Economics 210A
Spring 2015

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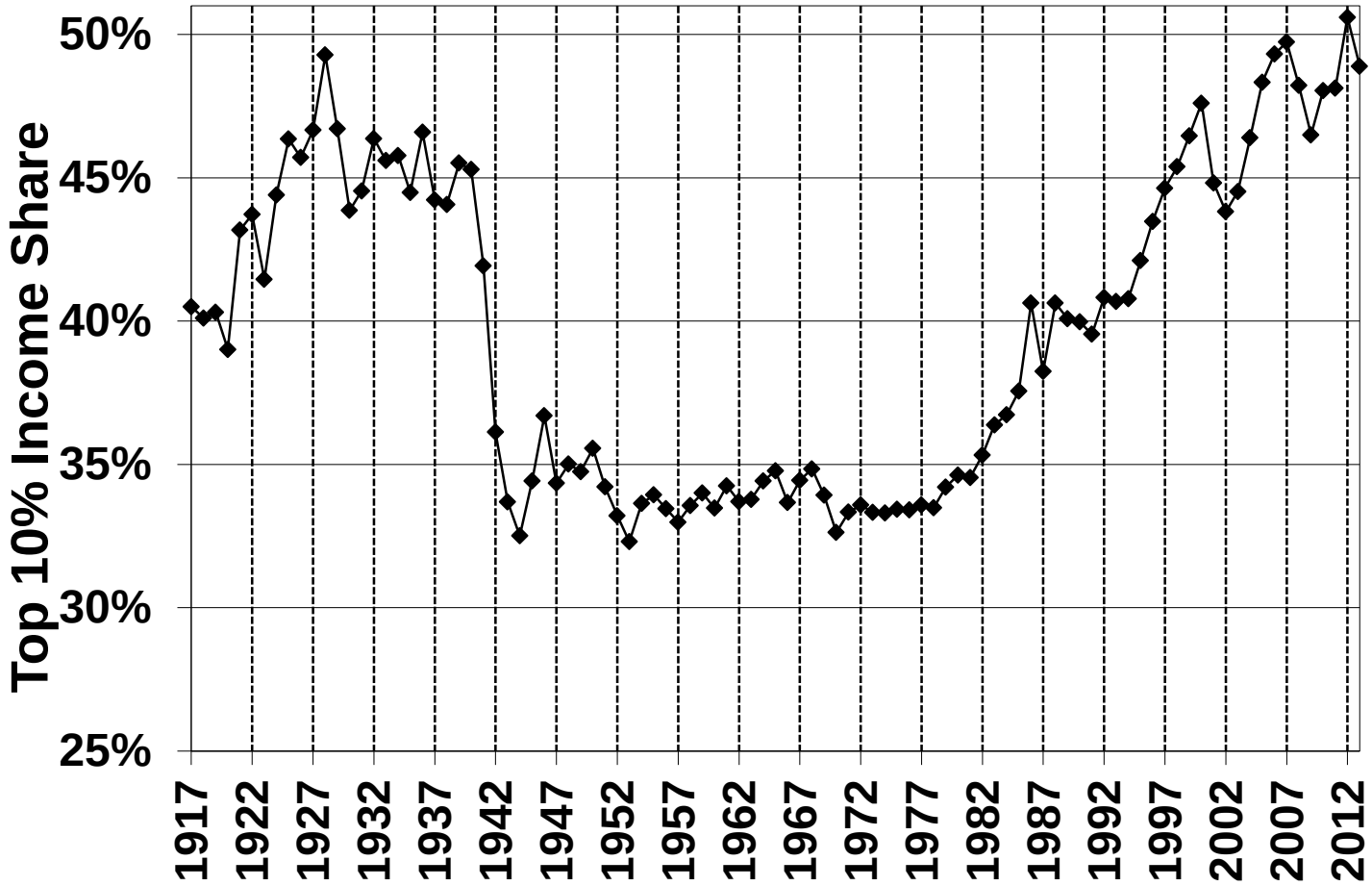
LECTURE 11
Inequality

April 8, 2015

I. Overview

Top 10% Pre-tax Income Share in the US, 1917-2013



Source: Piketty and Saez, 2003 updated to 2013. Series based on pre-tax cash market income including realized capital gains and excluding government transfers.

From: Piketty and Saez, *Quarterly Journal of Economics*, 1998 (2015 update).

Papers

- Goldin and Katz: The determinants of the evolution of wage inequality in the United States, 1915–2005.
- Long and Ferrie: Intergenerational mobility, United States and Britain, nineteenth and twentieth centuries.
- Piketty and Zucman: Evolution of the wealth-income ratio in major advanced economies, 1700–2010.

II. Goldin and Katz

"The Race between Education and Technology"

Overview

- Focus is on the evolution of inequality in the United States, 1915–2005.
- Examine the inequality of labor income.
- Concerned mainly with the bulk of the income distribution, not the extremes.
- Allows them to focus on a typical college graduate versus a typical high school graduate, or a typical high school graduate versus a typical non-graduate.

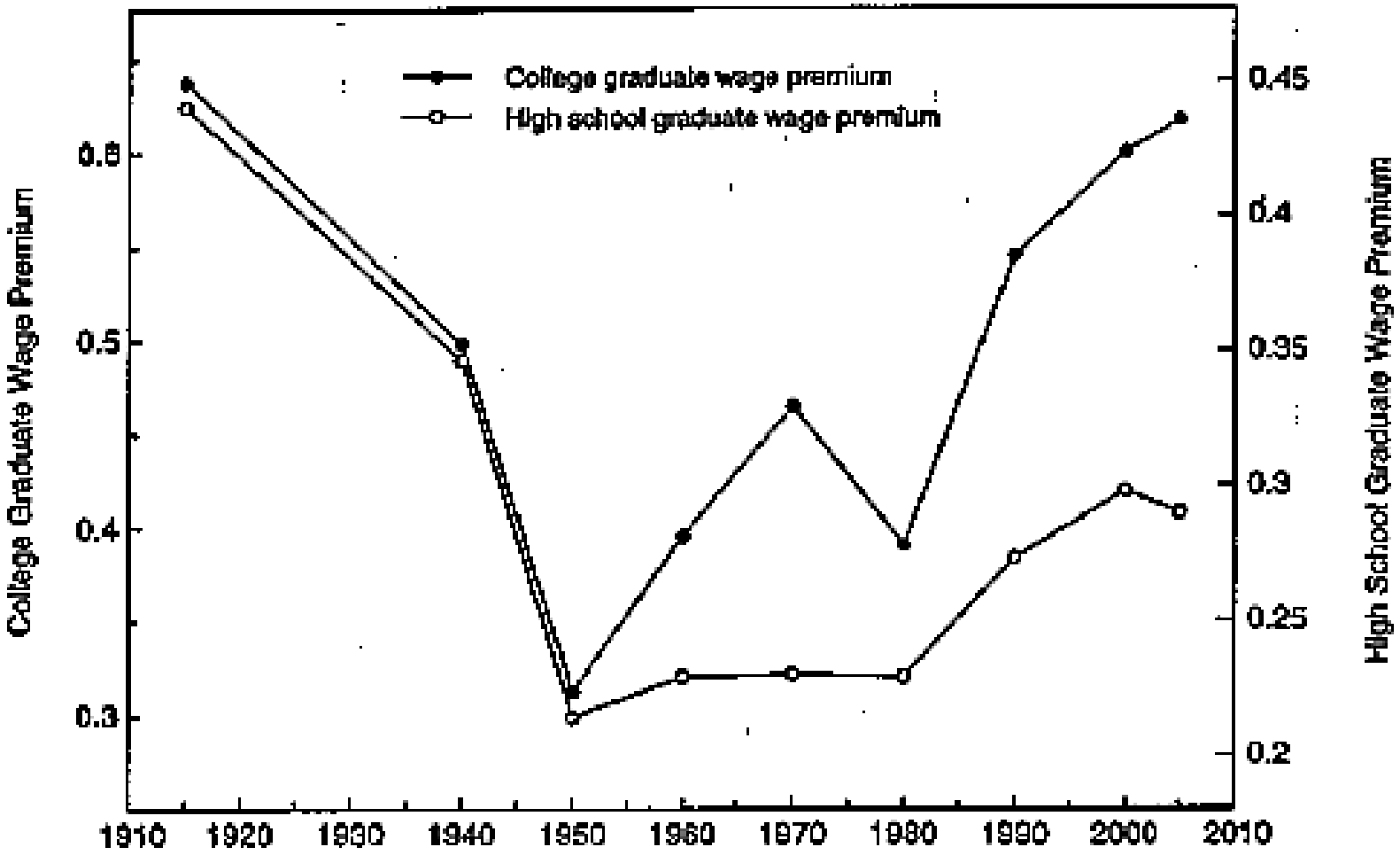
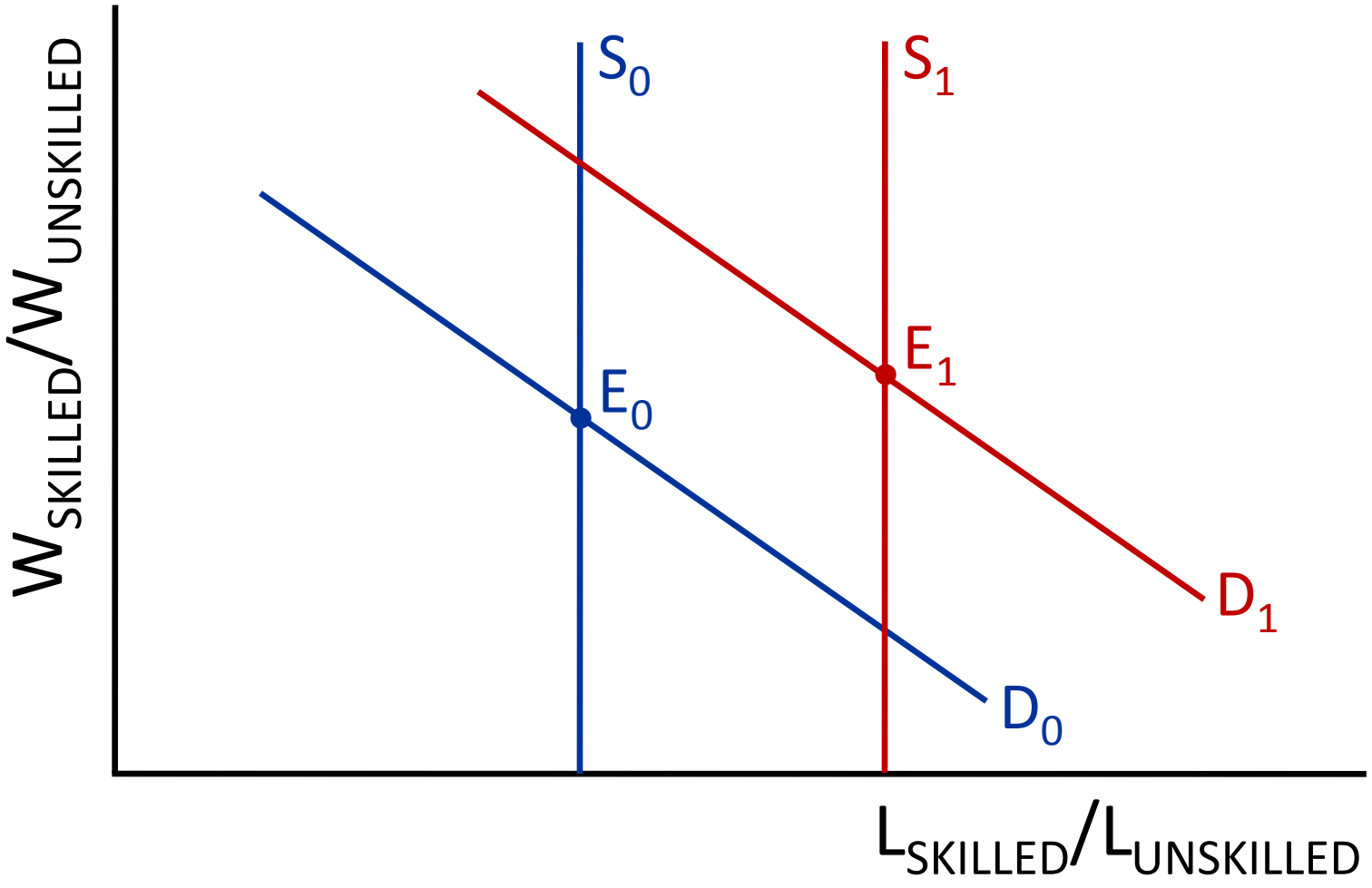


