

# Capital is Back: Wealth-Income Ratios in Rich Countries 1700-2010

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# How do wealth-income and capital-output ratios evolve in the long-run and why?

- ▶ Impossible to address this question until recently: national accounts mostly about flows, not stocks
- ▶ We have compiled a new database of national balance sheets to address it

**Table 1: A new macro database on income and wealth**

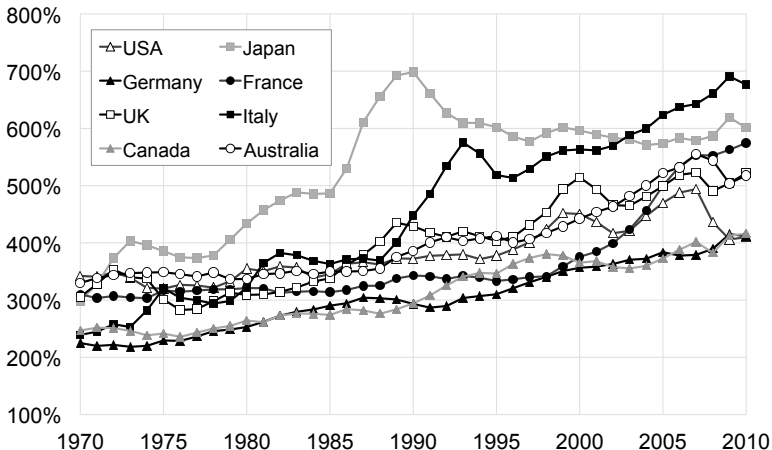
	<b>Total period covered in database</b>	Annual series	Decennial estimates
U.S.	<b>1770-2010</b>	1869-2010	1770-2010
Japan	<b>1960-2010</b>	1960-2010	
Germany	<b>1870-2010</b>	1870-2010	
France	<b>1700-2010</b>	1896-2010	1700-2010
U.K.	<b>1700-2010</b>	1855-2010	1700-2010
Italy	<b>1965-2010</b>	1965-2010	
Canada	<b>1970-2010</b>	1970-2010	
Australia	<b>1970-2010</b>	1970-2010	

# The wealth and income concepts we use

- ▶ Private wealth  $W = \text{assets} - \text{liabilities}$  of households (corporations valued at market prices through equities)
- ▶ Government wealth  $W_g$
- ▶ Market-value national wealth  $W_n = W + W_g$
- ▶  $W_n = K$  (land+housing+other domestic K) +  $NFA$
- ▶ Domestic output  $Y_d = F(K, L)$  (net of depreciation)
- ▶ National income  $Y = Y_d + rNFA$
- ▶ Private wealth-national income ratio  $\beta = W/Y$
- ▶ National wealth-national income ratio  $\beta_n = W_n/Y$
- ▶ Capital-output ratio =  $K/Y_d$

# We find a gradual rise of private wealth-national income ratios since 1970

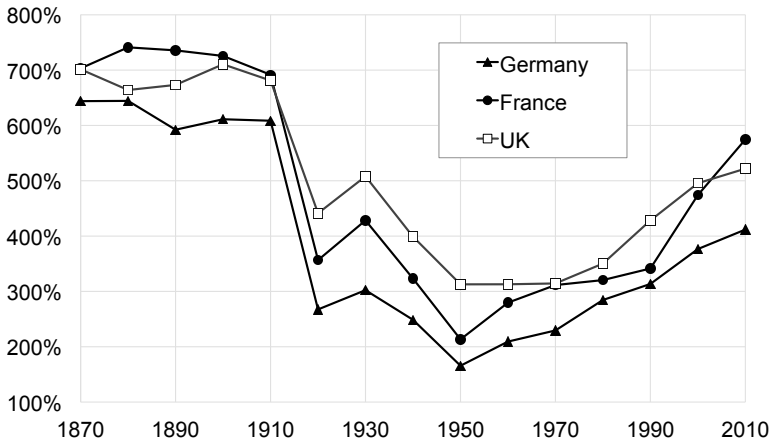
Figure 1: Private wealth / national income ratios 1970-2010



Authors' computations using country national accounts. Private wealth = non-financial assets + financial assets - financial liabilities (household & non-profit sectors)

# European ratios appear to be returning to their high 18c-19c values...

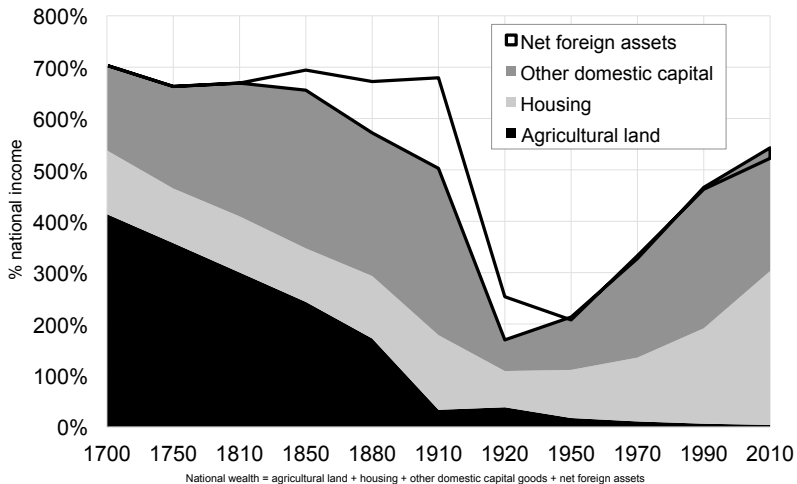
**Figure 2: Private wealth / national income ratios in Europe  
1870-2010**



