Behavioral responses to inheritance tax: Evidence from notches in France

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Motivation

Wealth is strongly concentrated
Wealth can be transmitted from generation to generation

Estate tax : Trade-off between equity and efficiency

Equity :
• Limit the perpetuation of inequality
• Limit corporate power on the political process

Efficiency cost due to behavioral responses :
• Real responses harmful to the macroeconomic success of an economy (incentives for entrepreneurship, savings, labor supply)
• Shifting responses reduce efficiency of taxation to curb wealth inequality
Why do behavioral responses matter?

• Behavioral responses . . .
  • Increase the efficiency cost of taxation
  • Limit the redistributive ability of governments

• Nature of behavioral responses yields different policy implications: Saez et al. (2012)
  • Real responses limit optimal top tax rate
  • Shifting responses are a symptom of a poorly design tax system

• Very scarce empirical research on the effect of inheritance taxation on wealth accumulation
  • Lack of good micro data
  • Issue about how to identify the causal effect of taxation on wealth accumulation
This paper

• **Research Question**: Estimation and implications of behavioral responses to inheritance tax

• Use the Preferential Tax Scheme for life insurance in France
  • Generate large discontinuities in tax liability depending on:
    • Life insurance policy start date (before and after November 20, 1991)
    • Age at which the premiums was paid (before or after 70 years old)

• Estimate different behavioral responses to estate taxation over time
  • Timing responses using bunching estimation
  • Aggregate of real and shifting responses using diff-in-diff method
The Preferential tax scheme for life insurance

• Introduced in 1965; entirely exempt life insurance from inheritance tax

• Reform of 1992 not retroactive
  • For life insurance policy taken out after 11/20/1991: recall life insurance premiums paid after age 70 in the inheritance tax base

• Reform of 1998
  • All life insurance premiums not recalled in the inheritance tax base are taxed at a flat rate of 20% after an exemption of 152,500 € by inheritor

• Generate large discontinuities in tax liability depending on:
  • Life insurance policy start date (before and after November 20, 1991)
  • Age at which the premiums was paid (before or after 70 years old)
The Preferential tax scheme for life insurance

**Table 1**: Life insurance taxation at death since 1998

<table>
<thead>
<tr>
<th>Life insurance taken out</th>
<th>Insurance premiums paid</th>
</tr>
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<tbody>
<tr>
<td><strong>Before 11/20/1991</strong></td>
<td>Flat tax rate of 20%</td>
</tr>
<tr>
<td><strong>After 11/20/1991</strong></td>
<td>Flat tax rate of 20%</td>
</tr>
<tr>
<td></td>
<td>Recalled into the inheritance tax base</td>
</tr>
</tbody>
</table>

Note: Top inheritance tax rate goes up to 40% for spouses and direct descendants and 60% for collateral heirs.
**Figure 1:** Behavioral responses to the reform of the preferential tax scheme
• Reform of the preferential tax scheme should induce:
  • Re-timing responses at age 70
  • Shifting among asset portfolio
  • Wealth dis-accumulation

• Source of variations and estimation methods:
  • Bunching estimation for timing responses
    • Difference in taxation at age 70
      (for life insurance policies taken out after 11/20/1991)
  • Diff-in-diff estimation for aggregate real and shifting responses
    • Comparison of life insurance premiums paid before or after age 70 for life insurance policy taken out before or after 11/20/1991
Contributions:

1. Estimate different behavioral responses to estate taxation over time
   - Timing responses in short and medium run:
     - Important short-term timing responses reflect moderate inter-temporal shifting in the medium term
     - Aggregate elasticity of real and shifting responses
       - Medium-term elasticity = 0.35
       - Long-term elasticity = 0.24

2. Implications on wealth accumulation and bequest motives:
   - Evidence that individuals fail to plan for the disposition of an estate well in advance
   - Evidence of “Wealth loving” motive

3. Develop an inter-temporal model of transfer taxation to rationalize findings 1 to 2

4. Derive Optimal inheritance tax rate from estimated elasticity
Outline

Macro-series and Data
  Macro-series
  Data

Empirical approach
  Timing responses due to the notch
  Medium and long term responses to inheritance tax

