

# **Chapter 6 -- The Capital-Labor Split in the 21st Century**

**Thomas Piketty, *Capital in the 21st Century* (Harvard University Press 2014)**

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# The First Fundamental Law of Capitalism

- . The first fundamental law of capitalism:

$$\alpha = r \times \beta$$

gives a correspondence between the capital/income ratio and the division of income between labor and capital.

- . For example, if the capital stock is equal to six years of national income ( $\beta = 6$ ), and if the average return on capital is 5 percent a year ( $r = 5\%$ ), then the share of income from capital  $\alpha$  (as a percentage of national income) is 30 percent, and the share of income from labor is therefore 70 percent.
- . **How is the rate of return on capital determined?**

# Evolution of the Capital Income Share

- . The capital income share  $\alpha$  has a U-shape similar to that of the capital/income ratio  $\beta$ , although the depth is less pronounced.
- . Changes in the rate of return on capital  $r$  have mitigated the evolution of the quantity of capital  $\beta$ :
  - $r$  is higher in periods when  $\beta$  is lower.
  - $r$  is lower in periods when  $\beta$  is higher.
- . The capital shares and rates of return are calculated by adding the various amounts of income from capital included in national accounts, including rents, profits, dividends, interest, royalties, etc., but excluding interest on public debt and excluding taxes.

## Capital Income Share and Capital/Income Ratio

- . The capital income share  $\alpha$  was about 35–40 percent in both the United Kingdom and France in the late 18th and throughout the 19th century.
- . In the middle of the 20th century  $\alpha$  fell to 20–25 percent, then rose again to 25–30 percent in the late 20th and early 21st.
- . This corresponds to an average rate of return on capital  $r$  of about 5–6 percent in the 18th and 19th centuries, 7–8 percent in the mid-20th century, 4–5 percent in the late 20th and early 21st.

# Average Rates of Return on Capital

- . The yield on the riskiest assets (including industrial capital in the form of partnerships in family firms and shares of stock in listed corporations) is often greater than 7–8 percent.
- . The yield on less risky assets is about 4–5 percent for farmland in the 18th and 19th centuries and 3–4 percent for real estate today.
- . These are pre-tax returns.
- . In the 18th and 19th century, taxes were low. Today the average tax rate on income from capital is around 30 percent in rich countries. The pure rate of return is therefore higher than the actual rate.
- . These are real returns (net of inflation).

# Non-Wage Income

- . The income of non-wage workers may include capital income as it is sometimes difficult to distinguish the source.
- . In partnerships and sole proprietorships, the head is often both owner and operator, which makes it difficult to distinguish personal and business accounts.
- . In rich countries today, around 10% of domestic production is due to non-wage workers in individually owned businesses, about the same proportion of non-wage workers in the active population.
- . Because today the share of mixed income in national income is small, the uncertainty about capital's share of mixed income affects no more than 1–2 percent of national income.

# The Return on Capital in Historical Perspective

- . There has been no pronounced long-term trend either upward or downward.
- . The pure rate of return rose significantly above 6% following the massive destruction of property of 1914-1945, but has returned to the lower levels observed in the past.

# The Marginal Productivity of Capital

- . The marginal productivity of capital is defined by the value of the additional production due to one additional unit of capital.
- . In a complex economy, the marginal productivity of capital may be difficult to determine for every possible use. The principle of 'no-arbitrage' suggests:
  - In a perfect capital market, each unit of capital is invested in the most productive way possible and earns the maximal marginal product feasible.
  - A perfectly diversified investment portfolio earns the average return risk-free rate.
- . The marginal productivity of capital decreases as the stock of capital increases, the 'law of diminishing marginal products.'



# Too Much Capital Kills the Return on Capital

- . In an office where 10 workers share 10 computers, if a computer breaks down a worker stands idle.
- . An office where 10 workers share 11 computers is more productive (at the margin), but also more costly to run (per unit of production).
- . An office where 10 workers share 12 computers: more productive but more costly.
- . An office where 10 workers share 100 computers: maybe a little more productive (arguable), but certainly much more costly.
- . Saturation is reached at some point.
- . Well before that point, the optimal level of capital is reached.

## How Fast Does Capital Reduce the Return on Capital?

- . The marginal productivity of capital falls when the stock of capital rises.
- . How fast does marginal productivity fall?
- . How does the return on capital  $r$  fall as the capital/income ratio  $\beta$  rises?
- . Two cases are possible.
  1.  $r$  falls **more** than proportionately as  $\beta$  increases.
  2.  $r$  falls **less** than proportionately as  $\beta$  increases.