Authors' computations using country national accounts. Private wealth = non-financial assets + financial assets - financial liabilities (household & non-profit sectors). Data are decennial averages (1910-1913 averages for 1910)

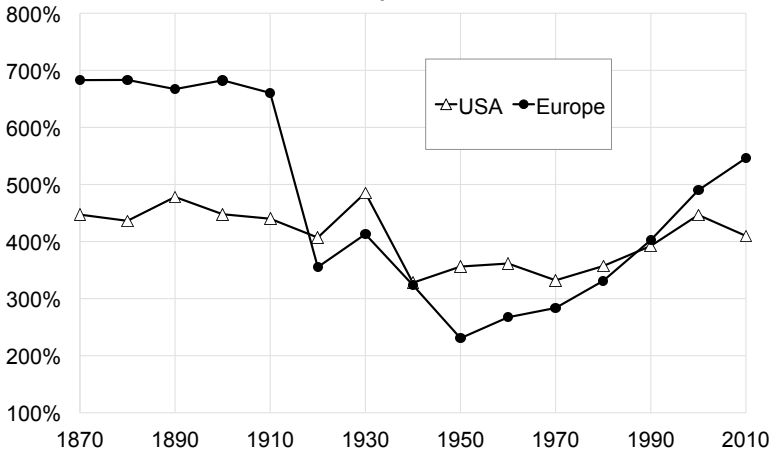
# Despite huge changes in the nature of wealth

**Figure 3: The changing nature of national wealth: UK  
1700-2010**



# US evolution is also U-shaped but less so

**Figure 4: Private wealth / national income ratios 1870-2010:  
Europe vs. USA**



Authors' computations using country national accounts. Private wealth = non-financial assets + financial assets - financial liabilities (household & non-profit sectors). Data are decennial averages (1910-1913 averages for Europe)



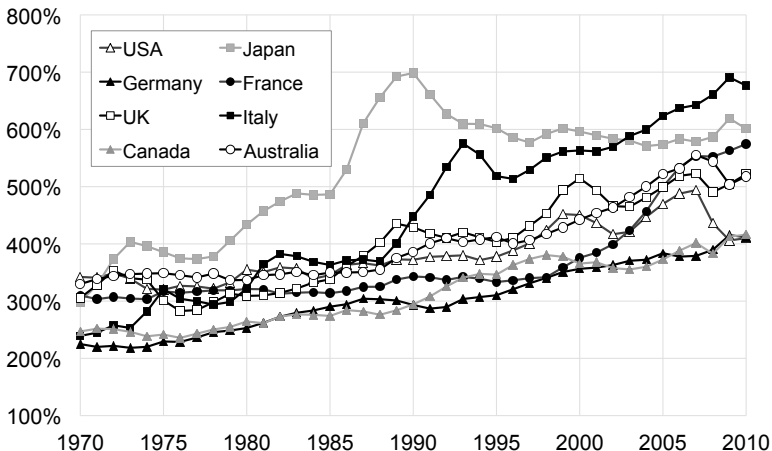
# Outline of the talk

1. The 1970-2010 rise of wealth-income ratios
2. The 1870-2010 U-shaped evolution of wealth-income ratios
3. The changing nature of wealth 1700-2010
4. Implications of the return of high wealth-income ratios

I- The 1970-2010 rise of  
wealth-income ratios

# 1970-2010: general rise of private wealth, with interesting cross-country variations

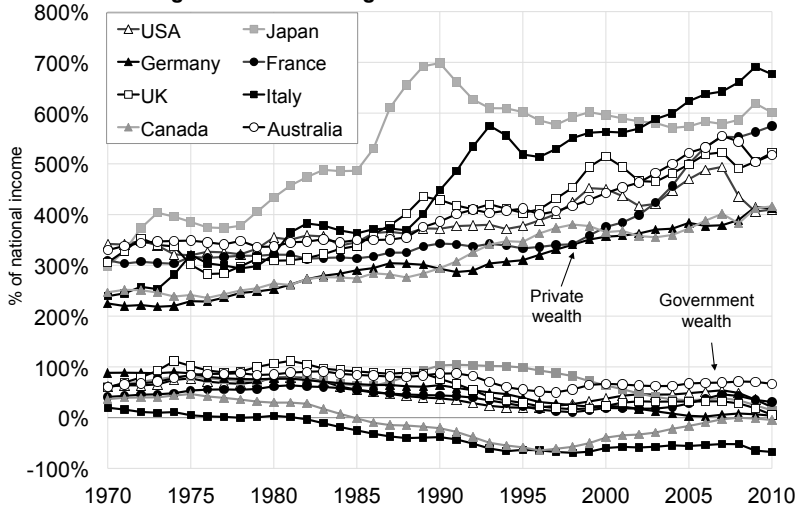
Figure 1: Private wealth / national income ratios 1970-2010



Authors' computations using country national accounts. Private wealth = non-financial assets + financial assets - financial liabilities (household & non-profit sectors)

