

Econ 133 – Global Inequality and Growth

Inequality between labor and capital

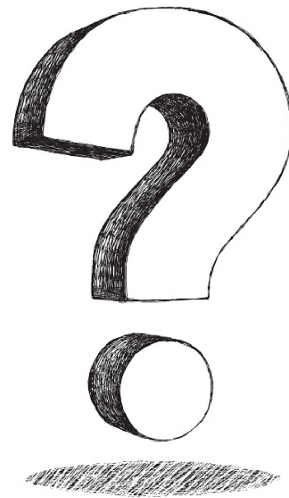
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What happens when wealth is accumulated?

- Do capital owners get a larger share of the pie? or...
- Do wage earners get the lions share?

Why do we care about the labor/capital share of income... do we?



In the last lecture we saw that:

- The capital share $\alpha = r \cdot \beta$
- The long-run wealth-income ratio $\beta \rightarrow s/g$

In this lecture we ask:

- If β rises, does this automatically imply that α will rise?
- More generally, what are the forces that determine α ?

Roadmap

1. Factor shares in a Cobb-Douglas world
2. Factor shares with CES production
3. The role of institutions and bargaining power

1 Factor shares in a Cobb-Douglas world

1.1 Definition of factor shares

- Capital income = all income flows going to capital owners (independently of any labor input)
- Labor income = all income flows going to labor earners (independently of any K input)
- Caveat: In practice, frontier between capital and labor can be hard to draw

1.2 The Cobb-Douglas production function

- Cobb-Douglas production function: $Y = F(K, L) = K^\alpha L^{1-\alpha}$
- With perfect competition, wage rate $v =$ marginal product of labor, rate of return $r =$ marginal product of capital:

$$r = F_K = \alpha K^{\alpha-1} L^{1-\alpha} \quad \text{and} \quad v = F_L = (1 - \alpha) K^\alpha L^{-\alpha}$$

- So capital income $Y_K = rK = \alpha Y$ and labor income $Y_L = vL = (1 - \alpha)Y$
- Capital and labor shares are entirely set by technology and do not depend on quantities of capital and labor

1.3 Wait a second... how is that possible?

How can the labor and capital share of total income not depend on the relative size of the labor force and amount of capital in a Cobb-Douglas world??

The world is governed by a Cobb-douglass production function and the capital stock increase:

Do capital owners earn more income?