## How Fast Does Capital Reduce the Return on Capital?

$$\alpha = r \times \beta$$

- . If the return on capital  $r$  falls more than proportionately when the capital/income ratio  $\beta$  rises, then the share of capital income in national income  $\alpha$  falls as  $\beta$  rises.
  - The fall in  $r$  more than compensates for the rise in  $\beta$ .
- . if  $r$  falls less than proportionately when  $\beta$  rises, then  $\alpha$  rises as  $\beta$  falls.
  - The fall in  $r$  moderates the rise in  $\beta$ .
- . Based on historical evolutions observed in the United Kingdom and France, the second case seems more relevant over the long run.

# The Aggregate Production Function

- . In the aggregate, the elasticity of substitution between capital and labor measures how easy/difficult it is to substitute capital for labor, or labor for capital, to produce goods and services.
- . If the coefficients of the production function are fixed, then the elasticity of substitution is zero ( $\sigma = 0$ ), e.g. one-for-one worker-machine pairing.
- . If the elasticity of substitution is infinite ( $\sigma = \infty$ ), the marginal productivity of capital is independent of the available quantity of capital and labor — and likewise for the marginal productivity of labor.
- . If the elasticity is **less** than one ( $\sigma < 1$ ), case **1** applies.
- . If the elasticity is **more** than one ( $\sigma > 1$ ), case **2** applies.

# The Cobb-Douglas Production Function

- . If the elasticity is **exactly** one ( $\sigma = 1$ ), the capital income share and labor income share are always constant!
- . If  $\alpha = 30\%$ , capital income accounts for 30% of national income and labor income 70%, *for any capital/income ratio  $\beta$* .
- . If the savings rate  $s$  and growth rate  $g$  yield a long-term capital/income ratio  $\beta = s/g$  corresponding to 600% of national income, then the rate of return on capital  $r$  will be 5%, and the capital income share will be 30%.
- . If the long-term capital stock is 300% of national income, then the return on capital  $r$  is 10%.
- . If the long-term capital stock is 1,000% of national income, then the return on capital  $r$  is 3%.

# The Capital-Labor Elasticity of Substitution

- . Recent data suggests an elasticity between 1.3 and 1.6 in modern economies.
- . Historical data suggests an elasticity less than 1 in traditional agricultural societies.
- . Estimates are uncertain and imprecise.
- . There is no reason why technologies of the future should exhibit the same elasticity as that of the past.

# The Contradictions of Capitalism

$$\alpha = r\beta, \quad \beta = s/g$$

- . If the savings rate  $s$  is positive, only permanent growth of productivity and population  $g$  can compensate for the permanent addition of new units of capital and prevent the capital/income ratio  $\beta$  from rising indefinitely.
- . If  $\beta$  is very large, then the return on capital  $r$  must get smaller and smaller, otherwise the capital income share  $\alpha$  ultimately captures all of national income.
- . Modern growth, based on productivity and the diffusion of knowledge, has made it possible to balance the process of capital accumulation.
- . And avoid the apocalypse predicted by Marx!

