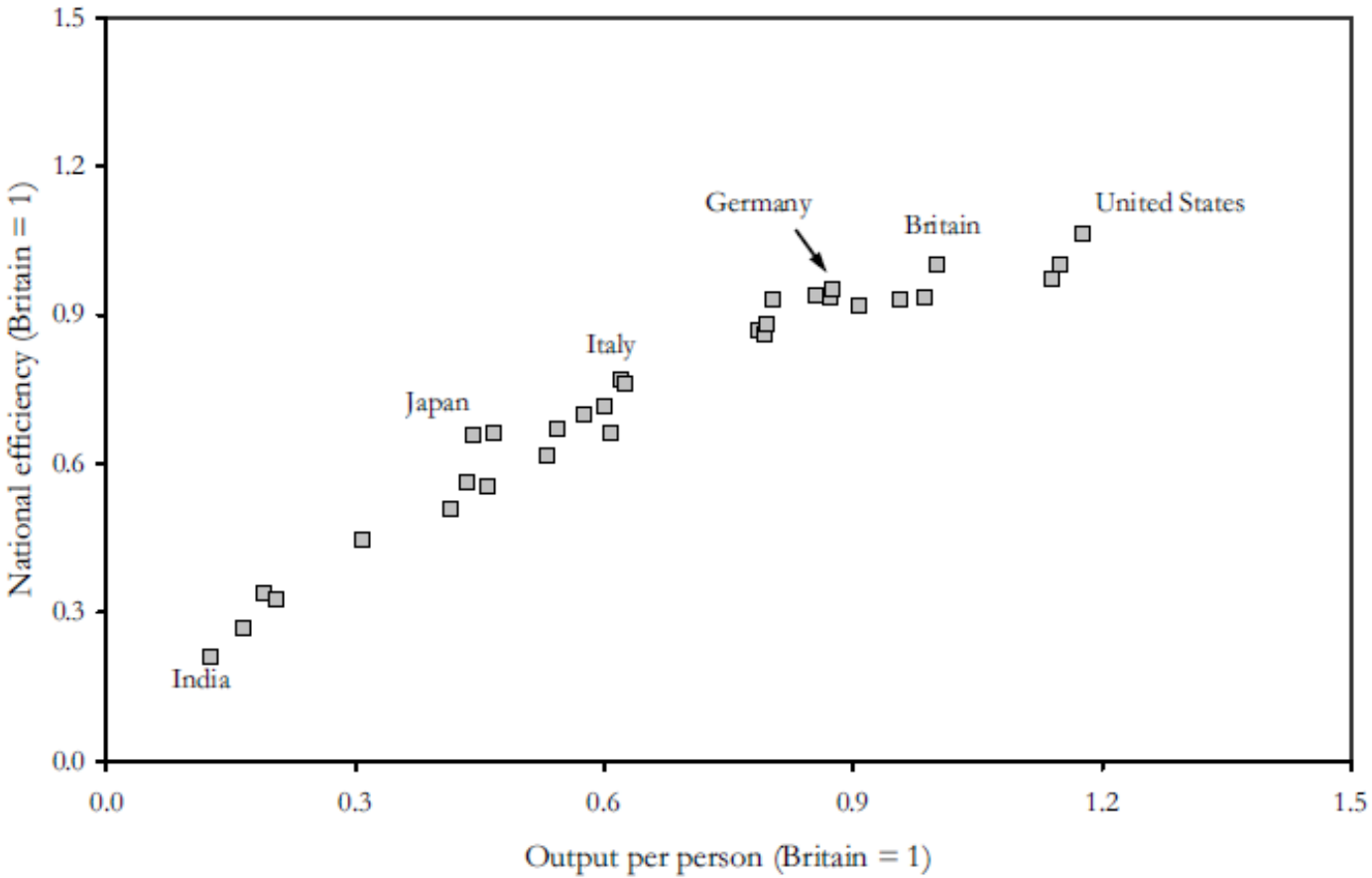


Figure 16.5 Efficiency versus output per worker, 1913.

From Correlates to Fundamental Causes of Growth

What affects A?

