Saving During Retirement

Eric French

University of Cambridge and Institute for Fiscal Studies

2021

What are we trying to understand?

The saving of the elderly:

- Many elderly individuals keep lots of assets.
- High income individuals deplete their assets more slowly than low income individuals.
- Low-income singles, no retirement savings

Why is this important?

- Elderly hold lots of wealth–key driver of aggregate savings.

Why is this important?

- Elderly hold lots of wealth–key driver of aggregate savings.
- Understanding financial well being of the elderly.

Why is this important?

- Elderly hold lots of wealth–key driver of aggregate savings.
- Understanding financial well being of the elderly.
- Understanding intergenerational altruism (key for understanding the implications of Social Security/pension reform (Fuster et al., 2007)).

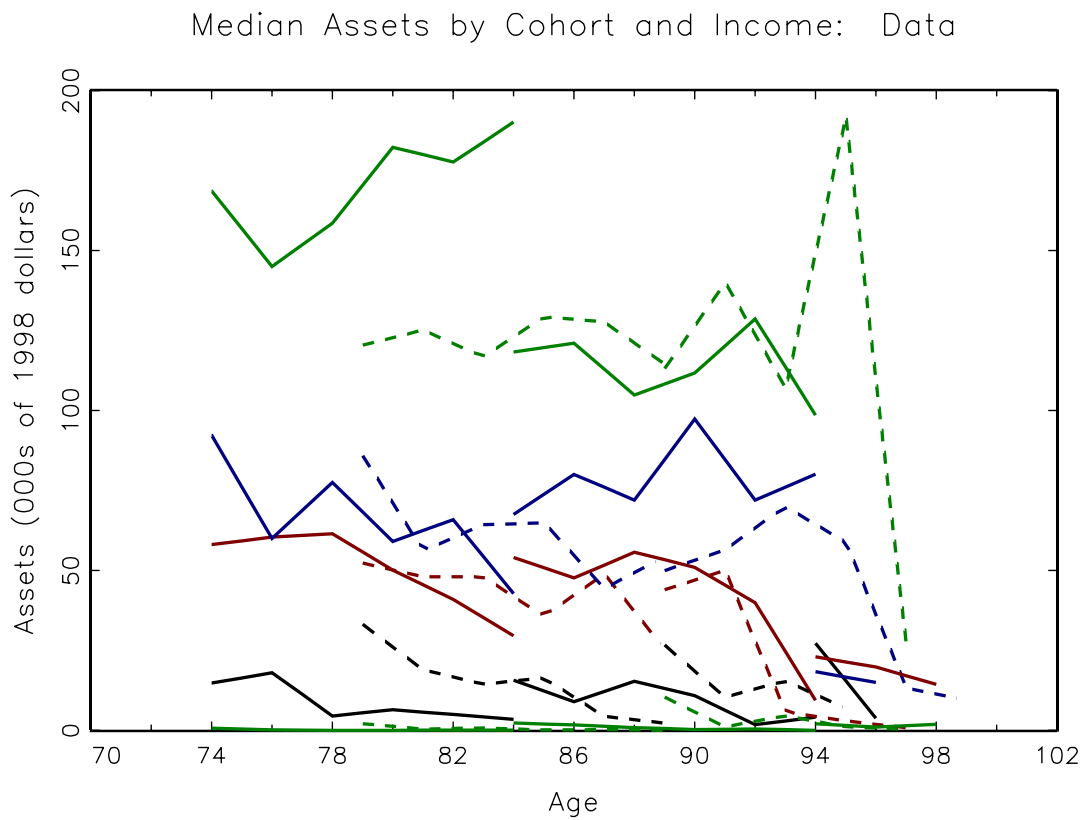
AHEAD data (a subset of the HRS)

- Household heads aged 70 or older in 1993/4
- Consider only the retired singles
- Follow-up interviews in 1995/6, 1998, 2000, 2002, 2004, 2006
- Asset data begins in 1996 (1994 asset data faulty), uses 2,688 individuals
- Use full, unbalanced panel

Median assets by age and income, by birth cohort

AHEAD data (unbalanced panel, singles only)

Median assets by age and income, by birth cohort



AHEAD data (unbalanced panel, singles only)

Potential drivers of retirement savings

- **Precautionary motive:** medical expense risk/uncertain lifetimes.

Potential drivers of retirement savings

- **Precautionary motive:** medical expense risk/uncertain lifetimes.
- Bequest motives.
- Housing/home ownership.

Potential drivers of retirement savings

- **Precautionary motive:** medical expense risk/uncertain lifetimes.
- Bequest motives.
- Housing/home ownership.

Key issue: many of the above motives affect savings patterns in similar ways, so it is difficult to disentangle the importance of the them.

Plan

A model of savings

- Preferences

$$\max_{\{c_{it}\}_{t=0}^{T}} E \sum_{t=1}^{T} \beta^t S_{it-1}(s_{it} u(c_{it}) + (1 - s_{it}) b(a_{it}))$$

  where c_{it} = consumption s_{it} = probability alive at time t given alive at time $t-1$, $S_{it-1} = \prod_{j=0}^{t-1} s_{ij}$.

- Budget constraint

$$a_{it+1} = (1 + r)a_{it} - c_{it} + Y_{it} + b_{it} - m_{it}$$

- and equations for income Y_{it}, gov't benefits b_{it}, medical spending m_{it}

Drivers of Savings

$$\max_{\{c_{it}\}_{t=0}^{T}} E \sum_{t=1}^{T} \beta^t S_{it-1}(s_{it} u(c_{it}) + (1 - s_{it}) b(a_{it}))$$

$$a_{it+1} = (1 + r)a_{it} - c_{it} + Y_{it} + b_{it} - m_{it}$$

1. Survival (a):$s_{it} = s(t, Y_{it}, gender, health_{it-1})$,
2.
3.
4.

Drivers of Savings

$$\max_{\{c_{it}\}_{t=0}^{T}} E \sum_{t=1}^{T} \beta^t S_{it-1}(s_{it} u(c_{it}) + (1 - s_{it}) b(a_{it}))$$

$$a_{it+1} = (1 + r)a_{it} - c_{it} + Y_{it} + b_{it} - m_{it}$$

1.
2. Medical spending risk $m_{it} = m(t, Y_{it}, gender, health_{it-1})$.
3.
4.

Drivers of Savings

$$\max_{\{c_{it}\}_{t=0}^{T}} E \sum_{t=1}^{T} \beta^t S_{it-1}(s_{it} u(c_{it}) + (1 - s_{it}) b(a_{it}))$$

$$a_{it+1} = (1 + r)a_{it} - c_{it} + Y_{it} + b_{it} - m_{it}$$

1.
2.
3. Bequest motives $b(a_{it})$
4.

Drivers of Savings

$$\max_{\{c_{it}\}_{t=0}^{T}} E \sum_{t=1}^{T} \beta^t S_{it-1}(s_{it} u(c_{it}, H_{it}) + (1 - s_{it}) b(a_{it}, H_{it}))$$

$$\begin{aligned} a_{it+1} &= (1+r)a_{it} - c_{it} + Y_{it} + b_{it} - m_{it} - h_{it} \\ H_{it+1} &= f(H_{it}, h_{it}) \end{aligned}$$

1.
2.
3.
4. Housing H_{it} with housing investments h_{it}

Plan

Lifespan uncertainty/heterogeneity

- Early models:
  - Hurd (1989)
  - De Nardi, French, and Jones (2009)

Lifespan uncertainty/heterogeneity

- Early models:
  - Hurd (1989)
  - De Nardi, French, and Jones (2009)
- Empirical work:
  - Hurd, McFadden, Merrill (2001)
  - Attanasio and Emmerson (2005)

Lifespan uncertainty/heterogeneity

- Early models:
  - Hurd (1989)
  - De Nardi, French, and Jones (2009)
- Empirical work:
  - Hurd, McFadden, Merrill (2001)
  - Attanasio and Emmerson (2005)
- Findings: Heterogeneity in mortality is large and is important to understand savings. So is lifespan uncertainty.

Life expectancy facts in the US

There is a lot of heterogeneity in life expectancy

- Rich people live longer
- Women live longer
- Healthy people live longer

This might have an important effect on retirement savings.