# The capital-labor split in the United Kingdom

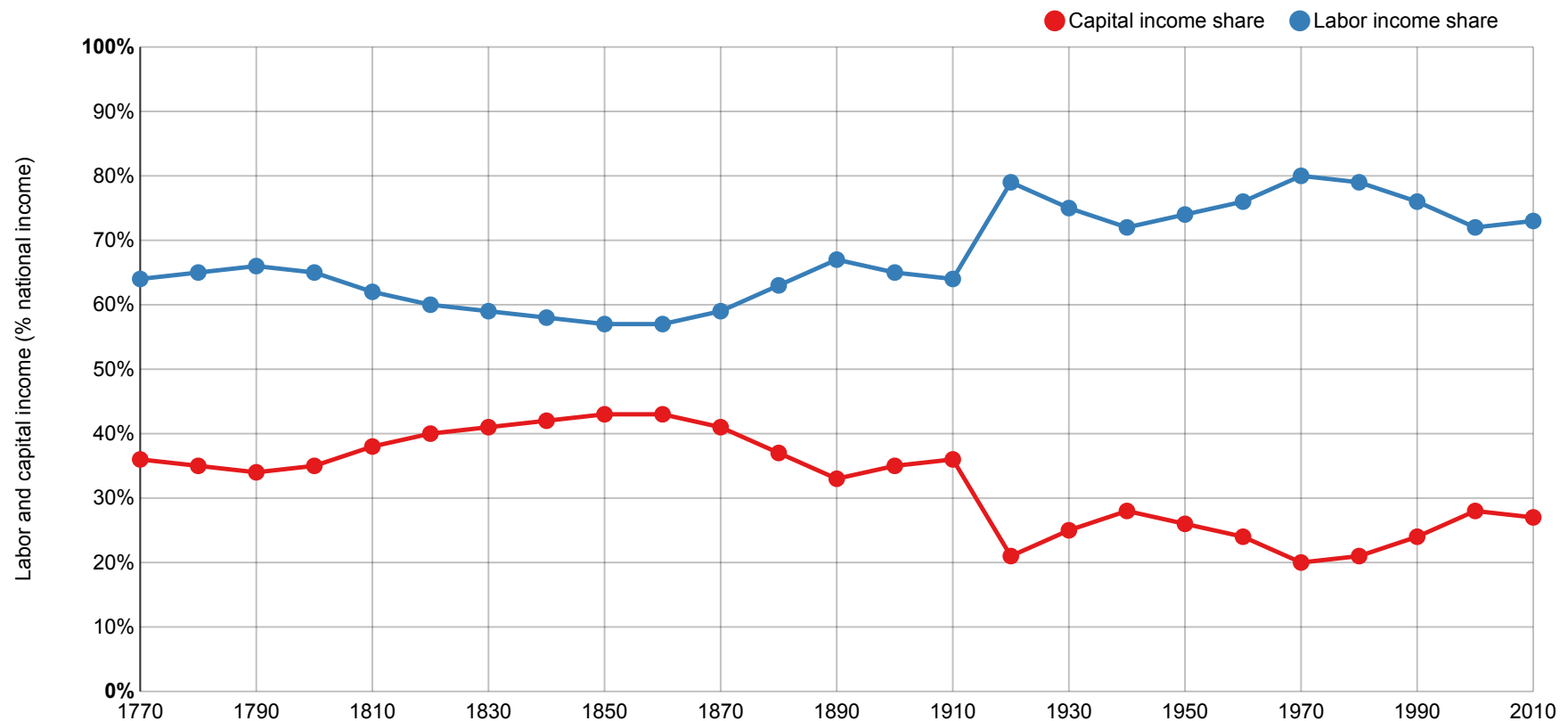


Figure 6.1. During the nineteenth century, capital income (rent, profits, dividends, interest...) absorbed about 40 percent of national income versus 60 percent for labor income (including both wage and non-wage income).



