Discussion on inheritance: France vs UK vs Sweden 1820-2010

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March 2012

Computing inheritance flow

$$\mathbf{B_t/Y_t = \mu^*_t\ m_t\ W_t/Y_t}$$

- W_t/Y_t = aggregate wealth/income ratio
- m_t = aggregate mortality rate
- μ_t = ratio between average wealth of decedents and average wealth of the living (= age-wealth profile)
- $\mu^*_t = (1+v_t)\mu_t$, with v_t)=gifts-bequest ratio

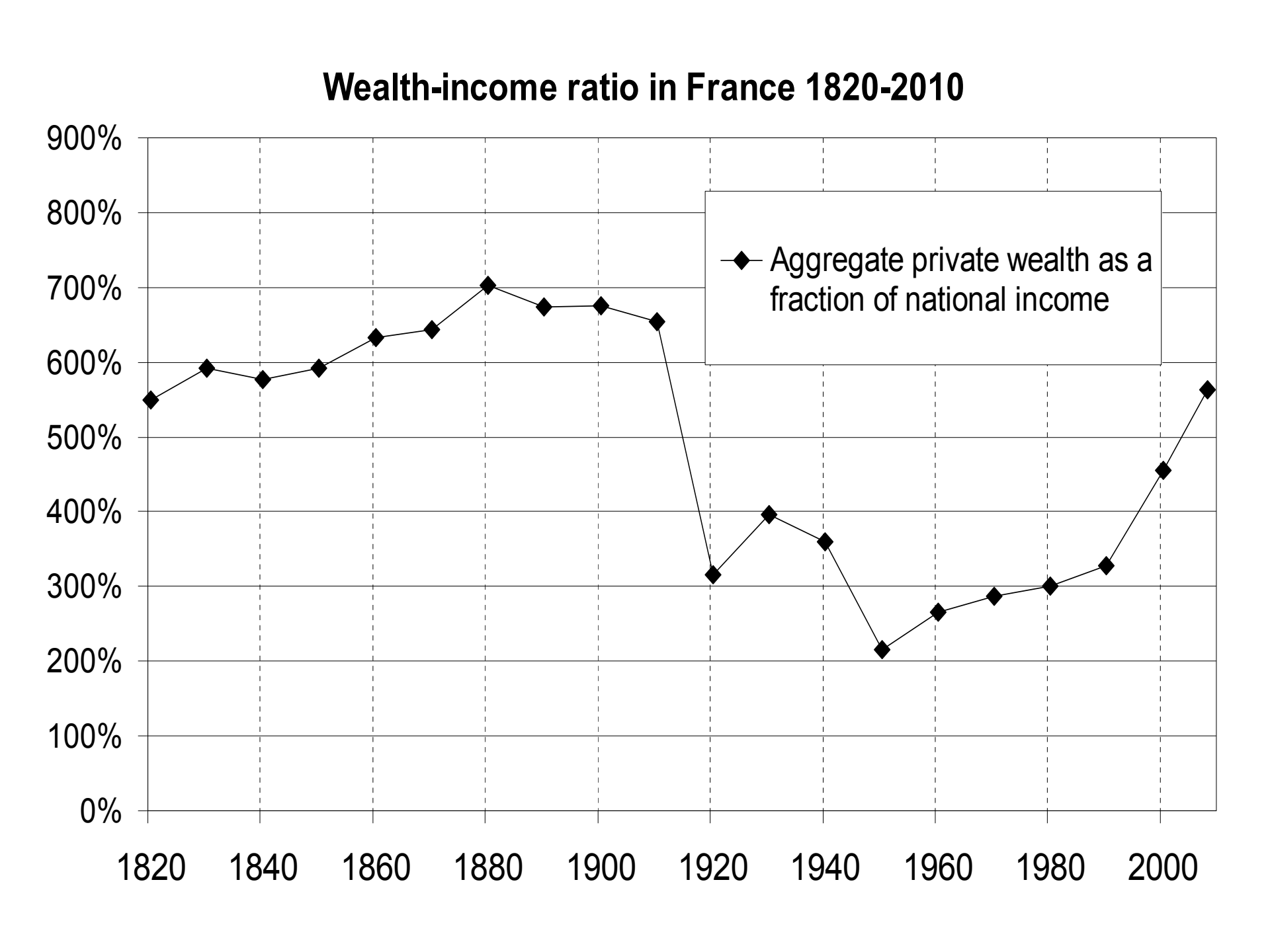
Main Point

- Before computing B_t/Y_t, we need to compute W_t/Y_t

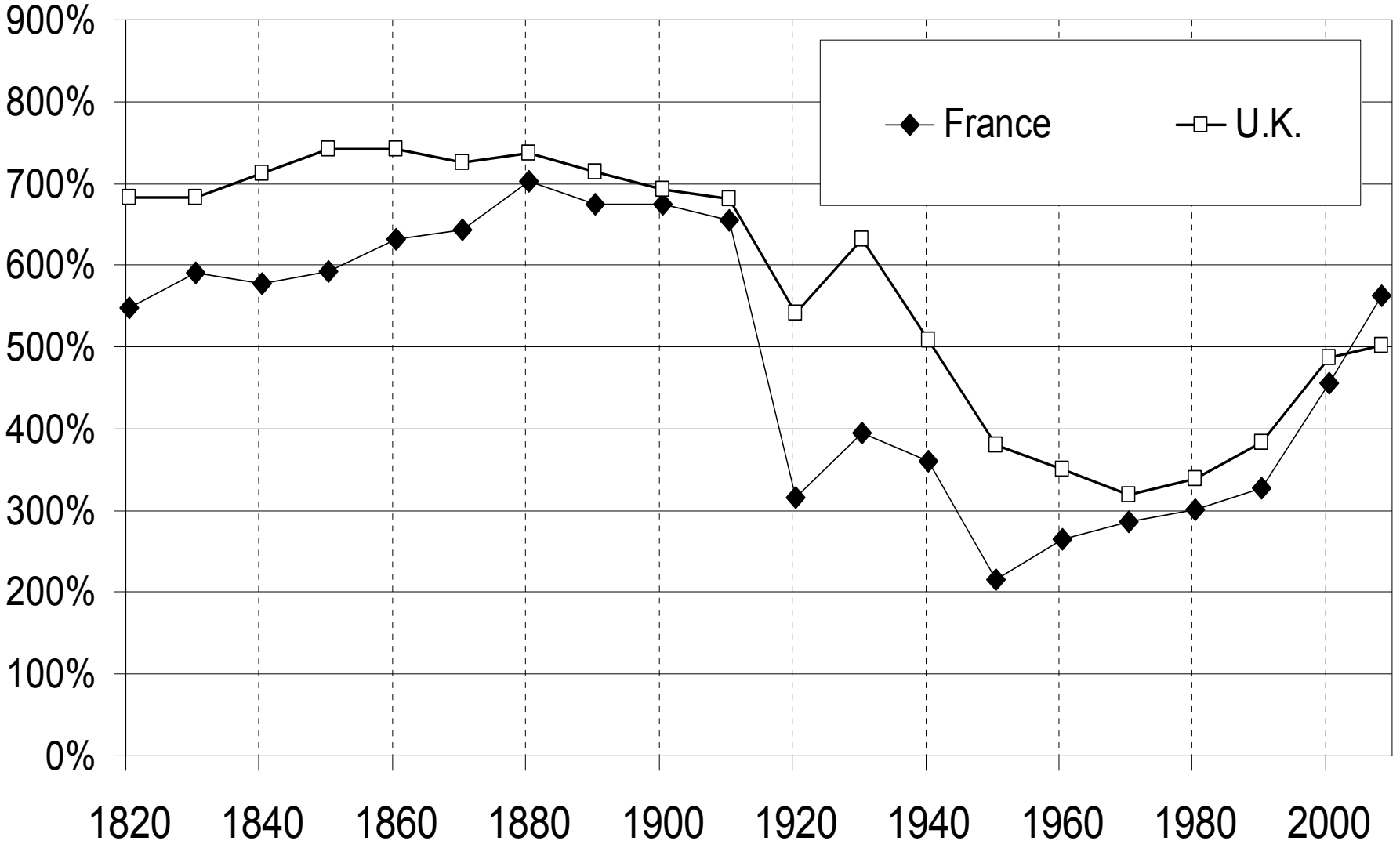
- $\beta_t = W_t/Y_t$ = aggregate wealth/income ratio
- In steady-state, Harrod-Domar-Solow formula: **$\beta^* = s/g$**

(s = saving rate, g= growth rate)

(i.e. s=10%, g=2% implies β^*=500%)

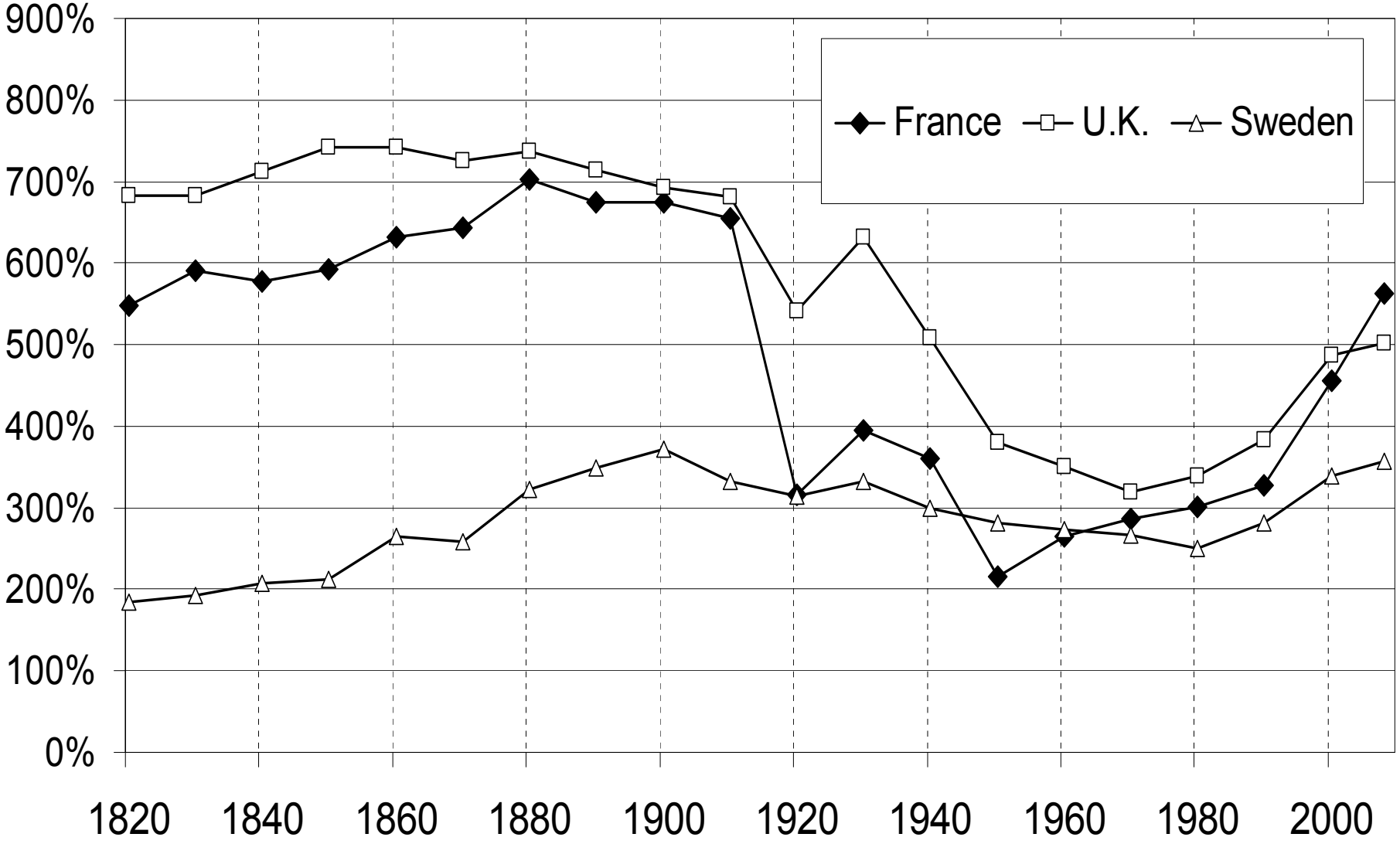

Wealth-income ratio in France 1820-2010
900%
800%
700%
600%
500%
400%
300%
200%
100%
0%
1820
1840
1860
1880
1900
1920
1940
1960
1980
2000
Aggregate private wealth as a fraction of national income

Wealth-income ratio: France vs UK 1820-2010



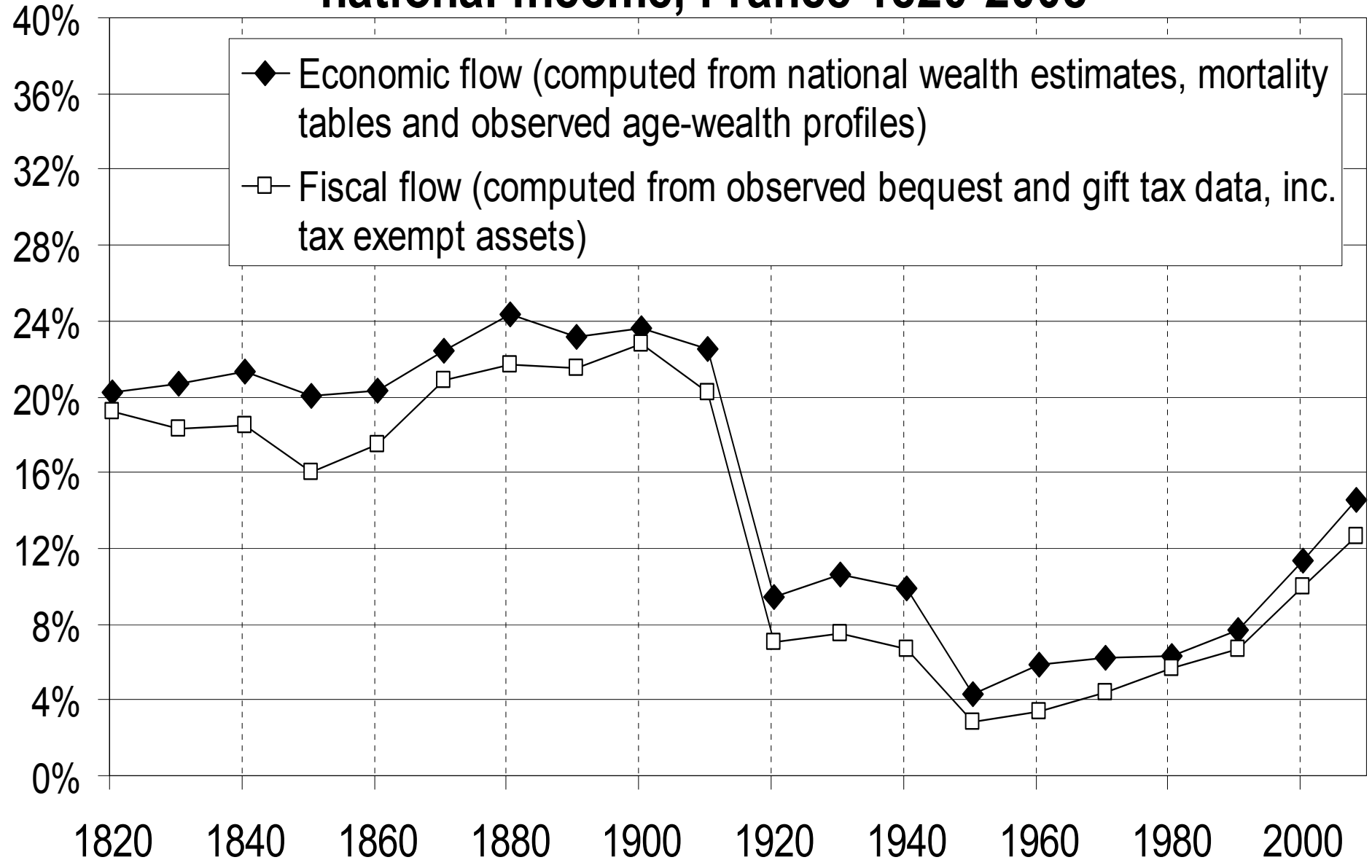
Sources: France: Piketty 2011; UK: Atkinson 2012, Giffen 1878, Goldsmith 1985