True

False

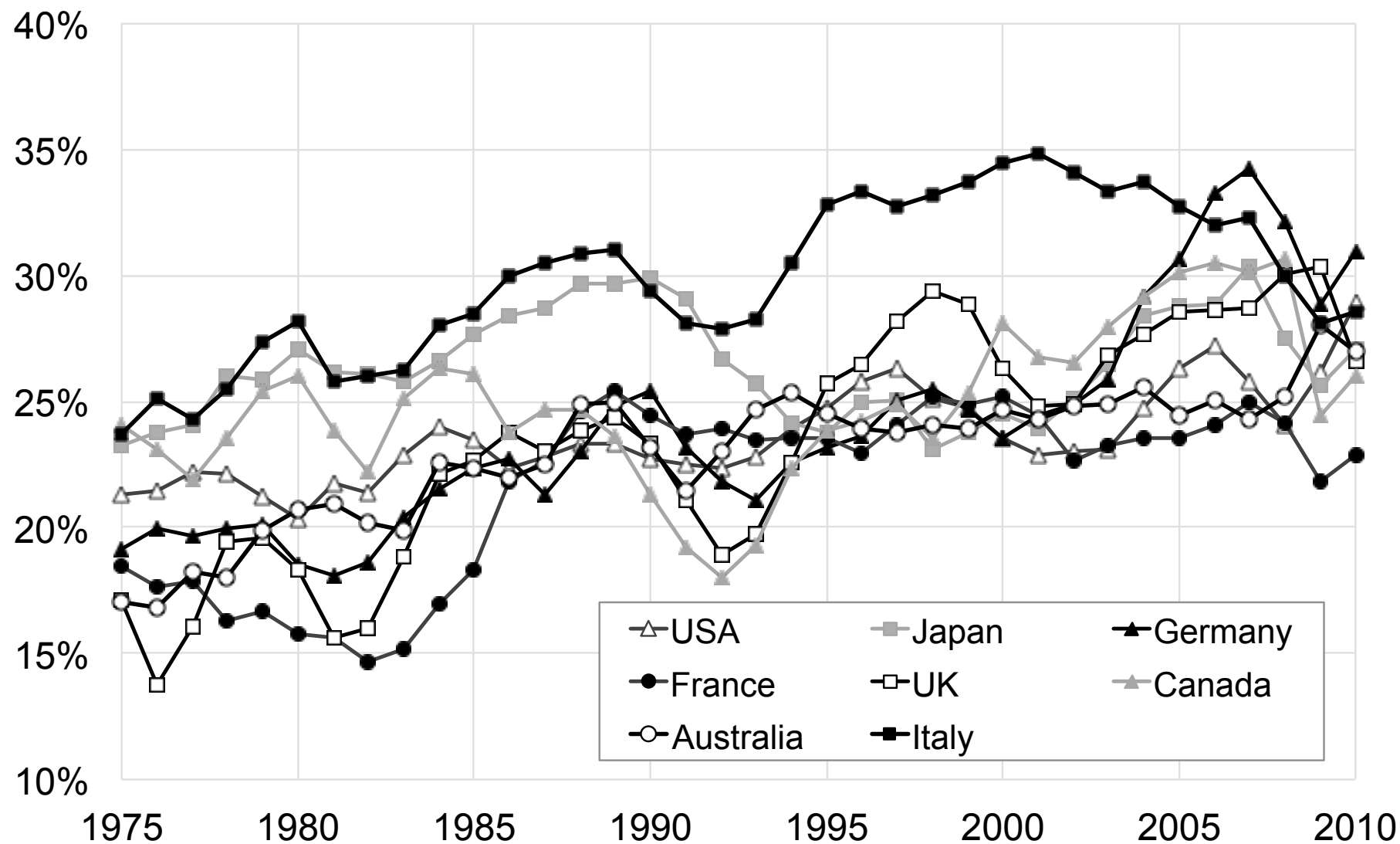
1.4 The limits of Cobb-Douglas

- Cobb-Douglas production very popular for a long time
- Writing in the 1920s, Keynes saw stable factor shares; became one of Kaldor's (1957) six stylized facts.