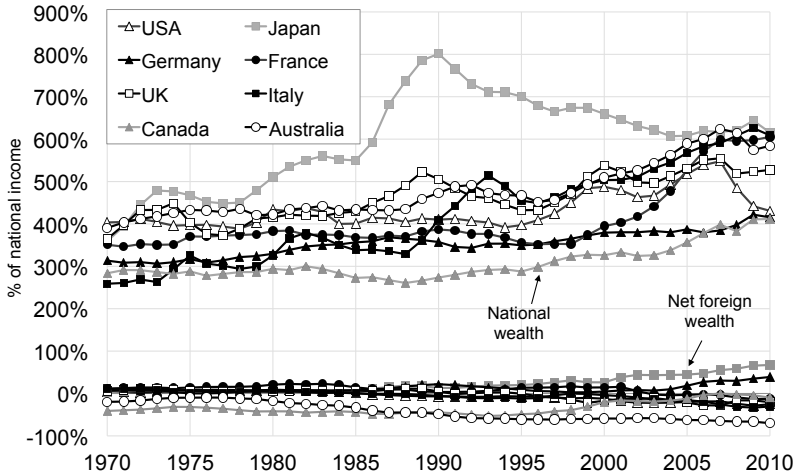
# Rise of private wealth has been larger than decline of government wealth...

Figure 5: Private vs. government wealth 1970-2010



...So that national wealth has also increased

Figure 6: National vs. foreign wealth, 1970-2010



Authors' computations using country national accounts. Net foreign wealth = net foreign assets owned by country residents in rest of the world (all sectors)

# How can we explain 1970-2010 rise of $\beta$ ?

Two key factors:

- 1. Slowdown of productivity and pop. growth**, in line with Harrod-Domar-Solow formula  $\beta = s/g$ :
  - ▶ In the long-run, wealth-income ratio  $\beta = s/g$
  - ▶ If  $s = 10\%$  and  $g = 3\%$  then  $\beta \approx 300\%$
  - ▶ But if  $s = 10\%$  and  $g = 1.5\%$  then  $\beta \approx 600\%$
  - ▶  $g = \text{productivity} + \text{pop. growth}$
- 2. A rise in relative asset prices**, itself driven by changes in capital policies since world wars

# Factor 1: Growth slowdown

A quick refresher on the Harrod-Domar-Solow formula:

- ▶  $W_{t+1} = W_t + s_t Y_t$
- ▶  $\beta_{t+1} = \beta_t(1 + g_{wst})/(1 + g_t)$ 
  - ▶  $1 + g_{wst} = 1 + s_t/\beta_t =$  saving-induced wealth growth rate
  - ▶  $1 + g_t = Y_{t+1}/Y_t =$  output growth rate (productivity + pop)
- ▶ In steady state, with fixed saving rate  $s_t = s$  and growth rate  $g_t = g$ :  
 $\beta_t \rightarrow \beta = s/g$  (**Harrod-Domar-Solow formula**)
- ▶ True in the steady-state of any one-good model of capital accumulation
- ▶ True wherever  $s$  comes from

$\beta \rightarrow s/g$  is true wherever  $s$  comes from

Production:  $Y_{dt} = F(K_t, L_t)$  with  $L_t = L_0 e^{gt}$ . Utility:

► **If wealth or bequest in the utility function**

$V(c, b) = c^{1-s} b^s$  then saving rate is set by taste for wealth  $s$  (and demography if life-cycle saving)

► **If dynastic utility**  $V = \int e^{-\theta t} c_t^{1-\gamma} / (1-\gamma)$  then  $r = \theta + \gamma g$  and  $\beta = \alpha / r = \alpha / (\theta + \gamma g) \nearrow$  as  $g \searrow$

⇓

In all cases,  $\beta = s/g$  increases as  $g \searrow$



# Factor 1: Growth slowdown (continued)

$\beta = s/g$  explains some key features of the data:

- ▶ Large fraction of rise in  $\beta$  in low-growth countries (Japan, Europe)
- ▶ Europe vs. US difference

With low growth,  $\beta$  may become very high in the whole world

- ▶ But no reason why  $\beta$  should reach any specific value
- ▶ All values possible in steady-state because  $s$  and  $g$  vary for all sorts of reasons

Because  $s$  and  $g$  vary for many independent reasons,  $\beta$  can vary a lot across countries

**Table 2: Growth rate vs private saving rate in rich countries, 1970-2010**

	<b>Real growth rate of national income</b>	Population growth rate	Real growth rate of per capita national income	<b>Net private saving rate</b> (personal + corporate) (% national income)
U.S.	<b>2.8%</b>	1.0%	1.8%	<b>7.7%</b>
Japan	<b>2.5%</b>	0.5%	2.0%	<b>14.6%</b>
Germany	<b>2.0%</b>	0.2%	1.8%	<b>12.2%</b>
France	<b>2.2%</b>	0.6%	1.6%	<b>11.1%</b>
U.K.	<b>2.2%</b>	0.3%	1.9%	<b>7.3%</b>
Italy	<b>1.9%</b>	0.3%	1.6%	<b>15.0%</b>
Canada	<b>2.8%</b>	1.1%	1.7%	<b>12.1%</b>
Australia	<b>3.2%</b>	1.4%	1.7%	<b>9.9%</b>

Authors' computations using country national accounts. Growth rates are geometric averages and for income use chain-weighted GDP deflators. For alternative deflators, see Appendix Table A3 and Country Tables US.3, JP.3, etc. 1970-2010 average saving rates are obtained by weighting yearly saving rates by real national income.