Wealth-income ratio: France vs UK vs Sweden 1820-2010



Sources: France: Piketty 2011; UK: Atkinson 2012, Giffen 1878, Goldsmith 1985; Sweden: Roine et al 2012

Figure 1: Annual inheritance flow as a fraction of national income, France 1820-2008



- **There are two ways to become rich**: either through one's own work, or through inheritance
- In the 19th century and early 20th, it was obvious to everybody that the 2nd channel was important: inheritance and successors are everywhere in the literature; huge inheritance flow in tax data

- **Q**: Does this belong to the past? Did modern growth kill the inheritance channel? E.g. rise of human capital and meritocracy?
- This paper answers « **NO** » to this question and attempts to explains why, taking France 1820-2050 as an illustration

Figure 1: Annual inheritance flow as a fraction of national income, France 1820-2008

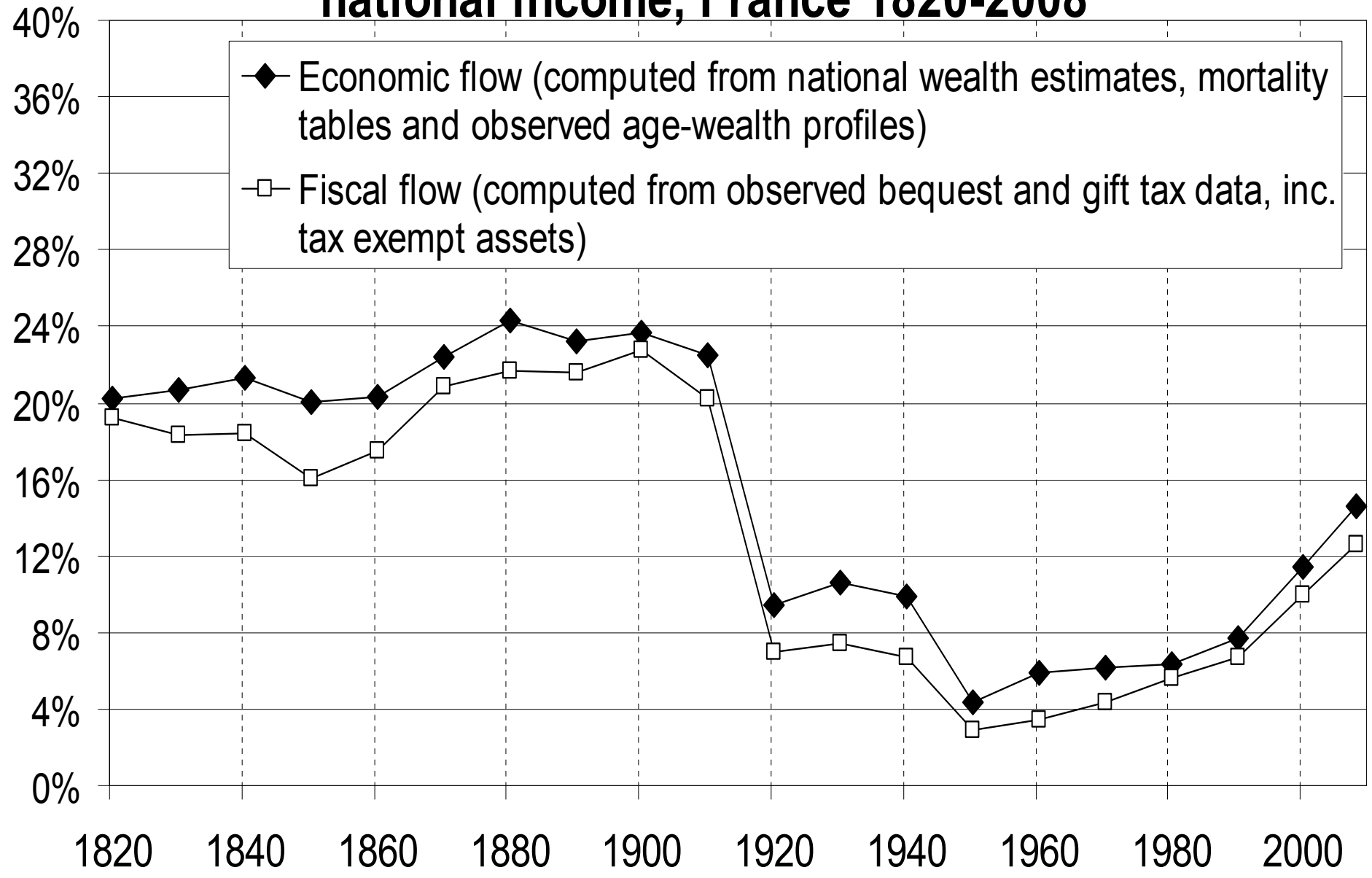
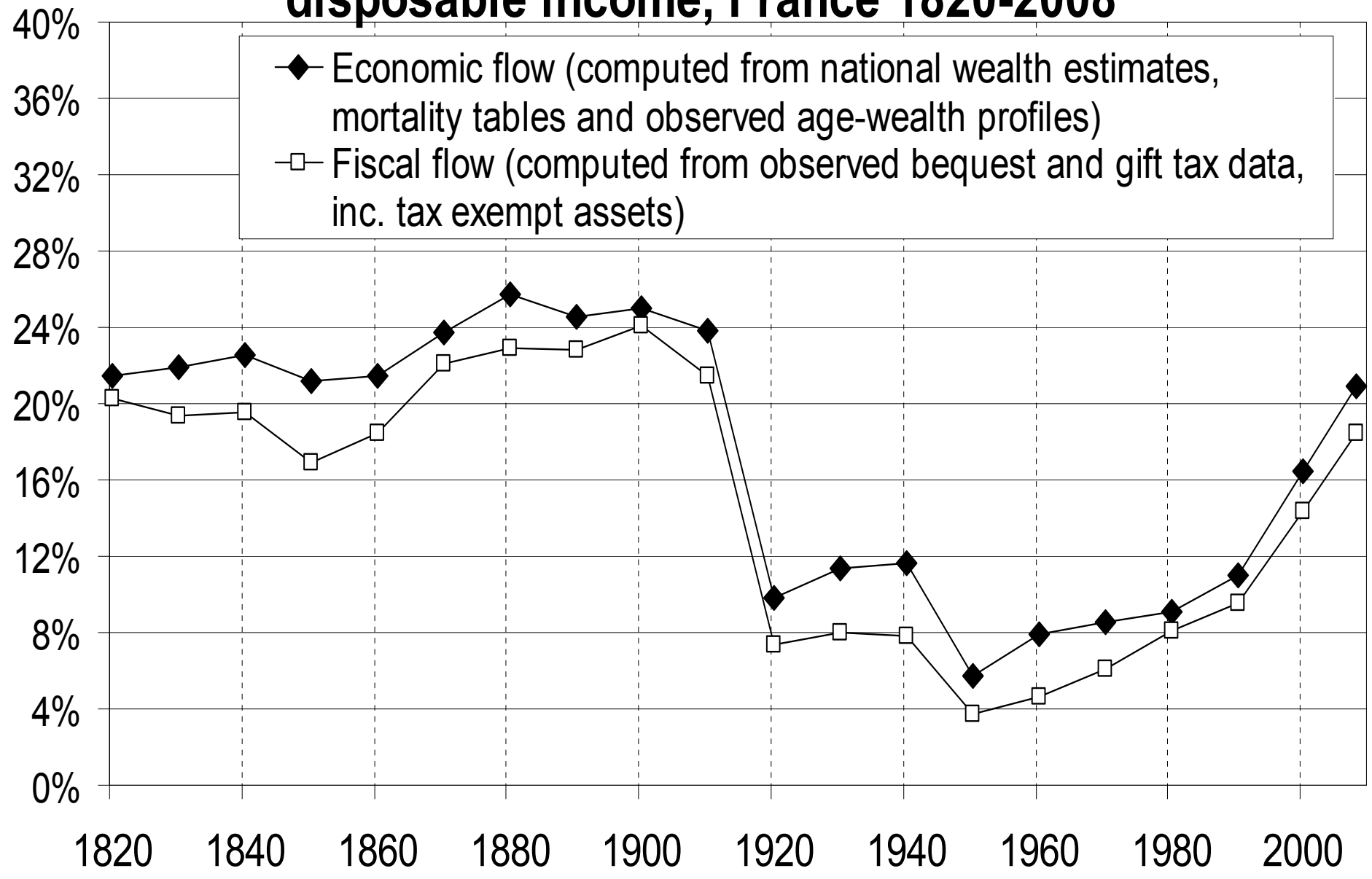


Figure 2: Annual inheritance flow as a fraction of disposable income, France 1820-2008



What this paper does

- Documents & explains this fact; draws lessons for other countries
- **Main lesson: with r>g (say, r=4%-5% vs g=1%-2%), then wealth coming from the past is being capitalized faster than growth, & inherited wealth dominates self-made wealth**
- Dynastic model: heirs save a fraction g/r of the return to inherited wealth, so that wealth-income ratio $\beta=W/Y$ is stationary. Then steady-state bequest flow $b_y=B/Y=\beta/H$, with H= generation length. If $\beta=600\%, H=30 \rightarrow b_y=20\%$
- This can be generalized to more general saving models: if g small & r>g, then b_y close to β/H

Application to the structure of lifetime inequality

- Top incomes literature: Atkinson-Piketty OUP 2007 & 2010 → 23 countries.. but pb with capital side: we were not able to decompose labor-based vs inheritance-based inequality, i.e. meritocratic vs rentier societies

→ **This paper = positive aggregate analysis; but building block for future work with heterogenity, inequality & optimal taxation**

Data sources

- **Estate tax data**: aggregate data 1826-1964; tabulations by estate & age brackets 1902-1964; national micro-files 1977-1984-1987-1994-2000-2006; Paris micro-files 1807-1932
- **National wealth and income accounts**: Insee official series 1949-2009; linked up with various series 1820-1949

- **French estate tax data is exceptionally good**: universal, fully integrated bequest and gift tax since 1791
- Key feature: everybody has to fill a return, even with very low estates
- 350,000 estate tax returns/year in 1900s and 2000s, i.e. 65% of the 500,000 decedents *(US: < 2%)*

(memo: bottom 50% wealth share < 10%)

Computing inheritance flow

$$B_t/Y_t = \mu_t \; m_t \; W_t/Y_t$$

- W_t/Y_t = aggregate wealth/income ratio
- m_t = aggregate mortality rate
- μ_t = ratio between average wealth of decedents and average wealth of the living (= age-wealth profile)

→ The U-shaped pattern of inheritance is the product of three U-shaped effects

Figure 1: Annual inheritance flow as a fraction of national income, France 1820-2008

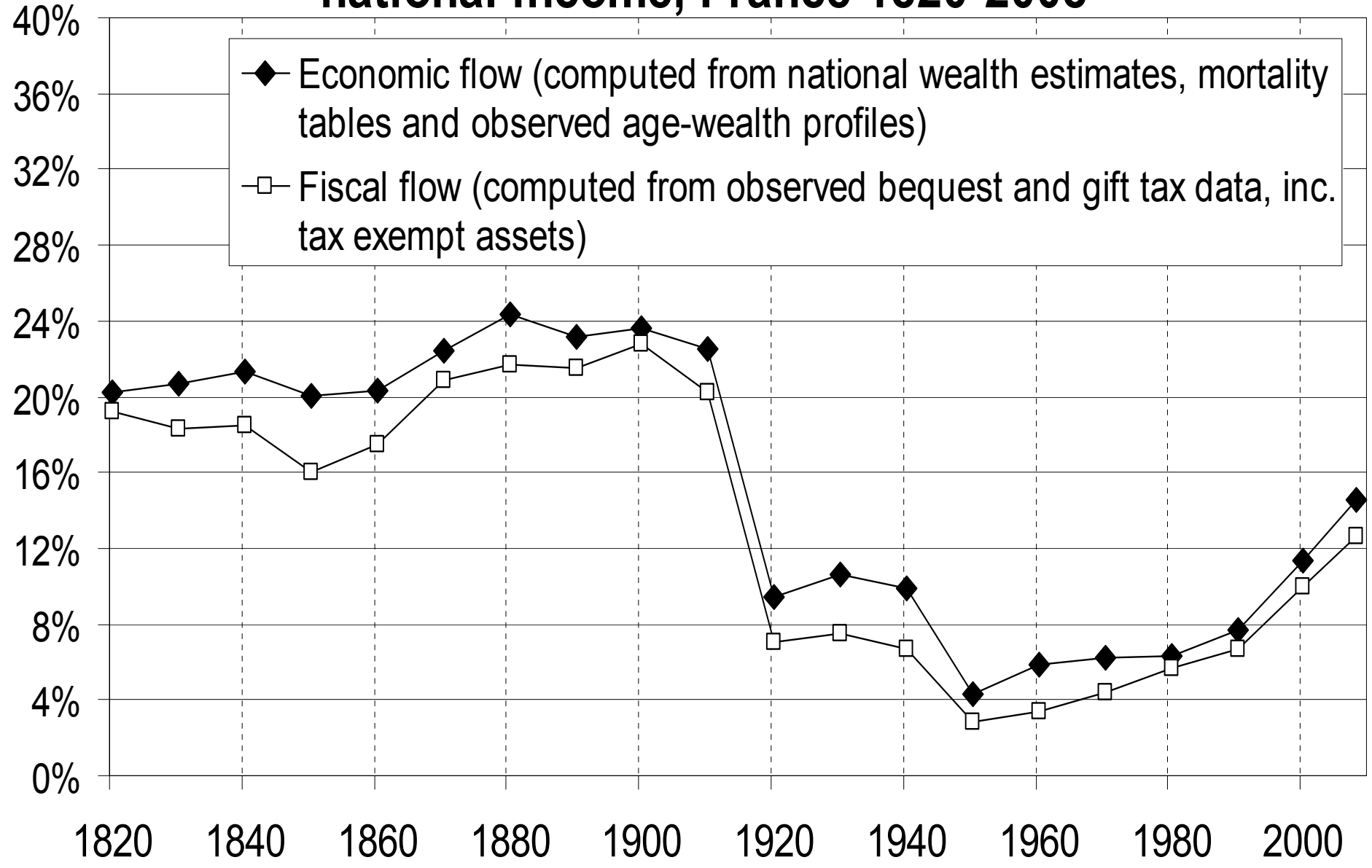


Figure 4: Wealth/income ratio in France 1820-2008

- 1900s: Y = 35 billions francs or, W = 250 billions, B = 8.5 billions

→ W/Y = 700%, B/Y = 25%

- 2008: Y = 1 700 billions € (i.e. 35 000€ per adult), W = 9 500 billions € (200 000€ per adult), B = 240 billions €