Theoretical framework

Optimal inheritance tax rate

Appendix
### TABLE 2: Life insurance and wealth in France, 1984-2013

<table>
<thead>
<tr>
<th>Year</th>
<th>Private Wealth (in % of national income)</th>
<th>Wealth composition (in % of private wealth)</th>
<th>Life ins. assets (in % of financial assets)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Tangible assets</td>
<td>Liabilities</td>
</tr>
<tr>
<td>1985</td>
<td>304%</td>
<td>74%</td>
<td>-9%</td>
</tr>
<tr>
<td>1995</td>
<td>330%</td>
<td>67%</td>
<td>-14%</td>
</tr>
<tr>
<td>2005</td>
<td>466%</td>
<td>70%</td>
<td>-11%</td>
</tr>
<tr>
<td>2013</td>
<td>597%</td>
<td>73%</td>
<td>-13%</td>
</tr>
</tbody>
</table>

Sources: National Accounts from INSEE (France’s National Institute of Statistics)
### Table 3: Life insurance transmitted at death, 1984-2006

<table>
<thead>
<tr>
<th>Year</th>
<th>Wealth at death</th>
<th>Wealth of the living</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1) Bequest flow</td>
<td>(2) Life insurance</td>
</tr>
<tr>
<td>1984</td>
<td>33,1</td>
<td>3,4</td>
</tr>
<tr>
<td>1987</td>
<td>35,4</td>
<td>4,5</td>
</tr>
<tr>
<td>1994</td>
<td>43,2</td>
<td>7,4</td>
</tr>
<tr>
<td>2000</td>
<td>59,2</td>
<td>12,5</td>
</tr>
<tr>
<td>2006</td>
<td>86,2</td>
<td>20,2</td>
</tr>
</tbody>
</table>

Sources: FFSA (French life insurance association), MTG surveys from DGFIP and National Accounts from INSEE.

All the aggregate flows are in billion 2013 euros.
Data

- French longitudinal data set from Axa (2003-2013)
  - Detailed information about life insurance policy

- Two types of insured
  - Insured taken out a standard life insurance policy (classical insured)
  - Wealthy insured that entrust Axa the management of their wealth (wealthy insured)
Data

• Three motives for life insurance
  1. Cash reserve
  2. Supplemental retirement benefit
  3. Transmission at death
  • Only 3 is affected by the preferential scheme

• Conditions of inclusion in the data set
  • Aged between 60 and 80 years old
  • Having not terminated the life policy during lifetime

• Huge database:
  350 000 individuals × 23 quarterly years = 8 millions of observations
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Appendix
• Reform of the preferential tax scheme should induce:

  • **Re-timing responses at age 70**
  • Shifting among asset portfolio
  • Wealth dis-accumulation

• Source of variations and estimation methods:

  • **Bunching estimation for timing responses**
    • Difference in taxation at age 70
      *for life insurance policies taken out after 11/20/1991*

  • Diff-in-diff estimation for aggregate real and shifting responses
    • Comparison of life insurance premiums paid before or after age 70 for life insurance policy taken out before or after 11/20/1991
## The Preferential tax scheme for life insurance

### Table 4: Life insurance taxation at death since 1998

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<thead>
<tr>
<th>Life insurance taken out</th>
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<tbody>
<tr>
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<td>Before aged 70</td>
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<td><strong>Before 11/20/1991</strong></td>
<td>Flat tax rate of 20%</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>After 11/20/1991</strong></td>
<td>Flat tax rate of 20%</td>
</tr>
</tbody>
</table>

Note: Top inheritance tax rate goes up to 40% for spouses and direct descendants and 60% for collateral heirs.
Timing responses due to the notch

- Timing responses using bunching estimation
  - Increase in taxation at age 70
  - Formation of a notch around age 70
  - Identification assumption:
    Distribution of life insurance premiums would have been smooth if there were no jump in the tax rate at age 70
    ⇒ No other factors can explain bunching at age 70
**FIGURE 2:** Life insurance premiums around the notch, (France 2003-2013)

Sample: Life insurance with portfolio manager (taken out after 11/20/1991)
Estimating the empirical distribution

- Fit a flexible polynomial to the empirical distribution, excluding data in a range around the notch

\[
\log y_a = \sum_{j=0}^{J} \beta_j \cdot (age_a)^j + \sum_{k=a_l}^{a_u} \gamma_k \cdot 1_{age_a=k} + \varepsilon_a
\]

where \( \log y_a \) is the log of life insurance premiums paid by individuals of age \( a \), \( J \) is the order of polynomial, \( age \) is the age normalized to be equal to 0 at the cutoff, \([a_l, a_u]\) is the excluded range around the notch point, \( 1 \) is the indicator function and \( \varepsilon_a \) is the error term.
Estimating the counterfactual distribution, Bunching and Holes