## Factor 2: The role of asset prices

**Consider now a two-goods model** (one capital and one consumption good):

- ▶ Define  $1 + q_t$  = real rate of capital gain (or loss) = excess of asset price inflation over consumer price inflation
- ▶ Then  $\beta_{t+1} = \beta_t(1 + g_{wst})(1 + q_t)/(1 + g_t)$ 
  - ▶  $1 + g_{wst} = 1 + s_t/\beta_t$  = saving-induced wealth growth rate
  - ▶  $1 + q_t$  = capital-gains induced wealth growth rate

# Is the rise of $\beta$ mostly due to saving or capital gains?

Our strategy to identify the source of the rise of  $\beta$ :

- ▶ We decompose the evolution of  $\beta$  into 2 multiplicative components:

$$\beta_{t+1} = \frac{(1 + g_{wst})(1 + q_t)}{1 + g_t} \beta_t$$

- ▶ We do not specify where  $q_t$  comes from and infer it from the data at our disposal on  $\beta_t \dots \beta_{t+n}$ ,  $s_t \dots s_{t+n}$  and  $g_t \dots g_{t+n}$

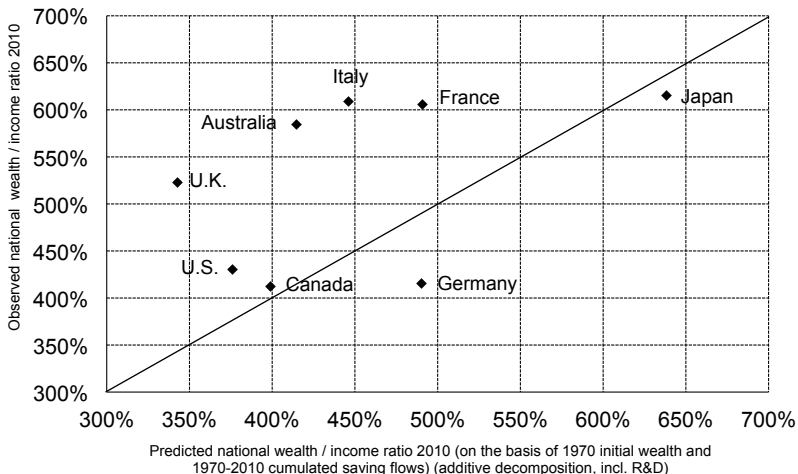
# We find a clear pattern of positive K gains

**Table 4: Accumulation of national wealth in rich countries, 1970-2010**

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

# Rising asset prices played an important role in Europe, except in Germany

**Figure 7a: Observed vs. predicted national wealth / national income ratios (2010)**



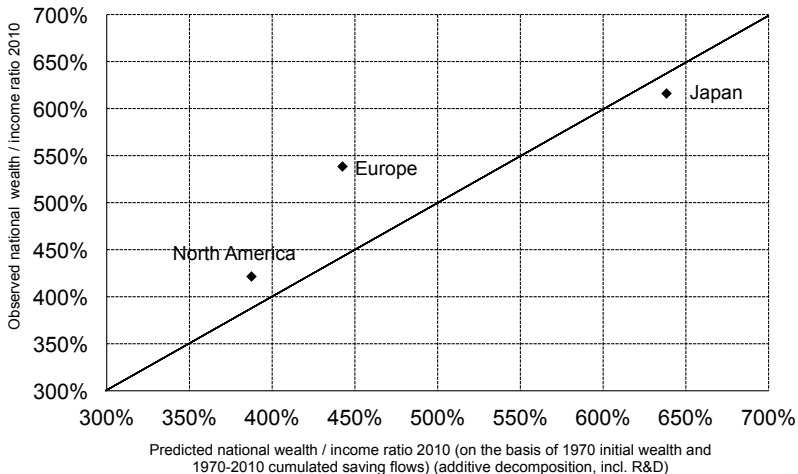
# The two sources of capital gains: domestic (Europe) vs. foreign (U.S.)

**Table 6: National wealth accumulation in rich countries: domestic vs. foreign capital gains**

	1970-2010 capital gains on national wealth (% of 2010 national income)	Decomposition of 1970-2010 capital gains	
		Domestic wealth	Foreign wealth
U.S.	105%	72%	33%
Japan	27%	45%	-18%
Germany	-25%	-3%	-22%
France	164%	179%	-15%
U.K.	235%	217%	18%
Italy	213%	240%	-27%
Canada	63%	55%	7%
Australia	220%	178%	41%