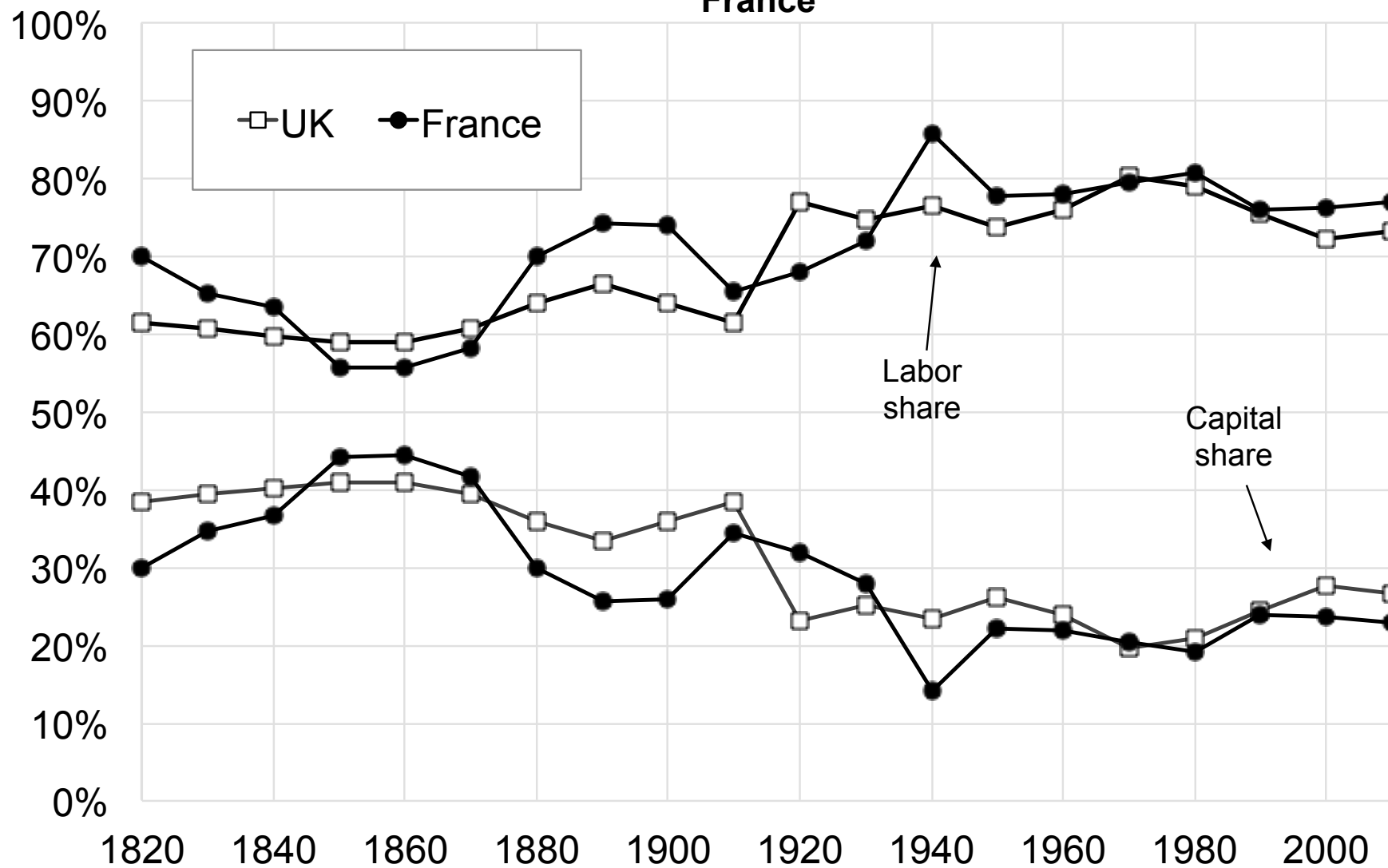
Two problems:

- Recent data show increase in capital share at global level. Reference on this: Karabarbounis and Neiman (2014)
- Evidence that α was higher in the 19th century than today

Capital shares in factor-price national income 1975-2010



Factor shares in factor-price national income 1820-2010: UK and France



2 Factor shares with CES production

2.1 The elasticity of substitution

- The elasticity of substitution σ captures the response of the capital-labor ratio K/L to a change in relative factor prices v/r :

$$\sigma = -\frac{d\log(K/L)}{d\log(F_K/F_L)} = \frac{d\log(K/L)}{d\log(v/r)}$$

- In the Cobb-Douglas case, σ is exactly equal to 1.

- Ex: if $\sigma = 1$ and wages rises by 1% relative to r , then firms use 1% less labor relative to K , so that labor share in output remains constant
- However, there is no reason why σ should be equal to 1 (Keynes: “a bit of miracle”)
- Ex: if $\sigma = 0.5$ and wages rises by 1% relative to r , then firms use 0.5% less labor relative to K , so that labor share in output *increase*
- Ex: if $\sigma = 1.5$ and wages rises by 1% relative to r , then firms use 1.5% less labor relative to K , so that labor share decrease *increase*