Figure 8.1. College Graduate and High School Graduate Wage Premiums: 1915 to 2005.

From: Goldin and Katz, "The Race between Education and Technology"

The Supply and Demand Framework for Analyzing the Wage Premium



Goldin and Katz's Framework (1)

- Output is a function of a composite labor input and other inputs.
- The composite labor input is a CES combination of skilled and unskilled labor, with a time-varying shift term.

Goldin and Katz's Framework (2)

The CES assumption implies:

$$\ln\left(\frac{W_{St}}{W_{Ut}}\right) = B_t - \frac{1}{\sigma_{SU}}\ln\left(\frac{S_t}{U_t}\right),$$

where:

S denotes skilled, *U* unskilled;

The *W*'s are wages;

S_t and U_t are the quantities of the two types of labor;

B_t is the shift term;

σ_{SU} is the elasticity of substitution between skilled and unskilled labor.

Goldin and Katz's Framework (3)

- Finally, each of *S* and *U* is a weighted sum of the quantities of different types of skilled and unskilled labor (where the types differ by gender, age, and amount of education).

- The weights are inferred from wages.

Estimating σ_{SU}

- Recall: $\ln\left(\frac{W_{St}}{W_{Ut}}\right) = B_t - \frac{1}{\sigma_{SU}}\ln\left(\frac{S_t}{U_t}\right)$.
- Preferred model of B_t:

$$B_t = a + bt + cYears_t^{\geq 1959} + dYears_t^{\geq 1992} + eD_t^{1949} + v_t.$$

- Substitute this into $\ln\left(\frac{W_{St}}{W_{Ut}}\right) = B_t - \frac{1}{\sigma_{SU}}\ln\left(\frac{S_t}{U_t}\right)$.
- Sample: 1914, 1939, 1949, 1959, annual 1963–2005.
- Estimate by OLS.

Concerns?

- Data-mining?
- Omitted variable bias?
- Are the standard errors too small?
- Other?

Table 8.2. Determinants of the College Wage Premium: 1915 to 2005

	(1)	(2)	(3)	(4)	(5)
(College/high school) supply	−0.544	−0.595	−0.610	−0.579	−0.618
	(0.079)	(0.093)	(0.065)	(0.099)	(0.079)
(College/high school) supply×post-1949					0.0078
					(0.0420)
Time	0.00378	0.00970	0.00991	0.00973	0.0103
	(0.00200)	(0.00243)	(0.00171)	(0.00545)	(0.0028)
Time×post-1949	0.0188				
	(0.0013)				
Time×post-1959		0.0156	0.0154		0.0150
		(0.0012)	(0.0009)		(0.0022)
Time×post-1992	−0.00465	−0.00807	−0.00739		−0.00742
	(0.00227)	(0.00279)	(0.00196)		(0.00199)
1949 Dummy			−0.137		−0.143
			(0.021)		(0.036)
$Time^2 \times 10$				−0.00342	
				(0.00203)	
$Time^3 \times 1000$				0.105	
				(0.034)	
$Time^4 \times 10{,}000$				0.00664	
				(0.00186)	
Constant	−0.493	−0.645	−0.656	−0.587	−0.674
	(0.168)	(0.197)	(0.138)	(0.210)	(0.079)
R^2	0.934	0.917	0.960	0.928	0.960
Number of observations	47	47	47	47	47

From: Goldin and Katz, "The Race between Education and Technology"

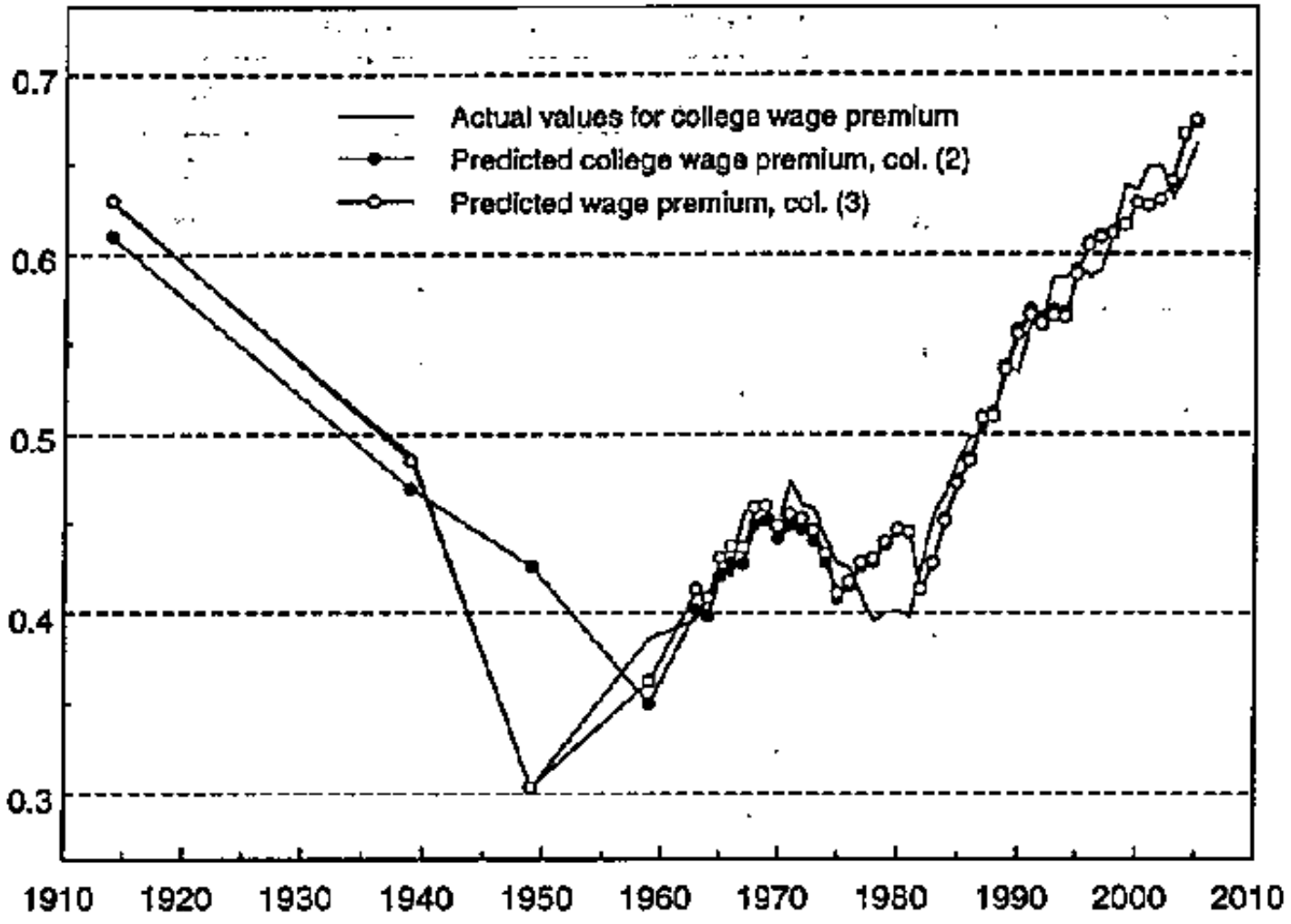


Figure 8.3. Actual versus Predicted College Wage Premium: 1915 to 2005.