→ W/Y = 560%, B/Y = 15%

- Between 1900s and 1950s, W/Y divided by 3, but B/Y divided by 6 → the fall in W/Y explains about half of the fall in B/Y

Figure 8: The ratio between average wealth of decedents and average wealth of the living in France 1820-2008

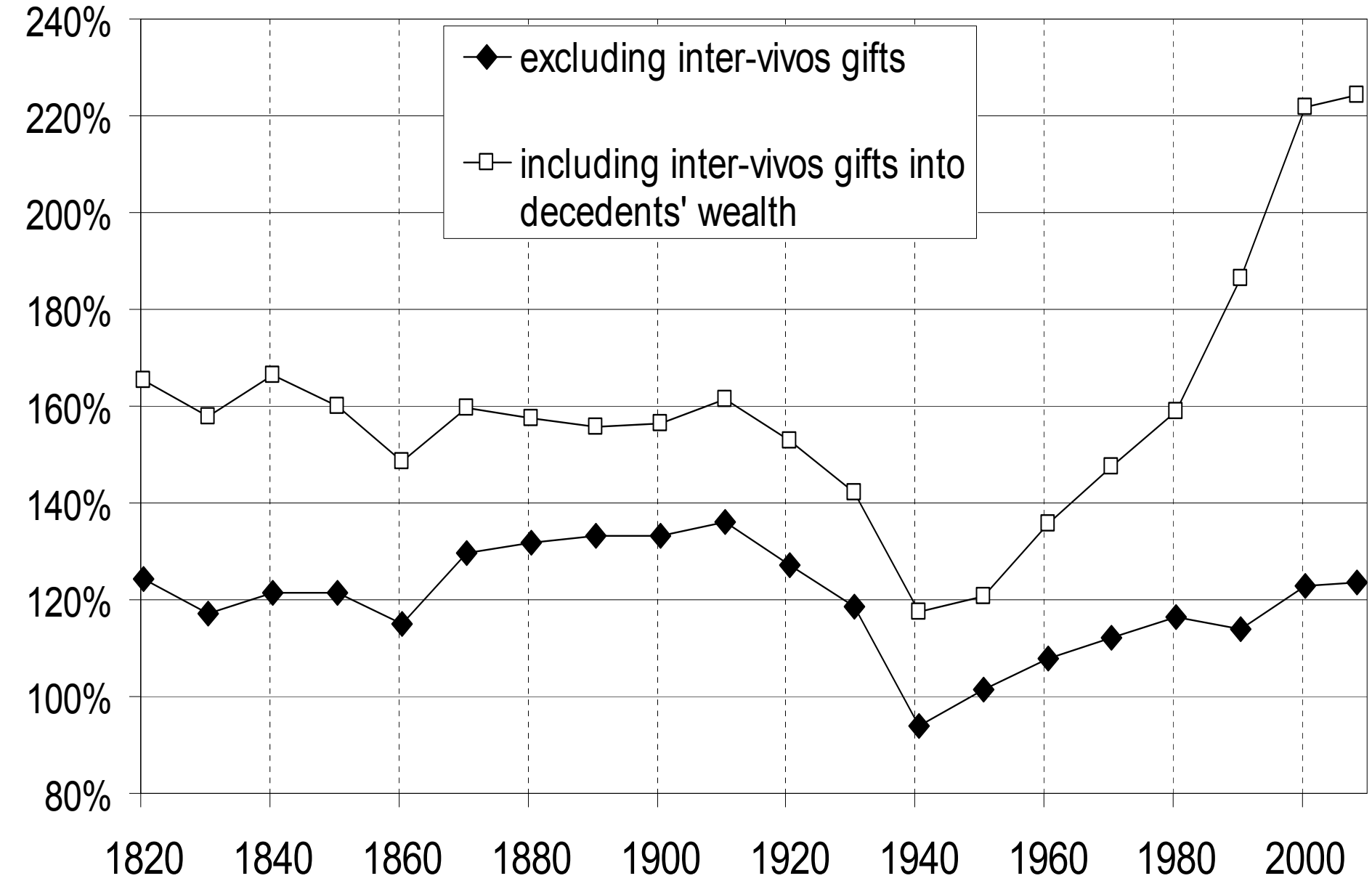


Table 2: Raw age-wealth-at-death profiles in France, 1820-2008

	20-29	30-39	40-49	50-59	60-69	70-79	80+
1827	50%	63%	73%	**100%**	113%	114%	122%
1857	57%	58%	86%	**100%**	141%	125%	154%
1887	45%	33%	63%	**100%**	152%	213%	225%
1902	26%	57%	78%	**100%**	172%	176%	233%
1912	23%	54%	74%	**100%**	158%	176%	237%
1931	22%	59%	77%	**100%**	123%	137%	143%
1947	23%	52%	77%	**100%**	99%	76%	62%
1960	28%	52%	74%	**100%**	110%	101%	87%
1984	19%	55%	83%	**100%**	118%	113%	105%
2000	19%	46%	66%	**100%**	122%	121%	118%
2006	25%	42%	74%	**100%**	111%	106%	134%

How can we account for these facts?

- 1914-45 capital shocks played a big role, and it took a long time to recover
- Key question: why does the age-wealth profile become upward-sloping again?

→ **the r>g effect**

- **Where does the B/Y=20%-25% magic number come from? Why $\mu_t \uparrow$ seem to compensate exactly $m_t \downarrow$?**

Theory 1: Demography

- To simplify: deterministic, stationary demographic structure: everybody becomes adult at age A, has one kid at age H, inherits at age I, and dies at age D
- 1900: A=20, H=30, D=60 → I=D-H=30
- 2050: A=20, H=30, D=80 → I=D-H=50
- mortality rate among adults:

$$m_t = 1/(D-A)$$

(1900: about 2.5%; 2050: about 1.7%)

Theory 2: Production

- $Y_t = F(K_t , H_t) = F(K_t , e^{gt} L_t)$
- g = exogenous productivity growth rate
- E.g. Cobb-Douglas: $F(K,H) = K^{\alpha} H^{1-\alpha}$
- $Y_t = Y_{Kt} + Y_{Lt}$, with $Y_{Kt} = r_t K_t = \alpha_t Y_t$
- Define $\beta_t = K_t/Y_t = W_t/Y_t$ (closed economy)

  (open economy: $W_t = K_t + FW_t$) (+D_t)
- Then $\alpha_t = r_t \beta_t$, i.e. $r_t = \alpha_t/\beta_t$
- E.g. if β_t = 600%, α_t =30%, then r_t = 5%

Theory 3: Savings

- Aggregate savings rate = stable at about 10% of Y_t since 1820

$\rightarrow \beta^* = s/g$ (g=1% & s=6% $\rightarrow \beta^* = 600\%$)

- Exogenous saving: $S_t = sY_t = s_L Y_{Lt} + s_K r W_t$
- **Is $s_K > s_L$?**
- **Dynastic utility function: $s_K = g/r$, $s_L = 0$**
- **Bequest in the utility function**: U(C,B)

$\rightarrow$ easy to generate $s_K > s_L$ (or $s_K < s_L$…)

- **Dynastic model**: $U = \int e^{-\theta t} C_t^{1-\sigma}/(1-\sigma)$

$\rightarrow$ Ramsey steady-state:

$$r^* = \theta + \sigma g \quad (> g)$$

- In effect: $\mathbf{s_L^*=0\%}$, $\mathbf{s_K=g/r^*\%}$
- Any wealth distribution s.t. $f'(k^*)=r^*$ is a steady-state
- Intuition: Y_{Lt} grows at rate g, workers don't need to save; but capitalists need to save a fraction g/r of their capital income $Y_{Kt}= r\, W_t$, so that W_t grows at rate g

Steady-state age-wealth profile

- If s_L=0%, then the cross-sectional age-wealth profile $W_t(a)$ at time t is very simple:

- If A<a<I, then $W_t(a) = 0$ (zero wealth until age of inheritance)
- If I<a<D, then $W_t(a) = W_t^{old}$ (growing at rate g, but independant of age a)

Intuition: young heirs receive larger estate (growing at rate g), but older heirs have capitalized their estate at rate s_K=g/r, so that the cross-sectional profile is flat

Figure 9: Steady-state cross-sectional age-wealth profile in the dynastic model ($r = \theta + \sigma g$, $s_L = 0$, $s_K = g/r$)

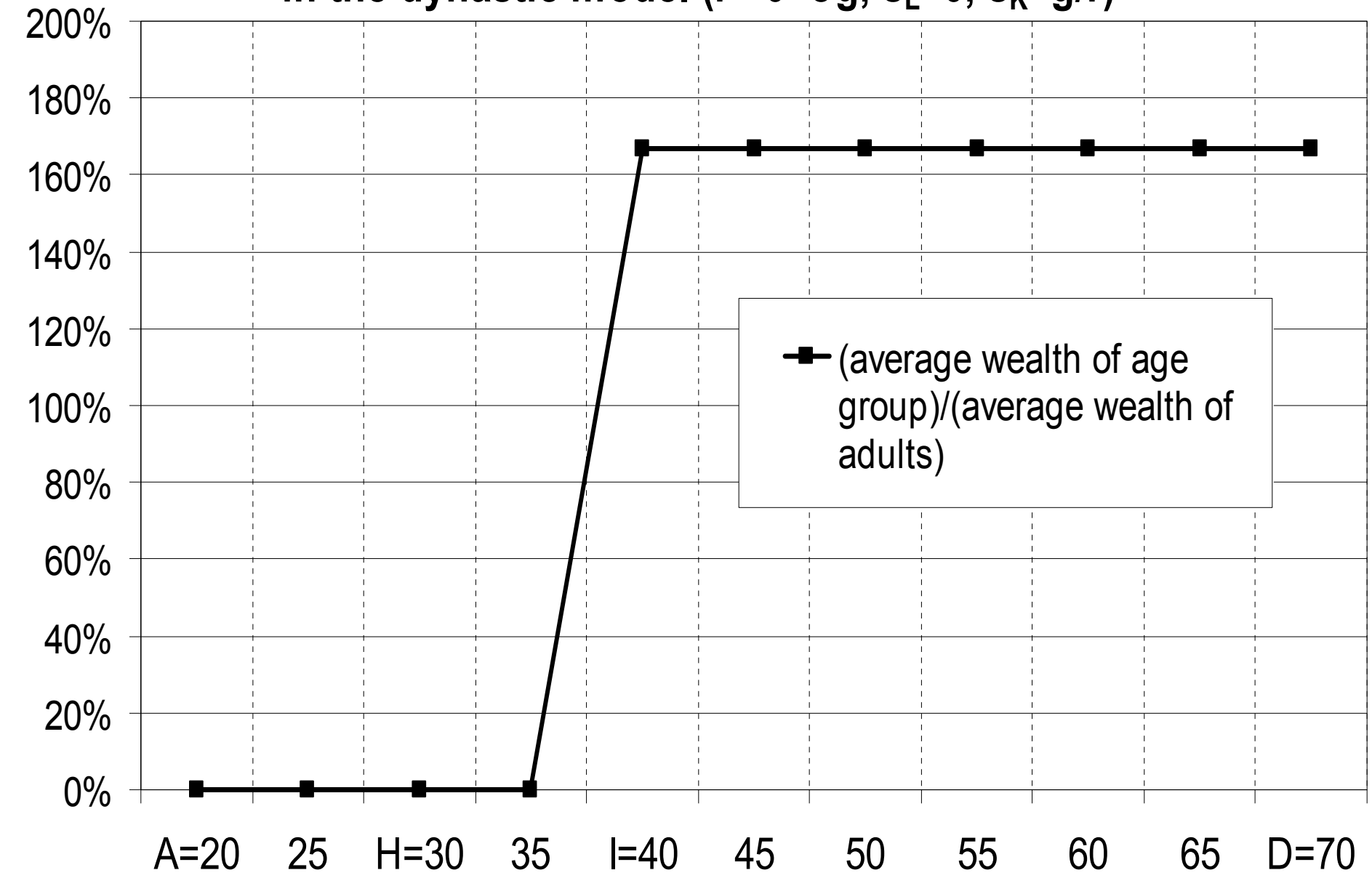
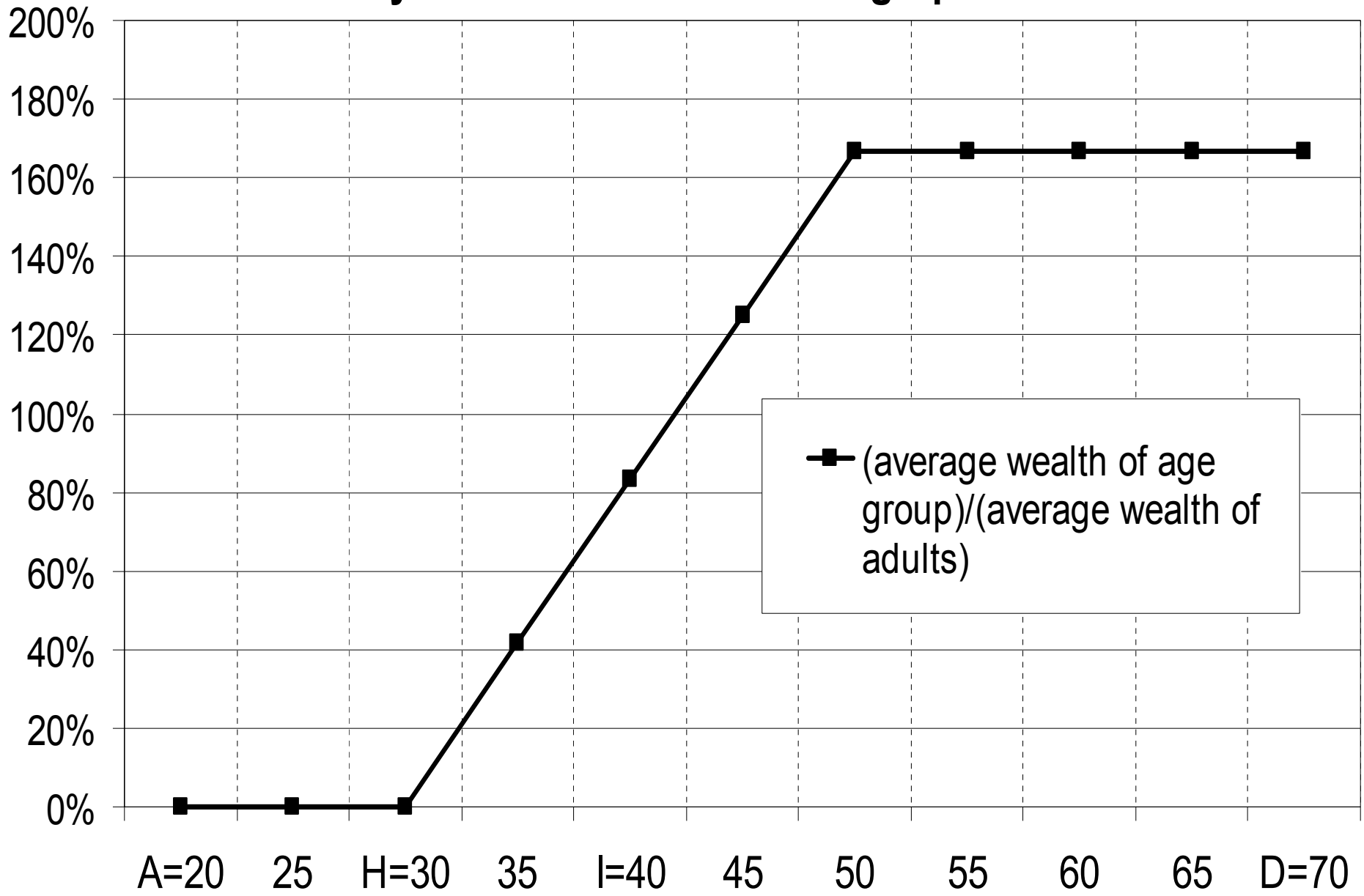