2.2 The CES production function

- In the CES production function, the elasticity of substitution can take any value
- With CES production, factor shares are not necessarily constant → useful to think about real world
- A CES production function is given by:

$$F(K, L) = (a \cdot K^{\frac{\sigma-1}{\sigma}} + (1 - a) \cdot L^{\frac{\sigma-1}{\sigma}})^{\frac{\sigma}{\sigma-1}}$$

- σ = constant elasticity of substitution

- As $\sigma \rightarrow \infty$, the production function becomes linear:
 $Y = rK + vL$. Robot economy \rightarrow i.e. the return to capital is independent of the quantity of capital
- As $\sigma \rightarrow 0$, the production function becomes putty-clay, i.e.
 $F(K, L) = \min(rK, vL)$: no substitution possibility, one needs exactly one machine per worker; otherwise the return to K falls to 0

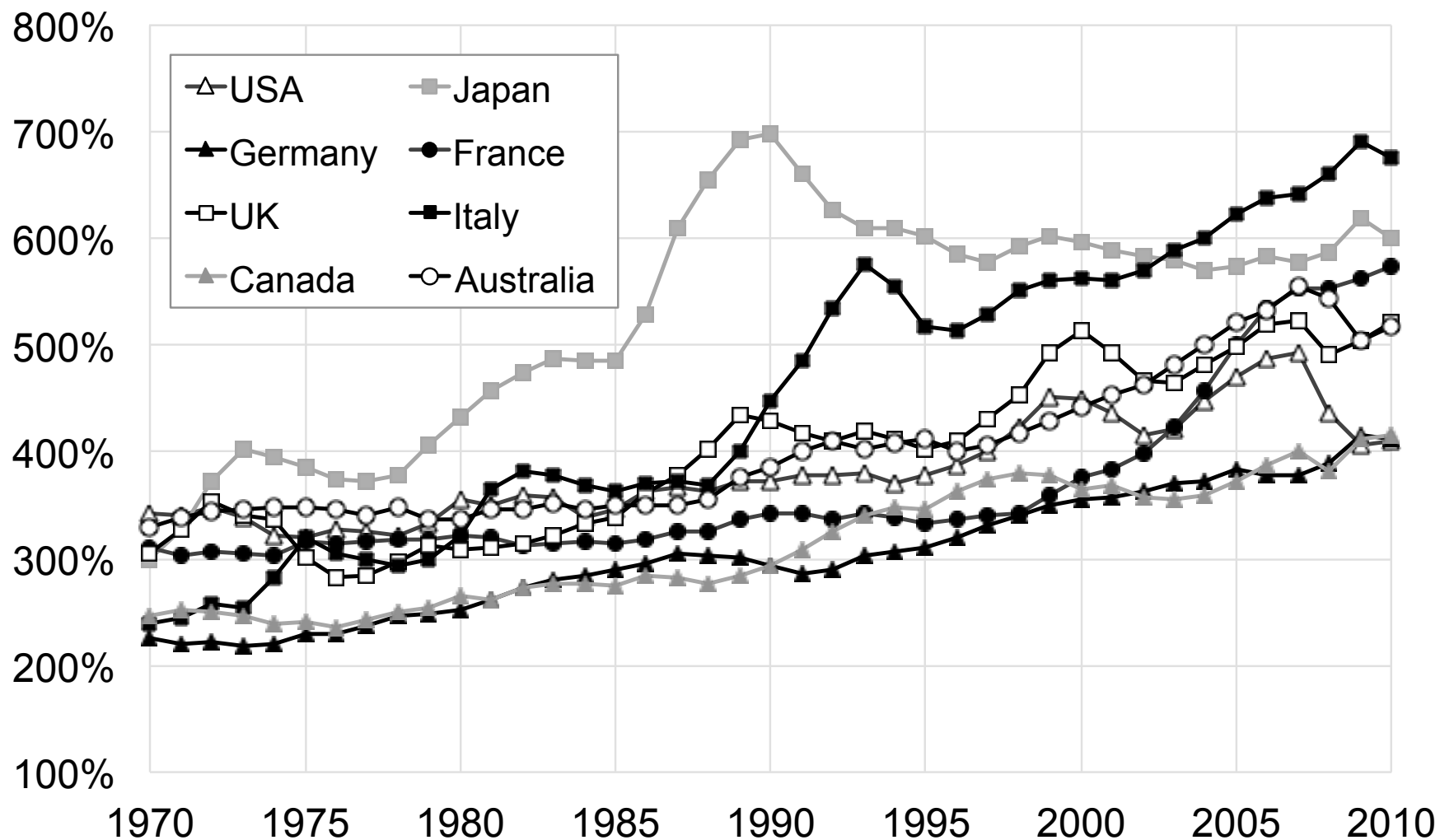
2.3 Let us simplify this:

- If machines can easily replace humans in production ($\sigma \gg 1$) \implies capital accumulation implies that capital owners can obtain the bulk of national income
- If machines are only valuable with high dependence on humans in production ($\sigma \rightarrow 0$) \implies capital accumulation implies that laborers can obtain the bulk of national income

2.4 Factor shares in a CES world

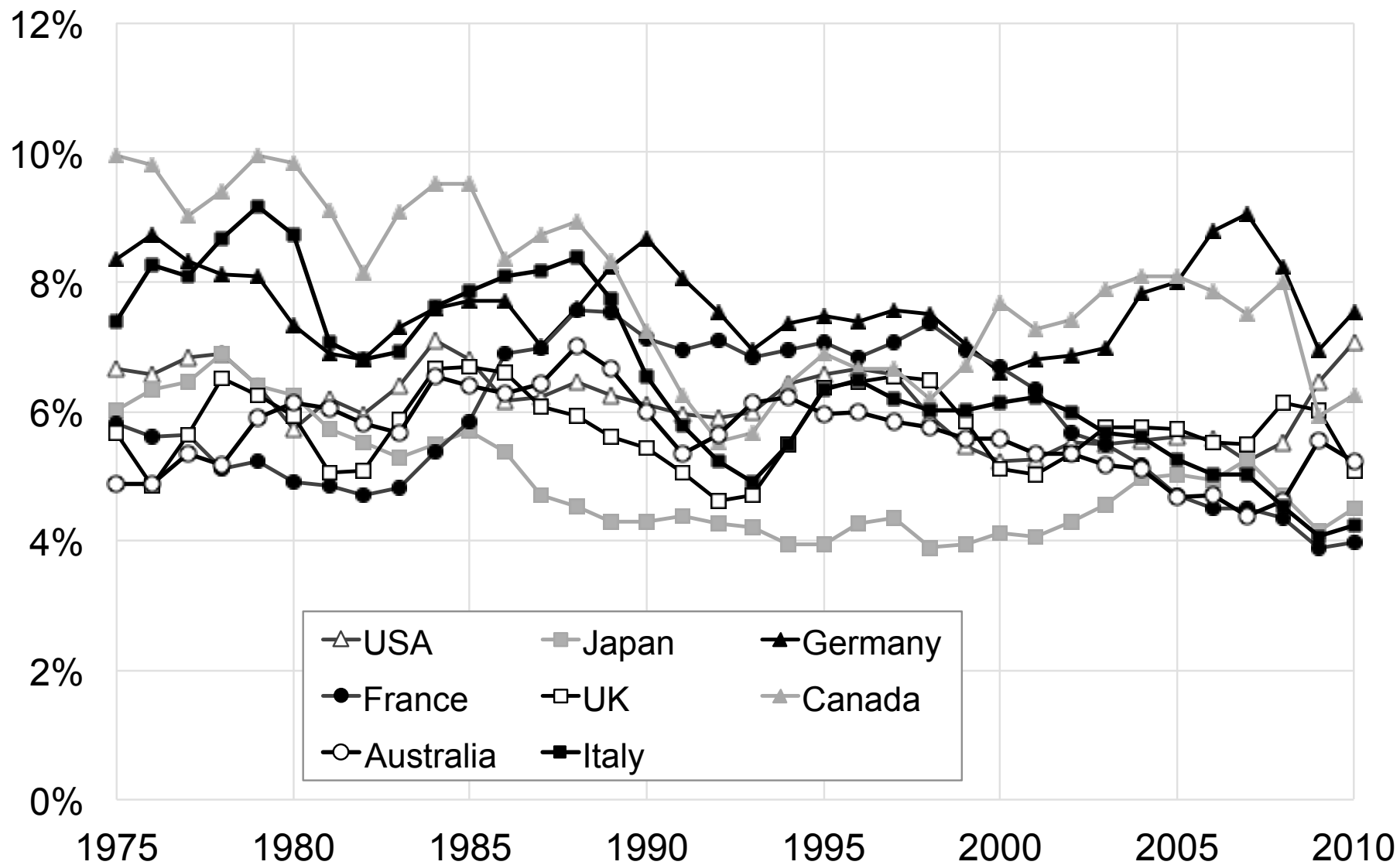
- The CES function helps think about the rise of the capital share
- Theorem: α is a rising function of β iff $\sigma > 1$
- Remember the accounting identity: $\alpha = r \cdot \beta$
- σ links the capital/income ratio β and the capital share α : it determines how much the rate of return r falls when β rises