# The capital-labor split in France

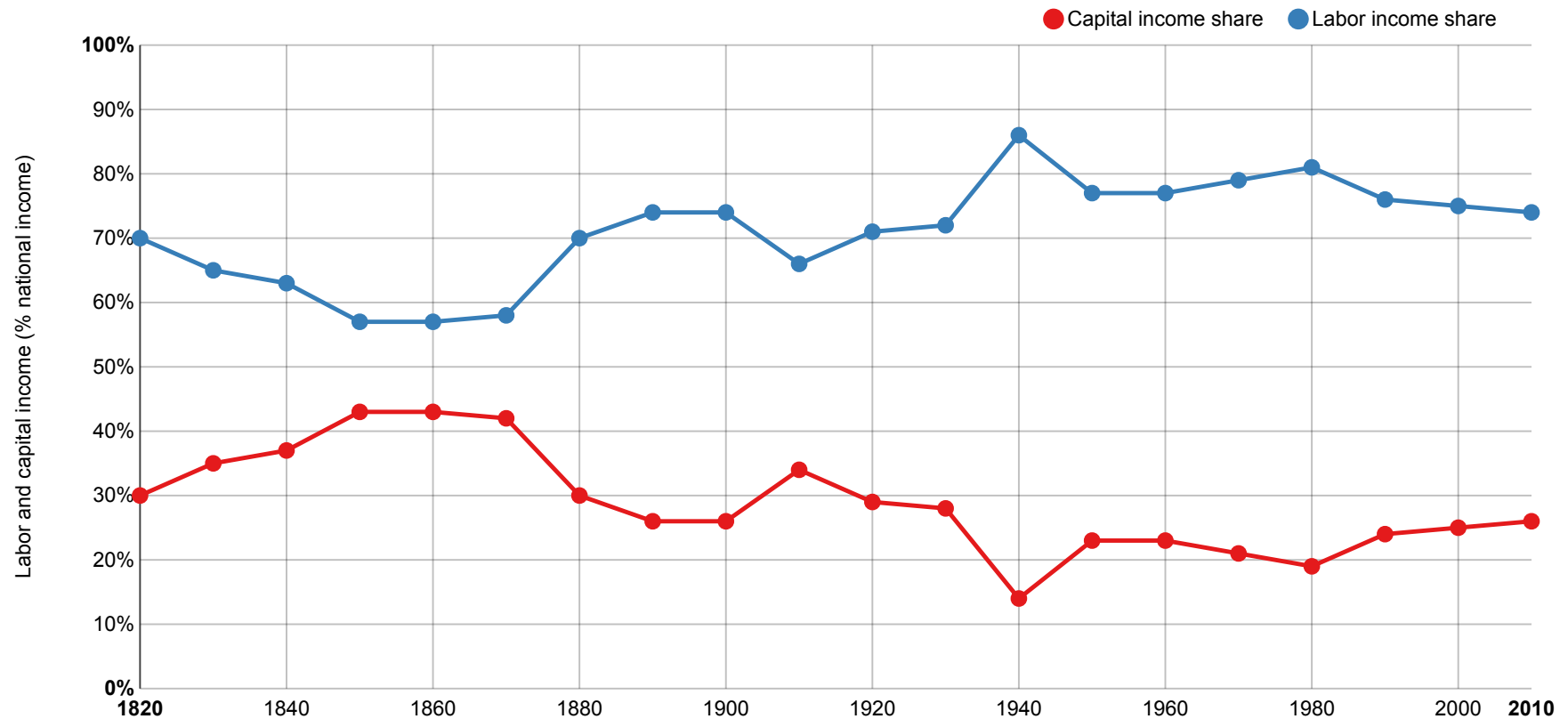


Figure 6.2. In the twenty-first century, capital income (rent, profits, dividends, interest...) absorbs about 30 percent of national income versus 70 percent for labor income (including both wage and non-wage income).

# The pure rate of return on capital in the United Kingdom

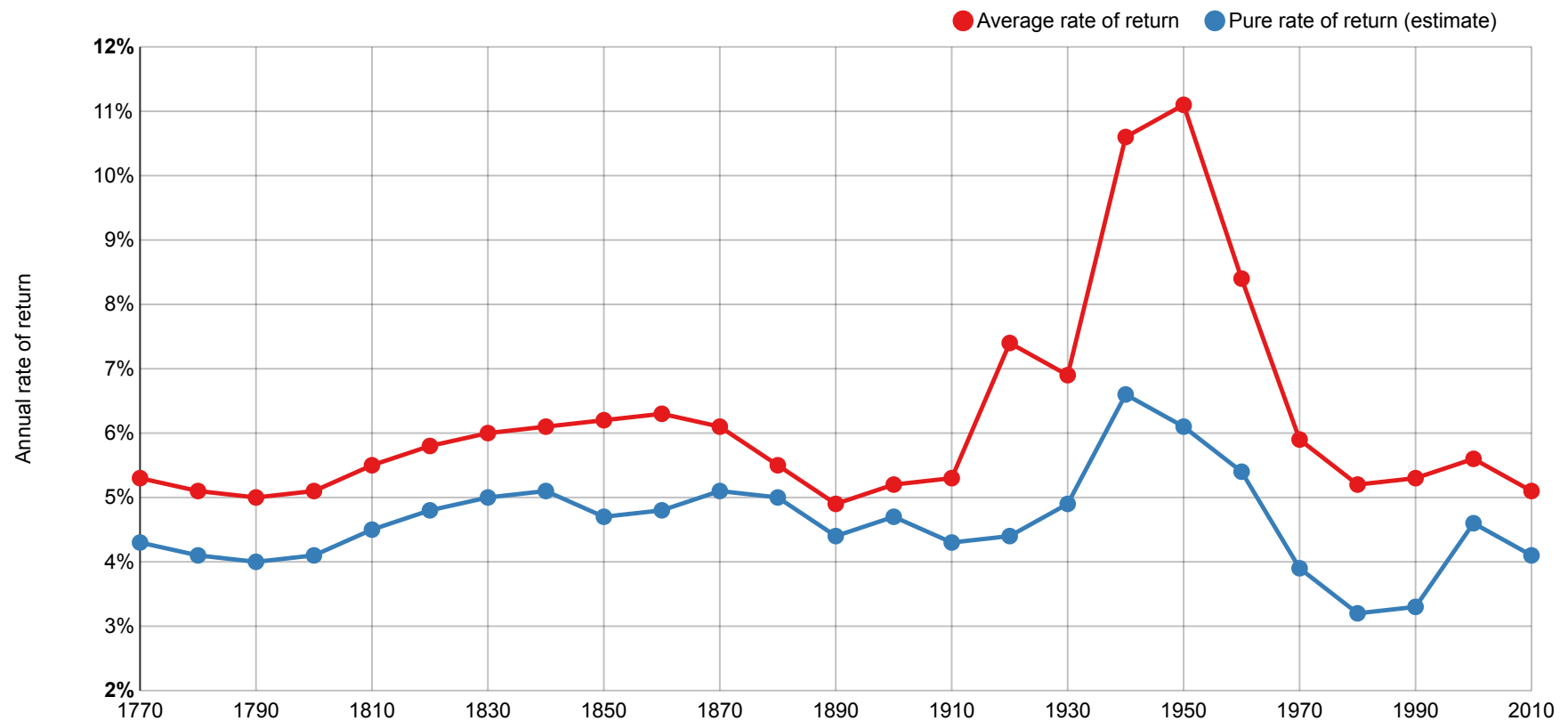


Figure 6.3. The pure rate of return to capital is roughly stable around 4-5 percent in the long run.