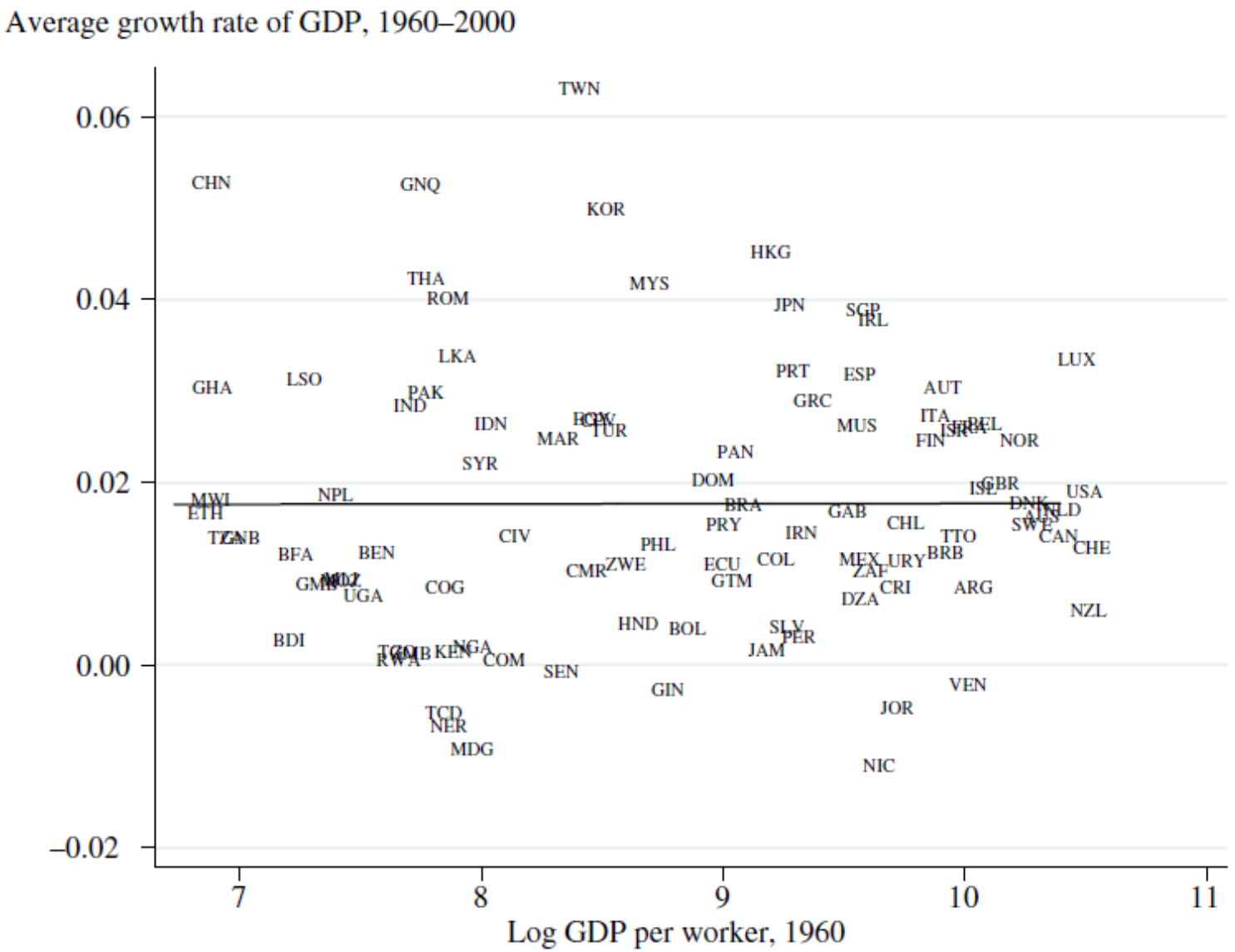
Açemoglu: Some of the fundamental causes of growth are:

- Luck: N.Korrea Vs. S.Korrea?
- Geography: proximity to prosperity; natural resources; productivity of agriculture
- Institutions and policies: rules of the game
- Culture and religion

Think: how does each of these factors affect the growth correlates: k, h, and A?

Do countries converge in living standards?

Absolute convergence



Do countries converge in living standards?