From: Goldin and Katz, "The Race between Education and Technology"

Table 8.1. Changes in the College Wage Premium and the Supply and Demand for College Educated Workers: 1915 to 2005 (100 × Annual Log Changes)

	Relative Wage	Relative Supply	Relative Demand (σ_{SU}=1.4)	Relative Demand (σ_{SU}=1.64)	Relative Demand (σ_{SU}=1.84)
1915–40	–0.56	3.19	2.41	2.27	2.16
1940–50	–1.86	2.35	–0.25	–0.69	–1.06
1950–60	0.83	2.91	4.08	4.28	4.45
1960–70	0.69	2.55	3.52	3.69	3.83
1970–80	–0.74	4.99	3.95	3.77	3.62
1980–90	1.51	2.53	4.65	5.01	5.32
1990–2000	0.58	2.03	2.84	2.98	3.09
1990–2005	0.50	1.65	2.34	2.46	2.56
1940–60	–0.51	2.63	1.92	1.79	1.69
1960–80	–0.02	3.77	3.74	3.73	3.73
1980–2005	0.90	2.00	3.27	3.48	3.66
1915–2005	–0.02	2.87	2.83	2.83	2.82

From: Goldin and Katz, "The Race between Education and Technology"

A Slightly Different Way of doing Goldin and Katz's Decomposition

- Recall: $\ln\left(\frac{W_{St}}{W_{Ut}}\right) = B_t - \frac{1}{\sigma_{SU}}\ln\left(\frac{S_t}{U_t}\right)$.
- So, decompose $\Delta \ln\left({}^{W_S}/_{W_U}\right)$ over some period into $\left({}^{1}/_{\hat{\sigma}_{SU}}\right)\Delta \ln\left({}^{S}/_{U}\right)$ and ΔB (computed as a residual).
- We can go further and separate out the portion of ΔB that is coming from $bt + cYears_t^{\geq 1959} + dYears_t^{\geq 1992}$.
- Note that all we need for the decomposition into $\left({}^{1}/_{\hat{\sigma}_{SU}}\right)\Delta \ln\left({}^{S}/_{U}\right)$ and ΔB is time-series data on *S/U* and a value for $\hat{\sigma}_{SU}$.

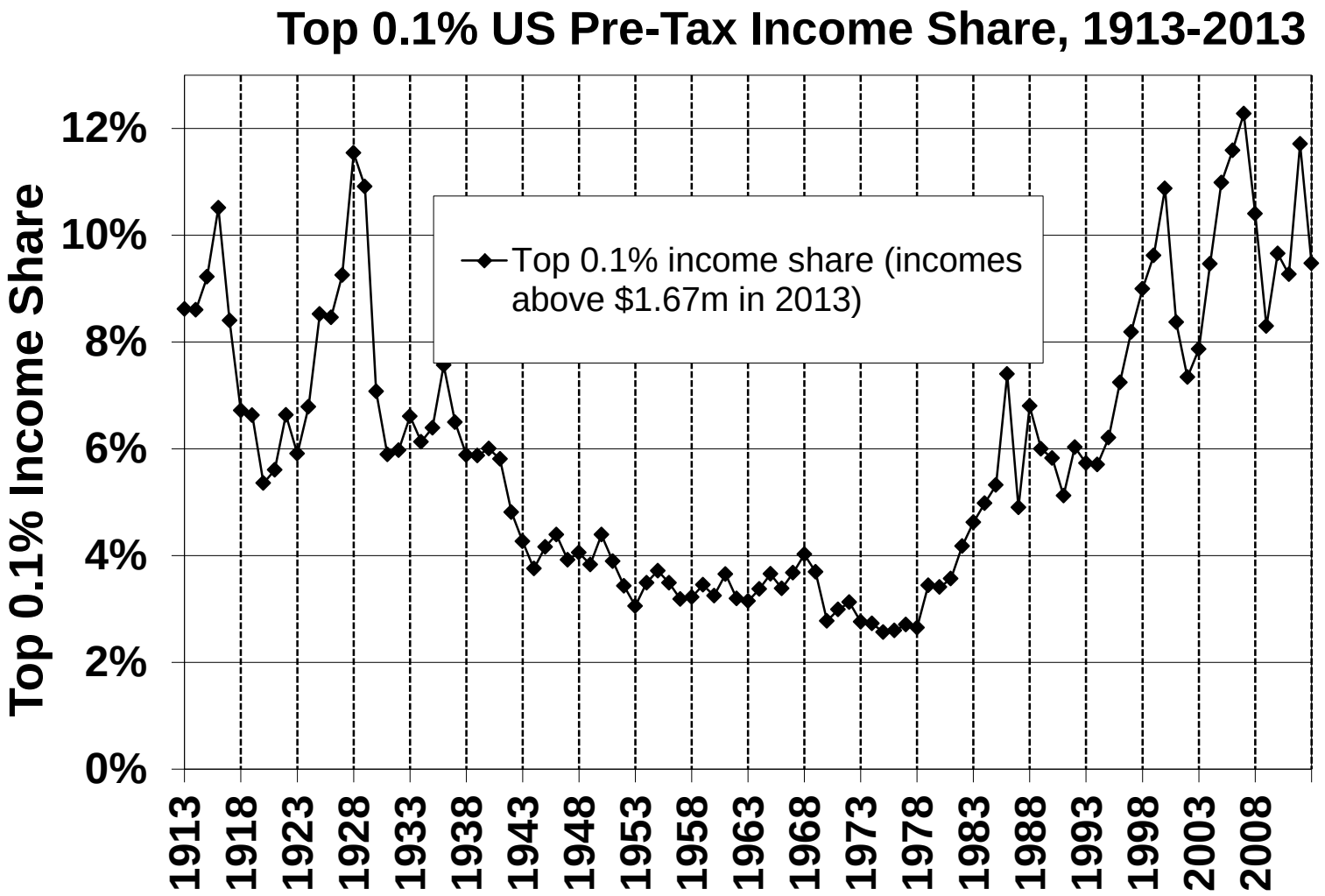
	Average Annual Rate of Change (percentage points)			
	$\frac{W_S}{W_U}$	Contribution of		
		$(\frac{1}{\hat{\sigma}_{SU}}) \ln\left(\frac{S}{U}\right)$	All other	Trend
Period				terms only
1960–1980	−0.02	−2.30	2.28	2.53
1980–2005	0.90	−1.22	2.12	2.18
1915–1960	−0.54	−1.79	1.25	0.99
1960–2005	0.49	−1.70	2.19	2.33

Based on Goldin and Katz, “The Race between Education and Technology,” Tables 8.1 and 8.2.

Consistent with “Supply variations were far more important in changing relative wages than were differential demand changes across periods”?

Final Comments

- Goldin and Katz also examine the high school wage premium (over non-high school graduates).
- In addition, they show that immigration has not played a big role in changes in the growth of high-skill versus labor supply.
- This is all about the bulk of the income distribution, not the extreme top.



Source: Piketty and Saez, 2003 updated to 2013. Series based on pre-tax cash market income including or

From: Piketty and Saez, *Quarterly Journal of Economics*, 1998 (2015 update).

III. Long and Ferrie

"Intergenerational Occupational Mobility in Great Britain and the United States since 1850"

Issues

- Focus in on intergenerational mobility.
- Concerns about inequality and about mobility are often linked.
- The greater the degree of mobility, the less concerned one is likely to be about a given degree of inequality at a point in time.

Overview

- Long and Ferrie take a long-term perspective.
- Nineteenth and twentieth century, United States Britain.
- Compare the two countries in the nineteenth century and in the twentieth, and compare United States in nineteenth and twentieth centuries.
- We will focus on the nineteenth century United States versus Britain comparison.

Data – Overview

- Their data are on occupations, not income.
- Four-way classification: White-collar worker, farmer, skilled worker, unskilled worker.
- They do not put the categories on a scale, but look at movements among the categories.