• Estimate of counterfactual distribution :

\[ \log y^c_a = \sum_{j=0}^{J} \hat{\beta}_j \cdot (age_a)^j \]  

(1)

• Estimates of excess bunching and hole (missing mass) :

\[ \hat{b} = \frac{\sum_{a=a_l}^{a_u} \log y_a - \log y^c_a}{\log y^c_{\bar{a}}} \]

\[ \hat{m} = \frac{\sum_{a=\bar{a}}^{a_u} \log y^c_a - \log y_a}{\log y^c_{\bar{a}}} \]
**Figure 3:** Life insurance premiums around the notch, (France 2003-2013)

- **Actual Distribution**
- **Counterfactual Distribution**

- $b = 0.82 (0.069)$
- $m = 1.23 (0.338)$
- $m - b = 0.42 (0.365)$
Timing responses due to the notch

**Figure 4**: Life insurance premiums around the notch, (France 2003-2013)

Sample: Standard life insurance policies (taken out after 11/20/1991)
**FIGURE 5:** Robustness Check: Life insurance taken out before 11/20/1991

Source: Life insurance policy from Axa, France 2003-2013
Estimating timing responses

\[
\log y_a = \sum_{j=0}^{J} \beta_j \cdot (\text{age}_a)^j + \gamma_1 \cdot 1_{a_l \leq \text{age}_a \leq \bar{a}} + \gamma_2 \cdot 1_{\bar{a} < \text{age}_a \leq a_u} + \varepsilon_a \quad (2)
\]

- \(1_{a_l \leq \text{age}_a \leq \bar{a}}\) and \(1_{\bar{a} < \text{age}_a \leq a_u}\) are respectively age dummies for being in the excluding range below or above the notch.
- \(\gamma_1\) : short-term timing responses
- \(\gamma_2\) medium-term timing responses
**Table 5:** Absolute value of timing responses and reduced-form elasticity estimates

<table>
<thead>
<tr>
<th></th>
<th>Timing responses</th>
<th>Reduced-form elasticity</th>
<th>Horizon of timing responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>short term</td>
<td>medium term</td>
<td>short term</td>
</tr>
<tr>
<td>Standard insured</td>
<td>0.15*** (0.008)</td>
<td>0.03*** (0.004)</td>
<td>0.51*** (0.028)</td>
</tr>
<tr>
<td>Wealthy insured</td>
<td>0.31*** (0.023)</td>
<td>0.03*** (0.008)</td>
<td>1.07*** (0.081)</td>
</tr>
</tbody>
</table>

* p < 0.1, ** p < 0.05, *** p < 0.01. Bootstrap standard errors in parentheses. The reduced-form elasticities are computed by dividing timing responses by \( \log(1 - 0.4) - \log(1 - 0.2) \) and the standard errors associated are derived by the delta method.
### TABLE 6: Absolute value of timing responses and reduced-form elasticity estimates for insured with life insurance between 100,000€ and 700,000€

<table>
<thead>
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<th></th>
<th>Timing responses</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>short term</td>
<td>medium term</td>
<td>short term</td>
</tr>
<tr>
<td>Standard insured</td>
<td>0.36***</td>
<td>0.035***</td>
<td>1.24***</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.012)</td>
<td>(0.10)</td>
</tr>
<tr>
<td>Wealthy insured</td>
<td>0.37***</td>
<td>0.049***</td>
<td>1.29***</td>
</tr>
<tr>
<td></td>
<td>(0.046)</td>
<td>(0.015)</td>
<td>(0.16)</td>
</tr>
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* p < 0.1, ** p < 0.05, *** p < 0.01. Bootstrap standard errors in parentheses. The reduced-form elasticities are computed by dividing timing responses by $\log(1 - 0.4) - \log(1 - 0.2)$ and the standard errors associated are derived by the delta method.
Results on timing response estimation:

- Strong short-term inter-temporal shifting elasticity
  - varying with level of wealth

- Moderate medium-term inter-temporal shifting elasticity around 0.1

- Difference among short-term elasticities is explained by the difference in time horizon
Life insurance taxation can also generate:
- Shifting among asset portfolio
- Wealth dis-accumulation

