On the Long-run Evolution of Inheritance
France 1820-2050

Thomas Piketty
Paris School of Economics
September 2010
• 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

- Economic flow (computed from national wealth estimates, mortality tables and observed age-wealth profiles)
- Fiscal flow (computed from observed bequest and gift tax data, inc. tax exempt assets)
Figure 2: Annual inheritance flow as a fraction of disposable income, France 1820-2008

- Economic flow (computed from national wealth estimates, mortality tables and observed age-wealth profiles)
- Fiscal flow (computed from observed bequest and gift tax data, inc. tax exempt assets)
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 \( \beta = 600\% \), \( H = 30 \) → \( b_y = 20\% \)

• This can be generalized to more general saving models: if \( g \) small & \( r > g \), then \( b_y \) close to \( \beta/H \)
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 heterogeneity, inequality & optimal taxation
Data sources


• **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
- \( \mu_t \) = 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

- Economic flow (computed from national wealth estimates, mortality tables and observed age-wealth profiles)
- Fiscal flow (computed from observed bequest and gift tax data, inc. tax exempt assets)
Figure 4: Wealth/income ratio in France 1820-2008

- Private wealth as a fraction of national income
• 1900s: $Y = 35$ billions francs or, $W = 250$ billions, $B = 8.5$ billions
  $\rightarrow W/Y = 700\%, \ B/Y = 25\%$

• 2008: $Y = 1\,700$ billions € (i.e. $35\,000$€ per adult), $W = 9\,500$ billions € ($200\,000$€ per adult), $B = 240$ billions €
  $\rightarrow W/Y = 560\%, \ B/Y = 15\%$

• Between 1900s and 1950s, $W/Y$ divided by 3, but $B/Y$ divided by 6 $\rightarrow$ 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

- Excluding inter-vivos gifts
- Including inter-vivos gifts into decedents' wealth
<table>
<thead>
<tr>
<th>Year</th>
<th>20-29</th>
<th>30-39</th>
<th>40-49</th>
<th>50-59</th>
<th>60-69</th>
<th>70-79</th>
<th>80+</th>
</tr>
</thead>
<tbody>
<tr>
<td>1827</td>
<td>50%</td>
<td>63%</td>
<td>73%</td>
<td>100%</td>
<td>113%</td>
<td>114%</td>
<td>122%</td>
</tr>
<tr>
<td>1857</td>
<td>57%</td>
<td>58%</td>
<td>86%</td>
<td>100%</td>
<td>141%</td>
<td>125%</td>
<td>154%</td>
</tr>
<tr>
<td>1887</td>
<td>45%</td>
<td>33%</td>
<td>63%</td>
<td>100%</td>
<td>152%</td>
<td>213%</td>
<td>225%</td>
</tr>
<tr>
<td>1902</td>
<td>26%</td>
<td>57%</td>
<td>78%</td>
<td>100%</td>
<td>172%</td>
<td>176%</td>
<td>233%</td>
</tr>
<tr>
<td>1912</td>
<td>23%</td>
<td>54%</td>
<td>74%</td>
<td>100%</td>
<td>158%</td>
<td>176%</td>
<td>237%</td>
</tr>
<tr>
<td>1931</td>
<td>22%</td>
<td>59%</td>
<td>77%</td>
<td>100%</td>
<td>123%</td>
<td>137%</td>
<td>143%</td>
</tr>
<tr>
<td>1947</td>
<td>23%</td>
<td>52%</td>
<td>77%</td>
<td>100%</td>
<td>99%</td>
<td>76%</td>
<td>62%</td>
</tr>
<tr>
<td>1960</td>
<td>28%</td>
<td>52%</td>
<td>74%</td>
<td>100%</td>
<td>110%</td>
<td>101%</td>
<td>87%</td>
</tr>
<tr>
<td>1984</td>
<td>19%</td>
<td>55%</td>
<td>83%</td>
<td>100%</td>
<td>118%</td>
<td>113%</td>
<td>105%</td>
</tr>
<tr>
<td>2000</td>
<td>19%</td>
<td>46%</td>
<td>66%</td>
<td>100%</td>
<td>122%</td>
<td>121%</td>
<td>118%</td>
</tr>
<tr>
<td>2006</td>
<td>25%</td>
<td>42%</td>
<td>74%</td>
<td>100%</td>
<td>111%</td>
<td>106%</td>
<td>134%</td>
</tr>
</tbody>
</table>
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 $D$
- $1900: A=20, H=30, D=60 \Rightarrow I=D-H=30$
- $2050: A=20, H=30, D=80 \Rightarrow I=D-H=50$
- Mortality rate among adults:
  \[ m_t = \frac{1}{(D-A)} \]
  (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 $\beta_t = 600\%$, $\alpha_t = 30\%$, then $r_t = 5\%$
Theory 3: Savings