Figure 10: Steady-state cross-sectional age-wealth profile in the dynastic model with demographic noise



Proposition 1: Steady-state of dynastic model :

$r=\theta+\sigma g$ (>g), $s_L=0$, $s_K=g/r$, $\mu=(D-A)/H$ (>1)

→ **B/Y is independant of life expectancy:**

$\mu = (D-A)/H$, $m=1/(D-A)$, so

$$\mathbf{B/Y = \mu\, m\, W/Y = \beta/H}$$

E.g. if $\beta=600\%$, $H=30$, then **B/Y=20%**

1900: D=60, I=30, m=2.5%, but μ=133%

2050: D=80, I=50, m=1.6%, but μ=200%»

Proposition 2: More generally:

$$\mu = [1-e^{-(g-s_K r)(D-A)}]/[1-e^{-(g-s_K r)(D-I)}]$$

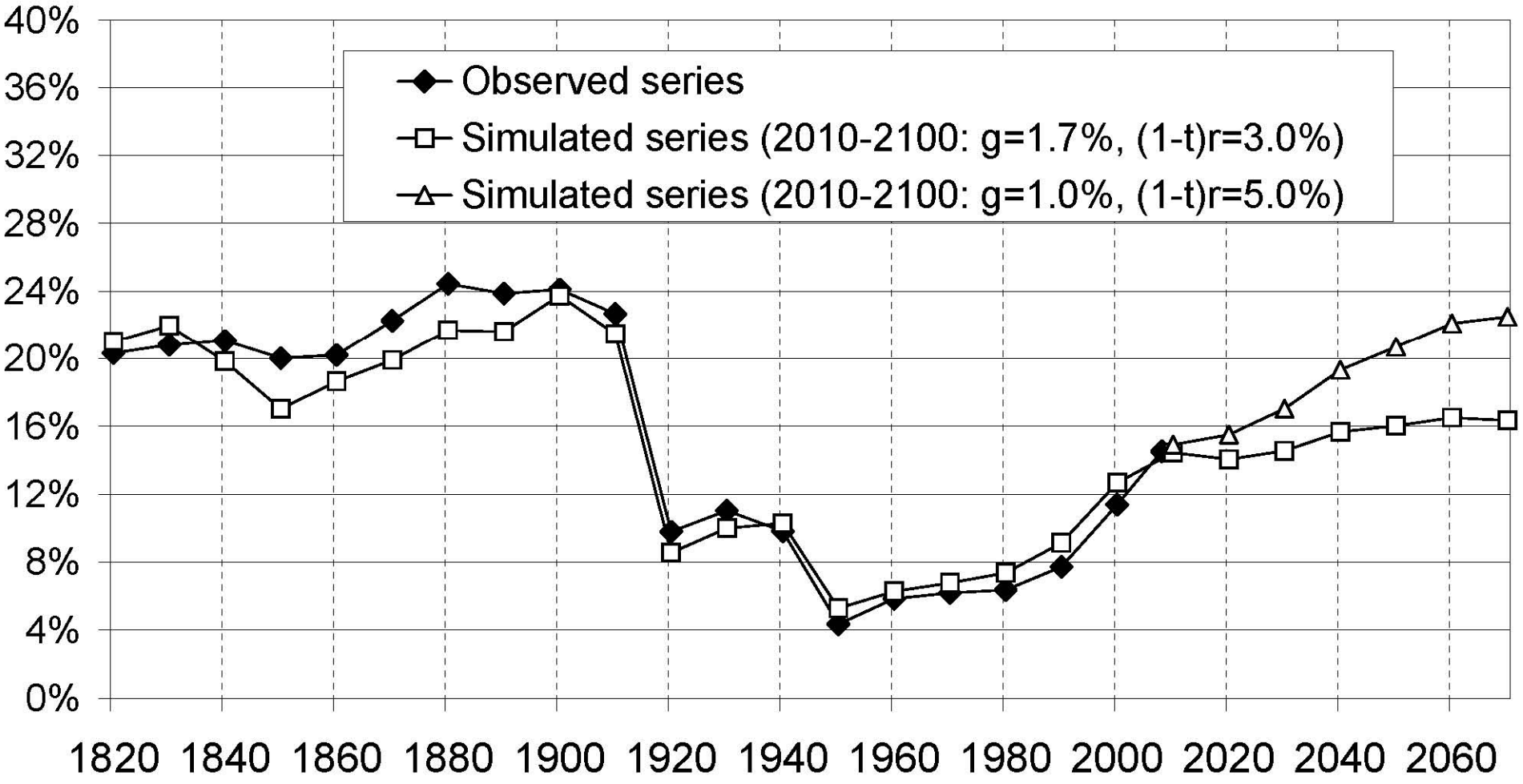
→ $\mu'(s_K)>0$, $\mu'(r)>0$, $\mu'(g)<0$

(→ for g small, μ close to (D-A)/H)

Simulations

- I start from the observed age-wealth profile $W_t(a)$ in 1820 or 1900
- I take s_t and r_t from national accounts
- I take observed age-labor income (+transfer income) profiles
- I apply observed mortality rates by age group, and observed age structure of heirs, donors and donees
- I try different savings behavior to replicate observed dynamics of μ_t & B_t/Y_t

Figure 9: Observed vs simulated inheritance flow B/Y, France 1820-2100



Simulations 1: 19th century

- France 1820-1910 = quasi-steady-state
- $\beta = W/Y = 629\%$, $g=1.0\%$, $s=10.1\%$, $\alpha=38\% \rightarrow$ **$r = 6.0\% >> g=1.0\%$**
- **Key fact about 19th century growth = rate of return r much bigger than g**

$\rightarrow$ **wealth holders only need to save a small fraction of their capital income to maintain a constant or rising W/Y**

($g_w = s/\beta = 1.3\% \rightarrow$ W/Y was slightly rising)

→ in order to reproduce both the 1820-1910 pattern of B/Y **and** the observed age-wealth profile (rising at high ages), one needs to assume that most of the savings came from capital income (i.e. s_L close to 0 and s_K close to g/r)

(consistent with high wealth concentration of the time)

Figure 11: Private savings rate in France 1820-2008

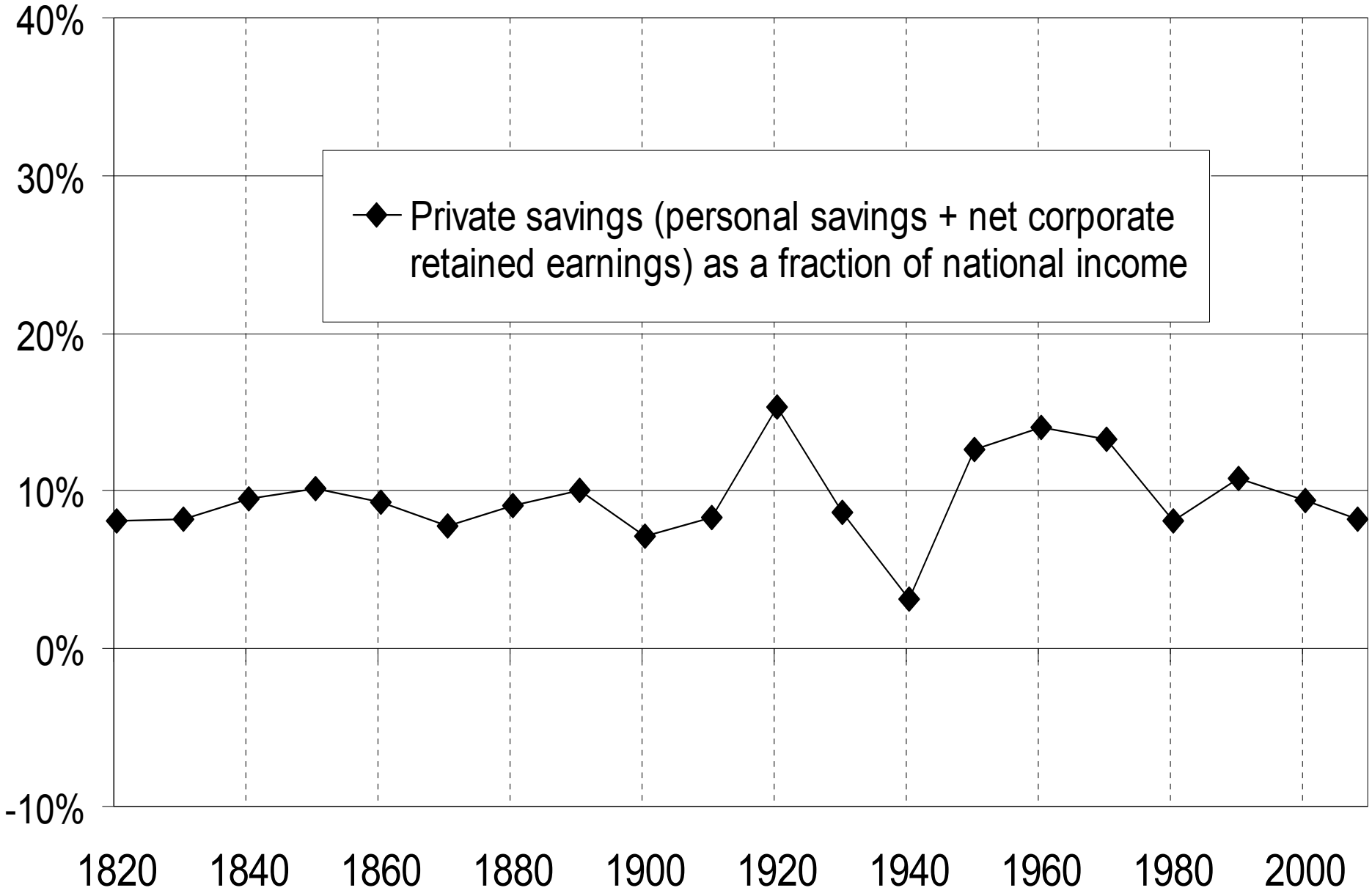


Figure 13: Labor & capital shares in (factor-price) national income, France 1820-2008