Life expectancy at age 70

Income Quintile	Healthy Male	Unhealthy Male	Healthy Female	Unhealthy Female	All
bottom	7.6	5.9	12.8	10.9	11.1
second	8.4	6.6	13.8	12.0	12.4
third	9.3	7.4	14.7	13.2	13.1
fourth	10.5	8.4	15.7	14.2	14.4
top	11.3	9.3	16.7	15.1	14.7
Men					9.7
Women					14.3
Healthy					14.4
Unhealthy					11.6

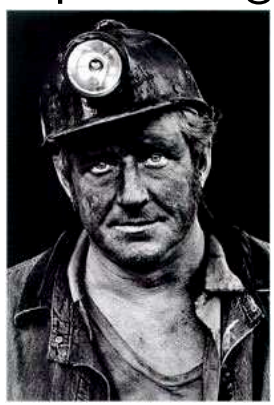
Source: De Nardi, French, and Jones (2010)

Heterogeneity implications

- For saving behavior
  - Differential mortality $\Rightarrow$ heterogenous saving rates, with high PI people and women saving more.

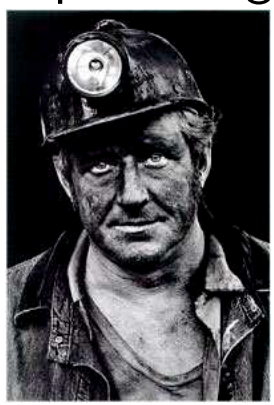
Heterogeneity implications: continued

- For observed sample: **mortality bias**
  - Sample changes: High PI people + women live longer



Heterogeneity implications: continued

- For observed sample: **mortality bias**
  - Sample changes: High PI people + women live longer



  - In an unbalanced panel, this causes observed assets to **increase** with age

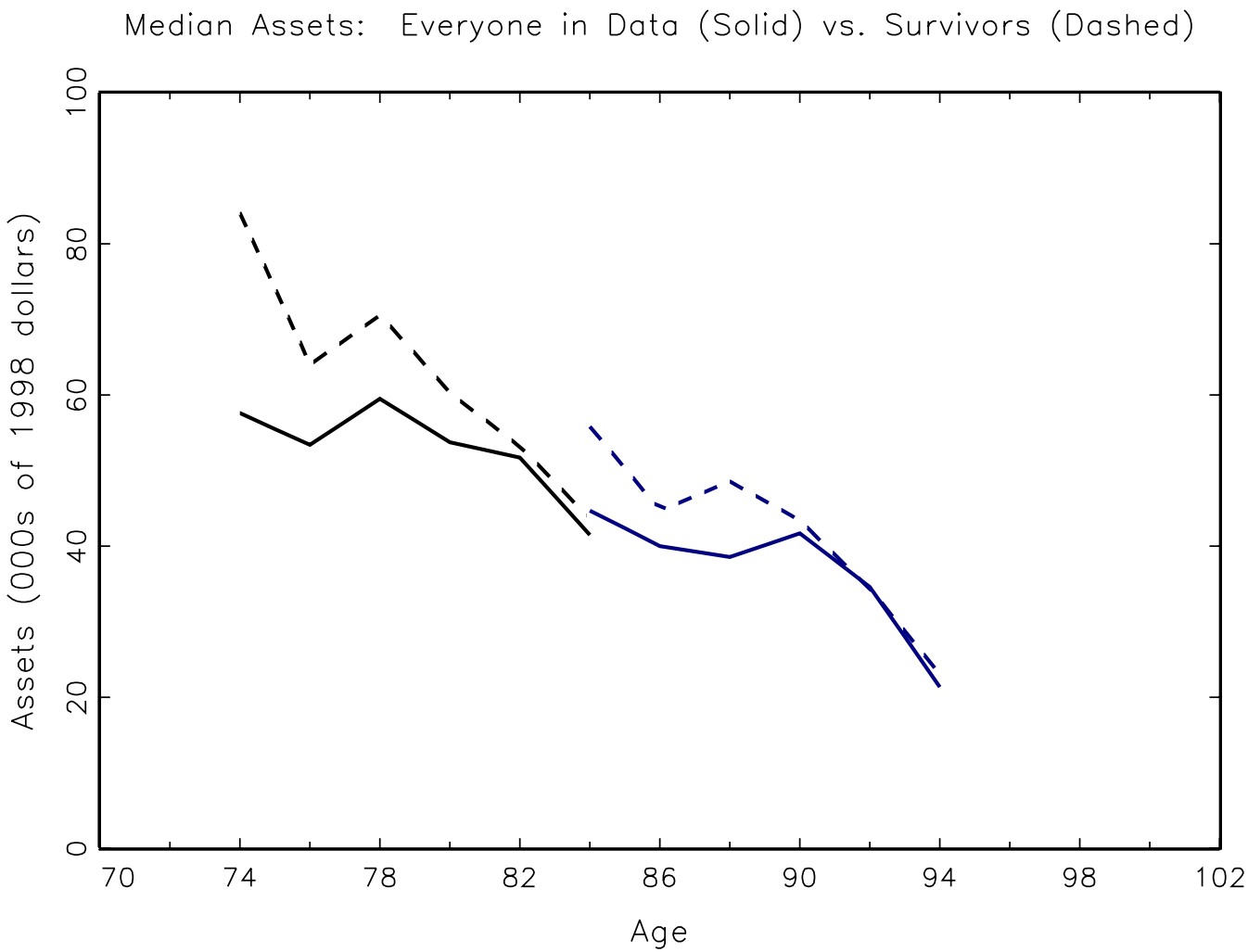


Figure: Median assets by birth cohort, AHEAD data

Plan

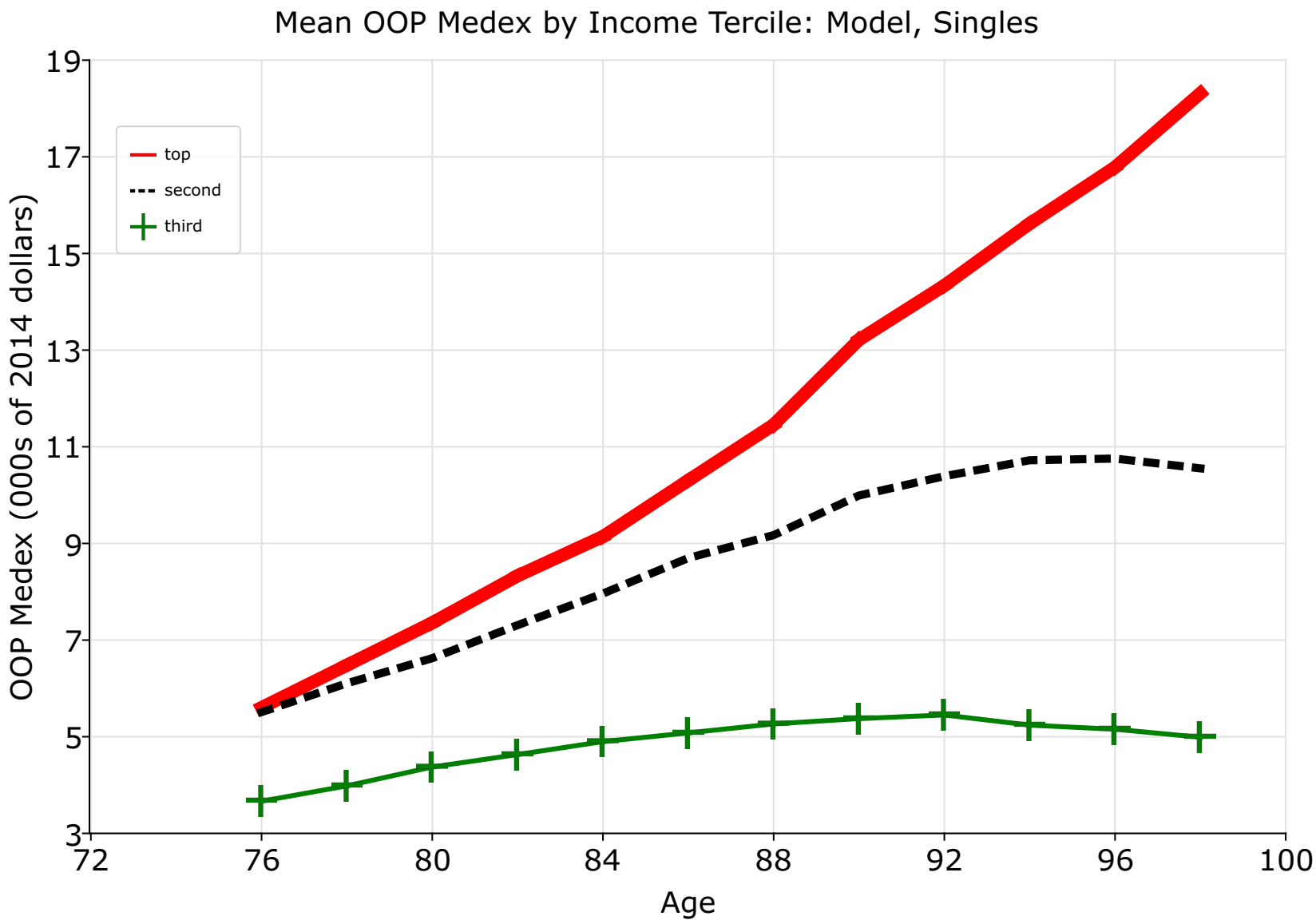
Research on Medical Spending

- Papers:
  - Kotlikoff (1988)
  - Feenberg and Skinner (1994)
  - Hubbard, Skinner, and Zeldes (1994)
  - Palumbo (1999)
  - French and Jones (2004)
  - De Nardi, French, and Jones (2009, 2010, 2016)
  - De Nardi, French, and Jones, McCauley (2016), De Nardi, French, Jones, McGee (2019, 2021)
- Previous structural work: Small effects of medical expenses.
- Our work: Large effects of medical expenses (rich data set).