**Empirical Strategy: Difference-in-differences**
- Life insurance tax change implemented in 1992 is not retroactive
- No tax change at age 70 for life insurance policy taken out before 11/20/1991 (control group)
- Tax change at age 70 for life insurance policy taken out after 11/20/1991 (treated group)

**Comparability issue**
- Life insurance premiums observed only during 2003-2013
- Sample restricted to life insurance policies taken out ± 2 years around 11/20/1991
The Preferential tax scheme for life insurance

**TABLE 7:** Life insurance taxation at death since 1998

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<th>Insurance premiums paid</th>
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<td>Before aged 70</td>
</tr>
<tr>
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<td>Flat tax rate of 20%</td>
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<tr>
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<td>Flat tax rate of 20%</td>
</tr>
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Note: Top inheritance tax rate goes up to 40% for spouses and direct descendants and 60% for collateral heirs.
Potential selection problem:

- Sample includes only life insurance policies:
  a) not terminated before 2003
  b) not terminated during lifetime between 2003 and 2013

- Reform should not play on a) and b) because of the existence of a supplemental tax exemption for life insurance

- Individuals could anticipate the reform by subscribing life insurance policy just before its implementation
  - the 1992 law was applied to life insurance policies taken out after 20/11/1991, i.e. 40 days before the law was voted

Selection bias
**Figure 6:** Life insurance premiums by age of the owners, France 2003-2013

![Life insurance premiums by age of the owners, France 2003-2013](image)
**FIGURE 7:** Life insurance premiums by age of the owners, France 2003-2013
Diff-in-Diff estimation

\begin{align}
\log y_{iat} &= \delta \cdot \text{Diff}_{ia} + \alpha_i + \gamma_a + \nu_t + \varepsilon_{iat} \\
\log y_{iat} &= \delta_1 \cdot \text{Diff}_{1ia} + \delta_2 \cdot \text{Diff}_{2ia} + \alpha_i + \gamma_a + \nu_t + \varepsilon_{iat}
\end{align}

• $\log y_{iat}$ = log of life insurance premiums paid by individual i of age a at time t
• $\alpha_i$, $\gamma_a$ and $\nu_t$ are respectively individual, age and time fixed effects
• $\text{Diff}_{ia}$ : being in the treatment group and aged more than 70 years old
• $\text{Diff}_{1ia}$ : being in the treatment group and aged between 70 and 75 years old
• $\text{Diff}_{2ia}$ : being in the treatment group and aged between 75 and 80 years old
**TABLE 8:** Panel estimates of the effect of inheritance tax change on life insurance premiums in France, 2003-2013

<table>
<thead>
<tr>
<th>Treatment: Aged 70 or more</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average effect</td>
<td>Reduced-form estimate</td>
<td>Elasticity $\frac{d \log y}{d \log (1 - \tau)}$ estimate</td>
<td>Number of observations</td>
</tr>
<tr>
<td></td>
<td>-0.073***</td>
<td>0.254***</td>
<td>673128</td>
</tr>
<tr>
<td></td>
<td>(0.020)</td>
<td>(0.069)</td>
<td>25858</td>
</tr>
<tr>
<td>Between 70 and 75</td>
<td>-0.068***</td>
<td>0.236***</td>
<td>673128</td>
</tr>
<tr>
<td></td>
<td>(0.020)</td>
<td>(0.069)</td>
<td>25858</td>
</tr>
<tr>
<td>After 75</td>
<td>-0.100***</td>
<td>0.346***</td>
<td>673128</td>
</tr>
<tr>
<td></td>
<td>(0.024)</td>
<td>(0.084)</td>
<td>25858</td>
</tr>
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Robustness checks

- Varying the window width for sample selection:
  - Robustness 1

- Falsification experiments:
  - Both groups not affected by the tax change:
    - Robustness 2
  - Both groups affected by the tax change:
    - Robustness 3
Findings

• Aggregate elasticity of real and shifting responses
  • Medium-term elasticity = 0.35
  • Long-term elasticity = 0.24

• Implications on wealth accumulation and bequest motives:
  • Increasing effect of inheritance taxation with respect to age:
    Evidence that individuals fail to plan for the disposition of an estate well in advance
  • Timing responses less important than aggregate shifting and real responses
    Evidence of “Wealth loving” motive
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Appendix
Novelty of the model