Conditional convergence

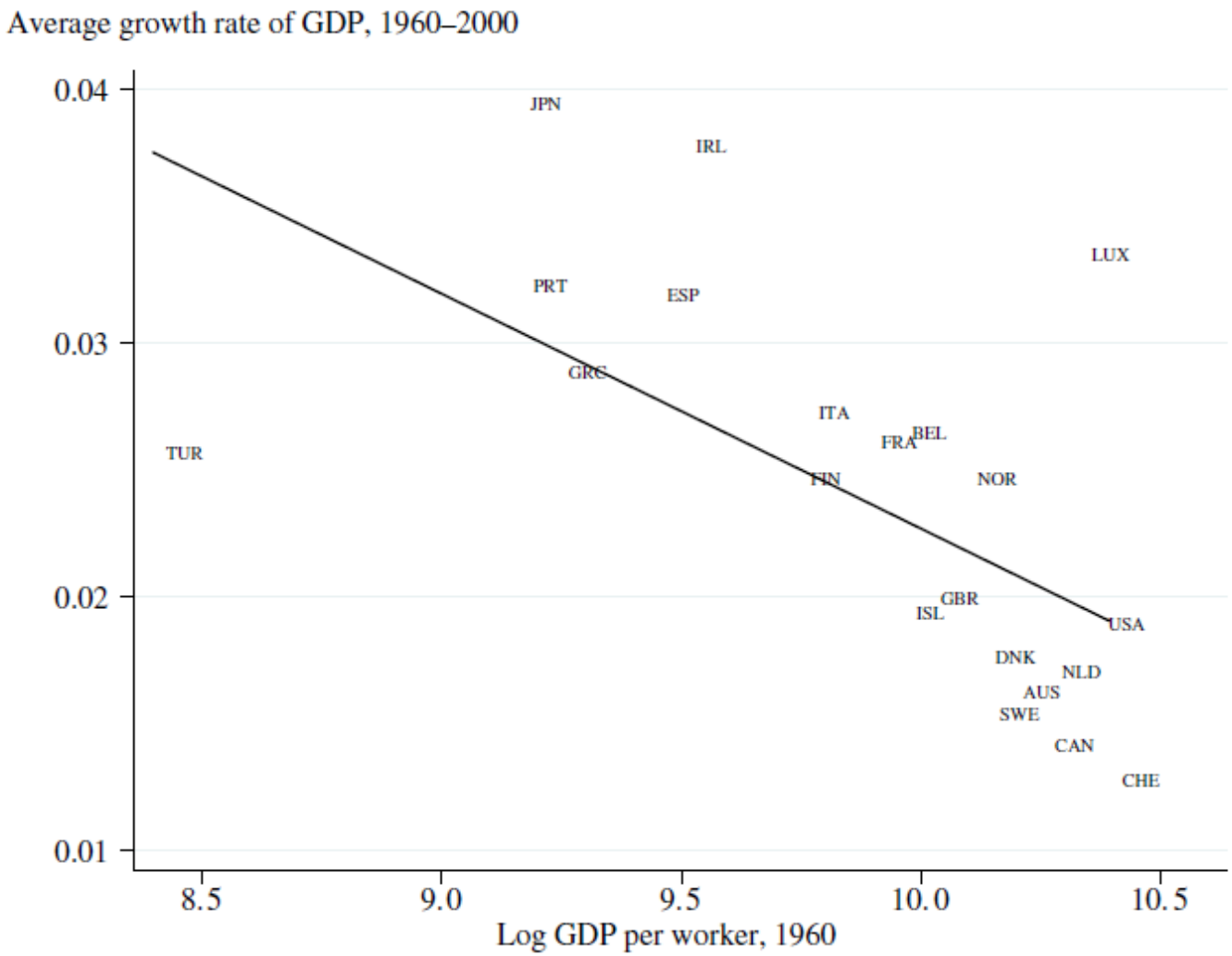


FIGURE 1.14 Annual growth rate of GDP per worker between 1960 and 2000 versus log GDP per worker in 1960 for core OECD countries.