# At a very aggregated level, key force is $s/g$

**Figure 7b: Observed vs. predicted national wealth / national income ratios (2010)**

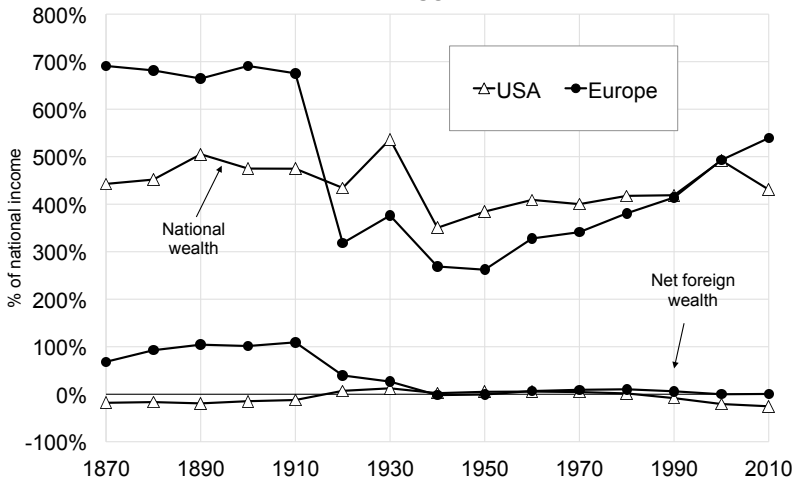




II- The 1870-2010 U-shaped evolution of wealth-income ratios

# How can we explain 1870-2010 evolution?

Figure 8: National and foreign wealth 1870-2010: Europe vs. USA



# Asset prices decreased a lot in the interwar, and then recovered

**Table 9: Accumulation of national wealth: US, UK, Germany, France, 1870-2010**

	Market-value national wealth-national income ratios		Real growth rate of national wealth	Savings-induced wealth growth rate (incl. war destructions)	Capital-gains-induced wealth growth rate
	$\beta_t$	$\beta_{t+n}$	$g_w$	$g_{ws} = s/\beta$	$q$
<b>Panel D: France</b>					
1870-2010	689%	605%	2.0%	1.8% <b>91%</b>	0.2% <b>9%</b>
1870-1910	689%	747%	1.3%	1.4% <b>103%</b>	0.0% <b>-3%</b>
1910-2010	747%	605%	2.2%	2.0% <b>89%</b>	0.3% <b>11%</b>
1910-1950	747%	261%	-1.2%	-0.1% <b>8%</b>	-1.1% <b>92%</b>
1950-1980	261%	383%	5.9%	4.7% <b>80%</b>	1.2% <b>20%</b>
1980-2010	383%	605%	3.4%	2.2% <b>65%</b>	1.2% <b>35%</b>

# 1910-1950: war destructions $\approx$ a third of the fall of $\beta$ in Germany and France

**Table 10: Accumulation of national wealth in rich countries, 1910-1950**

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

Germany's national wealth-income ratio fell from 637% to 223% between 1910 and 1950. 31% of the fall can be attributed to insufficient saving, 29% to war destructions, and 40% to real capital losses.

In the very long run  $\beta \rightarrow s/g$  works relatively well: no relative price divergence

**Table 8: Accumulation of national wealth in rich countries, 1870-2010**

	Market-value national wealth-national income ratios		Real growth rate of national income g	Decomposition of 1870-2010 wealth growth rate		
	$\beta$ (1870)	$\beta$ (2010)		Real growth rate of wealth	Savings-induced wealth growth rate	Capital-gains-induced wealth growth rate
				$g_w$	$g_{ws} = s/\beta$	q
U.S.	413%	431%	3.4%	3.4%	2.6% <b>76%</b>	0.8% <b>24%</b>
Germany	745%	416%	2.3%	2.0%	2.6% <b>128%</b>	-0.6% <b>-28%</b>
France	689%	605%	2.1%	2.0%	1.8% <b>91%</b>	0.2% <b>9%</b>
U.K.	656%	523%	1.9%	1.8%	1.6% <b>89%</b>	0.2% <b>11%</b>

The real growth rate of national wealth has been 3.4% per year in the U.S. between 1870 and 2010. This can be decomposed into a 2.6% savings-induced growth rate and a 0.8% residual term (capital gains and/or measurement errors).

Authors' computations using country national accounts. War destructions & other volume changes were included in savings-induced wealth growth rate. For full decomposition, see Appendix Country Tables US.4c, DE.4c, etc.

### III- The changing nature of wealth 1700-2010

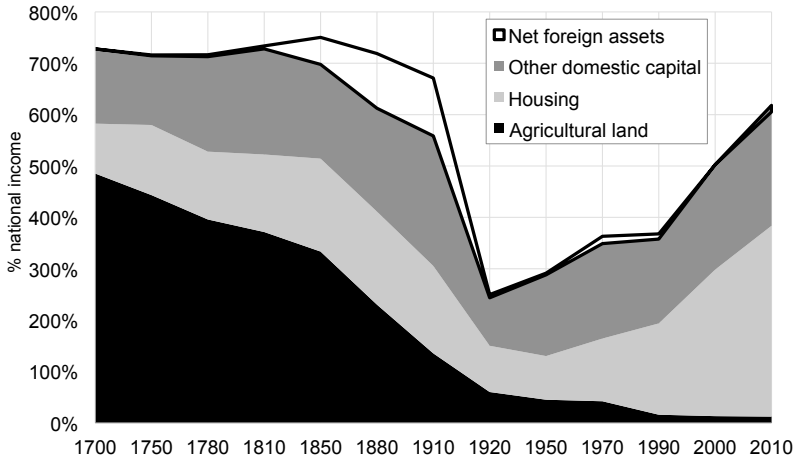
# What do we know about pre-1870 $\beta$ ?

- ▶ In Europe  $\beta \approx 600\%$ - $700\%$  throughout 18c-19c
- ▶ Not far from today despite considerable changes in nature of wealth
- ▶ How to explain pre-1870  $\beta$  levels?
  - ▶ One possible explanation is  $\beta = s/g$
  - ▶ But relative price effects also possible (land values)
  - ▶  $s$  series too uncertain to decompose  $\beta$  dynamics
  - ▶ “Pure” land values could be less than 50%  $Y$  or up to 200%

In order to make progress on these questions, useful to compare value of land in Old Europe and in New World