Medical expenses facts in the US

- Out-of-pocket medical costs rise with age and permanent income

Average medical expenses, AHEAD data



Government insurance programs

- In particular, means tested social insurance (SSI, Medicaid)

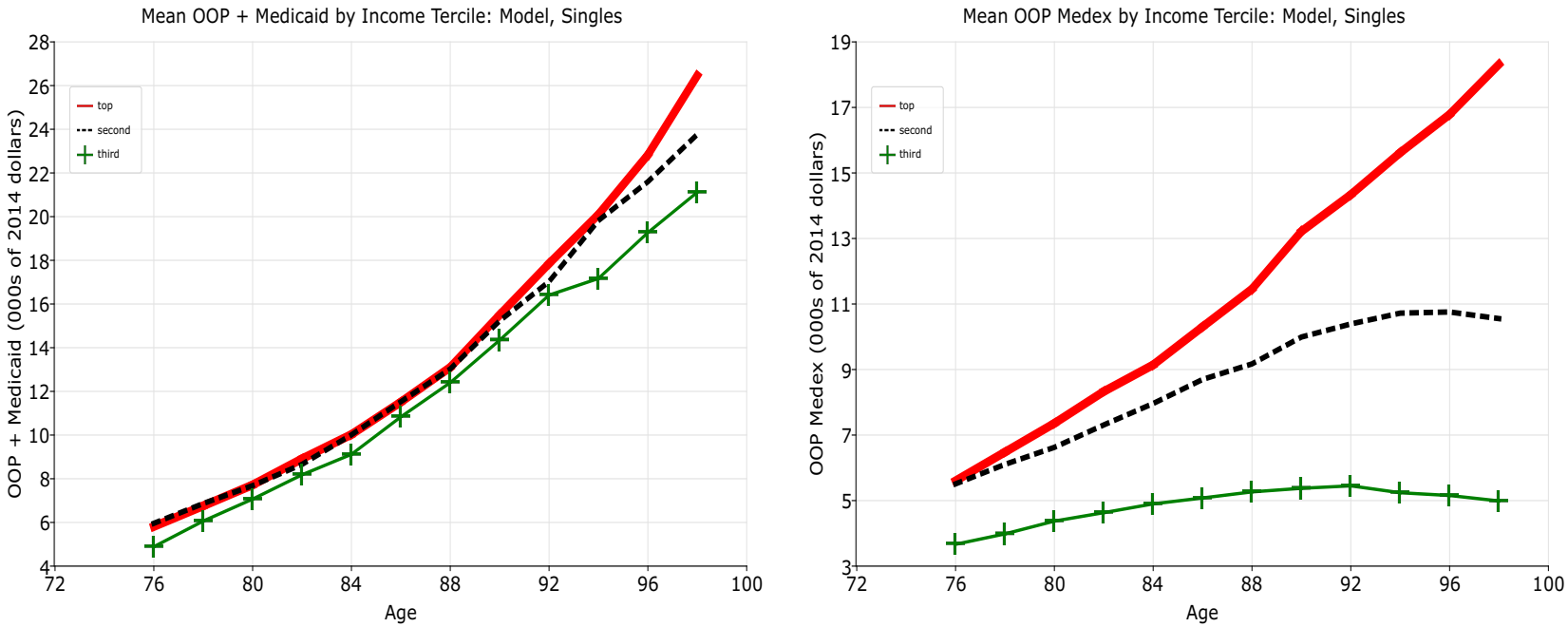
Government insurance programs

- In particular, means tested social insurance (SSI, Medicaid)
- Papers:
  - Hubbard, Skinner, Zeldes (1995)
  - Scholz, Seshadri, and Khitatrakun (2006)
  - De Nardi, French, and Jones (2010)

Government insurance programs

- In particular, means tested social insurance (SSI, Medicaid)
- Papers:
  - Hubbard, Skinner, Zeldes (1995)
  - Scholz, Seshadri, and Khitatrakun (2006)
  - De Nardi, French, and Jones (2010)
- Previous work: Means-tested insurance programs provide strong incentives for low-income individuals not to save, but have little effect on college graduates.
- Our work: OOP medical expenses rise with age and income. Hence government insurance also affects the savings of initially well-off individuals.

Average medical expenses, AHEAD data, including Medicaid



(a) (b)

Figure: Mean medical spending. Panel (a): out of pocket+Medicaid. Panel (b): out of pocket.

Plan

Bequests

- Papers:
  - Hurd (1989)
  - Kopczuk and Lupton (2007)
  - Ameriks et al. (2018)
  - De Nardi (2004)
  - De Nardi, French, and Jones (2010)
  - Lockwood (2018)
- Conclusion: Mixed evidence, more work is needed. **Both precautionary motives and bequest motives have similar implications.**

Plan

A Model with longevity risk, medical spending, bequest motives

De Nardi, French, Jones (2010): DFJ

How do we address these questions?

We write down a structural model, which we estimate in two steps:

- First step: estimate mortality and medical expenses as a function of age, gender, health and permanent income.

How do we address these questions?

We write down a structural model, which we estimate in two steps:

- First step: estimate mortality and medical expenses as a function of age, gender, health and permanent income.
- Second step: use first step results to estimate our model with method of simulated moments.

Model

- **Singles only,** abstract from spousal survival.

Model

- **Singles only,** abstract from spousal survival.
- **Households** maximize total expected lifetime utility.

Model

- **Singles only,** abstract from spousal survival.
- **Households** maximize total expected lifetime utility.
- **Flow utility** from consumption (CRRA). Utility can vary with health.

Model

- **Singles only,** abstract from spousal survival.
- **Households** maximize total expected lifetime utility.
- **Flow utility** from consumption (CRRA). Utility can vary with health.
- **Rational expectations.** Beliefs about mortality rates, health cost distribution, etc., are estimated from the data.

Model

- **Singles only,** abstract from spousal survival.
- **Households** maximize total expected lifetime utility.
- **Flow utility** from consumption (CRRA). Utility can vary with health.
- **Rational expectations.** Beliefs about mortality rates, health cost distribution, etc., are estimated from the data.
- **Bequest motive.** Functional form follows De Nardi (2004): bequests are a luxury good.

Income

$$
\begin{aligned}
y_t &= y(g, h, I, t), \\
g &= \text{gender}, \\
h &= \text{health}, \\
I &= \text{permanent income}.
\end{aligned}
$$

Uncertainty

- **Health status:** age-, gender- and permanent-income-specific Markov chain.

Uncertainty

- **Health status:** age-, gender- and permanent-income-specific Markov chain.
- **Survival:** function of gender, age, health status, and permanent income.

Uncertainty

- **Health status:** age-, gender- and permanent-income-specific Markov chain.
- **Survival:** function of gender, age, health status, and permanent income.
- **Medical expenses:**

$$\begin{aligned} \ln(m_t) &= m(g, h_t, I, t) + \sigma(g, h_t, I, t)\psi_t, \\ \psi_t &= \zeta_t + \xi_t, \\ \zeta_t &= \text{AR(1) shock}, \\ \xi_t &= \text{white noise shock}. \end{aligned}$$

Constraints

- Budget constraint:

$$a_{t+1} = a_t + y_n(ra_t + y_t, \tau) + b_t - m_t - c_t.$$

$y_n(.)$ = post-tax income; y_t = "non-interest" income;
τ = tax parameters; b_t = government transfers;
m_t = medical expenses.

Constraints

- Budget constraint:

$$a_{t+1} = a_t + y_n(ra_t + y_t, \tau) + b_t - m_t - c_t.$$

$y_n(.)$ = post-tax income; y_t = "non-interest" income;
τ = tax parameters; b_t = government transfers;
m_t = medical expenses.