Private wealth / national income ratios 1970-2010

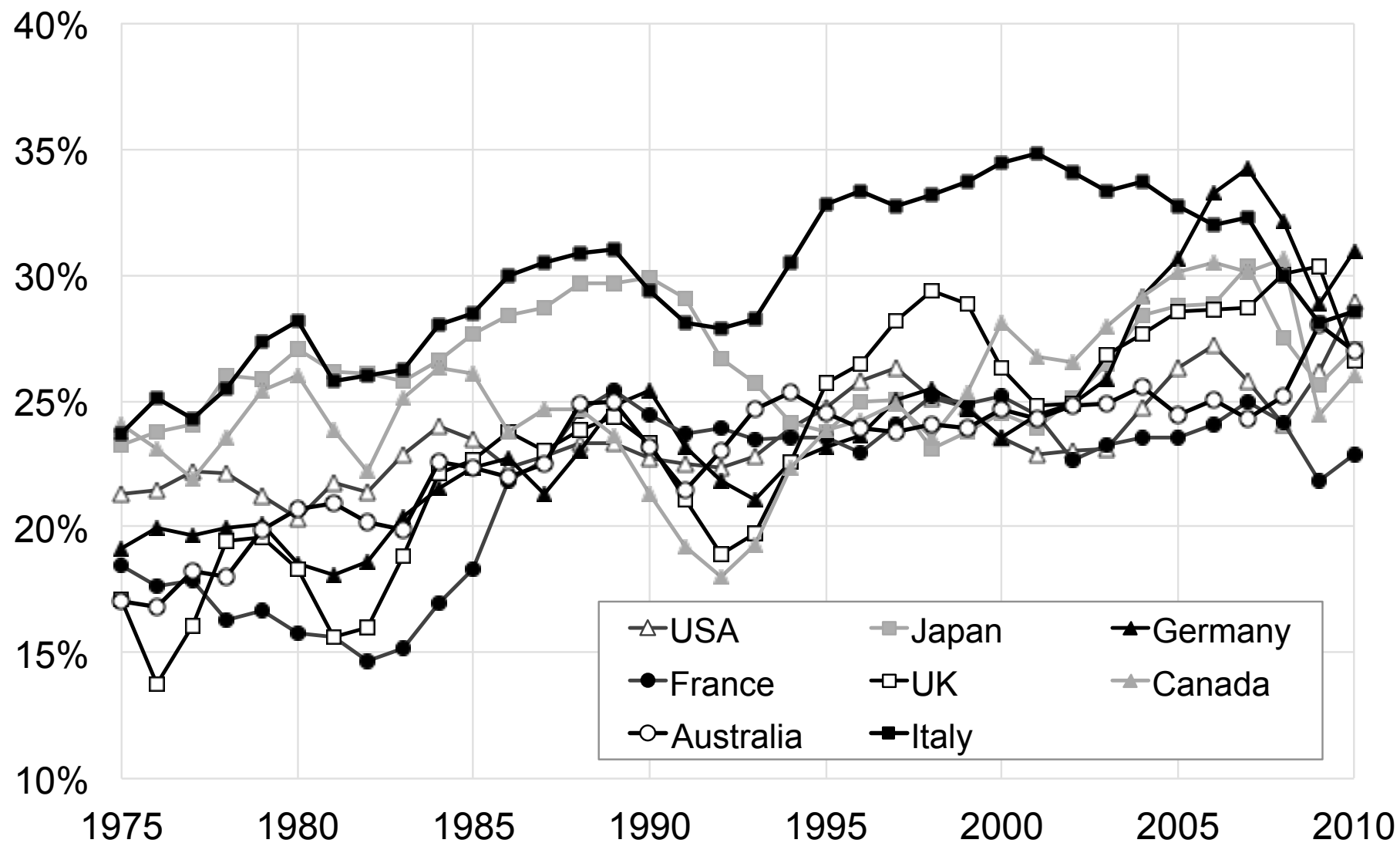


Source: Piketty and Zucman (2014). Authors' computations using country national accounts. Private wealth = non-financial assets + financial assets - financial liabilities (household & non-profit sectors)

Average return on private wealth 1975-2010



Capital shares in factor-price national income 1975-2010



- σ doesn't have to be much > 1 to account for observed trends
- If $\sigma = 1.5$, capital share rises from $\alpha = 28\%$ to $\alpha = 36\%$ when β rises from 250% to 500%
- In case β reaches 800%, α would reach 42%
- In case $\sigma=1.8$, α would be as large as 53%

2.5 What do we know about σ ?

- Micro literature usually finds $\sigma < 1$
- A recent macro literature finds $\sigma > 1$. Example: Karabarbounis and Neiman (2014)
- Possible that σ has increased over time: change in the nature of wealth, globalization

If the elasticity of substitution between labor and capital is > 1 :