# In 18c Old World, land/ $Y$ as high as 400%

**Figure 9: The changing nature of national wealth: France 1700-2010**

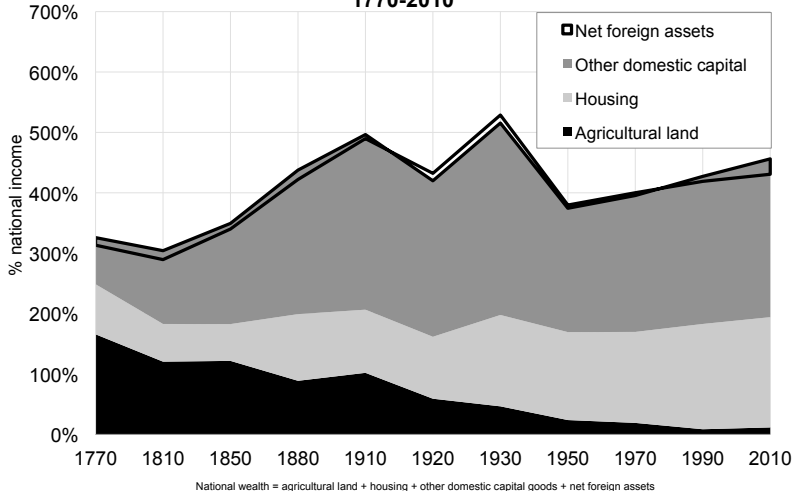


National wealth = agricultural land + housing + other domestic capital goods + net foreign assets

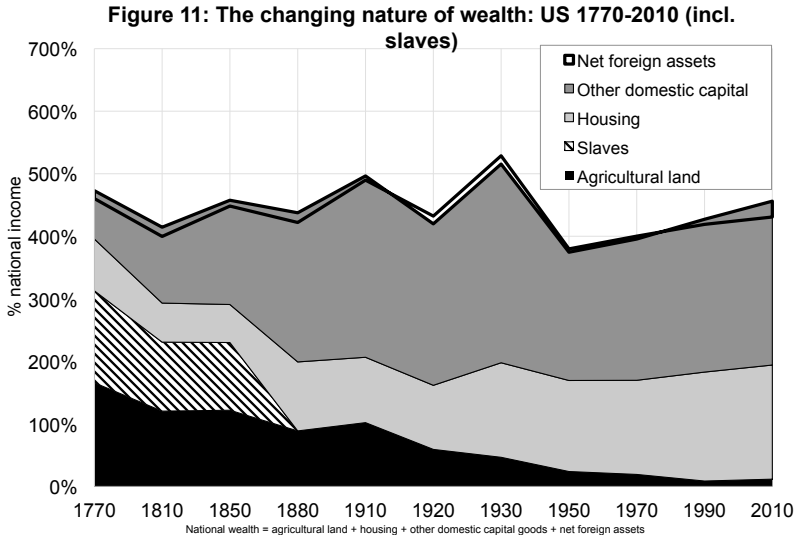


# Land in late 18c US was much less than in Old World: abundance effect with $\sigma < 1$

**Figure 10: The changing nature of national wealth: US  
1770-2010**

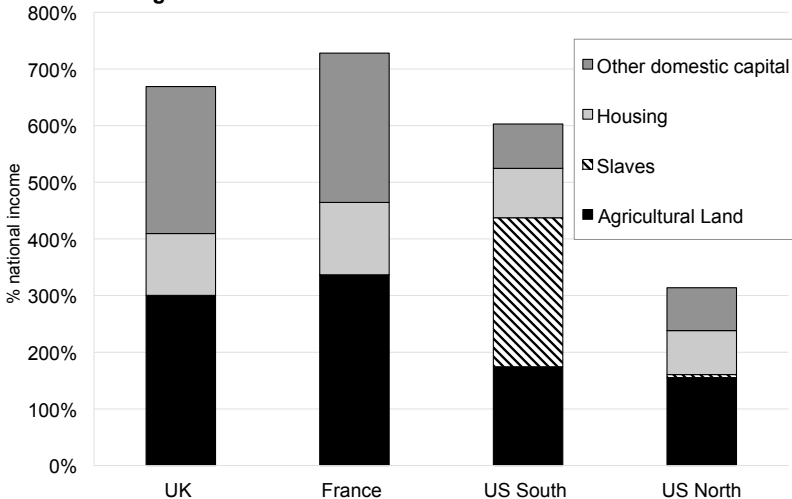


# Lower land values in the US were to some extent compensated by the slavery system



# There are two ways to be rich in 1810

Figure 12: National wealth in 1770-1810: Old vs. New world



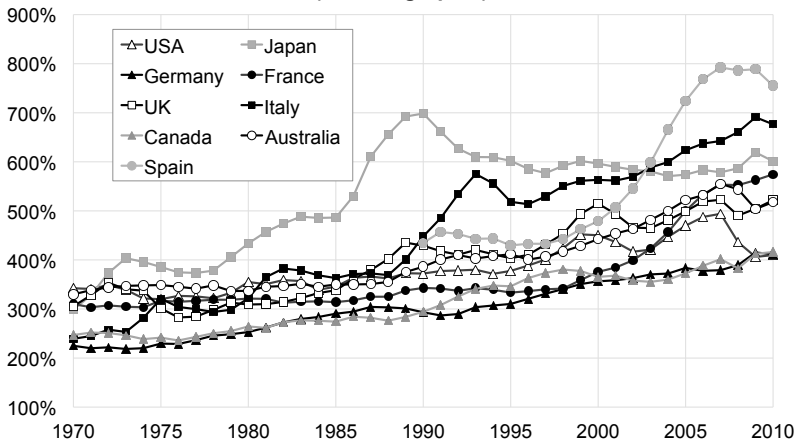
## IV - Implications of the return of high wealth-income ratios

# The return of high $\beta$ is not bad per se but raises new issues

- ▶ Wealth inequality likely to matter more than in postwar period
- ▶ Implications for optimal taxation
- ▶ Wide variations in  $\beta = s/g$  imply potentially very large net foreign asset positions...
- ▶ ... or domestic asset price bubbles (Spain, Japan)
- ▶ Rising capital shares with K-L elasticity  $\sigma > 1$

