Illiquid Wealth and the Timing of Retirement

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Introduction

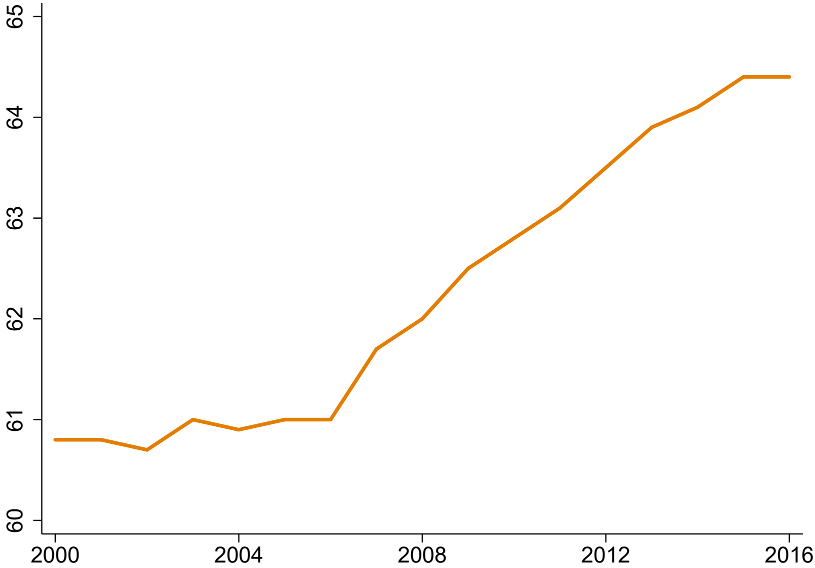
- Aging populations around the world $\Rightarrow$ urgent public finance challenge
- Change policies to encourage later retirement?
- Need to understand retirement timing, how it responds to policy

- We build a model of retirement and use it to interpret Dutch data

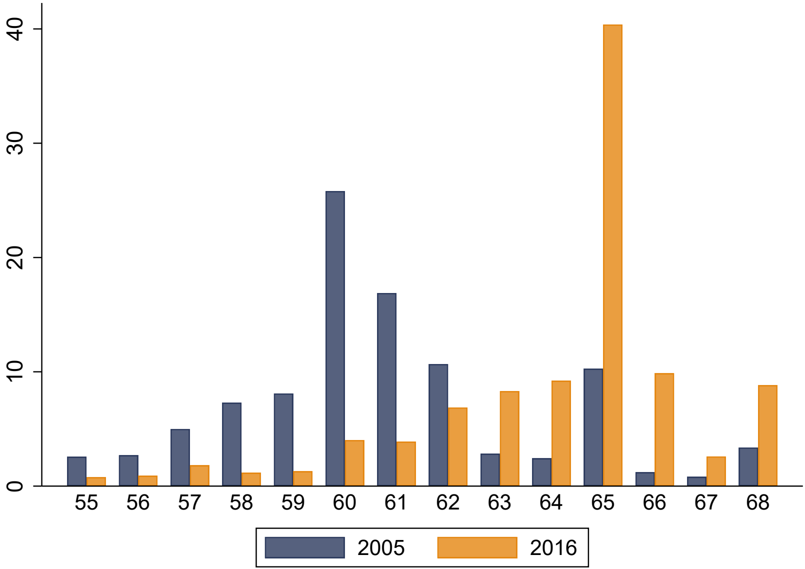
Why the Netherlands?

- Large recent changes in retirement patterns and policies
- High quality administrative data on income, wealth, health status, retirement choices

Average Age of Dutch People Retiring



Distribution of Ages of People Retiring



Why Are the Dutch Retiring Later?