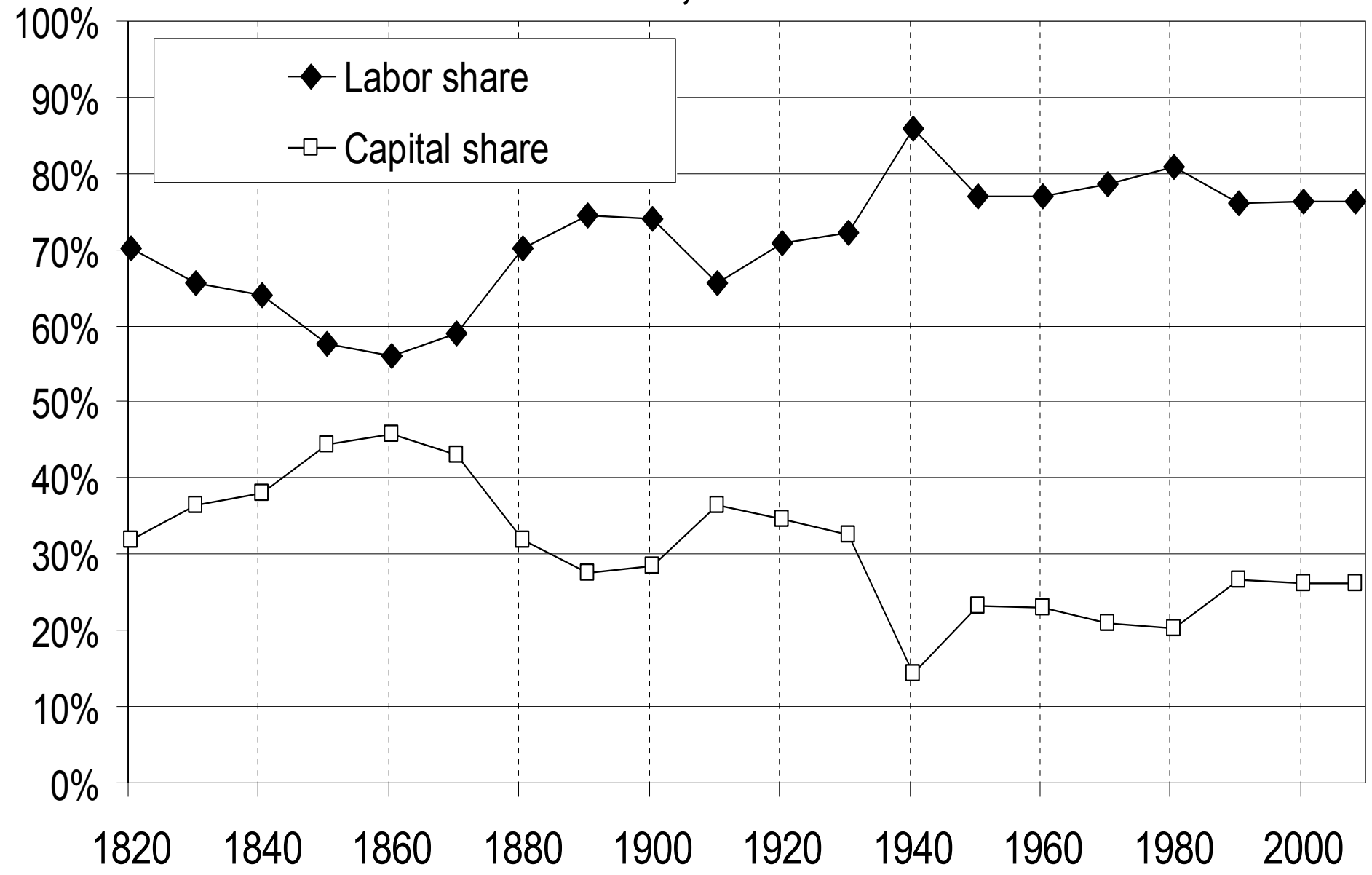


Figure 14: Rate of return vs growth rate France 1820-1913

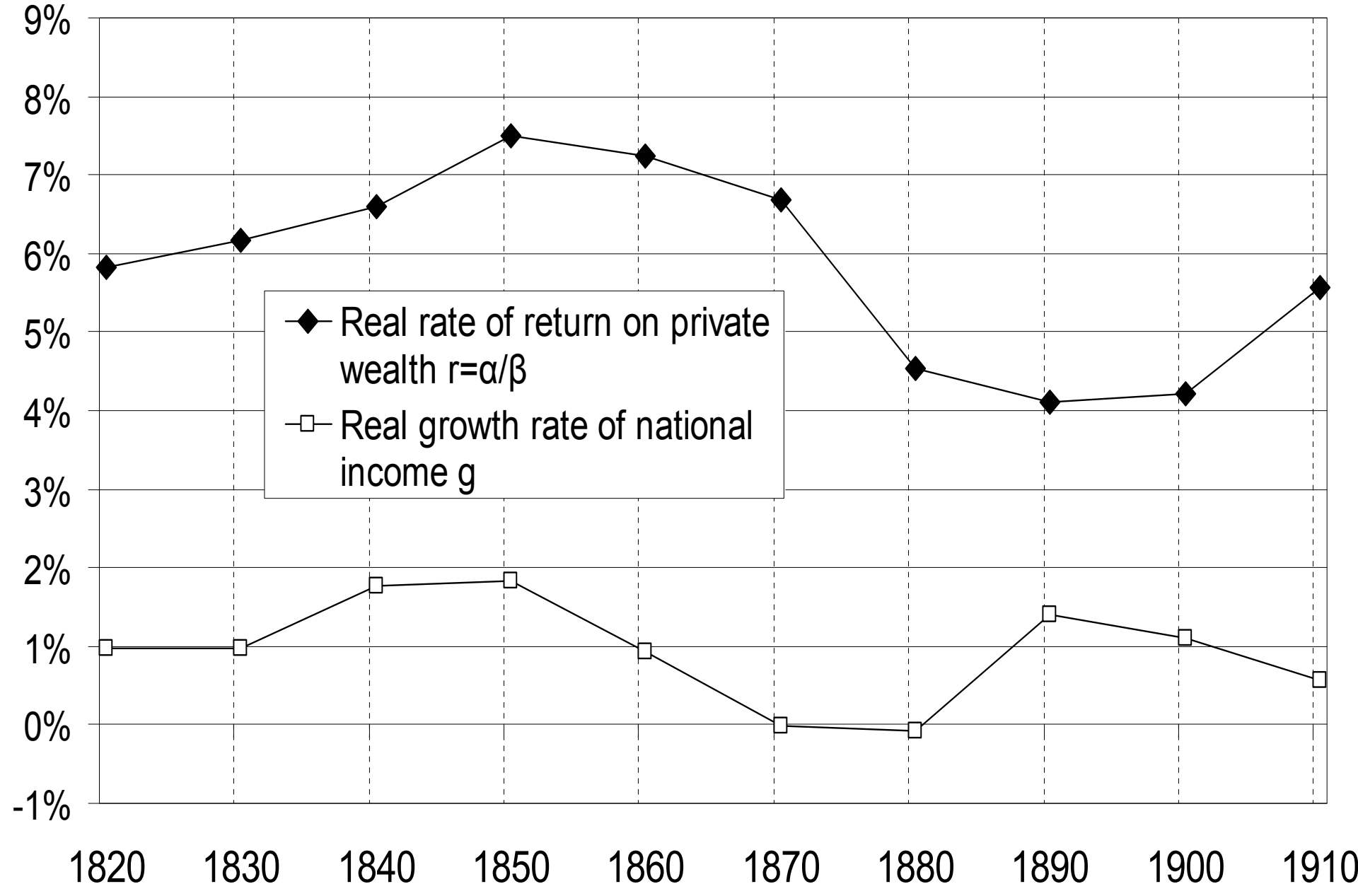
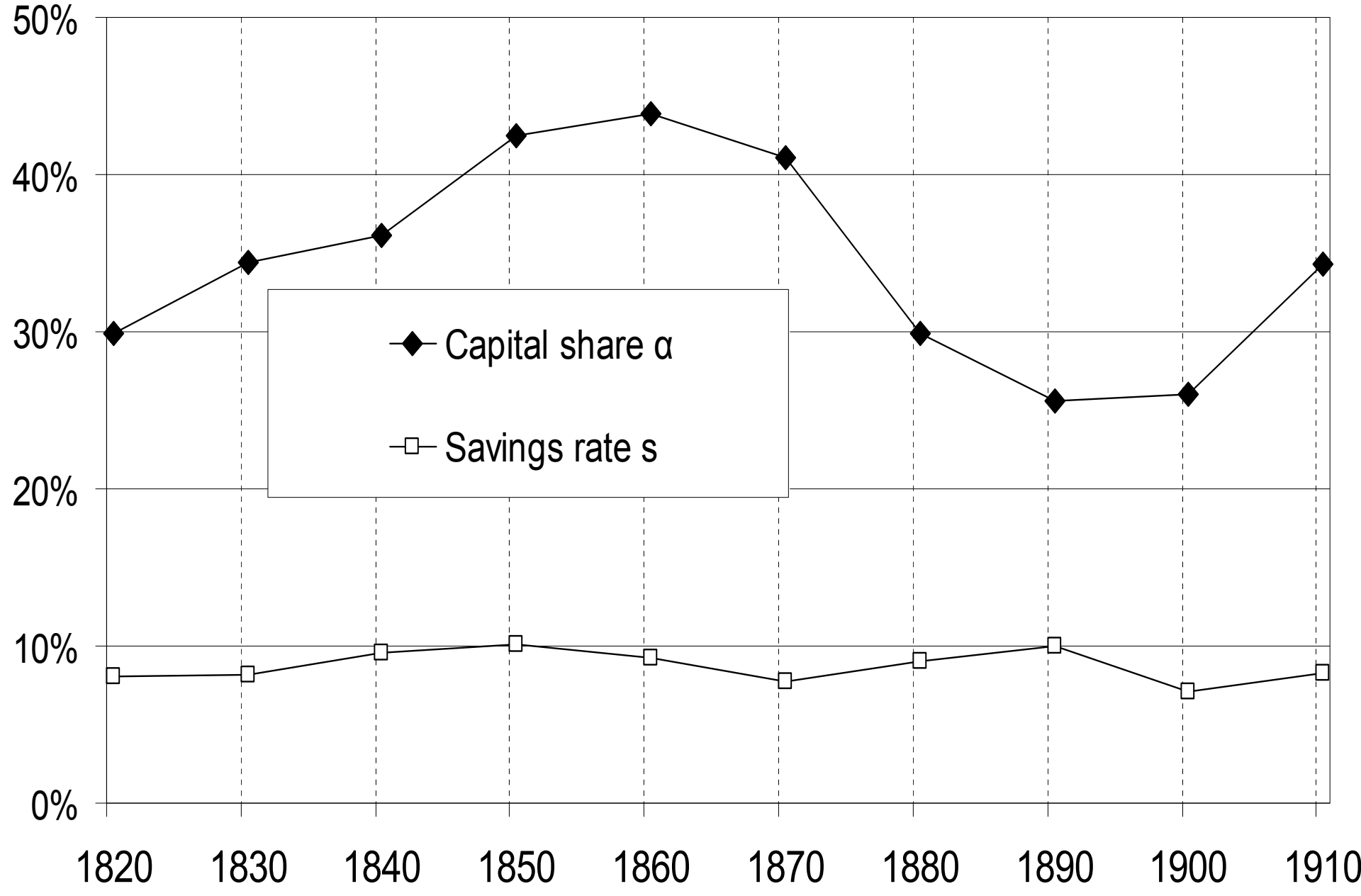


Figure 15: Capital share vs savings rate France 1820-1913



Simulations 2: 20th & 21st centuries

- Uniform savings $s=s_K=s_L$ can reproduce both B/Y & observed age-wealth profiles over 1900-2008
- **2010-2050 simulations**: g=1.7%, s=9.4%, α=26%, after-tax r=3.0%

→ B/Y stabilizes at 16%

- But if g=1.0% & after-tax r=4.5% (rising global k share and/or k tax cuts), then B/Y converges towards 22%-23%

Applications to distributional analysis

- **19^{c}: top successors dominate top labor earners; top 1% spouse > top 1% job**
- **Cohorts born in 1900s-1950s: for the first time maybe in history, top labor incomes dominate top successors**
- Cohorts born in 1970s-1980s & after: closer to 19^{c} rentier society than to 20^{c} meritocratic society. E.g. with labor income alone, hard to buy an appartment in Paris..

Figure 11: The share of inheritance in lifetime ressources received by cohorts born in 1820-2020

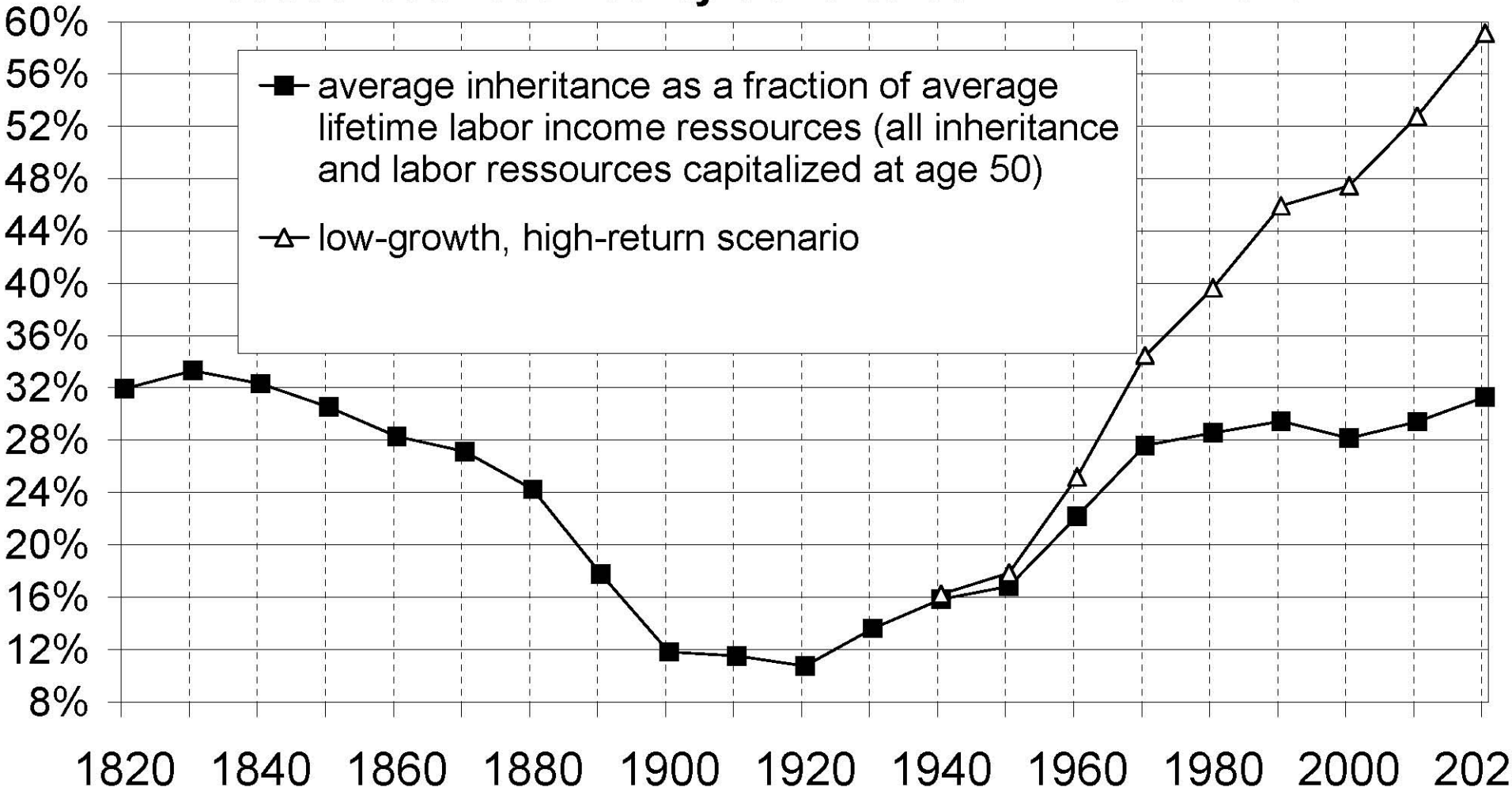


Table 3: Intra-cohort distributions of labor income and inheritance, France, 1910 vs 2010

Shares in aggregate labor income or inherited wealth	Labor income 1910-2010	Inherited wealth	
		1910	2010
Top 10% "Upper Class"	**30%**	**90%**	**60%**
incl. Top 1% "Very Rich"	*6%*	*50%*	*25%*
incl. Other 9% "Rich"	*24%*	*40%*	*35%*
Middle 40% "Middle Class"	**40%**	**5%**	**35%**
Bottom 50% "Poor"	**30%**	**5%**	**5%**

Figure 12: Top 50% successors vs top 50% labor income earners (cohorts born in 1820-2020)