A — The capital share of income tends to 100% in the long run

B — The capital share of income rises when the capital/income ratio rises

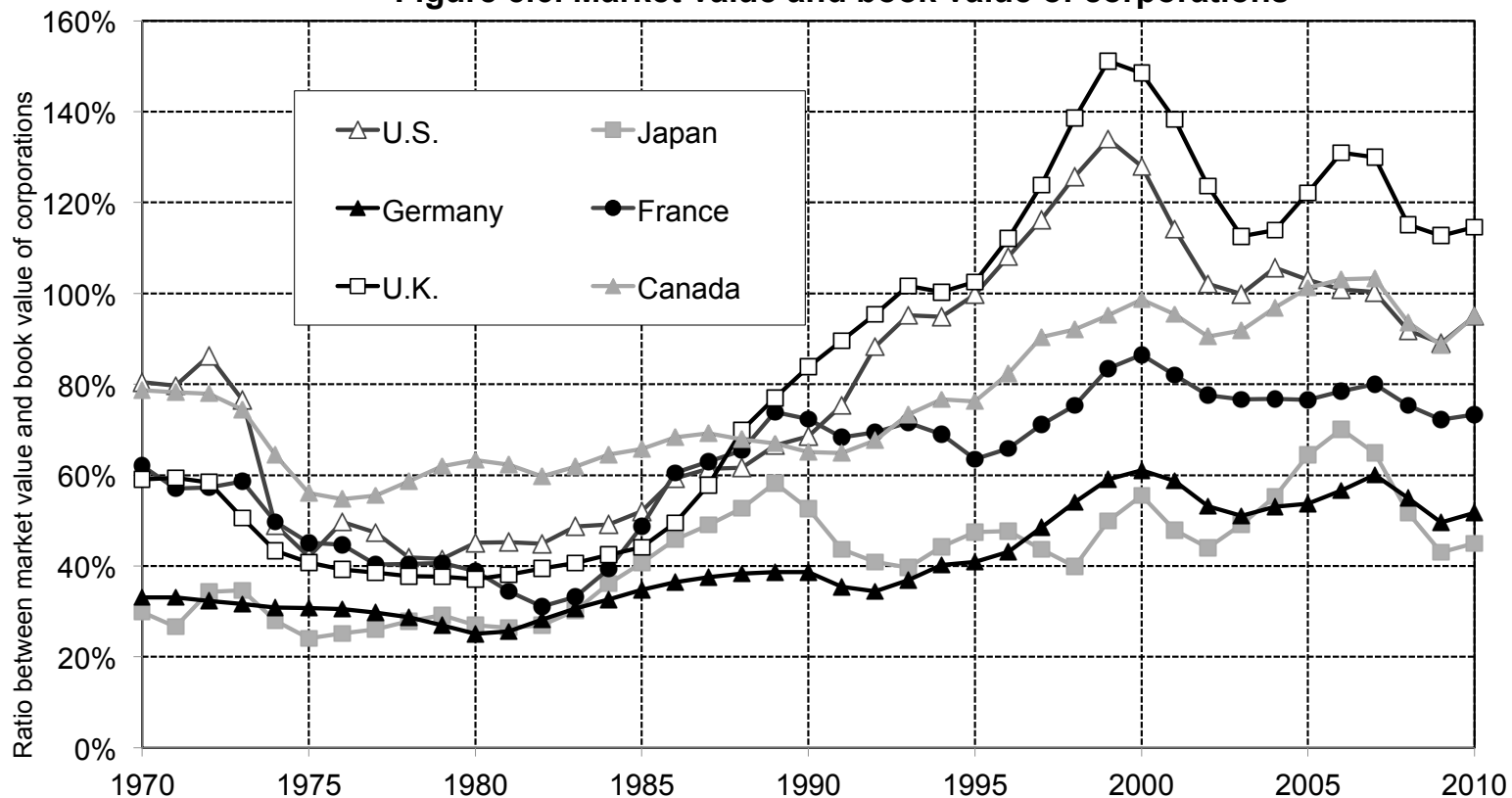
C — The capital share of income is constant

D — The capital share of income is entirely determined by technology

3 Change in the market power of capital

- So far we assumed perfect competition: capital and labor are paid their marginal product
- What if capital is paid more (or used to be paid less) than its marginal product?
- Possible channels: decline of unions, globalization, rise of network industries (Facebook, Twitter), change of social norms
- Evidence of change in market power for capital: rise of Tobin's Q

Figure 5.6. Market value and book value of corporations



Tobin's Q (i.e. the ratio between market value and book value of corporations) has risen in rich countries since the 1970s-1980s. Sources and series: see piketty.pse.ens.fr/capital21c.

Summary

- Factor shares are not constant: the capital share α is rising, the labor share $1 - \alpha$ falling
- One explanation is that the rise of the capital share of income may be the consequence of the rise of the stock of capital (rising β).
- If capital and labor are relatively substitutable ($\sigma > 1$), a rise in the wealth-income ratio β will trigger a rise in the capital share α
- \rightarrow *why is this important?*

Summary

- Another explanation is that market power for capital may be rising
- Because K income is v. unequally distributed (more than L income),
↑ α can have big consequences for interpersonal ineq.

References

Karabarbounis, Lukas and Brent Neiman, "The Global Decline of the Labor Share", *Quarterly Journal of Economics*, 2014 (web)

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Piketty, Thomas, and Gabriel Zucman, "Capital is back: wealth-income ratios in rich countries 1700-2010", *Quarterly Journal of Economics*, 2014 (web)