1. Changes in retirement policies:
    1. Increase in normal retirement age: 65 $\Rightarrow$ 66
    2. New taxes on early withdrawals from company pensions in 2005
2. Wealth losses during Great Recession
3. Increased longevity

Model Sketch

- Continuous time, no uncertainty
- Workers choose consumption / savings and timing of retirement
- Heterogeneity in wages and in taste for work
- Redistributive public pension system
- Costly to tap saving prior to normal retirement age
  - Unfavorable tax treatment of early pension withdrawals
  - (penalties for early 401(k) withdrawals)
  - Illiquid home equity
- $\Rightarrow$ clustering at normal retirement age

Model

- Born at $a = 0$, maximum age $a = A$
- Period utility for type i

$$u_i(c(a), l(a)) = \log c(a) - \varphi_i(a) l(a)$$

- Choose retirement age a_R

$$\begin{aligned} a &< a_R \Rightarrow l(a) = 1 \\ a &\geq a_R \Rightarrow l(a) = 0 \end{aligned}$$

- Earnings

$$y(a) = w_i(a) l(a)$$

- Lifetime utility

$$\int_0^A S_i(a) \exp(-\rho a) \left[\log c(a) - \varphi_i(a) l(a)\right] da$$

Pensions and Financial Markets

- Start collecting pension $p(a_R)$ at normal retirement age, $a = A_N$
- Affine function of lifetime earnings

$$\begin{aligned} p(a_R) &= p + \beta Y(a_R) \\ Y(a_R) &= \int_0^{a_R} e^{r(A_N - a)} w_i(a) da \end{aligned}$$

- Private wealth $b(a)$ with return r
- Two financial frictions:

1. Credit friction: No borrowing allowed: $b(a) \geq 0$
2. Liquidity friction: Tax χ on asset sales if $a < A_N$

$$\max_{\{c(a)\},a_R} \int_0^A S_i(a)\exp(-\rho a)\left[\log c(a) - \mathbb{I}_{\{a<a_R\}}\varphi_i(a)\right] da$$

subject to

$$\begin{aligned}
c(a) + s(a) &= \mathbb{I}_{\{a<a_R\}} w(a) + \mathbb{I}_{\{a\geq A_N\}} p(a_R) \\
\dot{b}(a) &= \begin{cases} s(a) + rb(a) & \text{if } s(a) \geq 0 \\ \frac{s(a)}{1-\chi(a)} + rb(a) & \text{if } s(a) < 0 \end{cases} \\
b(a) &\geq 0 \\
b(0) &= 0
\end{aligned}$$

Focus today on $\rho = r = 0$ and $\beta = 0 \Rightarrow p(a_R) = p$

Heterogeneity

$$\begin{aligned}\log \varphi_i &= \eta_i + \eta(a) \\ \log w_i &= z_i + z(a) \\ S_i(a) &= S(a)^{s_i}\end{aligned}$$

Assumptions for today

$\eta(a) = 0$	flat wage profile
$z(a) = 0$	flat disutility of work
$S(a) = 1$	no mortality prior to A

$$\begin{pmatrix} \log \varphi_i \\ \log w_i \end{pmatrix} = \begin{pmatrix} \eta_i \\ z_i \end{pmatrix} \sim N\left(\begin{matrix} \mu_\eta \\ \mu_z \end{matrix}, \begin{pmatrix} \sigma_\eta^2 & \rho\sigma_\eta\sigma_z \\ \rho\sigma_\eta\sigma_z & \sigma_z^2 \end{pmatrix} \right)$$

Solving for Optimal Choices

1. Solve for optimal consumption / savings rule given a_R
2. Given that rule, solve for optimal a_R

Step 1: Consumption Plan Conditional on a_R

1. $a_R \geq A_N$

$$c(a) = \bar{c} = \frac{1}{A}[a_R w + (A - A_N)p]$$

2. $a_R < A_N$

$$c(a) = \begin{cases} \bar{c} & a \in [0, a_R] \\ (1-\chi)\bar{c} & a \in [a_R, A_N] \end{cases}$$

3. $a_R << A_N$

$$c(a) = \begin{cases} \frac{a_R}{A_N} w & a \in [0, a_R] \\ (1-\chi)\frac{a_R}{A_N} w & a \in [a_R, A_N] \\ p_0 & a \in [a_N, A] \end{cases}$$