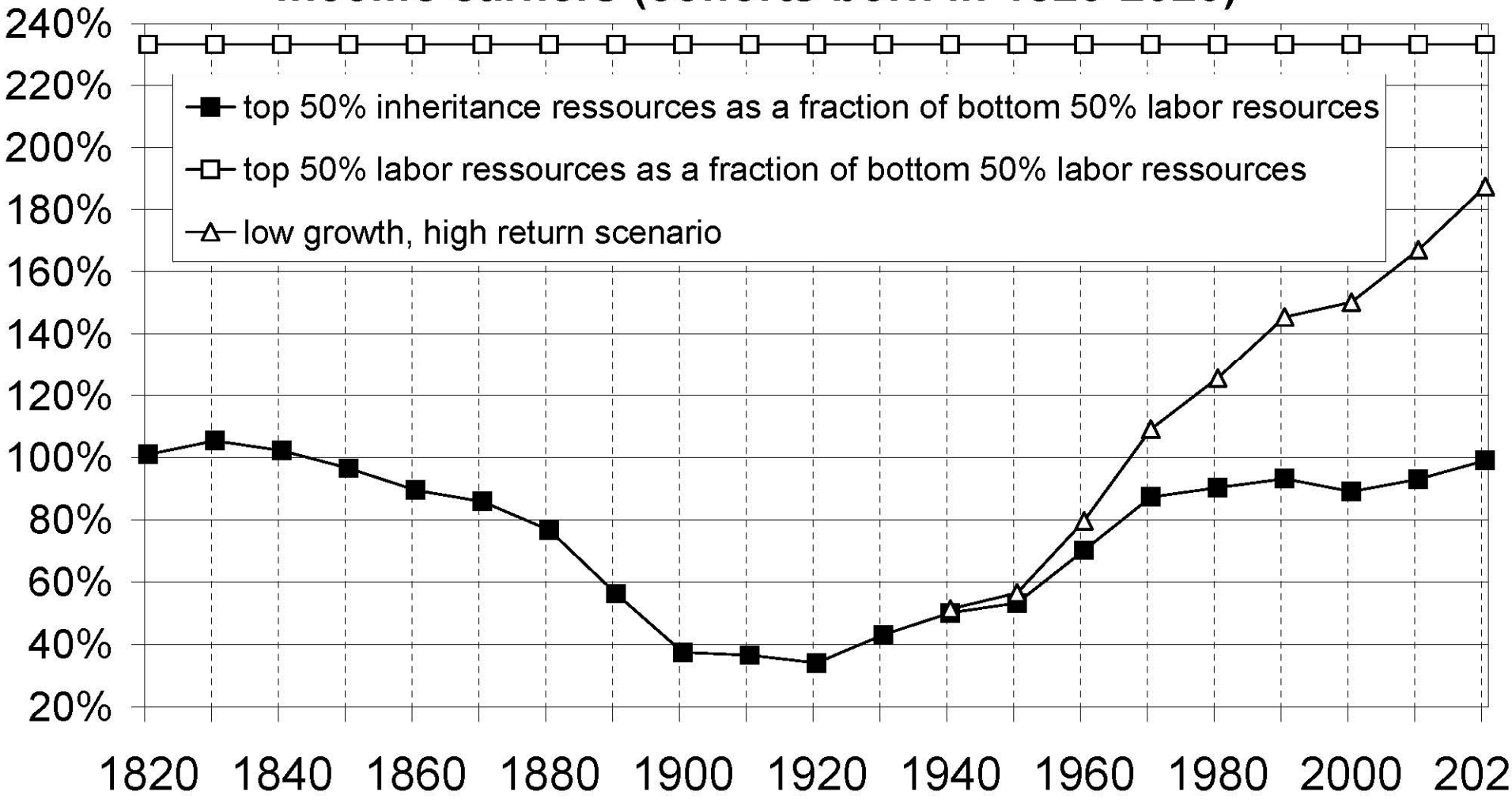


Figure 13: Top 10% successors vs top 10% labor income earners (cohorts born in 1820-2020)

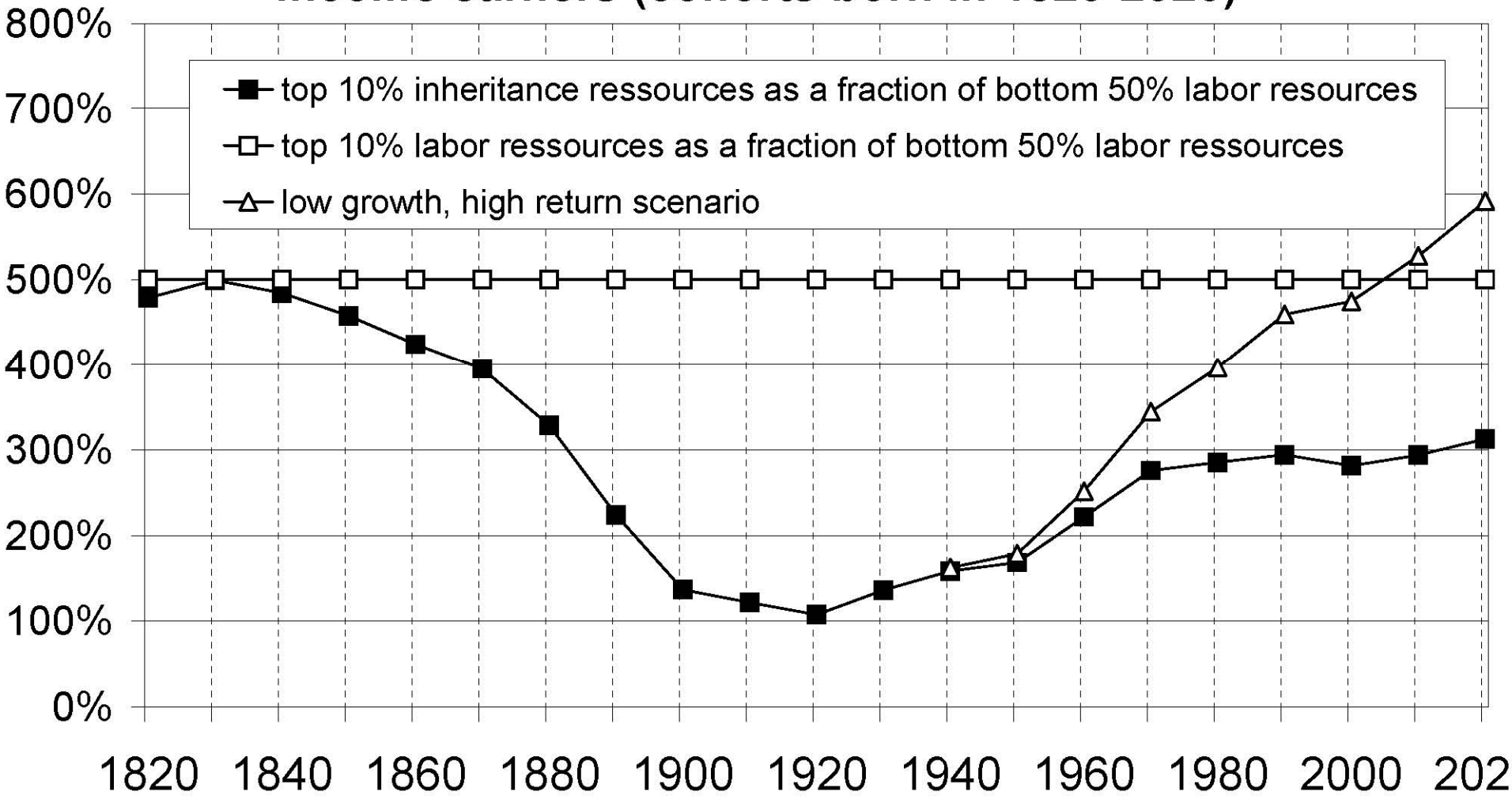


Figure 14: Top 1% successors vs top 1% labor income earners (cohorts born in 1820-2020)

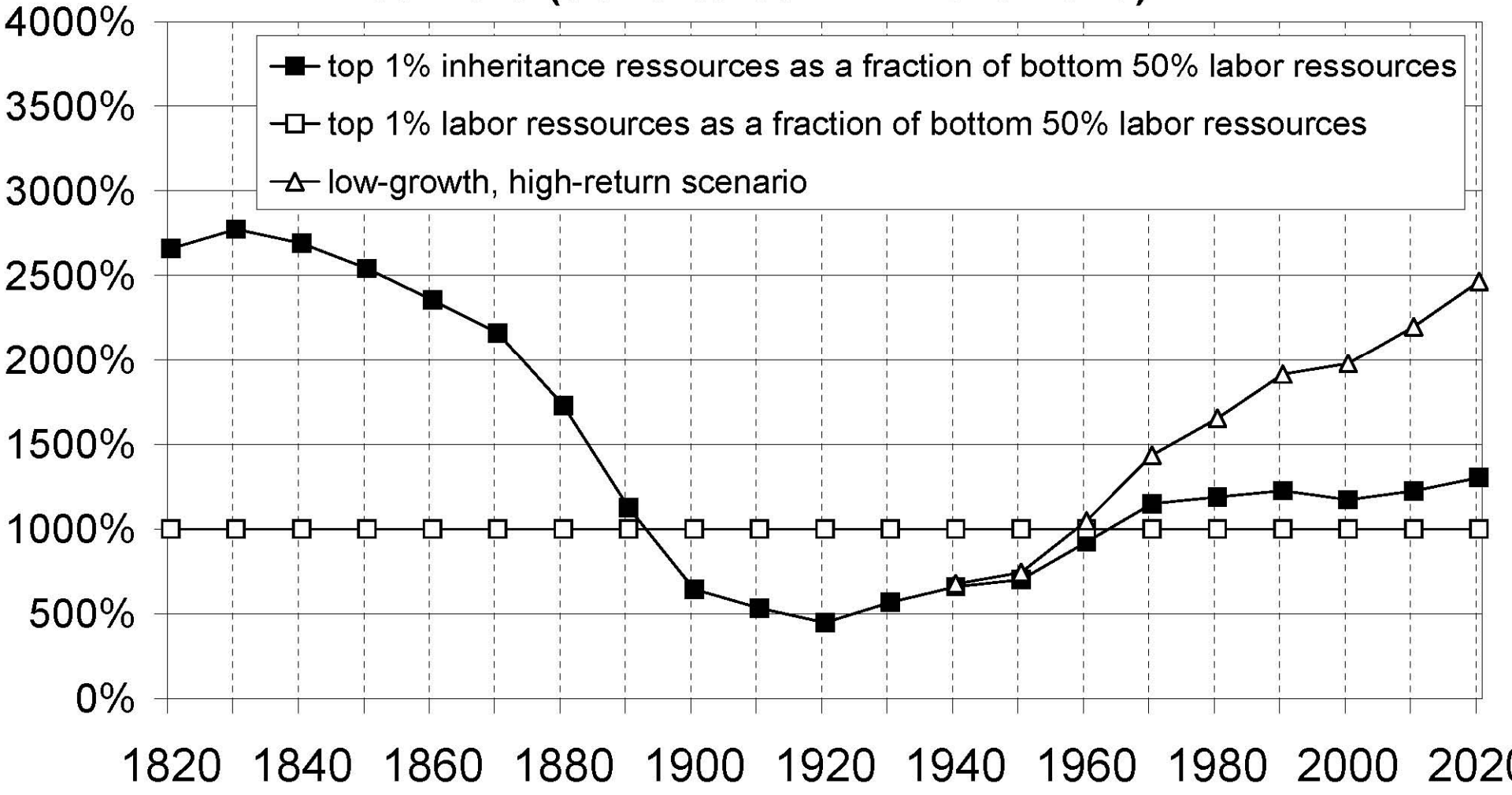
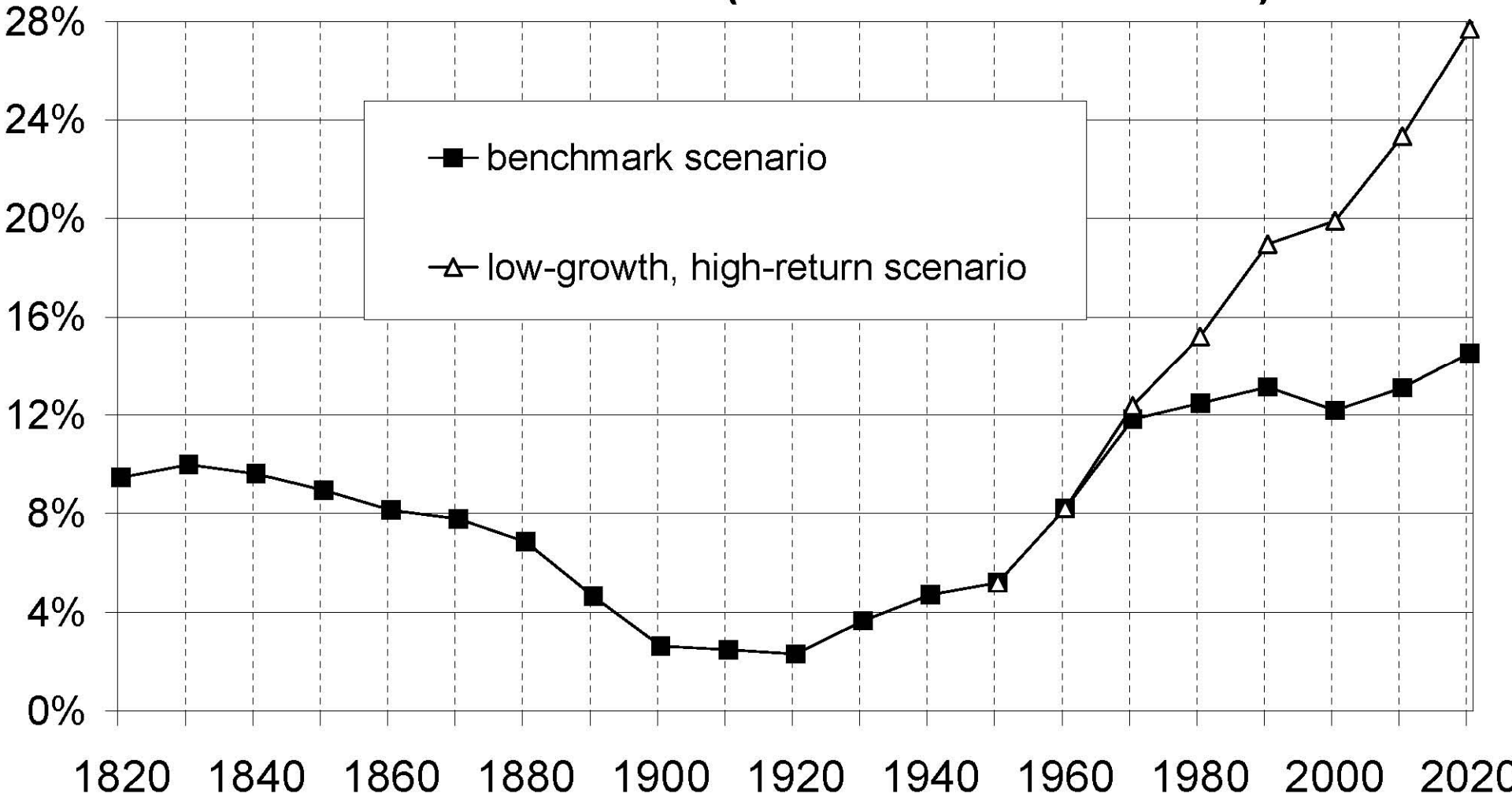


Figure 15: Cohort fraction inheriting more than bottom 50% lifetime labor resources (cohorts born in 1820-2020)



Application to the share of inheritance in total wealth

- Modigliani AER 1986, JEP 1988: inheritance = 20% of total U.S. wealth
- Kotlikoff-Summers JPE 1981, JEP 1988: inheritance = 80% of total U.S. wealth
- Three problems: - Bad data
- **We do not live in a stationary world: life-cycle wealth was much more important in the 1950s-1970s than it is today**
- **We do not live in a representative-agent world → new definition of inheritance share**