# Spanish bubble beats Japanese bubble

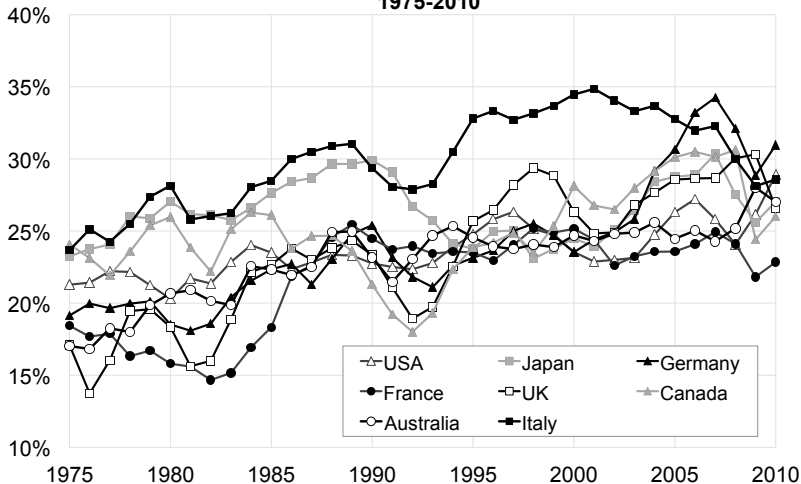
**Figure A8: Private wealth / national income 1970-2010  
(including Spain)**



Authors' computations using country national accounts. Private wealth = non-financial assets + financial assets - financial liabilities (household & non-profit sectors)

With  $\sigma > 1$ , the rise of  $\beta$  can explain the rise of capital share  $\alpha = r\beta$

Figure 13: Capital shares in factor-price national income  
1975-2010



## $\sigma$ does not have to be hugely $> 1$ to account for observed trends

CES production:  $F(K, L) = [aK^{\frac{\sigma-1}{\sigma}} + (1-a)L^{\frac{\sigma-1}{\sigma}}]^{\frac{\sigma}{\sigma-1}}$   
 $r = F_K = a\beta^{-1/\sigma}$  and capital share  $\alpha = r\beta = a\beta^{\frac{\sigma-1}{\sigma}}$

- ▶ If  $\sigma = 1.5$ , capital share rises from  $\alpha = 28\%$  to  $\alpha = 36\%$  when  $\beta$  rises from 250% to 500%
- ▶ In case  $\beta$  reaches 800%,  $\alpha$  would reach 42%
- ▶ In case  $\sigma = 1.8$ ,  $\alpha$  would be as large as 53%

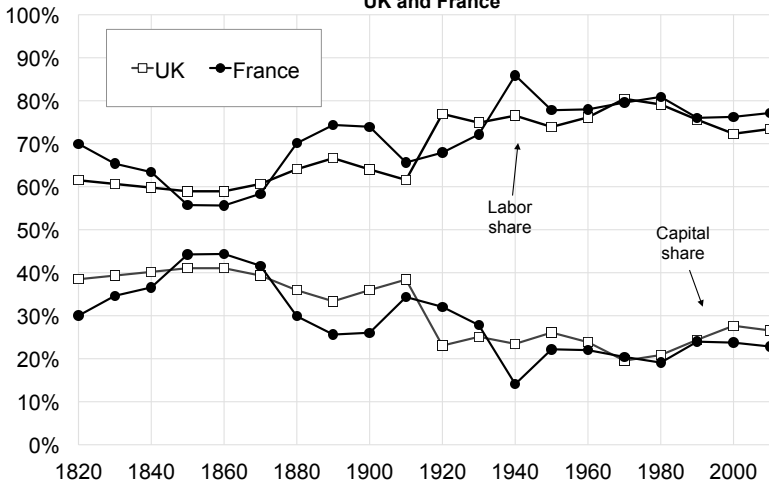


There are powerful forces in the one-good model that push toward high  $\alpha$



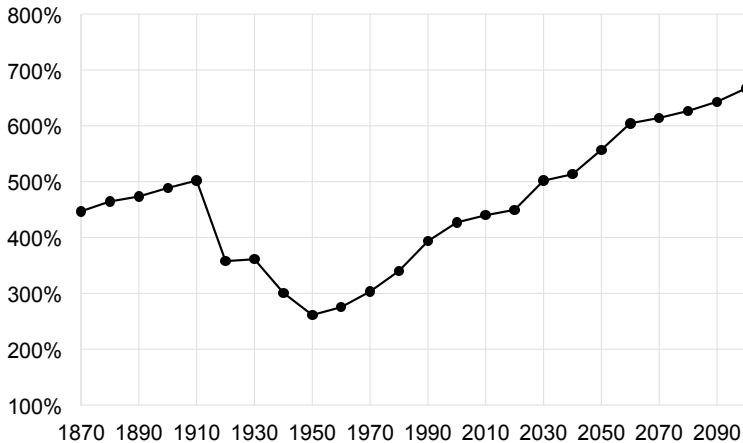
# Will $\alpha$ get back to its 19c level?