- Transfers support a consumption floor:

$$b_t = \max\{0, c_{min} + m_t - [a_t + y_n(ra_t + y_t), \tau)]\}.$$

Constraints

- Budget constraint:

$$a_{t+1} = a_t + y_n(ra_t + y_t, \tau) + b_t - m_t - c_t.$$

$y_n(.)$ = post-tax income; y_t = "non-interest" income;
τ = tax parameters; b_t = government transfers;
m_t = medical expenses.

- Transfers support a consumption floor:

$$b_t = \max\{0, c_{min} + m_t - [a_t + y_n(ra_t + y_t), \tau)]\}.$$

- Borrowing constraint:

$$a_{t+1} \geq 0.$$

Method of simulated moments

- Match median assets by permanent income quintile, cohort and age.
- Correct for cohort effects by using cohort-specific moments and initial conditions.
- Correct for mortality bias (rich people live longer) by allowing mortality rates to depend on permanent income and gender.

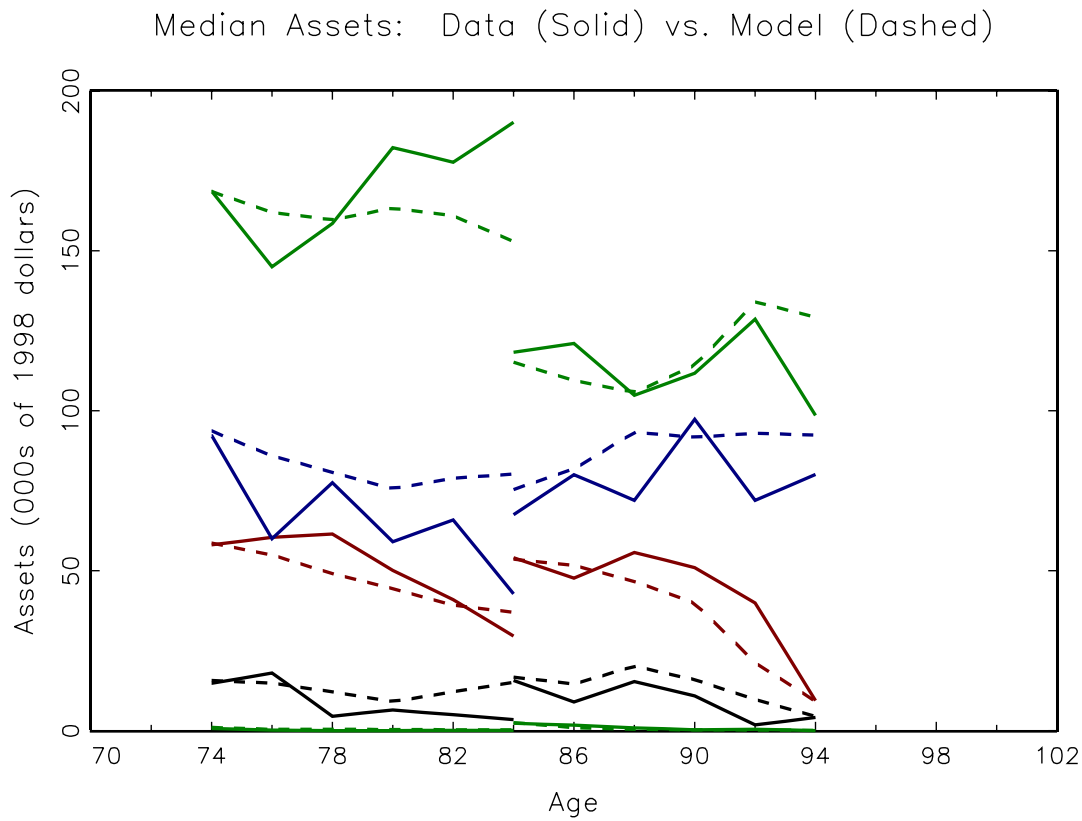
Estimated Structural Parameters

Utility from consumption if alive: $\frac{1}{1-\nu} c_t^{1-\nu}$

Utility bequests if dead: $\frac{\theta}{1-\nu} a_t^{1-\nu}$

Parameter	Benchmark (1)	Health (2)	Bequests (3)	All (4)
ν: coeff. relative risk aversion	3.81 (0.50)	3.75 (0.47)	3.84 (0.55)	3.66 (0.55)
β: discount factor	0.97 (0.04)	0.97 (0.05)	0.97 (0.05)	0.97 (0.04)
δ: pref. shifter, good health	0.0 NA	-0.21 (0.18)	0.0 NA	-0.36 (0.14)
c_{min}: consumption floor	2,663 (346)	2,653 (337)	2,665 (353)	2,653 (337)
θ: bequest intensity	0.0 NA	0.0 NA	2,360 (8,122)	2,419 (1,886)
k: bequest curvature (in 000s)	NA NA	NA NA	273 (446)	215 (150)
Overidentification statistic P-value	82.3 87.4%	80.6 88.5%	81.5 85.4%	77.5 90.5%

Median assets by cohort and PI quintile: data and benchmark model



Mortality bias

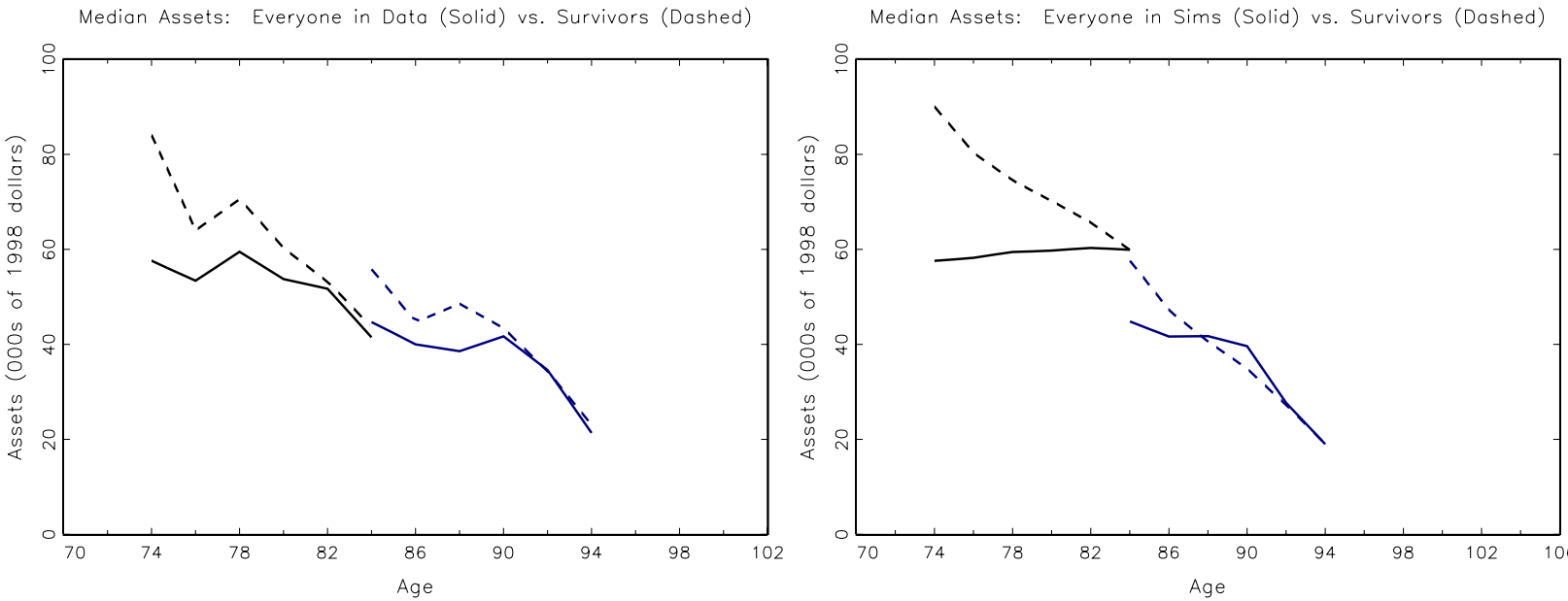


Figure: Left panel → AHEAD data; right panel → benchmark model

Bequests

- Bequest motives are very imprecisely estimated.
  - They do not improve the model's fit.
  - They do not not change other parameters.