# The pure rate of return on capital in France

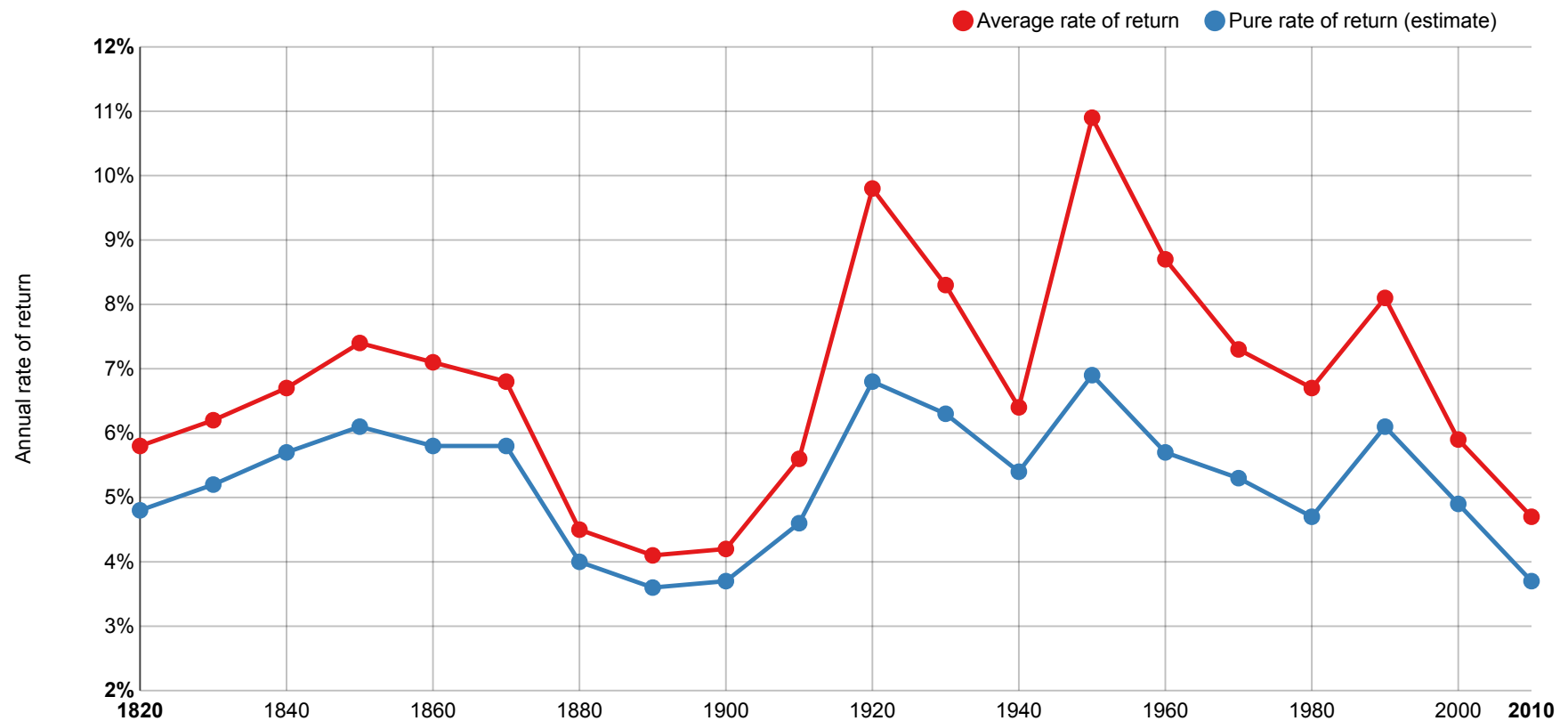


Figure 6.4. The observed average rate of return displays larger fluctuations than the pure rate of return during the twentieth century.