Figure 18: The share of non-capitalized inheritance in aggregate wealth accumulation , France 1850-2100

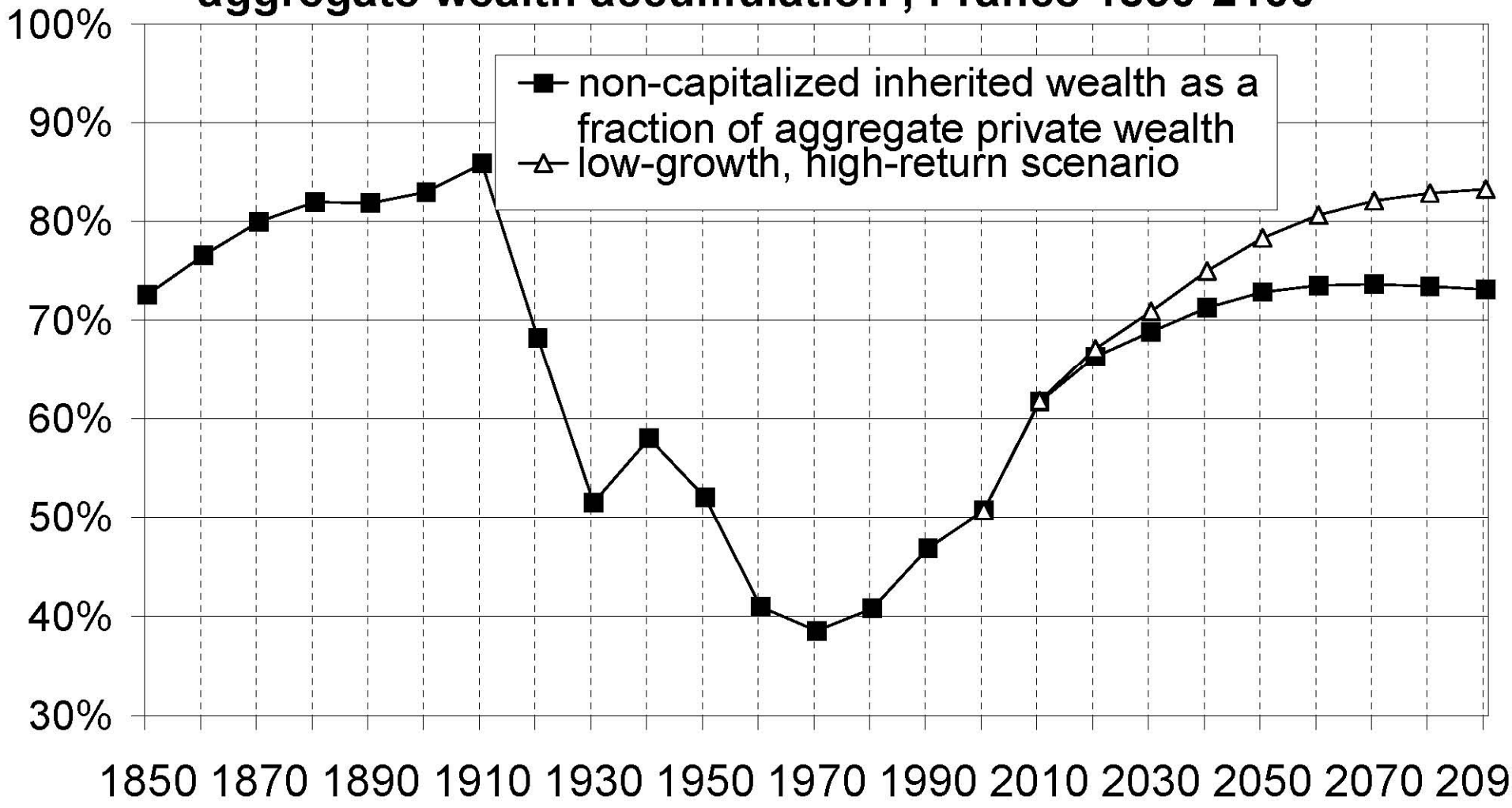
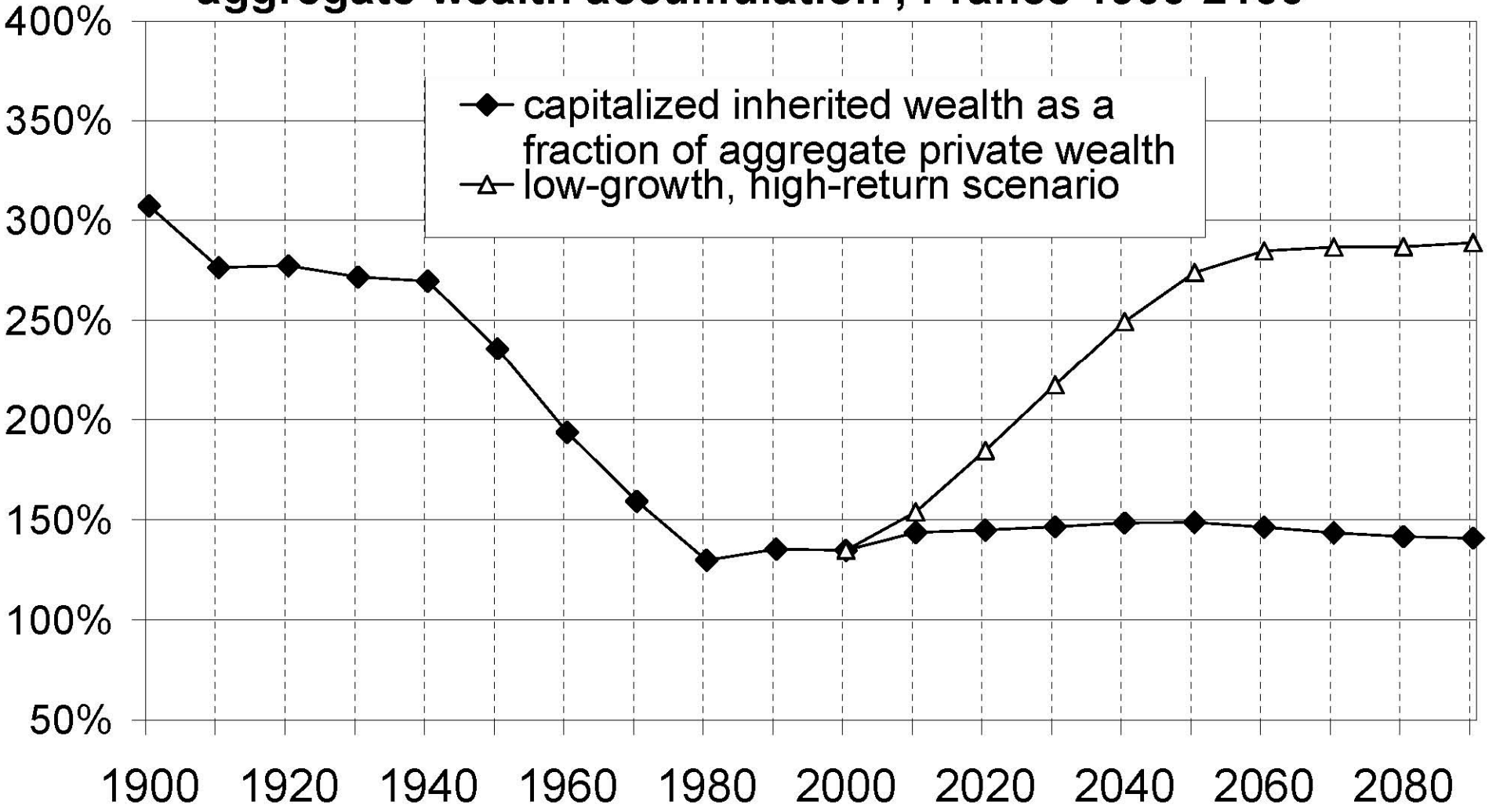


Figure 19: The share of capitalized inheritance in aggregate wealth accumulation , France 1900-2100



What have we learned?

- Capital accumulation takes time; one should not look at past 10 or 20 yrs and believe this is steady-state; life cycle theorists were too much influenced by what they saw in the 1950s-1970s…
- Inheritance is likely to be a big issue in the 21st century
- Modern economic growth did not kill inheritance; the rise of human capital simply did not happen; g>0 but small not very different from g=0

- **A lot depends on r vs g+n:**

→ China/India: inheritance doesn't matter

→ US: inheritance smaller than in Europe

→ Italy, Spain, Germany (n<0): U-shaped pattern probably even bigger than France

→ world, very long run: g+n=0%: inheritance and past wealth will play a dominant role; back to 19th century intuitions

- But no normative model… difficult conceptual issues before we have good optimal k tax theory (endogenous r)

→ see Piketty-Saez, in progress…

Table 1: Accumulation of private wealth in France, 1820-2009

	Real growth rate of national income g	Real growth rate of private wealth g_w	Savings-induced wealth growth rate $g_{ws} = s/\beta$	Capital-gains-induced wealth growth rate q	*Memo: Consumer price inflation* *p*
1820-2009	1.8%	1.8%	2.1%	-0.3%	*4.4%*
1820-1913	1.0%	1.3%	1.4%	-0.1%	*0.5%*
1913-2009	2.6%	2.4%	2.9%	-0.4%	*8.3%*
1913-1949	1.3%	-1.7%	0.9%	-2.6%	*13.9%*
1949-1979	5.2%	6.2%	5.4%	0.8%	*6.4%*
1979-2009	1.7%	3.8%	2.8%	1.0%	*3.6%*

Table 2: Rates of return vs growth rates in France, 1820-2009

	Growth rate of national income g	Rate of return on private wealth $r = \alpha/\beta$	Capital tax rate τ_K	After-tax rate of return $r_d = (1-\tau_K)\alpha/\beta$	Real rate of capital gains q	Rate of capital destruct. (wars) d	After-tax real rate of return (incl. k gains & losses) $r_d = (1-\tau_K)\alpha/\beta + q + d$
1820-2009	**1.8%**	**6.8%**	19%	**5.4%**	-0.1%	-0.3%	**5.0%**
1820-1913	**1.0%**	**5.9%**	8%	**5.4%**	-0.1%	0.0%	**5.3%**
1913-2009	**2.6%**	**7.8%**	31%	**5.4%**	-0.1%	-0.7%	**4.6%**
1913-1949	**1.3%**	**7.9%**	21%	**6.4%**	-2.6%	-2.0%	**1.8%**
1949-1979	**5.2%**	**9.0%**	34%	**6.0%**	0.8%	0.0%	**6.8%**
1979-2009	**1.7%**	**6.9%**	39%	**4.3%**	1.0%	0.0%	**5.3%**