Bequests

- Bequest motives are very imprecisely estimated.
  - They do not improve the model's fit.
  - They do not not change other parameters.
- But note: difficult to identify $\neq$ small or unimportant

Distribution of bequests: data and model

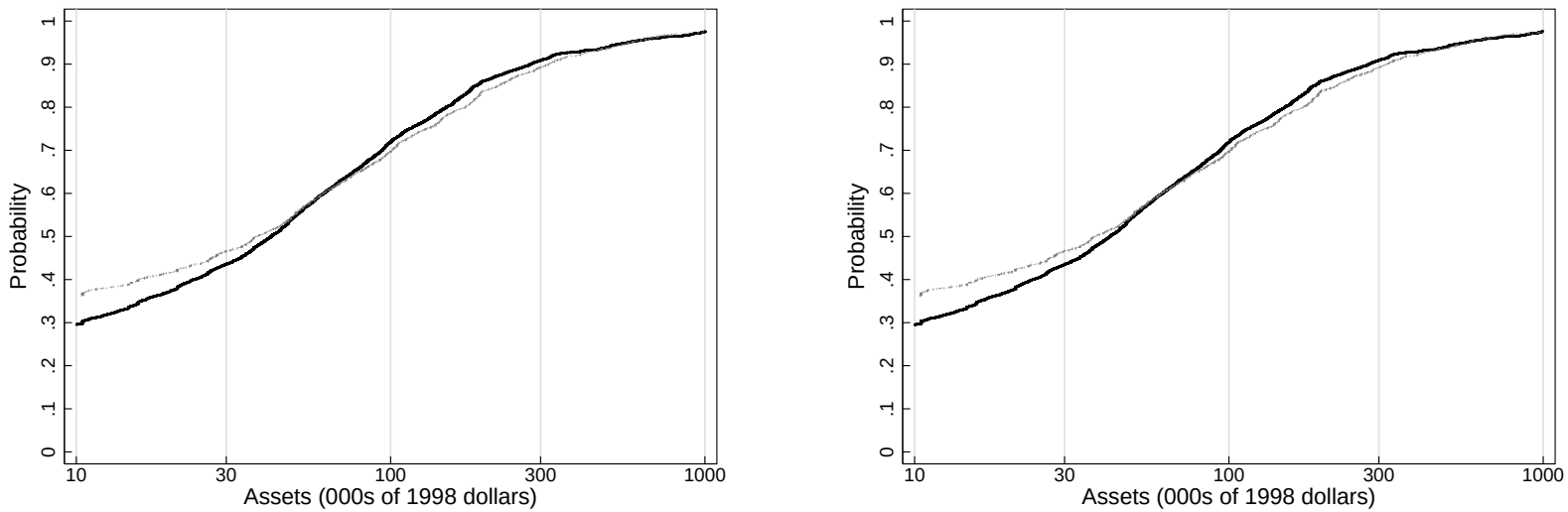
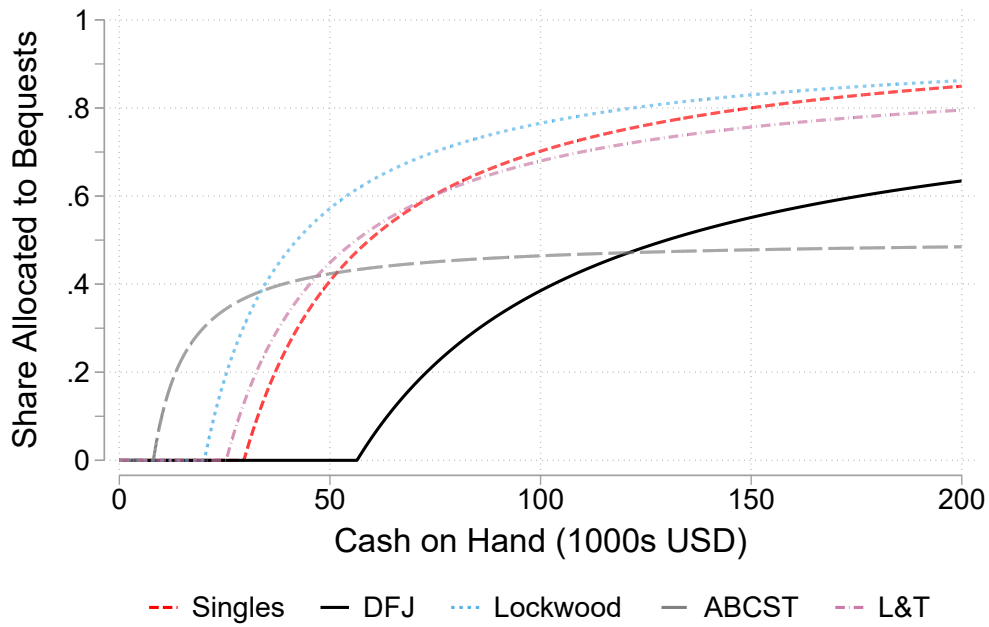


Figure: Cumulative distribution function of assets held 1 period before death. Left, model with bequest motives. Right: model without. Solid line: model, lighter line: data.

Bequest Parameters: Interpretation

In the last period of life, the individual solves

$$\max_c \frac{1}{1-\nu} c^{1-\nu} + \beta\theta \frac{1}{1-\nu} \left(R(a-c)+\kappa\right)^{1-\nu},$$



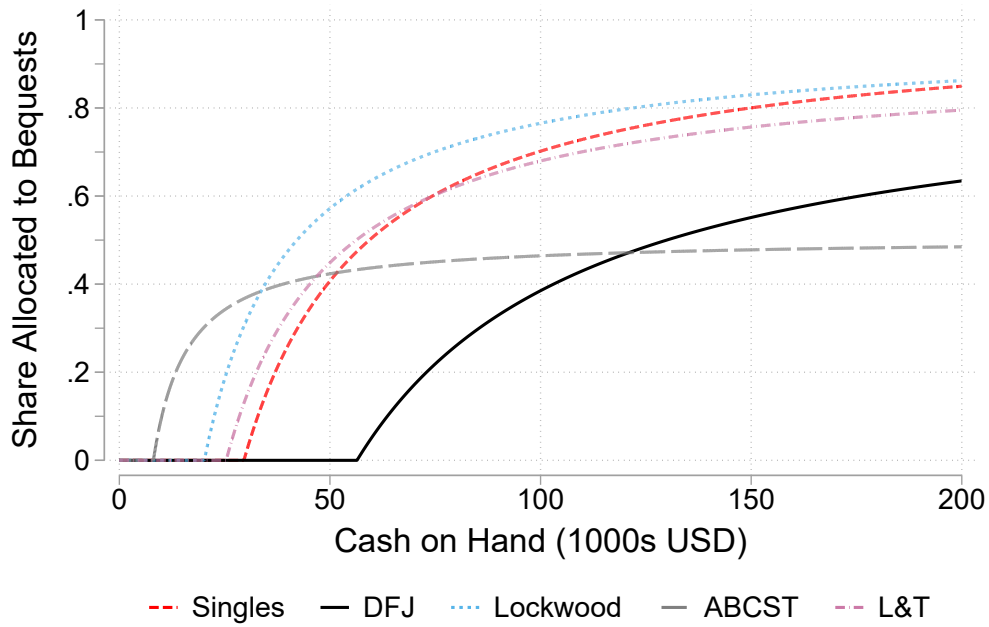
Bequest Parameters: Interpretation

In the last period of life, the individual solves

$$\max_c \frac{1}{1-\nu} c^{1-\nu} + \beta\theta \frac{1}{1-\nu} \left(R(a-c)+\kappa\right)^{1-\nu},$$

where bequests $= R(a-c)$. Optimal bequests:

$$\max\{\frac{R}{R+\varphi}\left(\varphi a - \kappa\right), 0\}, \varphi = \left[\beta\theta R\right]^{1/\nu}.$$



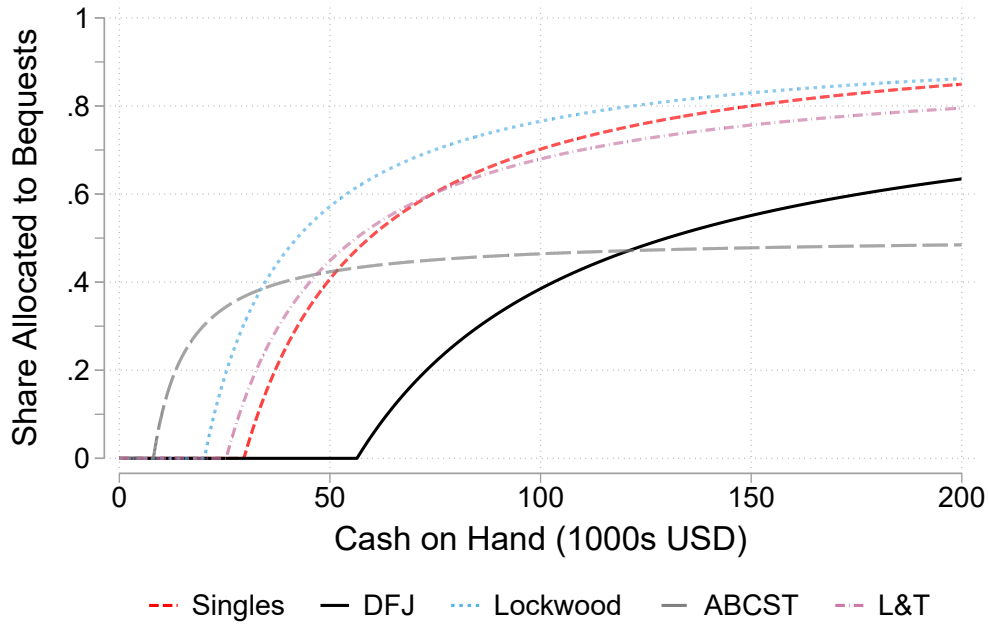
Bequest Parameters: Interpretation

In the last period of life, the individual solves

$$\max_c \frac{1}{1-\nu} c^{1-\nu} + \beta\theta \frac{1}{1-\nu} \left(R(a-c)+\kappa\right)^{1-\nu},$$

where bequests $= R(a-c)$. Optimal bequests:

$$\max\{\frac{R}{R+\varphi}\left(\varphi a - \kappa\right), 0\}, \varphi = \left[\beta\theta R\right]^{1/\nu}.$$