# The capital share in rich countries

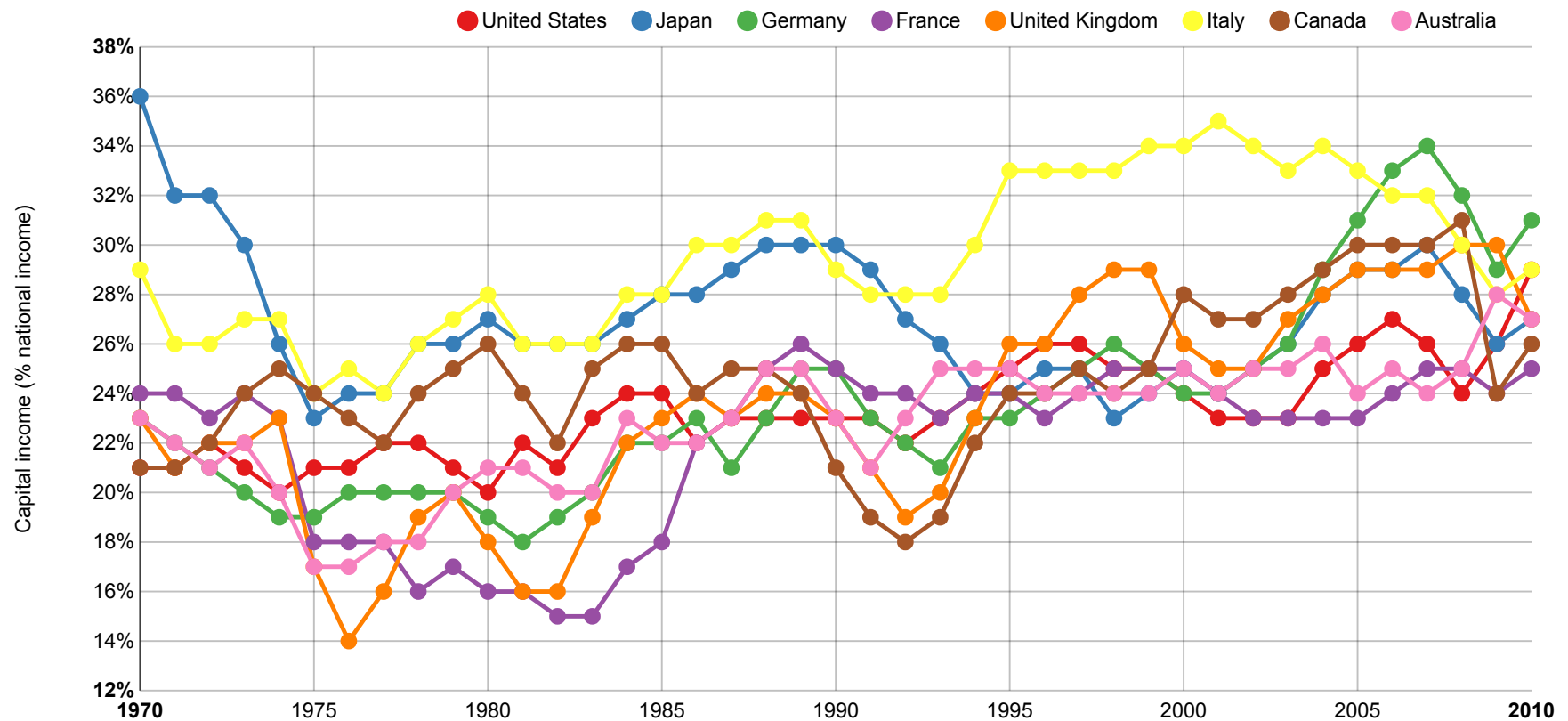


Figure 6.5. Capital income absorbs between 15 percent and 25 percent of national income in rich countries in 1970, and between 25 percent and 30 percent in 2000-2010.