Figure 15: Factor shares in factor-price national income 1820-2010:  
UK and France



# With $g$ low and $\sigma > 1$ the rise of human capital may turn out to be an illusion

**Figure 16: World private wealth / national income ratio  
1870-2100**



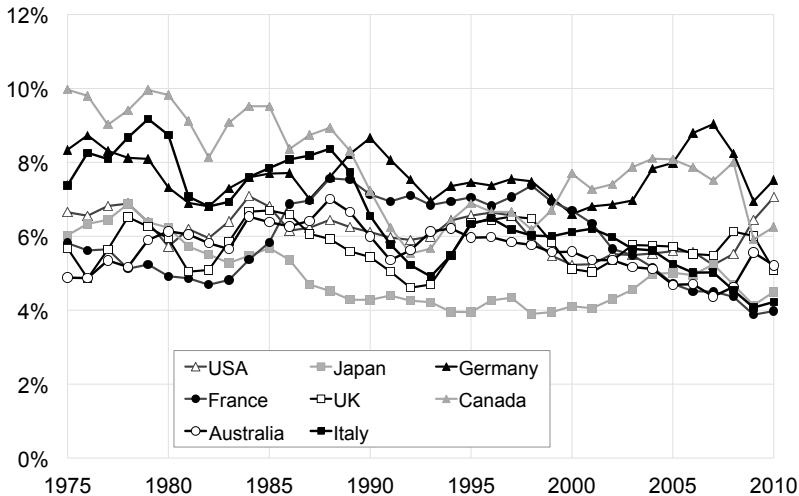
Authors' computations and simulations using country national accounts and UN growth projections. Private wealth = non-financial assets + financial assets - financial liabilities (household & non-profit sectors)

# Conclusion: capital is back

- ▶ Low  $\beta$  in 1950s-70s Europe were an anomaly
- ▶ With low growth, long run  $\beta$  can be very large (600%-700% or more). Key is  $\beta = s/g$
- ▶ The return of high  $\beta$  raises a new set of issues about capital regulation and taxation
- ▶ Next steps:
  - ▶ **Plug distributions:** Will China or global billionaires own the world? With low  $g$  both divergence can occur
  - ▶ **Normative implications:** relative importance of inherited vs. self-made wealth: 1910-2010 U-shaped pattern in France; on-going work on UK, Germany, and US

# Supplementary Slides

**Figure 14: Average return on private wealth 1975-2010**



**Table 3: Saving rates 1970-2010: national vs. private**

<i>Average saving rates 1970-2010 (% national income)</i>	Net national saving (private + government)	Net private savings (personal + corporate)	<i>incl. personal savings</i>	<i>incl. corporate savings (retained earnings)</i>	Net government saving
U.S.	5.2%	7.7%	4.6% 60%	3.1% 40%	-2.4%
Japan	14.6%	14.6%	6.8% 47%	7.8% 53%	0.0%
Germany	10.2%	12.2%	9.4% 76%	2.9% 24%	-2.1%
France	9.2%	11.1%	9.0% 81%	2.1% 19%	-1.9%
U.K.	5.3%	7.3%	2.8% 38%	4.6% 62%	-2.0%
Italy	8.5%	15.0%	14.6% 97%	0.4% 3%	-6.5%
Canada	10.1%	12.1%	7.2% 60%	4.9% 40%	-2.0%
Australia	8.9%	9.9%	5.9% 60%	3.9% 40%	-0.9%

Authors' computations using country national accounts. 1970-2010 averages are obtained by weighting yearly saving rates by real national income.

**Table 5: Accumulation of national wealth in rich countries, 1970-2010: domestic capital vs foreign wealth**

	1970 national wealth / national income ratio		2010 national wealth / national income ratio		1970-2010 rise in national wealth / national income ratio	
	<i>incl. Domestic capital</i>	<i>incl. Foreign wealth</i>	<i>incl. Domestic capital</i>	<i>incl. Foreign wealth</i>	<i>incl. Domestic capital</i>	<i>incl. Foreign wealth</i>
U.S.	404%		431%		27%	
	399%	4%	456%	-25%	57%	-30%
Japan	359%		616%		256%	
	356%	3%	548%	67%	192%	64%
Germany	313%		416%		102%	
	305%	8%	377%	39%	71%	31%
France	351%		605%		254%	
	340%	11%	618%	-13%	278%	-24%
U.K.	365%		527%		163%	
	359%	6%	548%	-20%	189%	-26%
Italy	259%		609%		350%	
	247%	12%	640%	-31%	392%	-42%
Canada	284%		412%		128%	
	325%	-41%	422%	-10%	97%	31%
Australia	391%		584%		194%	
	410%	-20%	655%	-70%	244%	-50%

**Table 7: Domestic capital accumulation in rich countries, 1970-2010: housing vs other domestic capital**

	1970 domestic capital / national income ratio		2010 domestic capital / national income ratio		1970-2010 rise in domestic capital / national income ratio	
	<i>incl. Housing</i>	<i>incl. Other domestic capital</i>	<i>incl. Housing</i>	<i>incl. Other domestic capital</i>	<i>incl. Housing</i>	<i>incl. Other domestic capital</i>
U.S.	399%		456%		57%	
	142%	257%	182%	274%	41%	17%
Japan	356%		548%		192%	
	131%	225%	220%	328%	89%	103%
Germany	305%		377%		71%	
	129%	177%	241%	136%	112%	-41%
France	340%		618%		278%	
	104%	236%	371%	247%	267%	11%
U.K.	359%		548%		189%	
	98%	261%	300%	248%	202%	-13%
Italy	247%		640%		392%	
	107%	141%	386%	254%	279%	113%
Canada	325%		422%		97%	
	108%	217%	208%	213%	101%	-4%
Australia	410%		655%		244%	
	172%	239%	364%	291%	193%	52%