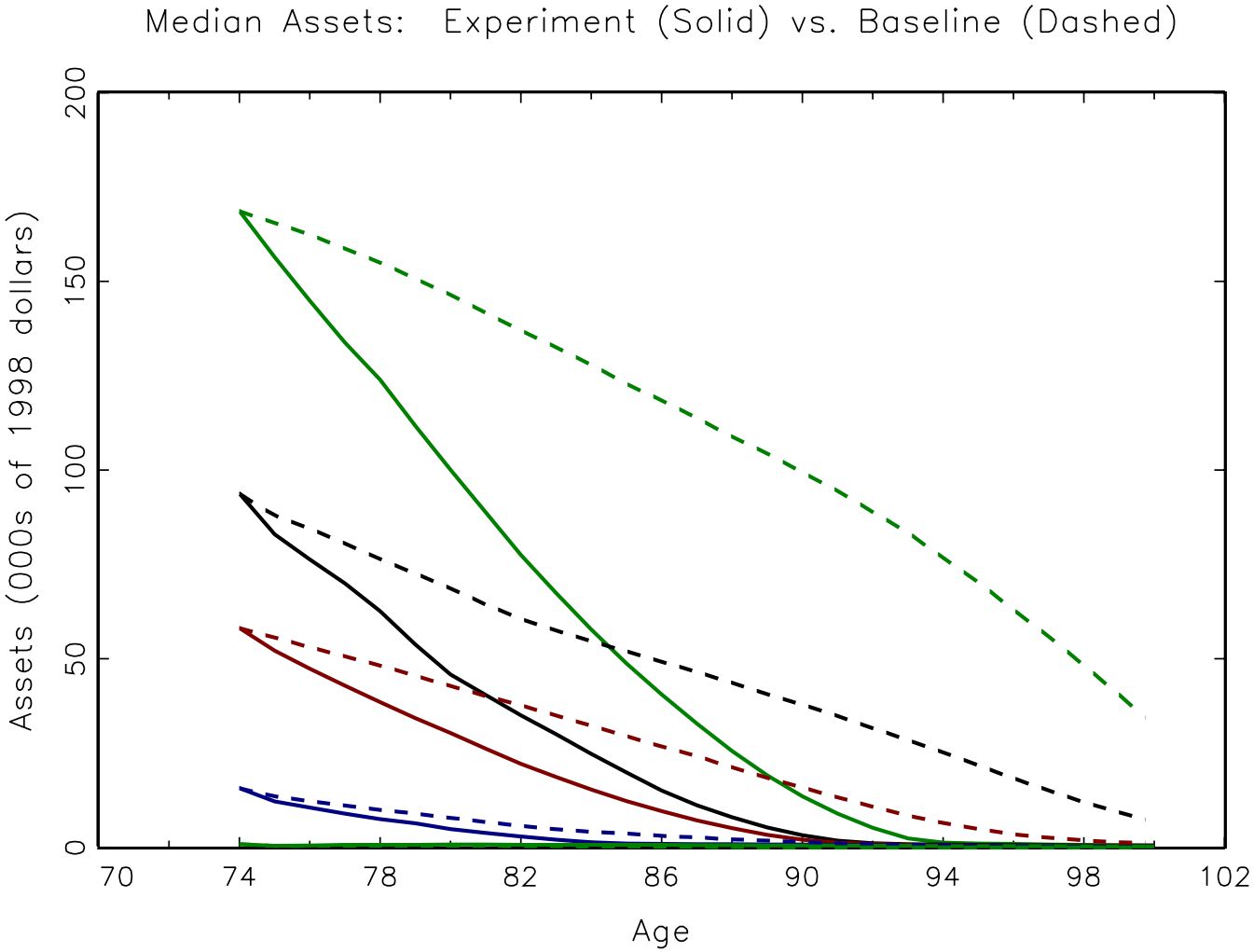
Summary of Estimates in Literature. Source: De Nardi, French, Jones, McGee

Plan

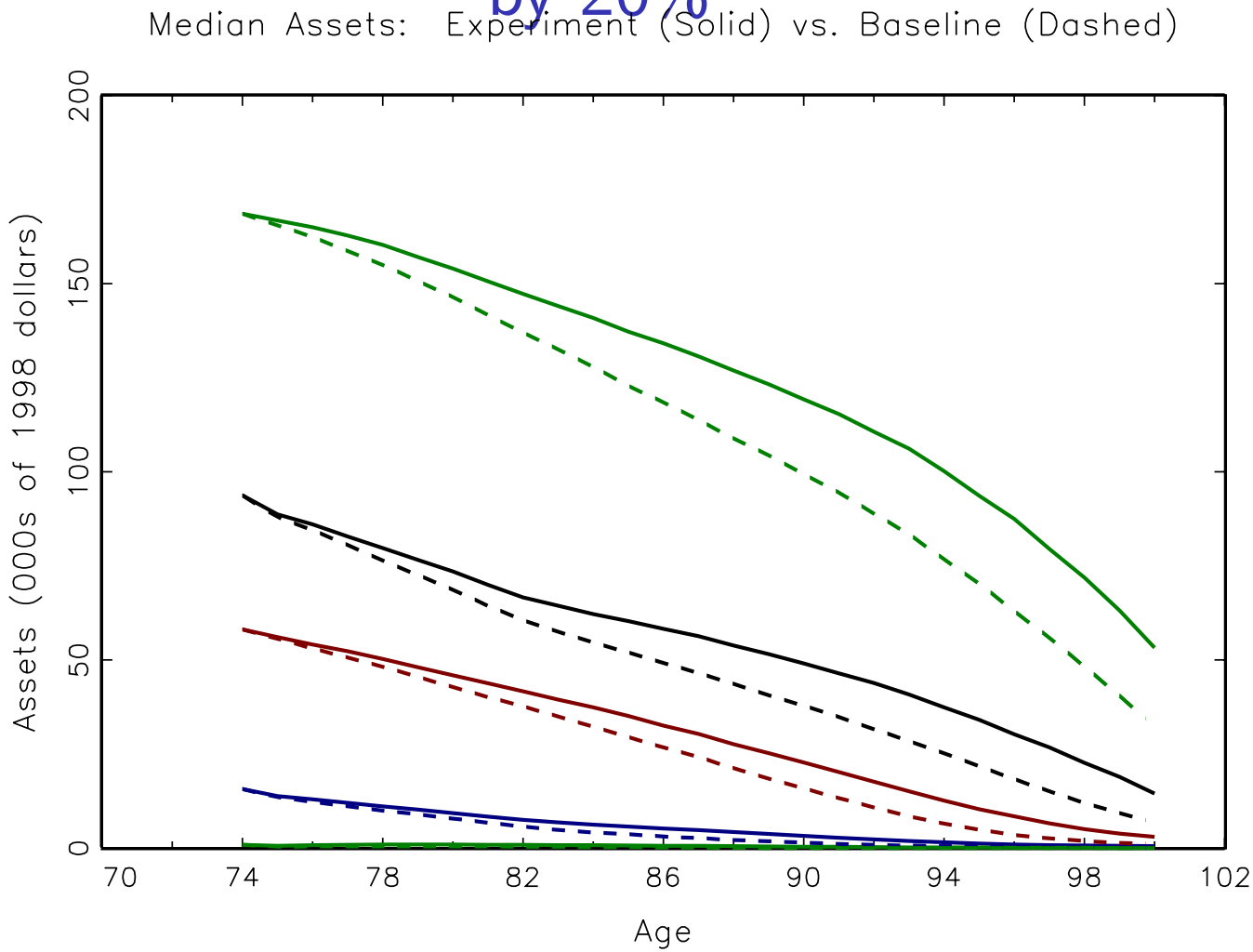
Experiments

- Fix preference parameters at baseline estimates, vary other parameters.
- Eliminating out-of-pocket medical expenditures has a big effect on savings.
- Lowering the consumption floor by 20% has a big effect on savings, even for the rich.