Step 2: Retirement Plan

- Retirement age FOC:

$$\frac{w}{\frac{1}{A}\left[wa_R + p(A - A_N)\right]} = \varphi + \mathbb{I}_{\{a_R < A_N\}} \log(1 - \chi)$$

  - high $w \Rightarrow$ retire late
  - high $\varphi \Rightarrow$ retire early

Types of Retiree:

1. Credit constrained – very low w / very high φ

$$a_R = \frac{A}{\varphi + \log(1-\chi)} - \frac{p(A-A_N)}{w} << a_N \text{ and } b(A_N) = 0$$

2. Early – low w / high φ

$$a_R = \frac{A}{\varphi + \log(1-\chi)} - \frac{p(A-A_N)}{w} < a_N \text{ and } b(A_N) > 0$$

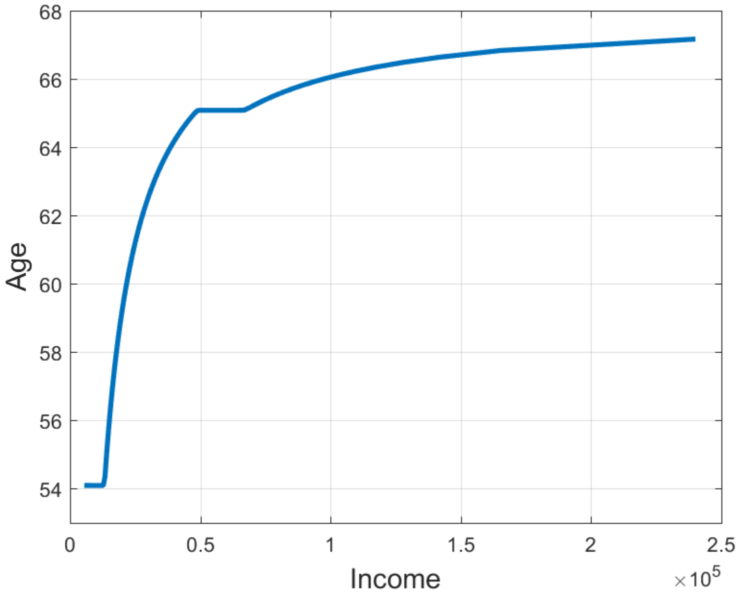
3. Normal – moderate w /φ

$$a_R = A_N$$

4. Late – high w / low φ

$$a_R = \frac{A}{\varphi} - \frac{p(A-A_N)}{y} > A_N$$

Decision Rule



Sensitivity of Retirement Age to Policy Parameter

	credit cons.	early	normal	late
p	0	$-\frac{(A-A_N)}{w}$	0	$-\frac{(A-A_N)}{w}$
A_N	$\frac{1}{\log(1-\chi)+\varphi}$	$\frac{p}{w}$	1	$\frac{p}{w}$
χ	$\frac{A_N}{(1-\chi)(\varphi+\log(1-\chi))^2}$	$\frac{A}{(1-\chi)(\varphi+\log(1-\chi))^2}$	0	0

- Only early and late retirees respond to p
  - low wage workers most responsive
- Credit constrained & normal retirees most responsive to A_N
- Liquidity friction plays key role:
  - Increase $\chi \Rightarrow$ early retirees increase a_R
  - Increase $\chi \Rightarrow$ more normal retirees
  - $\Rightarrow$ average retirement age more sensitive to A_N