Data – United States

- Start with a 1% sample of the 1850 census.
- Focus on white males, ages 13–19.
- Match to the full 1880 census.

Matching – United States

"For the U.S., the individual must have had either the same name or a close phonetic variation thereof, provided the same state of birth for himself (and his parents if they were present in 1850) in 1850 and 1880, and gave a year of birth that differed by no more than three years. … None of the matching information could be missing from an individual's record. Also, only unique matches were considered: if an individual from the 1850/51 sample had more than one match in the 1880/81 census, then that individual was dropped." (Long and Ferrie, online appendix, pp. 3–4).

Matching – United States (continued)

"For … 18%, there were several individuals who had names that were phonetically close and birth years that were within three years, but when an individual from the 1850 pubic use sample was matched to one of these individuals, it was possible in these cases to rank the matches by the proximity of the name and birth year, and choose the 'best' match." (Online appendix, p. 5)

Data – United States: Nitty-Gritty

- 22% match rate.
- Son's occupation: From 1880 census.
- Father's occupation: From 1850 census.
- Note that this requires that the son be living with the father in 1850 (Xie and Killewald, *AER*, 2013).
- Does the sample selection (coresidence and matching) cause important bias?
- Should we be concerned about the omission of African-Americans? Of women?
- Sample size: 2005.

Data – Britain

- Construction similar to U.S. data.
- 20% match rate.
- Sample size: 3076.

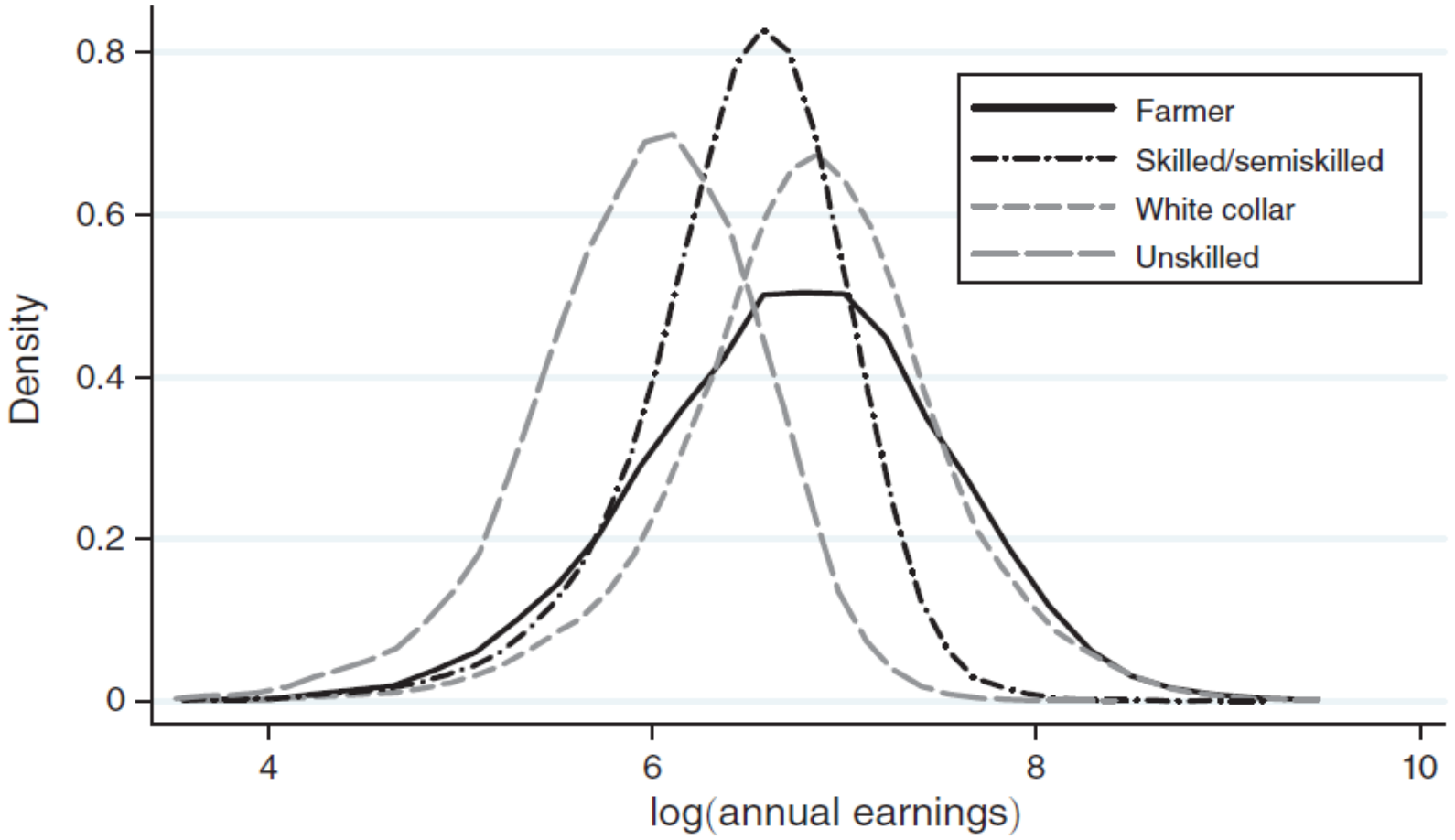


FIGURE 1. DISTRIBUTION OF LOG(ANNUAL EARNINGS) IN IOWA, 1915, MALES AGE 20–65

From: Long and Ferrie, "Reply" (*AER*, 2013)

Example 1

Country 1

		Fathers		
		Occ. 1	Occ. 2	Row ∑
Sons	Occ. 1	A	N – A	N
	Occ. 2	N – A	A	N
	Col. ∑	N	N	

Country 2

		Fathers		
		Occ. 1	Occ. 2	Row ∑
Sons	Occ. 1	B	M – B	M
	Occ. 2	M – B	B	M
	Col. ∑	M	M	

Occupational mobility in Country 1 is greater than in Country 2 iff $A/N < B/M$.

Example 2

Country 1

		Fathers		
		Occ. 1	Occ. 2	Row ∑
Sons	Occ. 1	35	15	50
	Occ. 2	15	35	50
	Col. ∑	50	50	

Country 2

		Fathers		
		Occ. 1	Occ. 2	Row ∑
Sons	Occ. 1	70	5	75
	Occ. 2	20	5	25
	Col. ∑	90	10	

There are more occupation switches in Country 1.

But, the correlation of fathers' and sons' occupations is lower in Country 2.

Example 3

Country 1

		Fathers			
		Occ. 1	Occ. 2	Occ. 3	Row ∑
Sons	Occ. 1	245	245	0	490
	Occ. 2	245	245	0	490
	Occ. 3	0	0	20	20
	Col. ∑	490	490	20	

Country 2

		Fathers			
		Occ. 1	Occ. 2	Occ. 3	Row ∑
Sons	Occ. 1	381	100	9	490
	Occ. 2	100	381	9	490
	Occ. 3	9	9	2	20
	Col. ∑	490	490	20	

Country 1 is much more mobile than Country 2 between Occupations 1 and 2.

But, Country 1 is exceptionally immobile in and out of Occupation 3.

Measuring Mobility

- There is no single “correct” measure of mobility.
- Long and Ferrie focus mainly on one particular measure (Altham, 1970).
- It is log-based, and so puts a lot of weight on low-probability cells (like the zeroes in Example 3).

TABLE 3—INTERGENERATIONAL OCCUPATIONAL MOBILITY IN BRITAIN AND THE US, 1850–1851 TO 1880–1881, FREQUENCIES (*Column percent*)

Son's occupation	Father's occupation				
	White collar	Farmer	Skilled/semiskilled	Unskilled	Row sum
Britain (Table P)					
White collar	103	31	219	63	416
	(36.6)	(11.1)	(13.3)	(7.3)	
Farmer	8	114	39	21	182
	(2.8)	(40.9)	(2.4)	(2.4)	
Skilled/semiskilled	143	90	1,155	386	1,774
	(50.0)	(32.3)	(70.2)	(44.6)	
Unskilled	32	44	233	395	704
	(11.2)	(15.8)	(14.2)	(45.7)	
Column sum	286	279	1,646	865	3,076
US (Table Q)					
White collar	55	177	82	30	344
	(38.5)	(12.9)	(22.6)	(23.3)	
Farmer	44	850	92	35	1,021
	(30.8)	(62.0)	(25.3)	(27.1)	
Skilled/semiskilled	33	214	166	40	453
	(23.1)	(15.6)	(45.7)	(31.0)	
Unskilled	11	129	23	24	187
	(7.7)	(9.4)	(6.3)	(18.6)	
Column sum	143	1,370	363	129	2,005

From: Long and Ferrie, "Intergenerational Occupational Mobility"

TABLE 2—SUMMARY MEASURES OF MOBILITY IN BRITAIN AND THE US

	M (1)	M' (2)	d(P, J) (3)	d(Q, J) (4)	d(P, Q) (5)	d^i(P, Q) (6)
1. Britain 1972 (P)	45.3	53.7	24.0***		7.9	7.2
versus US 1973 (Q)	56.7	48.3		20.8***		
2. Britain 1881 (P)	42.6	35.5	22.7***		13.2***	4.5
versus US 1880 (Q)	45.4	47.9		11.9***		
3. US 1880 (P)	50.6	57.7	12.1***		10.7***	2.4
versus US 1973 (Q)	56.7	43.7		20.8***		
4. US 1900 (P)	54.0	54.1	14.6***		9.1***	2.4
versus US 1973 (Q)	56.7	51.8		20.8***		

Notes: M is total mobility (percent off the main diagonal); M' is total mobility using the marginal frequencies from the other table (see Appendix). Significance levels for the likelihood ratio χ^2 statistic G^2 (d.f. 9 for d(P, J), d(Q, J), and d(P, Q); 5 for d^i(P, Q)).