- Aggregate savings rate = stable at about 10% of $Y_t$ since 1820
  $\beta^* = s/g$  \( (g=1\% \text{ and } s=6\% \rightarrow \beta^* = 600\%) \)
- Exogenous saving: $S_t = sY_t = s_L Y_{Lt} + s_K rW_t$
- 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**: \( U = \int e^{-\theta t} C_t^{1-\sigma}/(1-\sigma) \)

→ Ramsey steady-state:
\[
    r^* = \theta + \sigma g \ (> g)
\]

• In effect: \( s_L^* = 0\% \), \( 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 $W_t(a) = W_t^{\text{old}}$ (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 ($r = \theta + \sigma g, s_L = 0, s_K = g/r$)

(average wealth of age group)/(average wealth of adults)
Figure 10: Steady-state cross-sectional age-wealth profile in the dynastic model with demographic noise

\[ \frac{\text{average wealth of age group}}{\text{average wealth of adults}} \]
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 independent of life expectancy:
\[ \mu = (D-A)/H, \ m = 1/(D-A), \ \text{so} \]
\[ B/Y = \mu \ m \ W/Y = \beta/H \]
E.g. if \( \beta = 600\% \), \( H = 30 \), then \( B/Y = 20\% \)
1900: \( D = 60, \ I = 30, \ m = 2.5\%, \ \text{but} \ \mu = 133\% \)
2050: \( D = 80, \ I = 50, \ m = 1.6\%, \ \text{but} \ \mu = 200\% \)

Proposition 2: More generally:
\[ \mu = \left[ 1 - e^{-(g-s_Kr)(D-A)} \right] / \left[ 1 - e^{-(g-s_Kr)(D-I)} \right] \]
→ \( \mu'(s_K)>0, \ \mu'(r)>0, \ \mu'(g)<0 \)
(→ for g small, \( \mu \) 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 $\mu_t$ & $B_t/Y_t$
Figure 9: Observed vs simulated inheritance flow B/Y, France 1820-2100

- Observed series
- Simulated series (2010-2100: g=1.7%, (1-t)r=3.0%)
- Simulated series (2010-2100: g=1.0%, (1-t)r=5.0%)
Simulations 1: 19th century

- France 1820-1910 = quasi-steady-state
- \( \beta = \frac{W}{Y} = 629\%, \ g=1.0\%, \ s=10.1\%, \ \alpha=38\% \rightarrow r = 6.0\% >> g=1.0\% \)
- 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 \( \frac{W}{Y} \)
  \( (\ g_w=s/\beta=1.3\% \rightarrow \frac{W}{Y} \) 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

- Private savings (personal savings + net corporate retained earnings) as a fraction of national income

1820 1840 1860 1880 1900 1920 1940 1960 1980 2000
Figure 13: Labor & capital shares in (factor-price) national income, France 1820-2008

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

- Real rate of return on private wealth $r = \alpha / \beta$
- Real growth rate of national income $g$

\[ Figure 14: \text{Rate of return vs growth rate France 1820-1913} \]
Figure 15: Capital share vs savings rate France 1820-1913

- Capital share $\alpha$
- Savings rate $s$
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: $g=1.7\%$, $s=9.4\%$, $\alpha=26\%$, 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\textsuperscript{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\textsuperscript{c} rentier society than to 20\textsuperscript{c} meritocratic society. E.g. with labor income alone, hard to buy an appartment in Paris.
Figure 11: The share of inheritance in lifetime resources received by cohorts born in 1820-2020

- average inheritance as a fraction of average lifetime labor income resources (all inheritance and labor resources capitalized at age 50)
- ▲ low-growth, high-return scenario
Table 3: Intra-cohort distributions of labor income and inheritance, France, 1910 vs 2010

<table>
<thead>
<tr>
<th>Shares in aggregate labor income or inherited wealth</th>
<th>Labor income 1910-2010</th>
<th>Inherited wealth 1910</th>
<th>Inherited wealth 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top 10% &quot;Upper Class&quot;</td>
<td>30%</td>
<td>90%</td>
<td>60%</td>
</tr>
<tr>
<td>incl. Top 1% &quot;Very Rich&quot;</td>
<td>6%</td>
<td>50%</td>
<td>25%</td>
</tr>
<tr>
<td>incl. Other 9% &quot;Rich&quot;</td>
<td>24%</td>
<td>40%</td>
<td>35%</td>
</tr>
<tr>
<td>Middle 40% &quot;Middle Class&quot;</td>
<td>40%</td>
<td>5%</td>
<td>35%</td>
</tr>
<tr>
<td>Bottom 50% &quot;Poor&quot;</td>
<td>30%</td>
<td>5%</td>
<td>5%</td>
</tr>
</tbody>
</table>
Figure 12: Top 50% successors vs top 50% labor income earners (cohorts born in 1820-2020)

- ■ top 50% inheritance resources as a fraction of bottom 50% labor resources
- □ top 50% labor resources as a fraction of bottom 50% labor resources
- △ low growth, high return scenario
Figure 13: Top 10% successors vs top 10% labor income earners (cohorts born in 1820-2020)