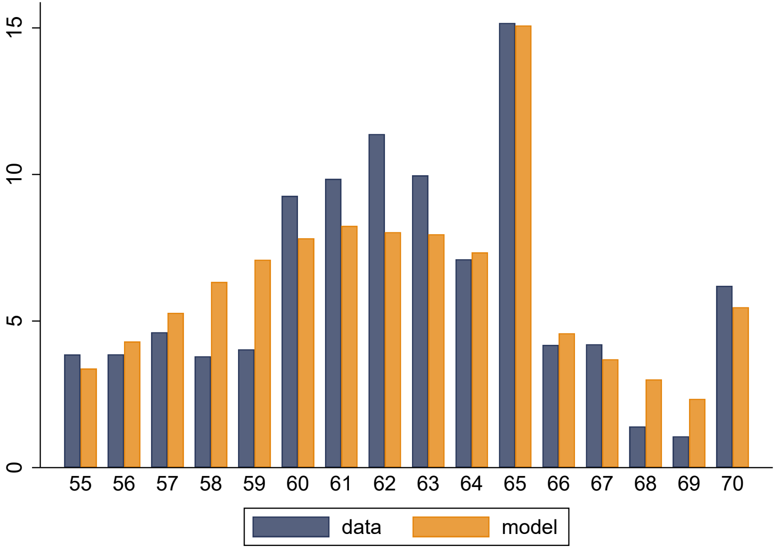
Administrative Data

- All Dutch individuals born in 1948
- Administrative earnings records 2003-2018, hours 2006
- Define as working in year t if earnings $> 2{,}000$ euros
- Define as retiring in year t if not working for all $j > t$
- Sample excludes self-employed and those not working in any year after 2003

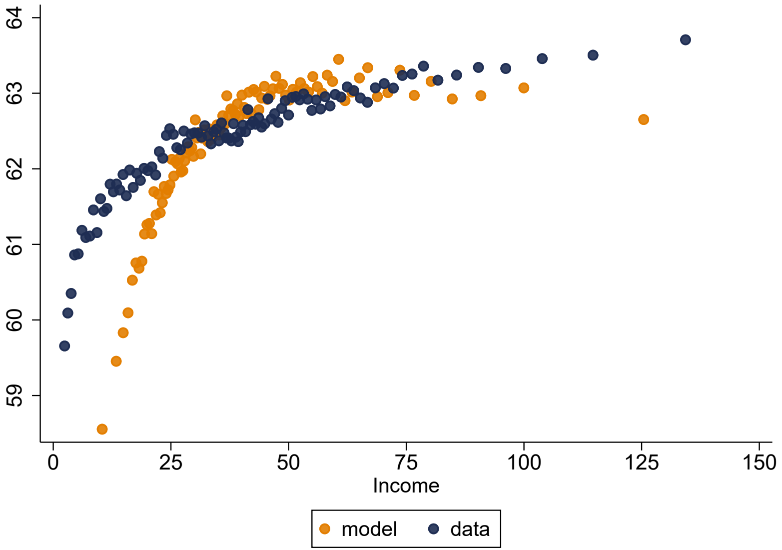
Calibration

Parameter	Value	Data Targeted	Data Value
A	65	Life expectancy	85
μ_z	10.47	Mean of log income	10.47
σ_z	0.23	Std dev of log wage	0.204
μ_η	0.340	Mean retirement age	62.4
σ_η	0.107	Std dev retirement age	3.90
ρ	0.30	Corr (wage, retirement age)	0.1
A_N	45+1/12	Normal retirement age	65+1/12
p	10,500	Dutch govt. pension	10,500
χ	0.045	Density at A_N	15%

Retirement Age Distribution



Income and Retirement Age



Explaining Observed Change

Policy	Change Avg. Retirement Age
Baseline	0.00
(1) $A'_N = A_N + 1$	+0.30
(2) 18% wealth loss	+0.62
(3) $\chi' = 0.10$	+1.19
(1)+(2)+(3)	+2.34

Role of Illiquidity

	Change in Avg. Retirement Age	
χ	$A'_N = A_N + 1$	$p' = p - (1/20)p$
0.00	+0.33	+0.31
0.045	+0.38	+0.29
0.10	+0.47	+0.26

Conclusions

- A simple model with a liquidity friction replicates well the Dutch retirement distribution
  - High income workers retire later
  - Clustering around "normal" retirement age
- Higher illiquidity, rise in normal retirement age and wealth losses explain most of observed increase in mean retirement age
- Making retirement saving illiquid and increasing normal retirement age are powerful complementary policies to induce later retirement