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

From: Long and Ferrie, "Intergenerational Occupational Mobility"

TABLE 2—RATIOS OF OBSERVED TO PREDICTED COUNTS IN TWO US MOBILITY TABLES

Son's occupation	Father's occupation			
	White collar	Farmer	Skilled/ semiskilled	Unskilled
Panel A. 1860–1880 census				
White collar	2.41	0.72	1.32	0.86
Farmer	0.39	1.28	0.51	0.58
Skilled/Semiskilled	1.05	0.75	1.68	1.40
Unskilled	0.91	0.90	1.00	1.83
Panel B. 1973 OCG				
White collar	1.48	0.66	0.90	0.73
Farmer	**0.14**	**5.32**	**0.22**	0.42
Skilled/Semiskilled	0.56	1.07	1.17	1.27
Unskilled	0.63	1.26	1.00	1.42

Note: Predicted counts are based on the independence model.

Source: Data are from Tables 1 and 5 of Long and Ferrie (2013).

From: Xie and Killewald, "Comment" (*AER*, 2013)

Conclusion/Evaluation

IV. Piketty and Zucman

"Capital Is Back: Wealth-Income Ratios in Rich Countries 1700–2010"

Issues

- About the long-run evolution of the wealth-income (or capital-output) ratio in major advanced countries, 1700–2010.

- Since capital income is distributed much more unequally than labor income, an increase in the capital share, all else equal, raises inequality.

- (But: Whether an increase in the capital-output ratio raises capital's share is ambiguous.)

Approach

- Want to find $(P_K K)/(P_Y Y)$ over time.
- Do by (relatively) direct measurement, not by inferring from a model.
- But they sometimes interpret their results using a simple model (or accounting framework).

Framework: $\beta = \frac{s}{g}$

- If for all t, $P_K/P_Y = 1$, Y grows at rate g, and $\dot{K}(t) = sY(t)$,

Then: In the long run, $\frac{P_K K}{P_Y Y} = \frac{s}{g}$.

- If we change the assumption about P_K/P_Y to be that it is always growing at rate ρ,

Then: In the long run, $\frac{P_K K}{P_Y Y} = \frac{s}{g - \rho}$.

- Is this useful?

Why $\frac{K}{Y} = \frac{s}{g}$ in the Long Run

- $\frac{\dot{K}(t)}{K(t)} = \frac{sY(t)}{K(t)}$.
- So, $\frac{\dot{K}(t)}{K(t)} > g$ (and thus *K/Y* is rising) if $\frac{sY(t)}{K(t)} > g$ – that is, if $\frac{K(t)}{Y(t)} < \frac{s}{g}$.
- Etc.

Data and Methodology

- Very little about these in the paper.
- But, a 165-page online appendix.
- Concerns?
  - Little formal analysis of uncertainty about the estimates.
  - Other?

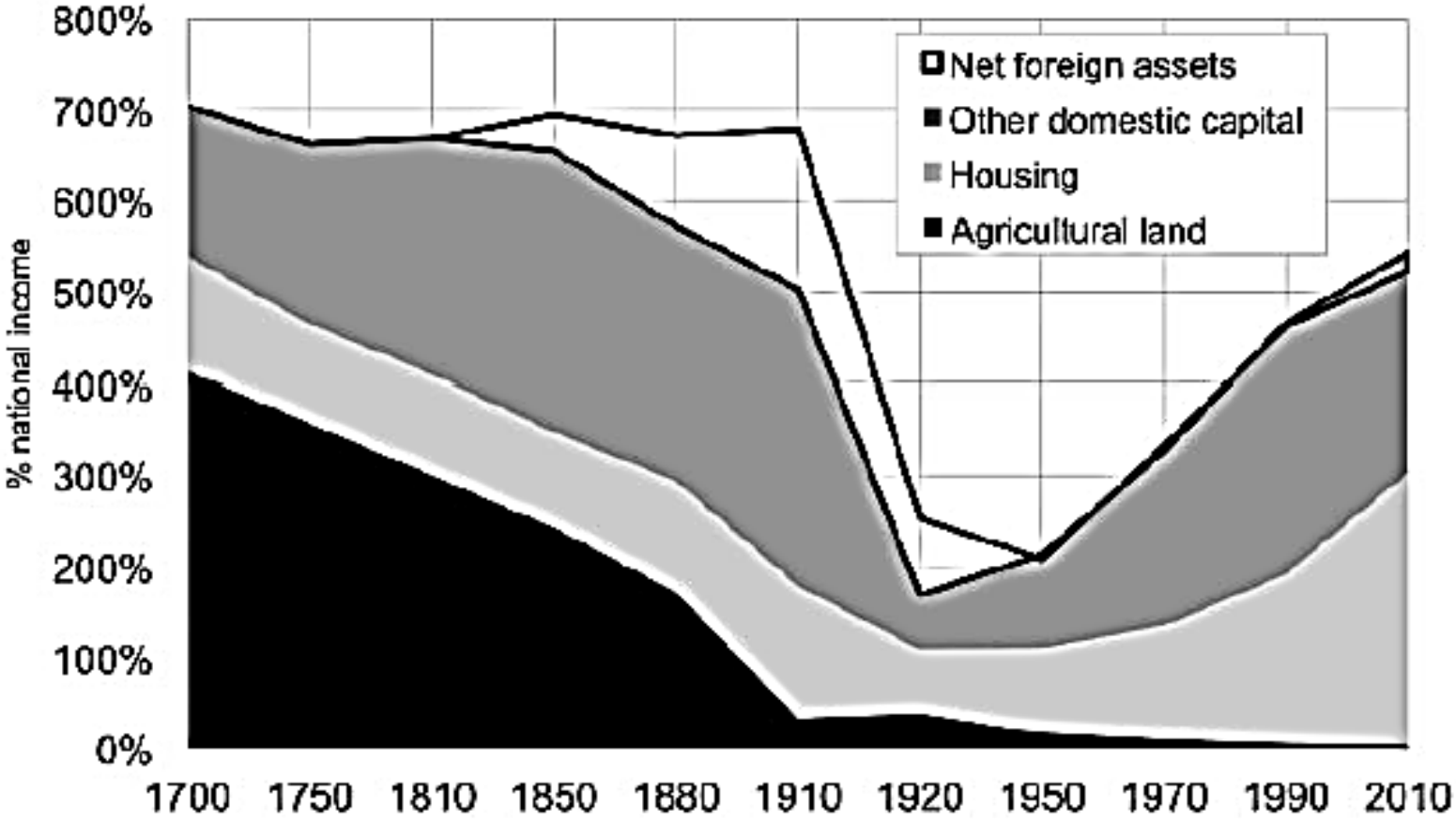


FIGURE III

The Changing Nature of National Wealth: United Kingdom, 1700–2010

From: Piketty and Zucman, "Capital Is Back"