Benchmark and model with no medical expenditures



Benchmark and model with the consumption floor reduced by 20%



Making medical expenditures endogenous

- Retirees receive utility from medical goods.
- Medical expenses do not affect health and/or survival: RAND experiment (Brook et al., 1983); Fisher et al. (2003); Finkelstein and McKnight (2005); Khwaja (2009).

Nursing home quality varies a lot

Endogenous medical expenditure model

- Flow utility:

$$u(c_t, m_t, h_t, \zeta_t, \xi_t, t) = \frac{1}{1-\nu} c_t^{1-\nu} + \mu(t, h_t, \zeta_t, \xi_t) \frac{1}{1-\omega} m_t^{1-\omega},$$

$\mu(\cdot)$: medical "preference shifter"
m_t : **total** medical expenditures
$q(t, h_t)m_t$: out-of-pocket medical expenditures

Endogenous medical expenditure model

- Flow utility:

$$u(c_t, m_t, h_t, \zeta_t, \xi_t, t) = \frac{1}{1-\nu} c_t^{1-\nu} + \mu(t, h_t, \zeta_t, \xi_t) \frac{1}{1-\omega} m_t^{1-\omega},$$

  $\mu(\cdot)$: medical "preference shifter"
  m_t : **total** medical expenditures
  $q(t, h_t)m_t$: out-of-pocket medical expenditures

- Transfers: set to guarantee a minimum level of utility, and thus depend on $\mu(\cdot)$:

$$b(t, a_t, g, h_t, I, \zeta_t, \xi_t) = \max\{0, b^*(t, a_t, g, h_t, I, \zeta_t, \xi_t)\}.$$

Expanded estimation

- In addition to matching asset profiles, we now match:
  - mean and 90^{th} percentile of medical spending, conditional on age and permanent income
  - 1^{st} and 2^{nd} autocorrelations of logged medical spending

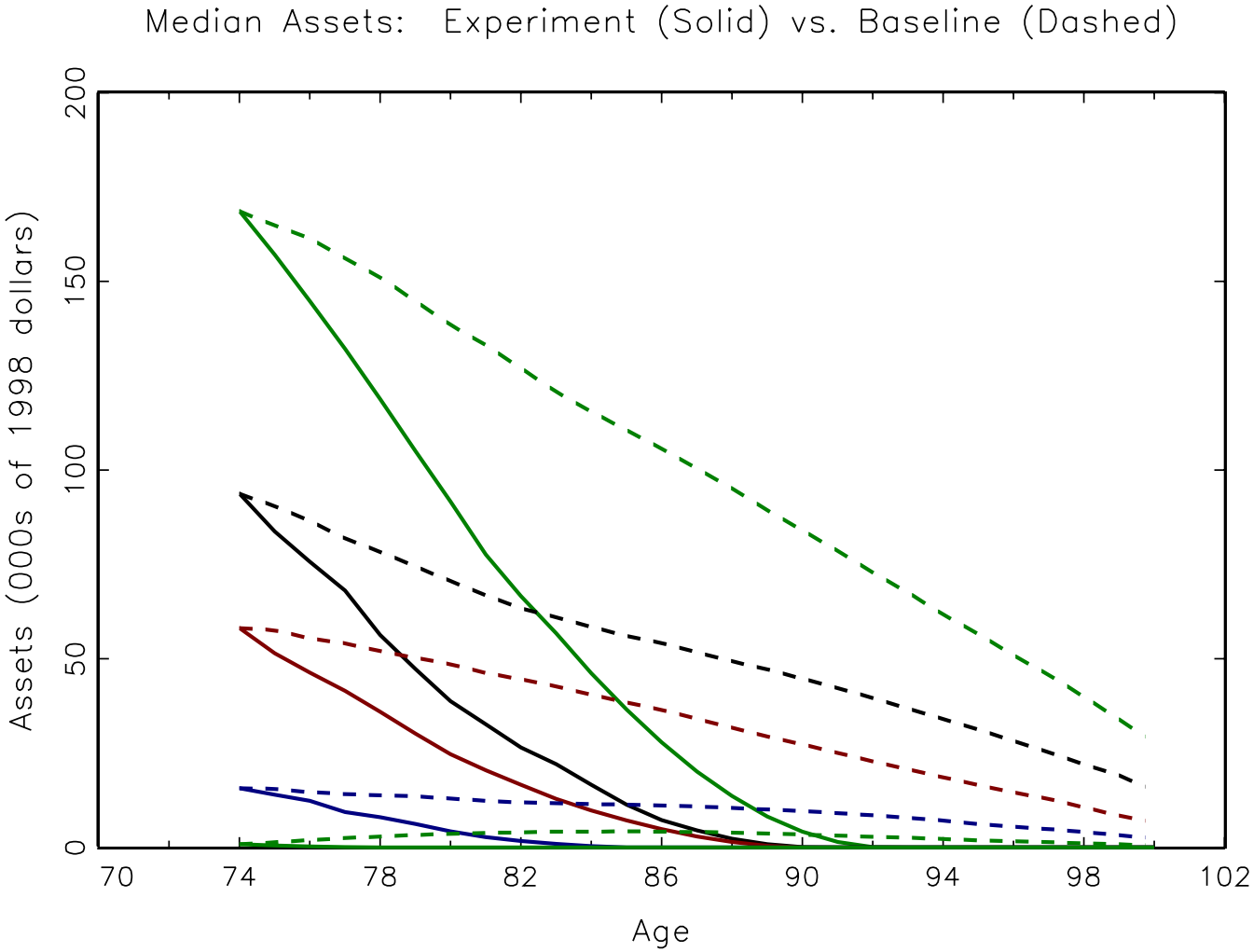
Results for endogenous expenditure model

- Estimated parameters: $\nu = 2.15$; $\omega = 3.19$; $\beta = 0.99$
- Model does a reasonable job of fitting the asset data.
- Model fits the medical expenditure data well.

Results for endogenous expenditure model

- Estimated parameters: $\nu = 2.15$; $\omega = 3.19$; $\beta = 0.99$
- Model does a reasonable job of fitting the asset data.
- Model fits the medical expenditure data well.
- **Medical spending is still important:** Eliminating out-of-pocket medical expenditures still has a big effect on savings.
- The effect of reducing the consumption floor is smaller than before, but still important at all income levels.

Benchmark and model with no medical expenditures



Effects of reducing the consumption floor

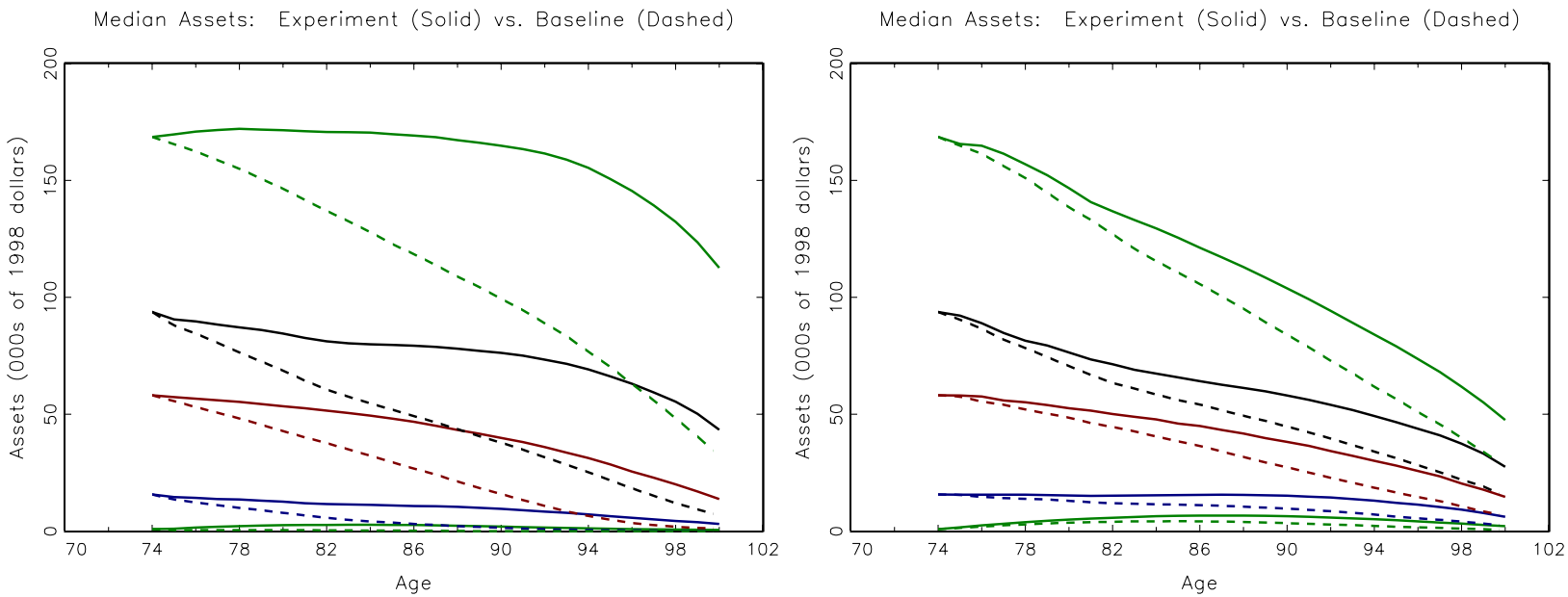


Figure: Median assets: baseline and model with 50% of the consumption floor for the exogenous (left panel) and endogenous (right panel) medical expense models.