Figure 5:Wealth/disposable income ratio France 1820-2008

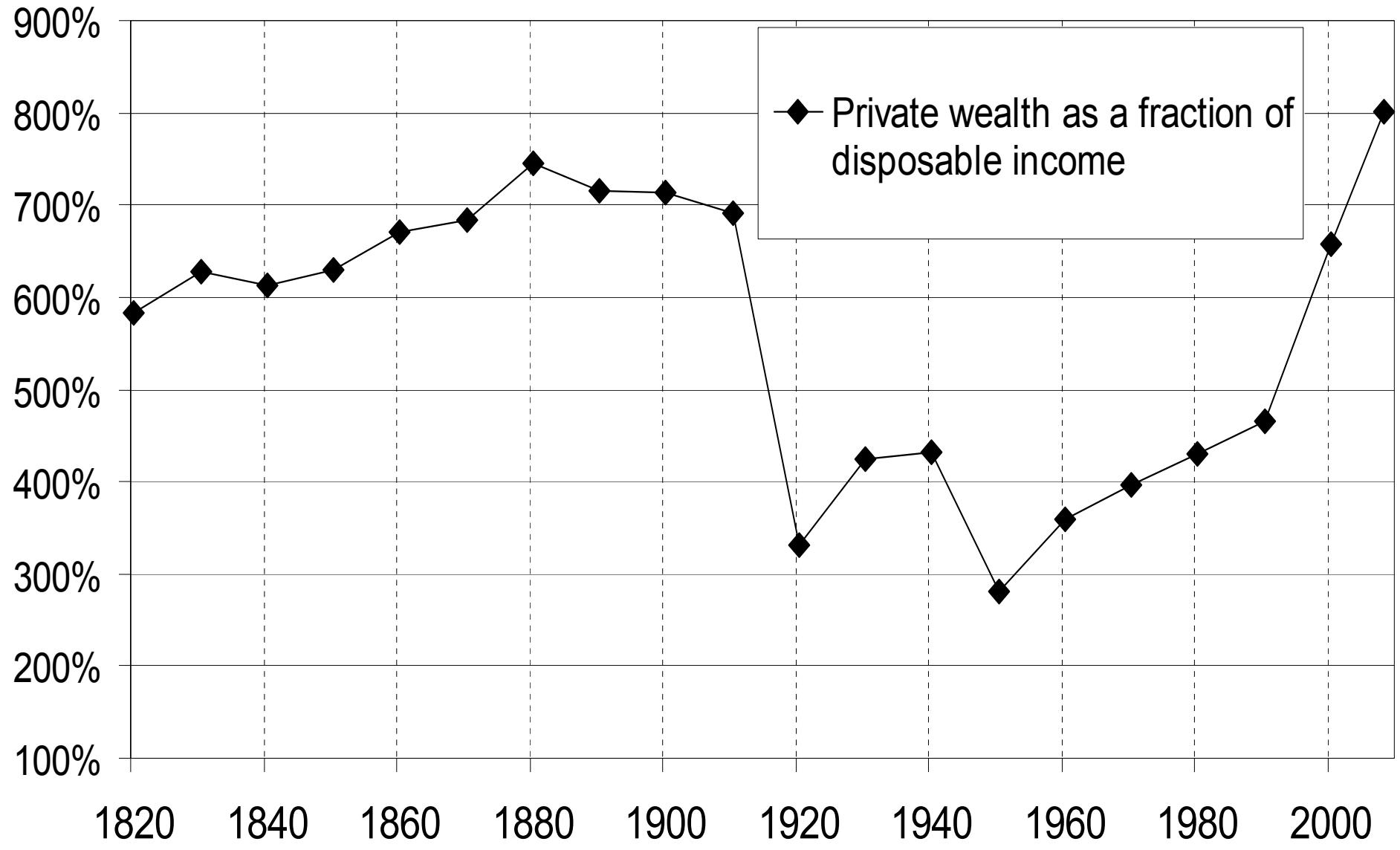


Figure 6: Mortality rate in France, 1820-2100

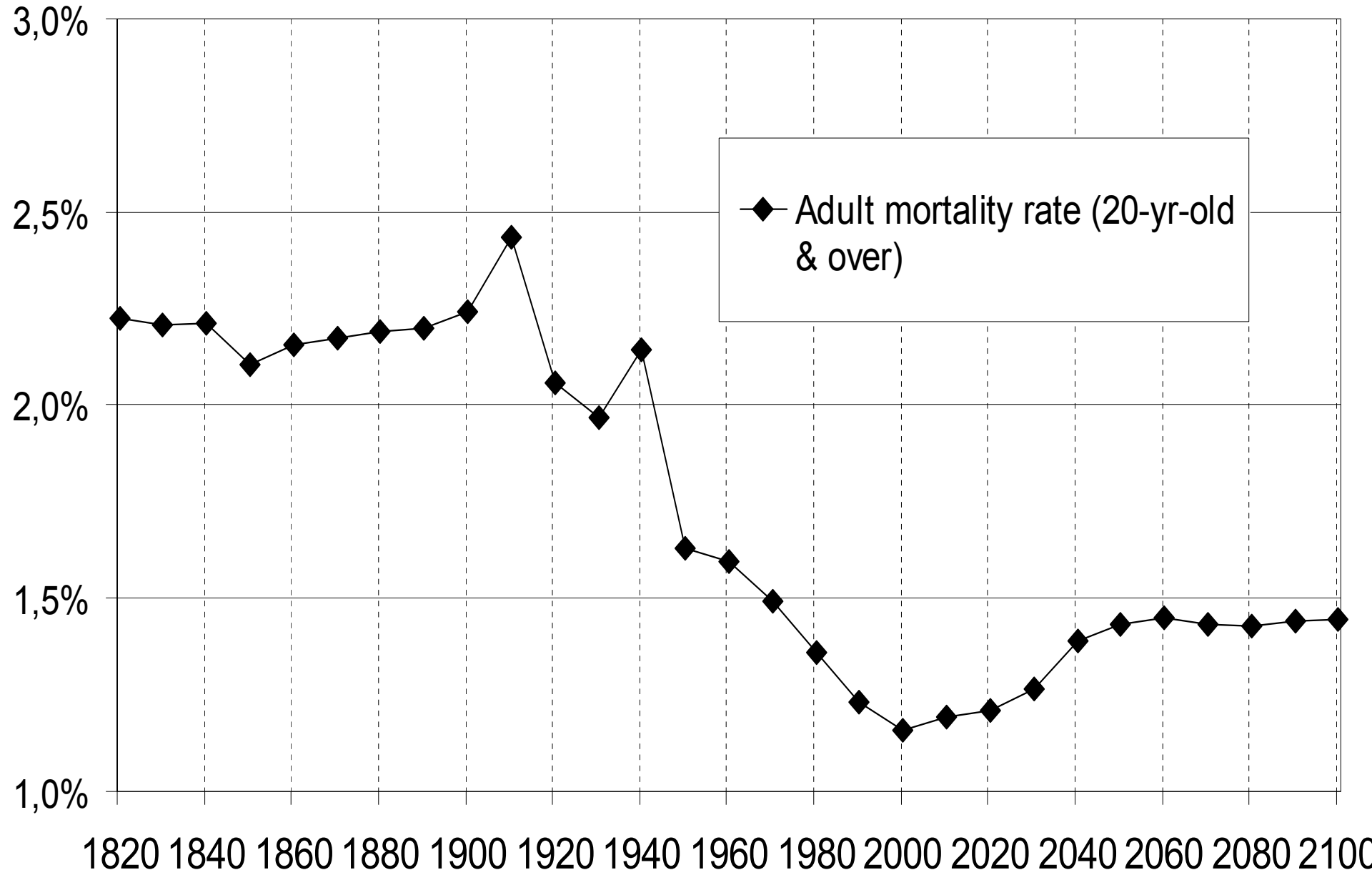


Figure 7: Age of decedents & heirs in France, 1820-2100

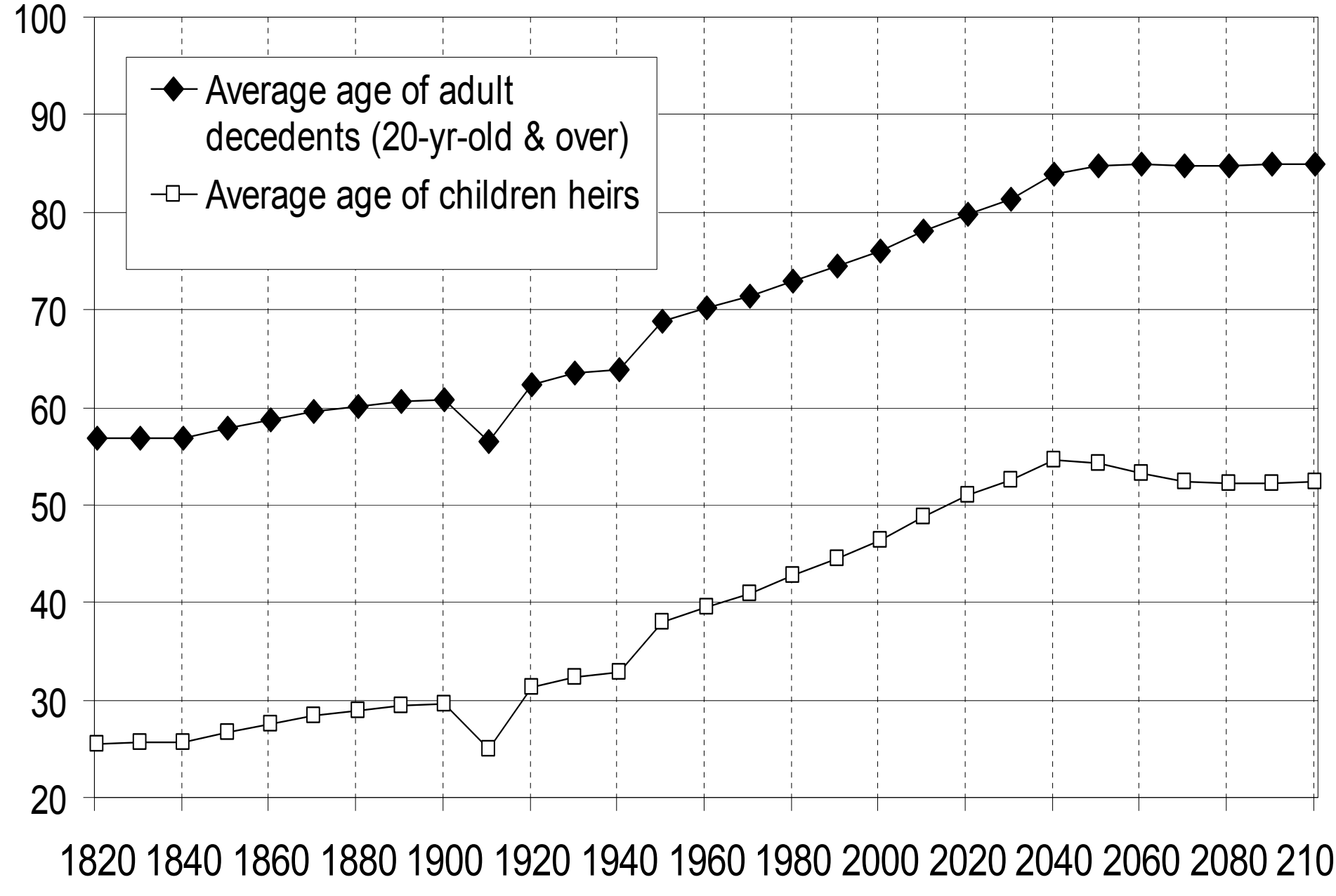


Figure A1: Annual inheritance flow as a fraction of national income, France 1900-2008 (annual series)

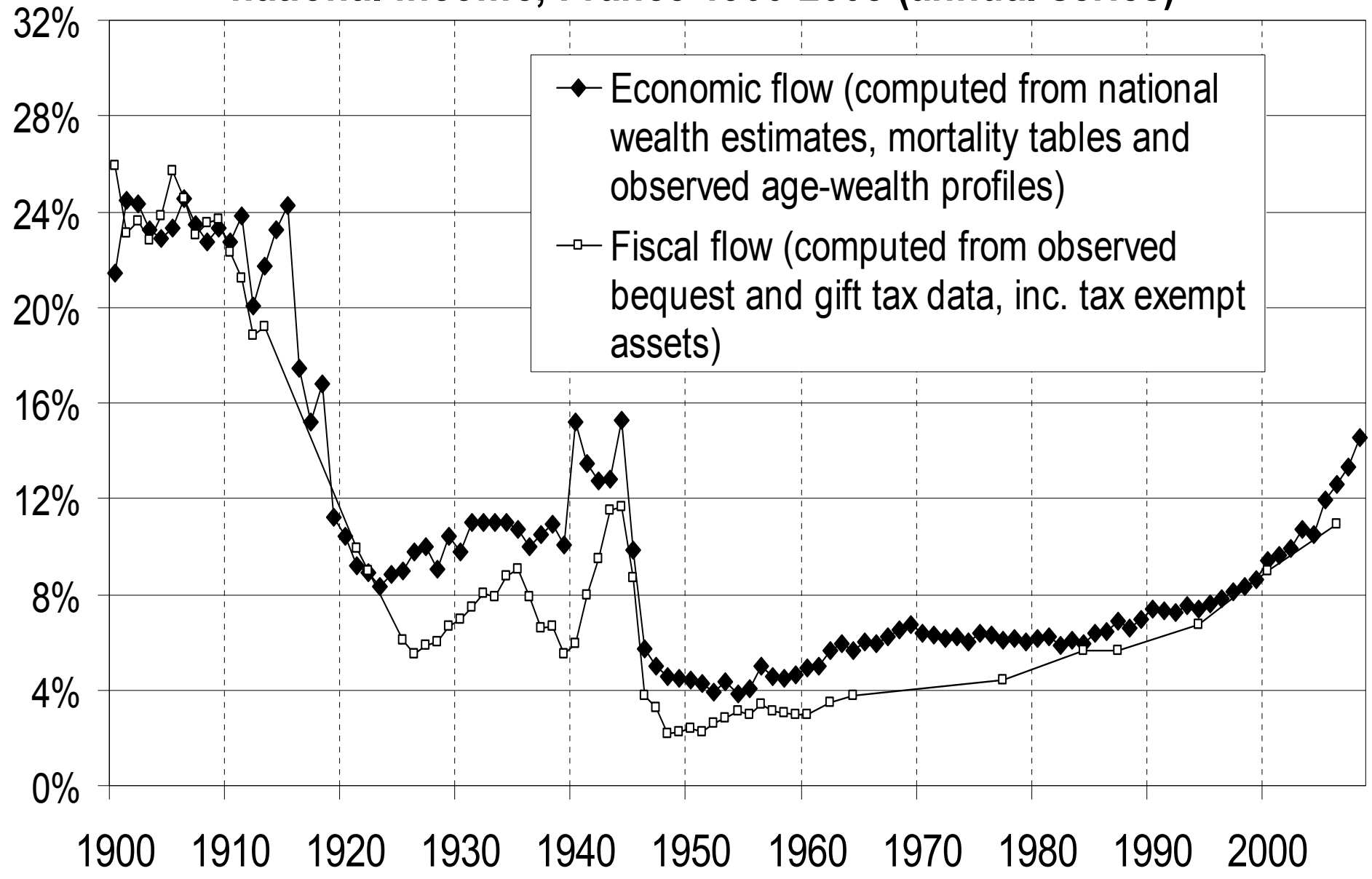


Figure A2: Wealth-income ratio in France 1896-2009 (annual series)

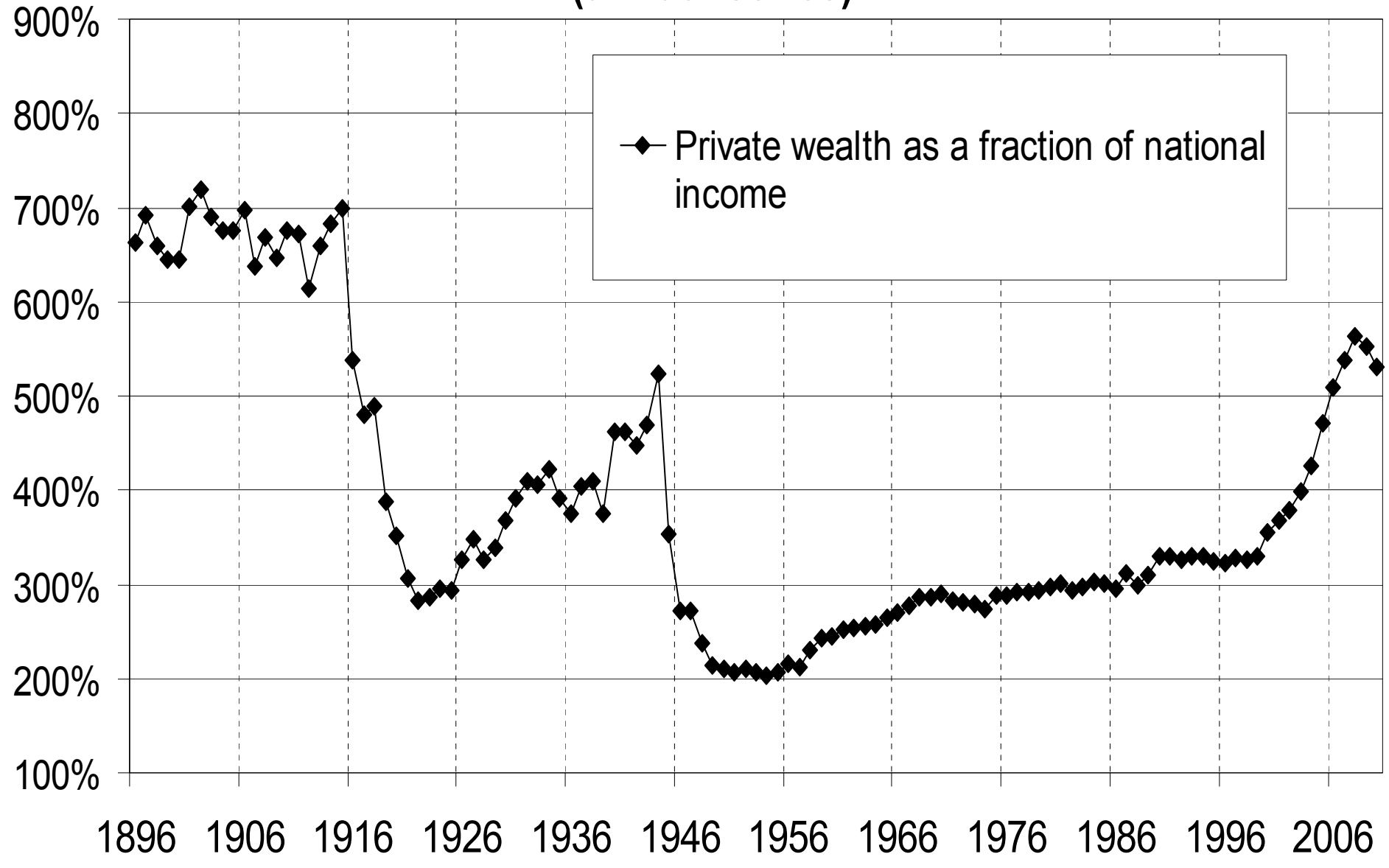


Figure A3: Wealth-disposable income ratio in France 1896-2009 (annual series)