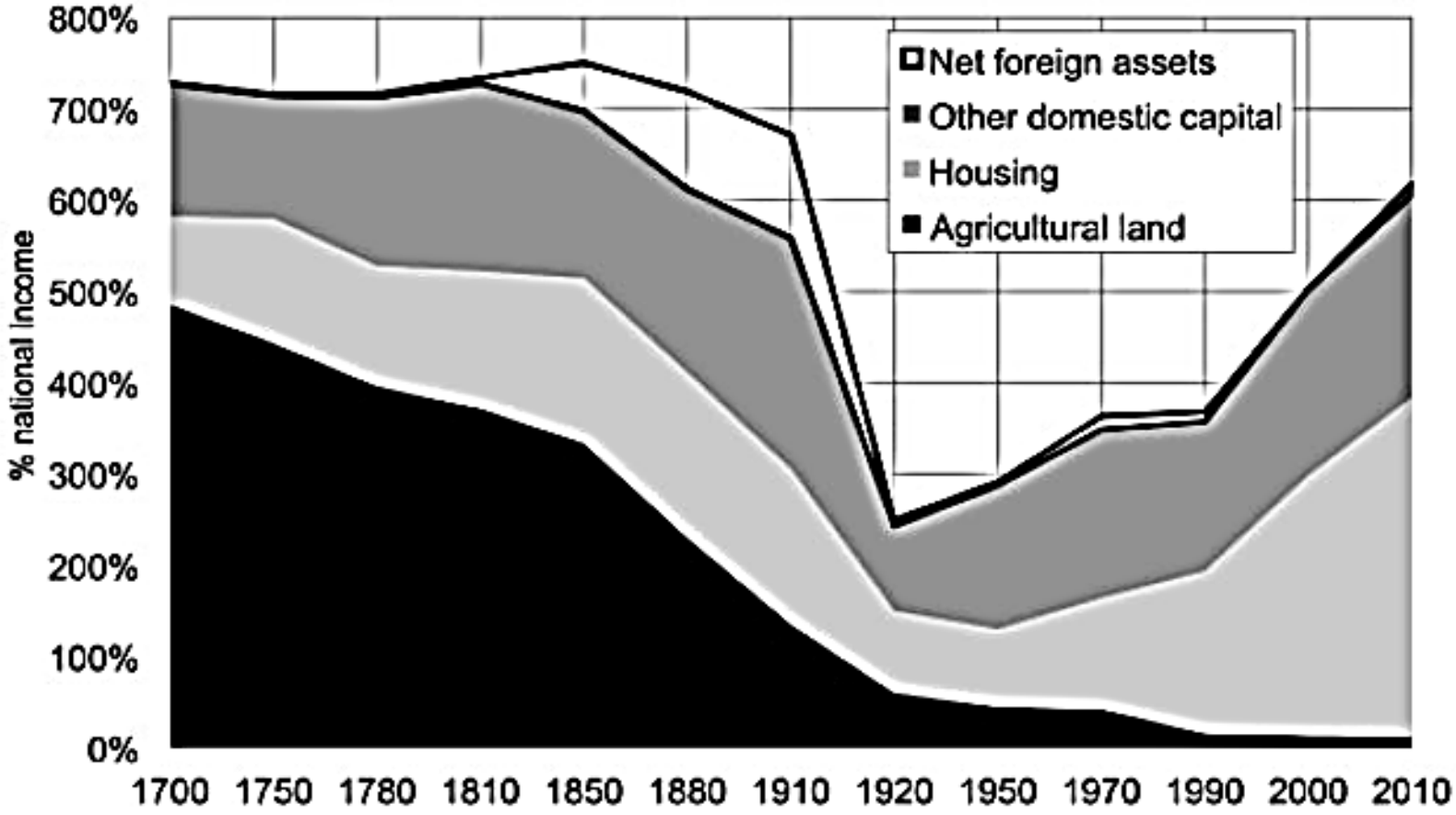


FIGURE IX

The Changing Nature of National Wealth: France, 1700–2010

From: Piketty and Zucman, "Capital Is Back"

TABLE VIII

ACCUMULATION OF NATIONAL WEALTH IN RICH COUNTRIES, 1910–1950

	National wealth-national income ratios (%)		Decomposition of 1950 national wealth-national income ratio (%)			
	β (1910)	β (1950)	Initial wealth effect	Cumulated new savings	Cumulated war destructions	Capital gains or losses
United States	469	380	132	193	0	55
Germany	637	223	400	109	−120	−165
				31	29	40
France	747	261	421	144	−132	−172
				38	27	35
United Kingdom	719	208	409	75	−19	−256
				46	4	50

From: Piketty and Zucman, “Capital Is Back”

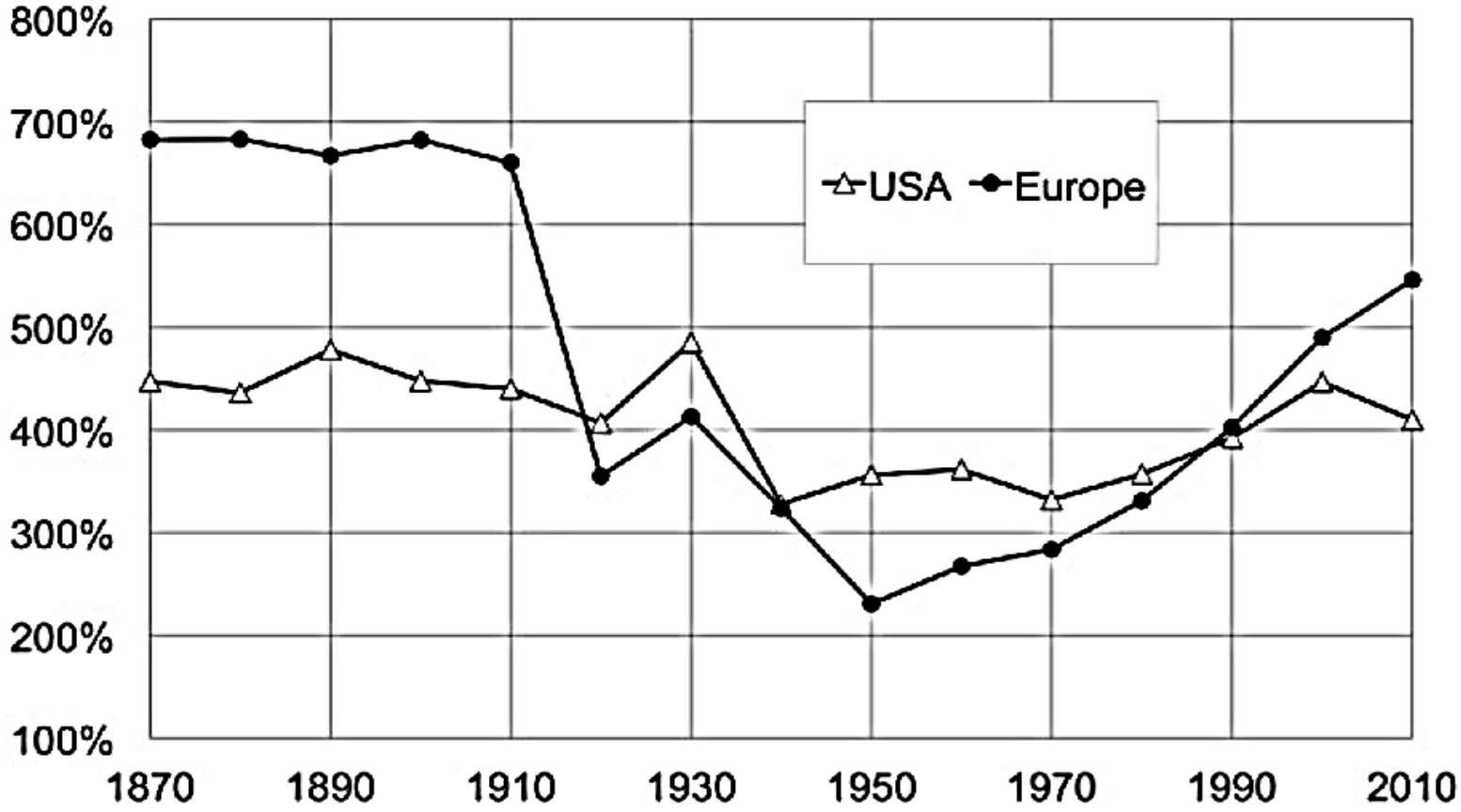


FIGURE IV

Private Wealth-National Income Ratios, 1870–2010: Europe versus United States

From: Piketty and Zucman, "Capital Is Back"

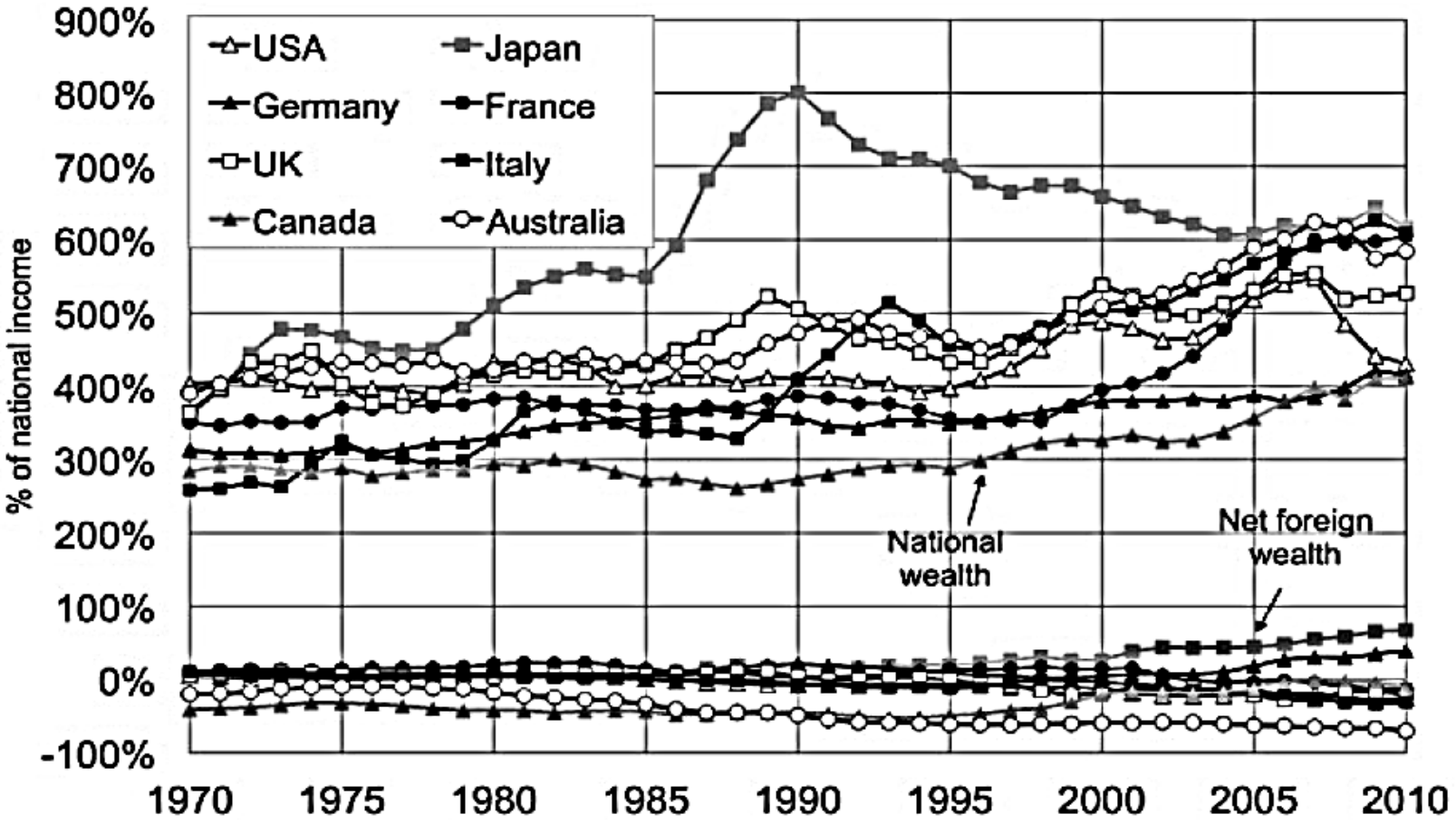


FIGURE VI

National versus Foreign Wealth, 1970–2010

From: Piketty and Zucman, "Capital Is Back"