- Introduction of two assets in an inter-temporal framework
- Life insurance does not yield utility during lifetime but tangible assets do
  - Housing or Business ownership may yield power or social status.
  - Utility of wealth per se (secondary residence next to the sea, family house)
- Trade-off between life insurance and tangible assets
  - Life insurance benefits from preferential inheritance taxation
  - Tangible assets yield utility during lifetime and at death
Set up

• Three periods
  • Period 1: individuals aged between 20 and 70 years old
  • Period 2: individuals aged between 70 and 80 years old
  • Period 3: individuals die at age 80 and leave a bequest

• For each period during lifetime, individuals choose between
  • Consuming $C_t$
  • Accumulating life insurance $X_t$ for bequest purpose
  • Saving to increase their tangible asset holdings
During lifetime, individuals derive utility from consumption and tangible asset holdings but not from life insurance accumulation

$$U(C_t, W_t) = u(C_t) + v(W_t) = \frac{c_t^{1-s_c}}{1-s_c} + \frac{W_t^{1-s_w}}{1-s_w}$$

At death, individuals derive utility from bequeathing total life insurance accumulation and end-of-life wealth

$$\phi(B) = \phi(W_2, X_1, X_2) = \frac{(R_x^2(1-\tau_1)X_1 + R_x(1-\tau_2)X_2 + R_w(1-\tau_w)W_2)^{1-s_b}}{1-s_b}$$
Decision Problem

\[
V(W_t, C_t, X_t) = \max(\sum_{t=1}^{T} \beta^{t-1} \cdot U(C_t, W_t) + \beta^2 \phi(B))
\]
subject to
\[
\begin{align*}
W_t &= R_w \cdot W_{t-1} + Y_t - C_t - X_t \\
B &= R_x^2(1 - \tau_1)X_1 + R_x(1 - \tau_2)X_2 + R_w \cdot (1 - \tau_w) \cdot W_2 \\
R_x &> R_w, \; \tau_1 < \tau_2 < \tau_w
\end{align*}
\]
Impact of the reform of the preferential tax scheme?

When $\tau_2$ increase then $X_2$ decreases and is substituted by

- $C_1$ and $C_2$ (real responses)
- $W_1$ and $W_2$ (Shifting among asset portfolio responses)
- $X_1$ (timing responses)
• Retiming responses

\[
\frac{\partial v}{\partial W_1} = \beta^2[R_x^2(1 - \tau_1) - R_x R_w(1 - \tau_2)] \frac{\partial \phi}{\partial B}
\]

• Shifting among asset portfolio

\[
\frac{\partial v}{\partial W_2} = \beta (R_x(1 - \tau_2) - R_w(1 - \tau_w)) \frac{\partial \phi}{\partial B}
\]

• Increase of the consumption

\[
\frac{\partial u}{\partial C_2} = \beta R_x(1 - \tau_2) \frac{\partial \phi}{\partial B}
\]
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Policy implications

• Optimal inheritance tax design
  • Tax-neutrality across assets
  • Broadening the tax base

• Life insurance reform
  • Improve partially the inheritance tax design
  • But introduce new avoidance opportunities through timing responses

• Optimal inheritance tax in absence of the preferential tax scheme?
• The government want to maximise social welfare of a particular group

• Sufficient statistic formula for optimal inheritance tax rate (Piketty and Saez (2013))

\[
\tau_B = \frac{1 - \left[1 - \frac{e_L \tau_L}{1 - \tau_L}\right] \left[\bar{b}_{\text{received}} \bar{y}_L (1 + \hat{e}_B) + \frac{\nu}{R/G} \bar{b}_{\text{left}} \bar{y}_L \right]}{1 + \hat{e}_B - \left[1 - \frac{e_L \tau_L}{1 - \tau_L} \bar{b}_{\text{received}} \bar{y}_L (1 + \hat{e}_B) \right]}
\]  

(8)

• \(\bar{b}_{\text{left}}, \bar{b}_{\text{received}}\) and \(\bar{y}_L\) are respectively the ratios of bequest left, bequest received and earnings of the sub-group targeted by the government to population averages.

• \(e_B\) and \(e_L\) are respectively the elasticities of aggregate taxable bequests and taxable income.

• \(R/G = e^{(r-g)H}\) with \(r\) the return on capital and \(g\) the growth rate.