Growth Distributions

The outcome of the fundamental factors at work

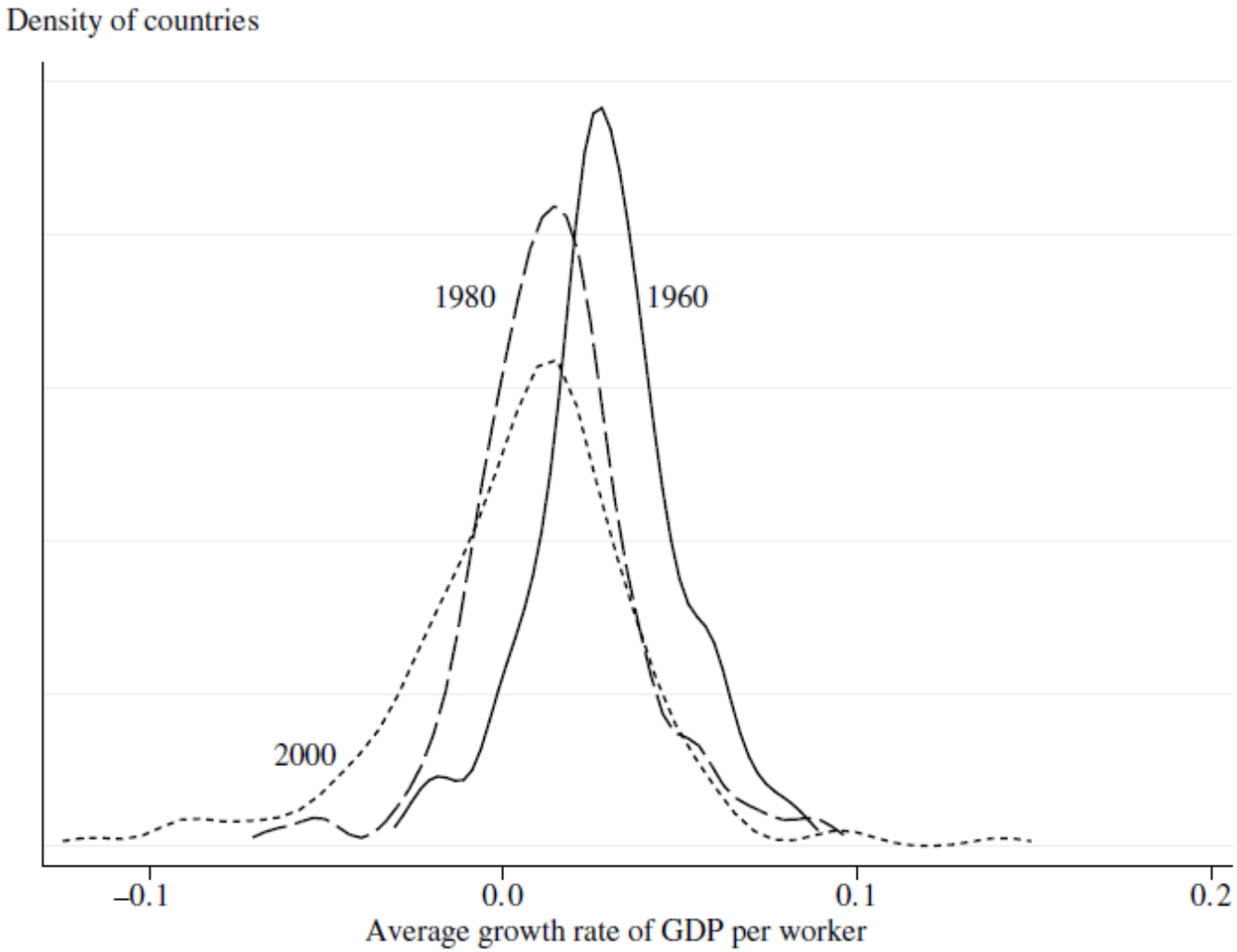


FIGURE 1.7 Estimates of the distribution of countries according to the growth rate of GDP per worker (PPP adjusted) in 1960, 1980, and 2000.