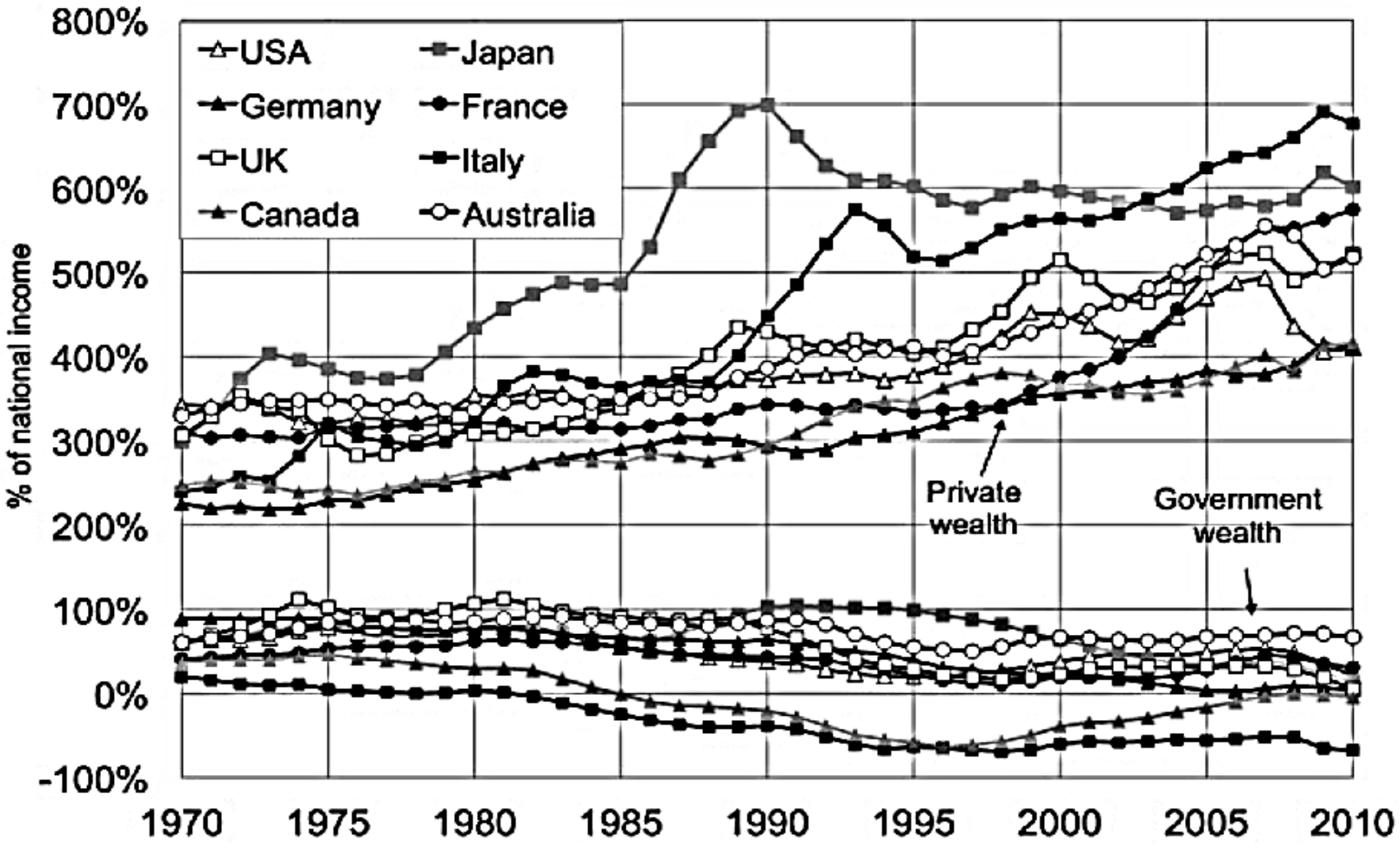


FIGURE V

Private versus Government Wealth, 1970–2010

From: Piketty and Zucman, "Capital Is Back"

TABLE V

ACCUMULATION OF NATIONAL WEALTH IN RICH COUNTRIES, 1970–2010

	National wealth-national income ratios (%)		Decomposition of 1970–2010 wealth growth rate (%)		
	β (1970)	β (2010)	Real growth rate of national wealth g_w	Savings-induced wealth growth rate $g_{ws}=\frac{s}{\beta}$	Capital gains–induced wealth growth rate q
United States	404	431	3.0	2.1	0.8
				72	28
Japan	359	616	3.9	3.1	0.8
				78	22
Germany	313	416	2.7	3.1	−0.4
				114	−14
France	351	605	3.6	2.7	0.9
				75	25
United Kingdom	314	523	3.5	1.5	2.0
				42	58
Italy	259	609	4.1	2.6	1.5
				63	37
Canada	284	412	3.8	3.4	0.4
				89	11
Australia	391	584	4.2	2.5	1.6
				61	39

From: Piketty and Zucman, “Capital Is Back”

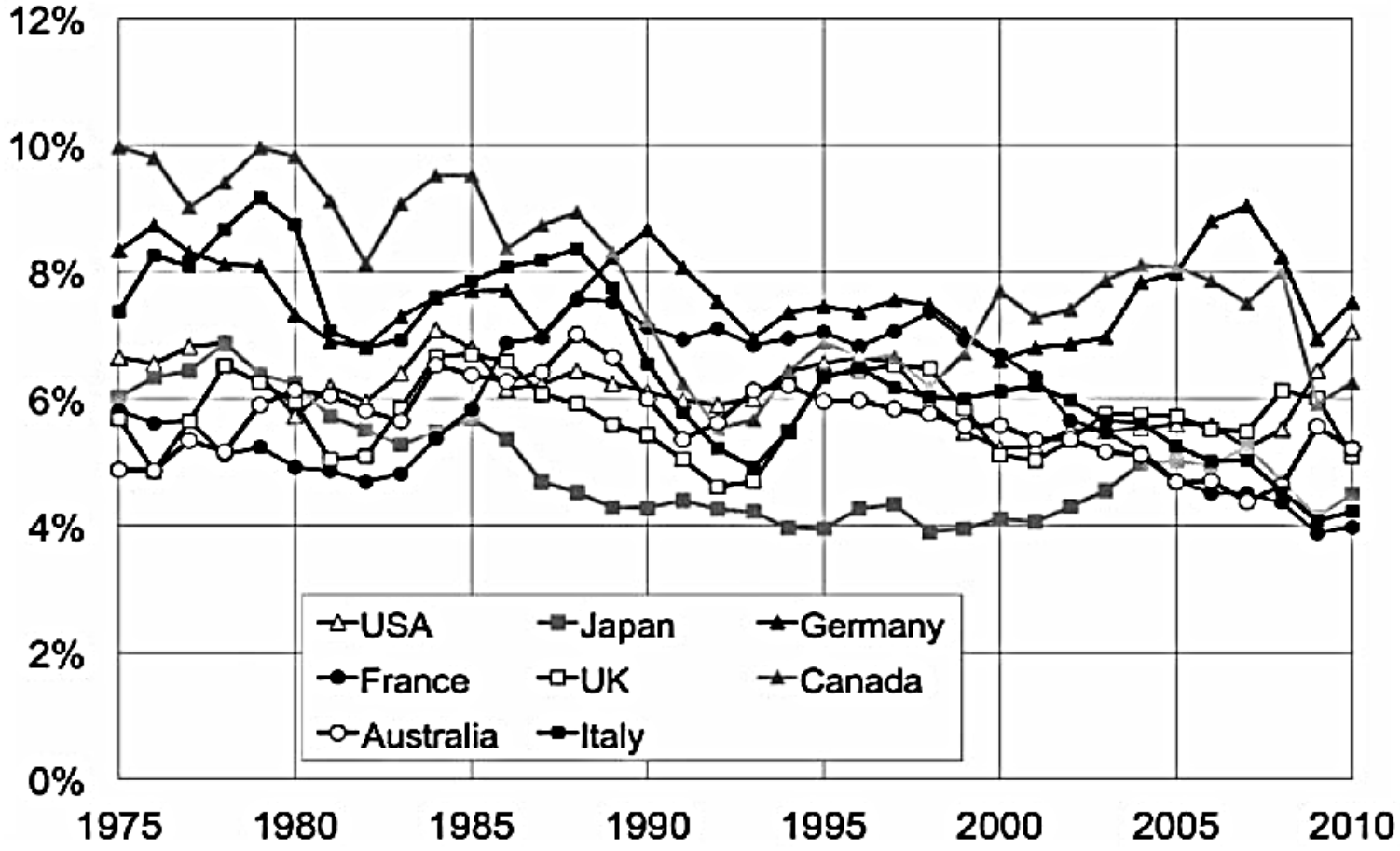


FIGURE XIII

Average Return on Private Wealth, 1975–2010

From: Piketty and Zucman, "Capital Is Back"