• \(\nu\) is the parameter for pure bequest motive.
### Table VII – Optimal Inheritance Tax Rate Calibrations

<table>
<thead>
<tr>
<th></th>
<th>Optimal Tax Rate (by Percentile of Bequest Received)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>France</td>
</tr>
<tr>
<td>Fraction of the Bequest Elasticity due to Real Responses</td>
<td>100%</td>
</tr>
<tr>
<td>Real Elasticity</td>
<td>0,25</td>
</tr>
</tbody>
</table>

1. Optimal Linear Tax Rate by Percentile of Bequest Received

- **Meritocratic Rawlsian Case**: P0-50
  - France: 61% 64% 67% 71% 76%
  - U.S.: 56% 59% 63% 66% 70%

- **Median Voter Case**: P40-60
  - France: 59% 63% 66% 70% 74%
  - U.S.: 56% 59% 63% 66% 71%

- **Pro-Capitalist Case**: P90-95
  - France: -340% -328% -315% -300% -284%
  - U.S.: -93% -82% -70% -57% -43%

2. Optimal Top Tax Rate Above Positive Exemption Amount for Zero Receivers (bottom 50%)

- **Above 500,000**: 61% 66% 72% 79% 88%
- **Above 1,000,000**: 61% 67% 74% 82% 92%
• Optimal tax rate in Meritocratic Rawlsian case and Median Voter case:
  • in France: 60%-70%
  • in the USA: 55%-65%
  • When elasticity is due entirely to real responses: $\tau_B = 60$

• Bottom 50% receivers and Median voter
  • leave substantially less wealth than average to their heirs
  • have earnings close to average

• Optimal policy is to increase inheritance tax rate and reduce labor tax rate

• In the Pro-capitalistic case, inheritance should be subsidized
Conclusion

• First comprehensive study of behavioral responses to inheritance tax

• We have benefited from:
  • First-time access to longitudinal data set of life insurance policies
  • Compelling variation created by the French preferential tax scheme for life insurance transmitted at death

• Estimation of two kinds of behavioral responses
  • Timing responses using bunching estimation:
    Strong short-term timing responses reflect moderate inter-temporal shifting in the medium term
  • Aggregate real and shifting among asset portfolio responses:
    Medium-term elasticity = 0.35 Long-term elasticity = 0.24
Conclusion

- Motivations behind bequest motives:
  - Increasing effect of inheritance taxation with respect to age: Evidence that individuals fail to plan for the disposition of an estate well in advance
  - Timing responses less important than aggregate shifting and real responses
    Evidence of “Wealth loving” motive

- Policy implications:
  - Optimal tax rate might be as large as 60%–70% in the median voter or meritocratic Rawlsian case
  - Inheritance should be subsidized in the Pro-capitalistic case
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BACK UP SLIDES
### The Preferential tax scheme for life insurance

**Table 9:** Life insurance taxation at death since 1998

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<thead>
<tr>
<th>Life insurance taken out</th>
<th>Insurance premiums paid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before 11/20/1991</td>
<td>Flat tax rate of 20%</td>
</tr>
<tr>
<td>After 11/20/1991</td>
<td>Recalled into the inheritance tax base</td>
</tr>
</tbody>
</table>

- Before aged 70
- After aged 70

Note: Top inheritance tax rate goes up to 40% for spouses and direct descendants and 60% for collateral heirs.
Panel A: Life insurance policies taken out after 20/11/1991

<table>
<thead>
<tr>
<th></th>
<th>All life insurance owners</th>
<th>Wealthy insured</th>
<th>Standard insured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>68.5 (5.88)</td>
<td>69.5 (6.04)</td>
<td>68.4 (5.85)</td>
</tr>
<tr>
<td>Life insurance policy (in ’000s of 2013 euros)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean</td>
<td>60.2</td>
<td>192.7</td>
<td>41.7</td>
</tr>
<tr>
<td>p50</td>
<td>14.5</td>
<td>54.7</td>
<td>11.5</td>
</tr>
<tr>
<td>p99</td>
<td>611.2</td>
<td>2,002.5</td>
<td>419.1</td>
</tr>
<tr>
<td>P99-100</td>
<td>1,757.7</td>
<td>6,473.7</td>
<td>829.8</td>
</tr>
<tr>
<td>Life insurance premiums (in ’000s of 2013 euros)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean</td>
<td>1.2</td>
<td>3.0</td>
<td>0.9</td>
</tr>
<tr>
<td>p99</td>
<td>20.1</td>
<td>41.8</td>
<td>17.8</td>
</tr>
<tr>
<td>Number of observations</td>
<td>7,826,454</td>
<td>958,265</td>
<td>6,868,189</td>
</tr>
<tr>
<td>Number of individuals</td>
<td>347,253</td>
<td>41,074</td>
<td>306,179</td>
</tr>
<tr>
<td>Average number of spells</td>
<td>22.5</td>
<td>23.3</td>
<td>22.4</td>
</tr>
<tr>
<td>Duration of the contract (in years)</td>
<td>12.4</td>
<td>13.5</td>
<td>12.3</td>
</tr>
</tbody>
</table>
Panel B. Life insurance policies taken out between 20/11/1989 and 20/11/1993