# The profit share in the value added of corporations in France

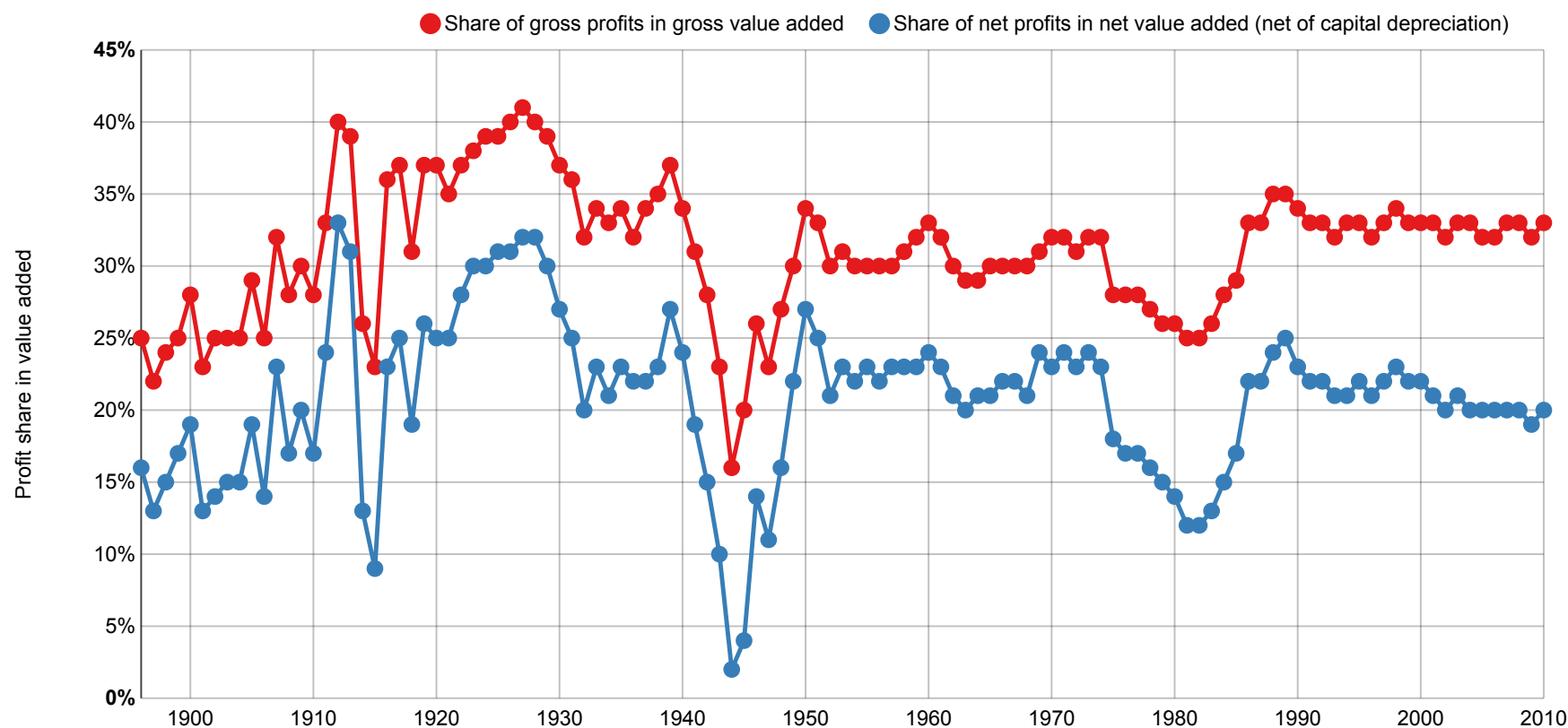


Figure 6.6. The share of gross profits in gross value added of corporations rose from 25 percent in 1982 to 33 percent in 2010; the share of net profits in net value added rose from 12 percent to 20 percent.