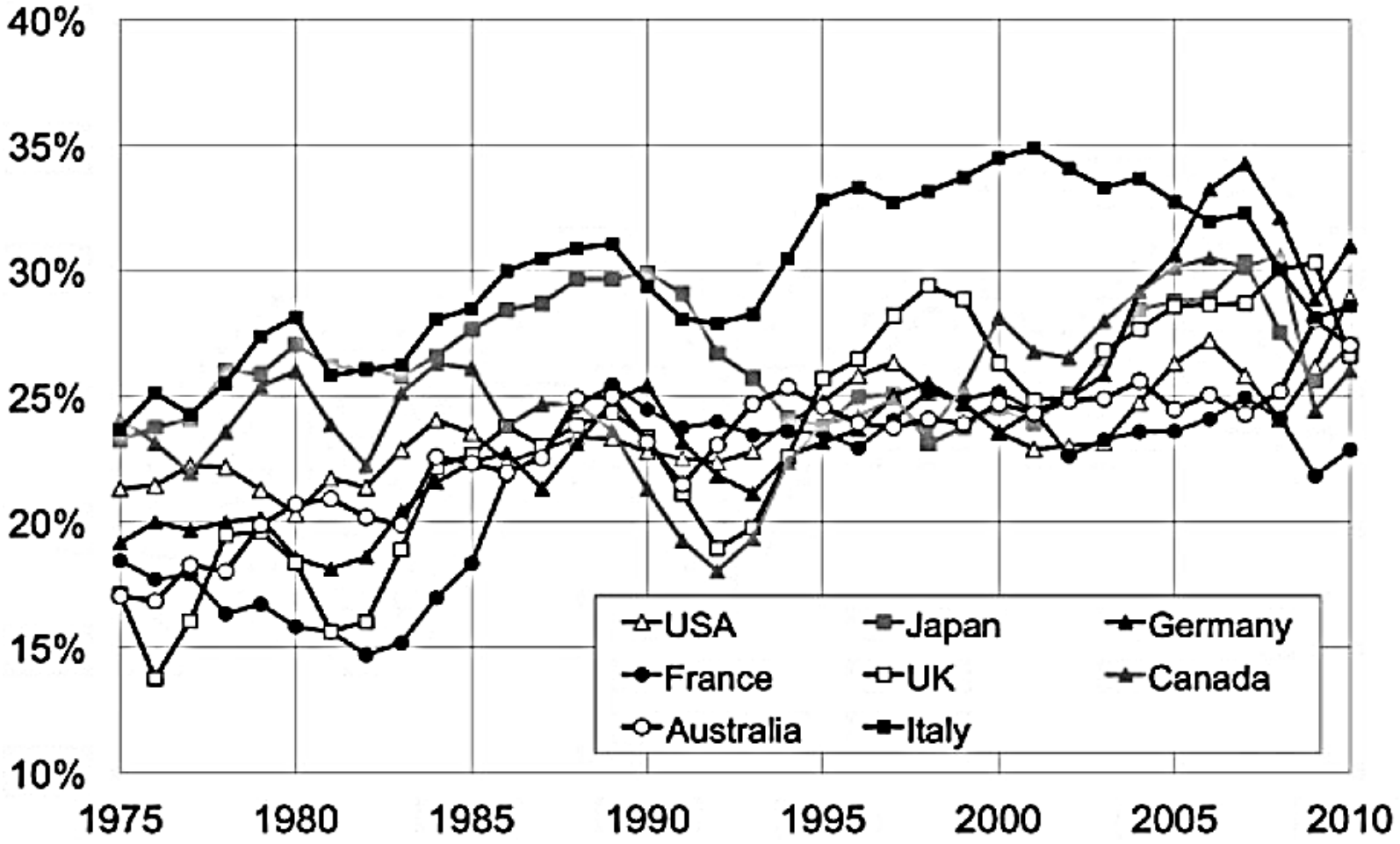


FIGURE XII

Capital Shares in Factor-Price National Income, 1975–2010

From: Piketty and Zucman, "Capital Is Back"

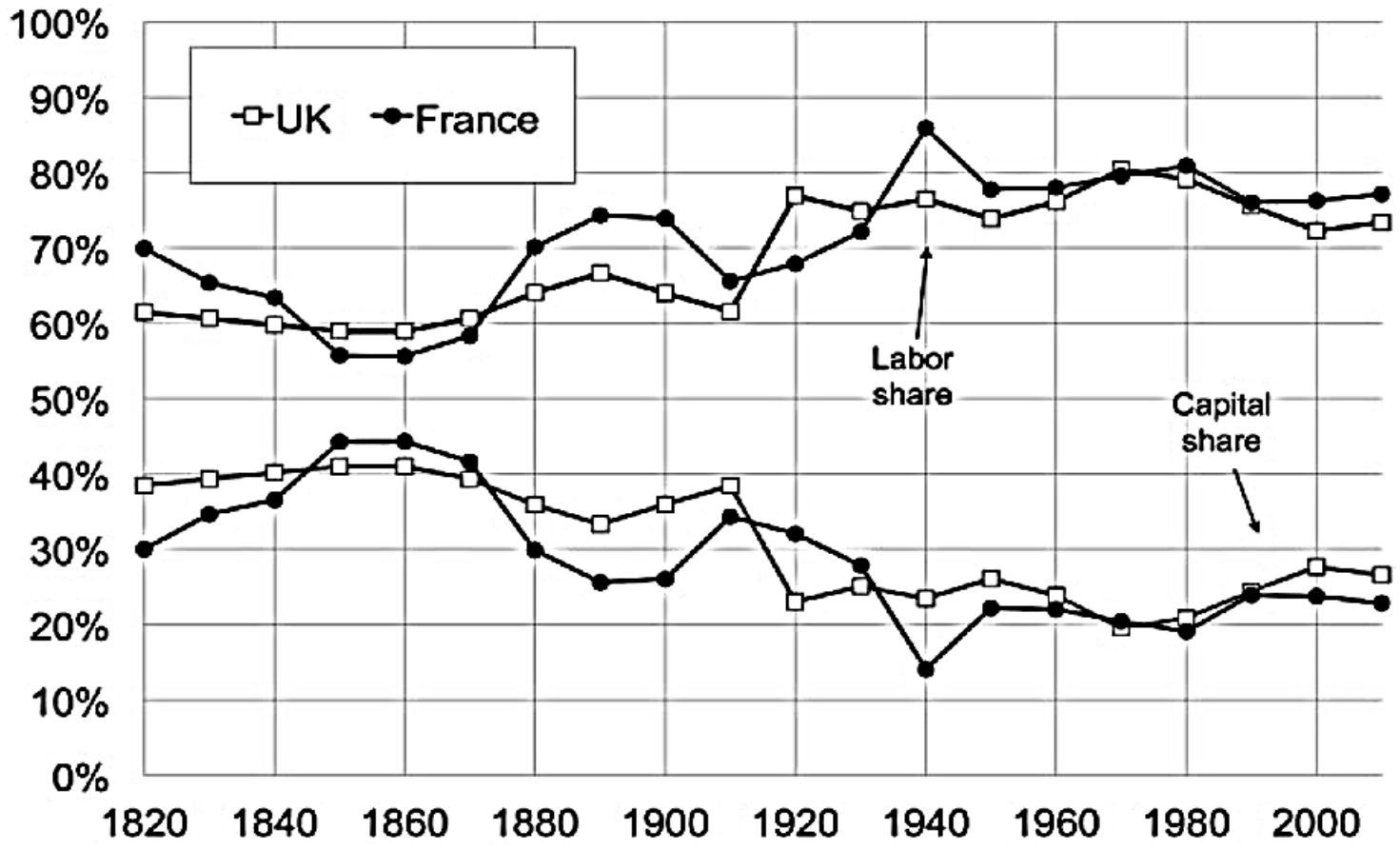


FIGURE XIV

Factor Shares in Factor-Price National Income, 1820–2010: United Kingdom and France

From: Piketty and Zucman, "Capital Is Back"

Capital's Share

- If K/Y rises with the production function unchanged, capital's share rises if the net elasticity of substitution between capital and labor is greater than one, and falls if the net elasticity of substitution is less than one.

- The evidence suggests that the net elasticity of substitution is less than one (Rognlie, 2015).

- Suggests that something other than increases in K/Y are driving increases in capital's share.

Conclusion/Discussion