World Income Distributions

The outcome of growth processes

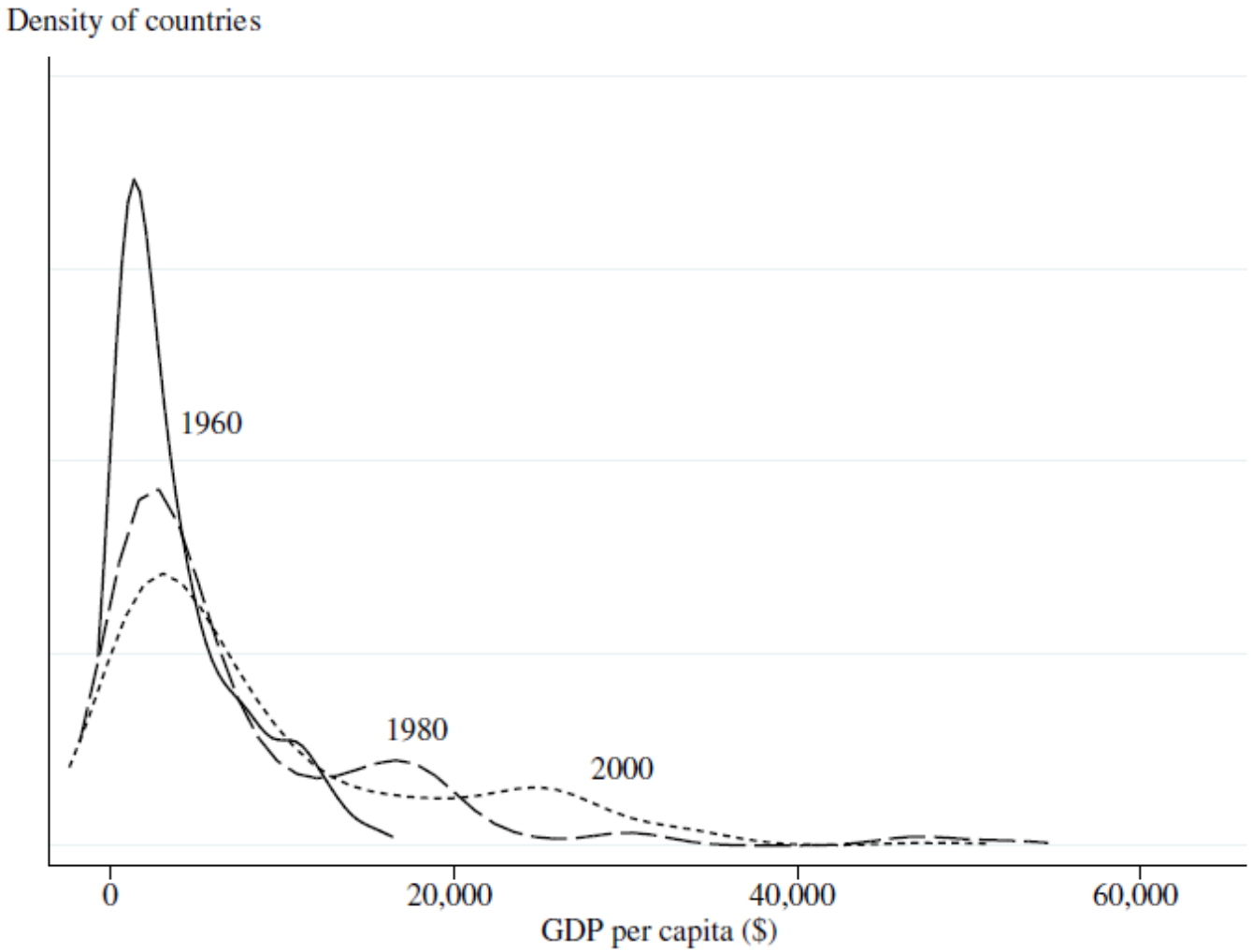


FIGURE 1.1 Estimates of the distribution of countries according to PPP-adjusted GDP per capita in 1960, 1980, and 2000.

Further reading

1. *** Clark, Gregory, (2007). A Farewell to Alms. A Brief Economic History of the World. Princeton University Press, Princeton, NJ [**Chapter 10**; Chapters 15-17]
2. *** Acemoglu, Daron, (2008). Introduction to Modern Economic Growth. Princeton University Press, Princeton, NJ. [**Chapter 1**. Economic Growth and Economic Development: the Questions; **Chapter 24**. Epilogue: Mechanics and Causes of Economic Growth]
3. Hausmann, Ricardo, and Pritchet, Lant, and Dani Rodrik, (2005). Growth Accelerations. *Journal of Economic Growth*, Vol. 10, 303-329, http://www.jstor.org/stable/40216082
4. Rodrik, Dani, (2005). Growth Strategies. In: *Handbook of Economic Growth*, Volume 1A, Chapter 14. Edited by Philippe Aghion and Steven N. Durlauf, 2005 Elsevier B.V.