# The share of housing rent in national income in France

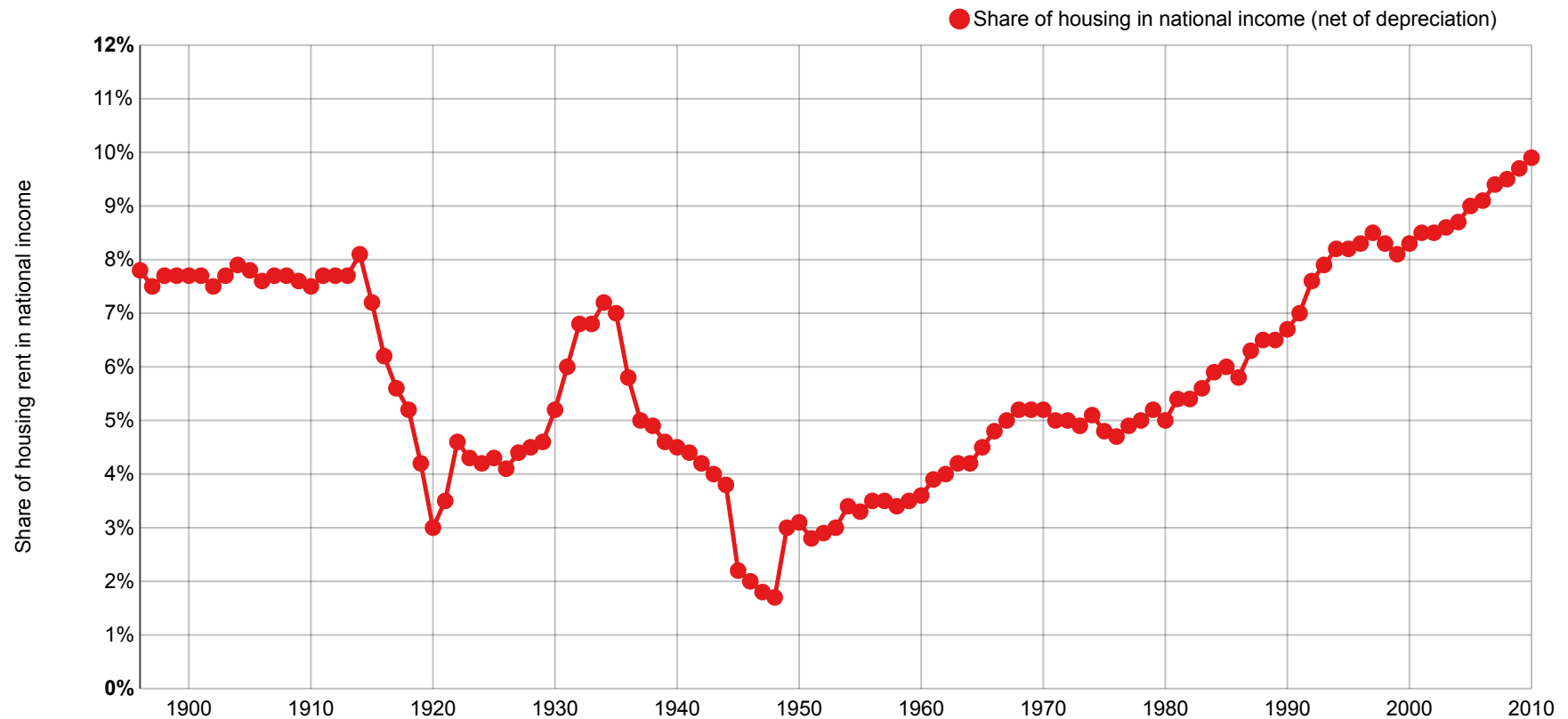


Figure 6.7. The share of housing rent (rental value of dwellings) rose from 2 percent of national income in 1948 to 10 percent in 2010.

# The capital share in national income in France

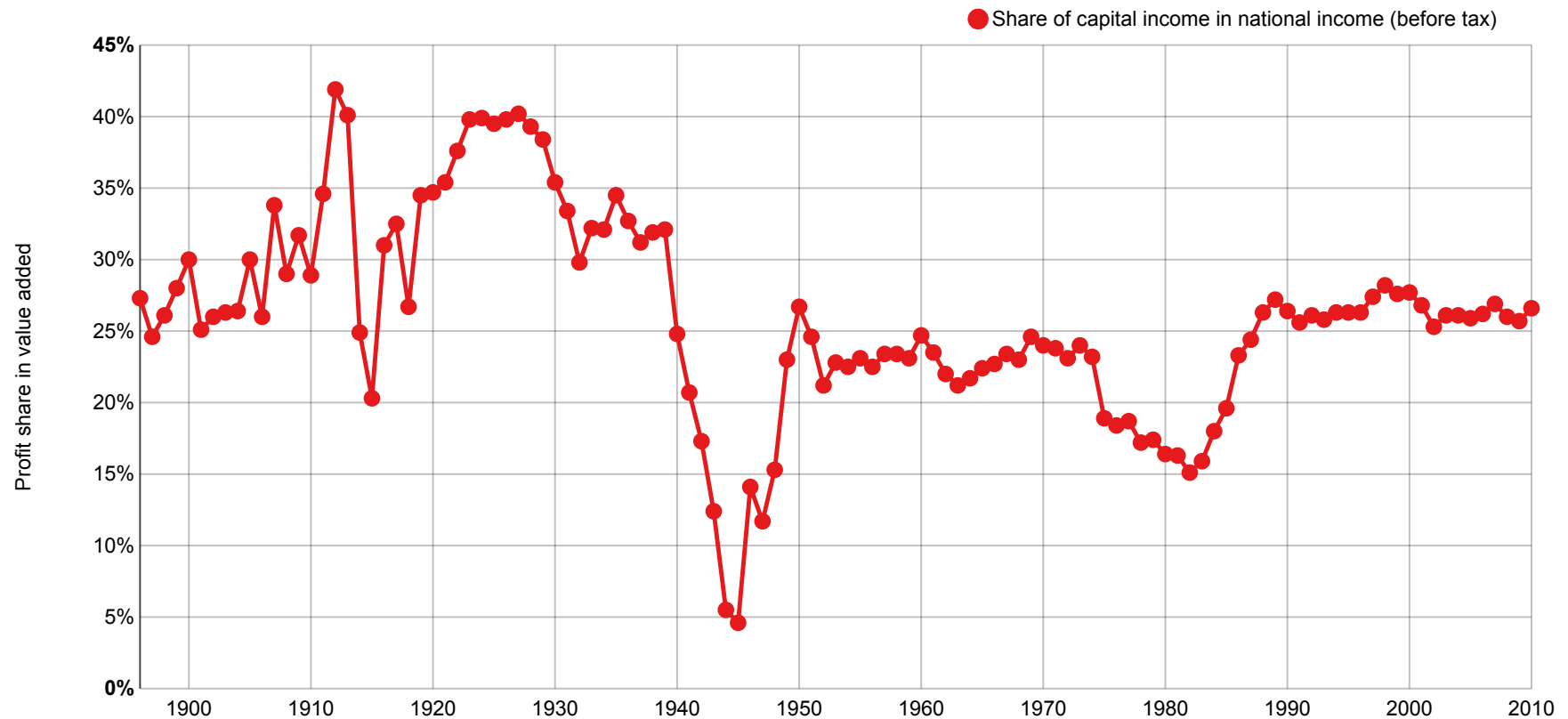


Figure 6.8. The share of capital income (net profits and rents) rose from 15 percent of national income in 1982 to 27 percent in 2010.