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>policies taken out before 20/11/1991</th>
<th>policies taken out after 20/11/1991</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>70.2 (6.25)</td>
<td>70.1 (6.24)</td>
<td>70.2 (6.27)</td>
</tr>
<tr>
<td>Life insurance policy (in ’000s of 2013 euros)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean</td>
<td>89.5</td>
<td>73.5</td>
<td>106.4</td>
</tr>
<tr>
<td>p50</td>
<td>26.3</td>
<td>23.5</td>
<td>29.5</td>
</tr>
<tr>
<td>p99</td>
<td>822.3</td>
<td>719.1</td>
<td>967.7</td>
</tr>
<tr>
<td>P99-100</td>
<td>2,970.7</td>
<td>1,987.6</td>
<td>3,978.3</td>
</tr>
<tr>
<td>Life insurance premiums (in ’000s of 2013 euros)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>p99</td>
<td>2.9</td>
<td>2.5</td>
<td>3.2</td>
</tr>
<tr>
<td>Number of observations</td>
<td>747,307</td>
<td>383,153</td>
<td>364,154</td>
</tr>
<tr>
<td>Number of individuals</td>
<td>31,073</td>
<td>15,514</td>
<td>15,559</td>
</tr>
<tr>
<td>Average number of spells</td>
<td>24.1</td>
<td>24.7</td>
<td>23.4</td>
</tr>
<tr>
<td>Duration of the contract (in years)</td>
<td>21.9</td>
<td>23.0</td>
<td>20.8</td>
</tr>
</tbody>
</table>

Source: Computation of the authors from Axa data set.
Estimating the empirical distribution

• Fit a flexible polynomial to the empirical distribution, excluding data in a range around the notch

\[ \log y_a = \sum_{j=0}^{J} \beta_j \cdot (a)^j + \sum_{k=a_{l}}^{a_{u}} \gamma_k \cdot \mathbb{1}_{a=k} + \varepsilon_a \]

where \( \log y_a \) is the log of life insurance premiums paid by individuals of age \( a \), \( J \) is the order of polynomial, \( a \) is the age normalized to be equal to 0 at the cutoff, \([a_{l}, a_{u}]\) is the excluded range around the notch point, \( \mathbb{1} \) is the indicator function and \( \varepsilon_a \) is the error term
Estimating the counterfactual distribution, Bunching and Holes

- Estimate of counterfactual distribution:

\[
\log y_a^c = \sum_{j=0}^{J} \hat{\beta}_j \cdot (a)^j
\]  

(9)

- Estimates of excess bunching and hole (missing mass):

\[
\hat{b} = \frac{\sum_{a=a_l}^{a_u} \log y_a - \log y_a^c}{\log y_a^c}
\]

\[
\hat{m} = \frac{\sum_{a=\hat{a}}^{a_u} \log y_a^c - \log y_a}{\log y_a^c}
\]
FIGURE 8: Falsification experiment with both groups affected by the tax change

![Graph showing insurance premiums in log scale against age for two groups of insurance contracts taken out between different dates.]

- Dashed line: Insurance contracts taken out between 20/11/1993 and 20/11/1995
**Figure 9:** Falsification experiment with both groups affected by the tax change
**Figure 10:** Falsification experiment with both groups unaffected by the tax change
**Figure 11:** Falsification experiment with both groups unaffected by the tax change
**Figure 12:** Other distributions from life insurance taken out before 11/20/1991
**FIGURE 13:** Number of life insurance policies by year of subscription
**Figure 14:** Number of life insurance policies by date of subscription
### Table 10: Narrowing the window “±1 year”