- ■ top 10% inheritance reasources as a fraction of bottom 50% labor resources
- □ top 10% labor resources as a fraction of bottom 50% labor resources
- ▲ low growth, high return scenario
Figure 14: Top 1% successors vs top 1% labor income earners (cohorts born in 1820-2020)

- ■ top 1% inheritance resources as a fraction of bottom 50% labor resources
- □ top 1% labor resources as a fraction of bottom 50% labor resources
- ▲ low-growth, high-return scenario
Figure 15: Cohort fraction inheriting more than bottom 50% lifetime labor resources (cohorts born in 1820-2020)

- ■ benchmark scenario
- △ low-growth, high-return scenario
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

- non-capitalized inherited wealth as a fraction of aggregate private wealth
- low-growth, high-return scenario
Figure 19: The share of capitalized inheritance in aggregate wealth accumulation, France 1900-2100

- Capitalized inherited wealth as a fraction of aggregate private wealth
- Low-growth, high-return scenario
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>
<thead>
<tr>
<th></th>
<th>Real growth rate of national income</th>
<th>Real growth rate of private wealth</th>
<th>Savings-induced wealth growth rate</th>
<th>Capital-gains-induced wealth growth rate</th>
<th>Memo: Consumer price inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1820-2009</td>
<td>1.8%</td>
<td>1.8%</td>
<td>2.1%</td>
<td>-0.3%</td>
<td>4.4%</td>
</tr>
<tr>
<td>1820-1913</td>
<td>1.0%</td>
<td>1.3%</td>
<td>1.4%</td>
<td>-0.1%</td>
<td>0.5%</td>
</tr>
<tr>
<td>1913-2009</td>
<td>2.6%</td>
<td>2.4%</td>
<td>2.9%</td>
<td>-0.4%</td>
<td>8.3%</td>
</tr>
<tr>
<td>1913-1949</td>
<td>1.3%</td>
<td>-1.7%</td>
<td>0.9%</td>
<td>-2.6%</td>
<td>13.9%</td>
</tr>
<tr>
<td>1949-1979</td>
<td>5.2%</td>
<td>6.2%</td>
<td>5.4%</td>
<td>0.8%</td>
<td>6.4%</td>
</tr>
<tr>
<td>1979-2009</td>
<td>1.7%</td>
<td>3.8%</td>
<td>2.8%</td>
<td>1.0%</td>
<td>3.6%</td>
</tr>
<tr>
<td></td>
<td>Growth rate of national income</td>
<td>Rate of return on private wealth ( r = \alpha/\beta )</td>
<td>Capital tax rate ( \tau_K )</td>
<td>After-tax rate of return ( r_d = (1-\tau_K)\alpha/\beta )</td>
<td>Real rate of capital gains ( q )</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------------------------</td>
<td>-----------------------------------------------</td>
<td>-----------------</td>
<td>-------------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>1820-2009</td>
<td>1.8%</td>
<td>6.8%</td>
<td>19%</td>
<td>5.4%</td>
<td>-0.1%</td>
</tr>
<tr>
<td>1820-1913</td>
<td>1.0%</td>
<td>5.9%</td>
<td>8%</td>
<td>5.4%</td>
<td>-0.1%</td>
</tr>
<tr>
<td>1913-2009</td>
<td>2.6%</td>
<td>7.8%</td>
<td>31%</td>
<td>5.4%</td>
<td>-0.1%</td>
</tr>
<tr>
<td>1913-1949</td>
<td>1.3%</td>
<td>7.9%</td>
<td>21%</td>
<td>6.4%</td>
<td>-2.6%</td>
</tr>
<tr>
<td>1949-1979</td>
<td>5.2%</td>
<td>9.0%</td>
<td>34%</td>
<td>6.0%</td>
<td>0.8%</td>
</tr>
<tr>
<td>1979-2009</td>
<td>1.7%</td>
<td>6.9%</td>
<td>39%</td>
<td>4.3%</td>
<td>1.0%</td>
</tr>
</tbody>
</table>
Figure 5: Wealth/disposable income ratio France 1820-2008

- Private wealth as a fraction of disposable income
Figure 6: Mortality rate in France, 1820-2100

- Adult mortality rate (20-yr-old & over)
Figure 7: Age of decedents & heirs in France, 1820-2100

- Average age of adult decedents (20-yr-old & over)
- Average age of children heirs
Figure A1: Annual inheritance flow as a fraction of national income, France 1900-2008 (annual series)

- Economic flow (computed from national wealth estimates, mortality tables and observed age-wealth profiles)
- Fiscal flow (computed from observed bequest and gift tax data, inc. tax exempt assets)
Figure A2: Wealth-income ratio in France 1896-2009
(annual series)

- Private wealth as a fraction of national income
Figure A3: Wealth-disposable income ratio in France 1896-2009 (annual series)

Private wealth as a fraction of personal disposable income