<table>
<thead>
<tr>
<th>Treatment: Aged 70 or more</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average effect</td>
<td>-0.059**</td>
<td>-0.048</td>
<td>-0.115***</td>
</tr>
<tr>
<td></td>
<td>(0.030)</td>
<td>(0.030)</td>
<td>(0.037)</td>
</tr>
<tr>
<td>Between 70 and 75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elasticity (\frac{d\log y}{d\log (1-\tau)}) estimate</td>
<td>0.204**</td>
<td>0.168</td>
<td>0.401***</td>
</tr>
<tr>
<td></td>
<td>(0.103)</td>
<td>(0.103)</td>
<td>(0.130)</td>
</tr>
<tr>
<td>After 75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of observations</td>
<td>286425</td>
<td>286425</td>
<td>286425</td>
</tr>
<tr>
<td>Number of individuals</td>
<td>10864</td>
<td>10864</td>
<td>10864</td>
</tr>
</tbody>
</table>

(Policy taken out between 20/11/1990 and 20/11/1992)

* p < 0.1, ** p < 0.05, *** p < 0.01. The standard errors in parentheses are clustered at the individual level.
### Table 11: Widening the window “±5 years”

<table>
<thead>
<tr>
<th>Treatment : Aged 70 or more</th>
<th>Average effect</th>
<th>Between 70 and 75</th>
<th>After 75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced-form estimate</td>
<td>-0.061***</td>
<td>-0.059***</td>
<td>-0.072***</td>
</tr>
<tr>
<td></td>
<td>(0.011)</td>
<td>(0.011)</td>
<td>(0.014)</td>
</tr>
<tr>
<td>Elasticity $\frac{d \log y}{d \log (1 - \tau)}$ estimate</td>
<td>0.210***</td>
<td>0.203***</td>
<td>0.249***</td>
</tr>
<tr>
<td></td>
<td>(0.039)</td>
<td>(0.039)</td>
<td>(0.049)</td>
</tr>
<tr>
<td>Number of observations</td>
<td>2269600</td>
<td>2269600</td>
<td>2269600</td>
</tr>
<tr>
<td>Number of individuals</td>
<td>87286</td>
<td>87286</td>
<td>87286</td>
</tr>
</tbody>
</table>

* p < 0.1, ** p < 0.05, *** p < 0.01. The standard errors in parentheses are clustered at the individual level.
### Table 12: Robustness Check 2: Both groups unaffected by the reform

<table>
<thead>
<tr>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Treatment : Aged 70 or more</strong></td>
<td><strong>Average effect</strong></td>
<td><strong>Between 70 and 75</strong></td>
</tr>
<tr>
<td><strong>Reduced-form estimate</strong></td>
<td>-0.035*</td>
<td>-0.037*</td>
</tr>
<tr>
<td></td>
<td>(0.019)</td>
<td>(0.019)</td>
</tr>
<tr>
<td><strong>Elasticity</strong></td>
<td>0.122*</td>
<td>0.128*</td>
</tr>
<tr>
<td></td>
<td>(0.066)</td>
<td>(0.065)</td>
</tr>
<tr>
<td><strong>Number of observations</strong></td>
<td>586490</td>
<td>586490</td>
</tr>
<tr>
<td><strong>Number of individuals</strong></td>
<td>23448</td>
<td>23448</td>
</tr>
</tbody>
</table>

* p < 0.1, ** p < 0.05, *** p < 0.01. The standard errors in parentheses are clustered at the individual level.
### TABLE 13: Robustness Check 3: Both groups affected by the reform

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Treatment</strong>: Aged 70 or more</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average effect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between 70 and 75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After 75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Reduced-form estimate</strong></td>
<td>0.027</td>
<td>0.024</td>
<td>0.042*</td>
</tr>
<tr>
<td></td>
<td>(0.018)</td>
<td>(0.018)</td>
<td>(0.022)</td>
</tr>
<tr>
<td><strong>Elasticity</strong> $\frac{d \log y}{d \log (1 - \tau)}$ estimate</td>
<td>-0.093</td>
<td>-0.083</td>
<td>-0.147*</td>
</tr>
<tr>
<td></td>
<td>(0.062)</td>
<td>(0.062)</td>
<td>(0.077)</td>
</tr>
<tr>
<td><strong>Number of observations</strong></td>
<td>1113739</td>
<td>1113739</td>
<td>1113739</td>
</tr>
<tr>
<td><strong>Number of individuals</strong></td>
<td>42325</td>
<td>42325</td>
<td>42325</td>
</tr>
</tbody>
</table>

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The standard errors in parentheses are clustered at the individual level.