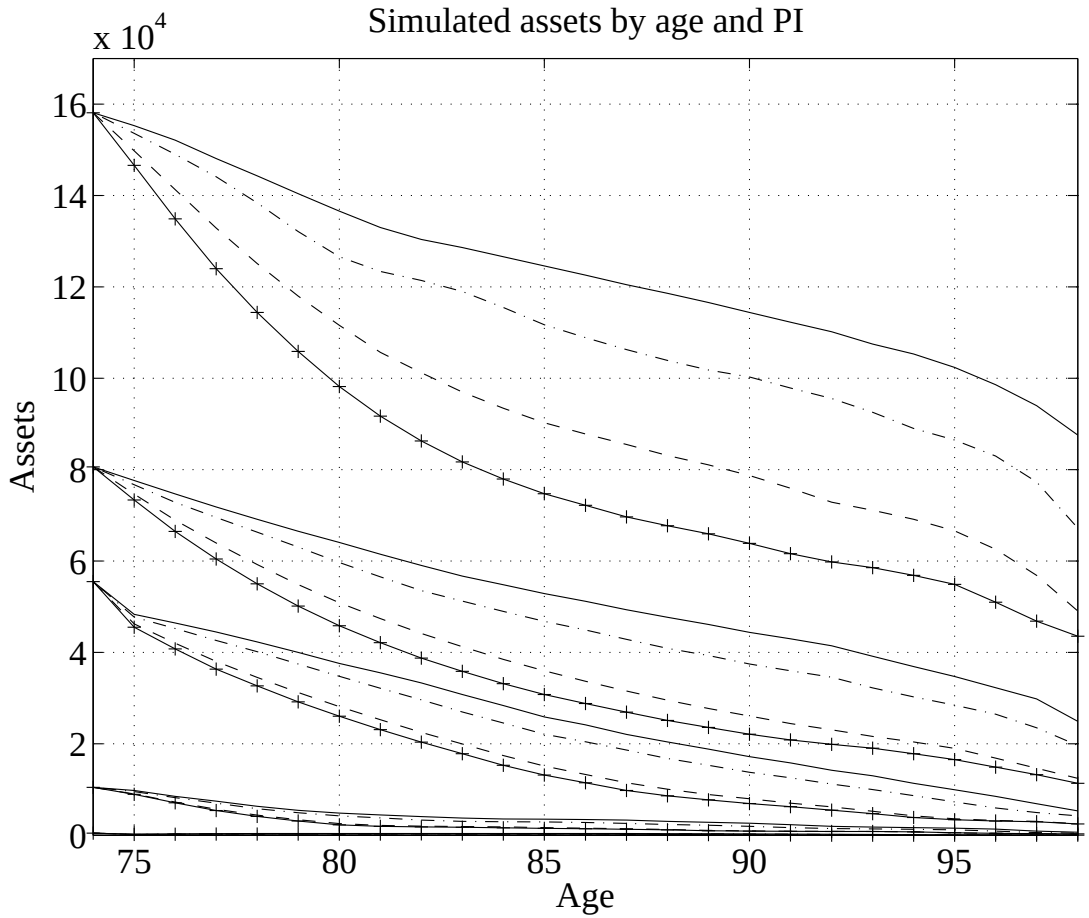
Conclusions from DFJ (2010)

- Medical spending that rises fast with income and age goes a long way to explaining savings of single retirees
- Social insurance (from Medicaid) affects savings even of the high income
- Above results robust to allowing for
  - Endogenous medical spending
  - Bequest motives

Life expectancy and old age savings, AER 2009

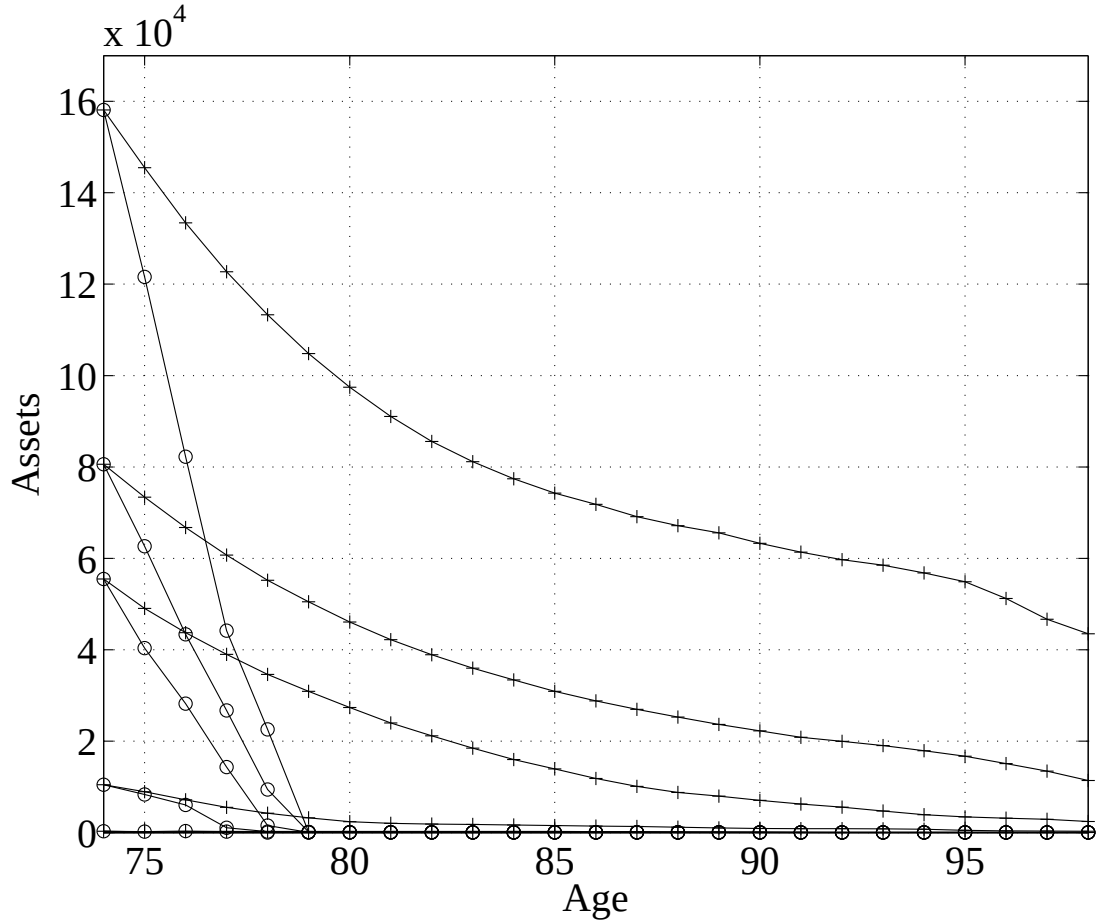
How much of the asset accumulation of old rich people is due to longer life expectancy and lifespan risk?

Median net worth, various mortalities



Notes: —-: baseline. – · –: everyone in bad health. – –: everyone male and in bad health. –+—+–: everyone low permanent income, male, and in bad health.

Median net worth: eliminating lifespan risk



Notes: −+—+−: everyone low permanent income, male, and in bad health. −⊖−: everyone low permanent income, male, in bad health, and with a certain lifespan.

Conclusions about life expectancy and savings

- Differences in life expectancy related to health, gender, and permanent income are important to understanding savings patterns across groups
- The effect of each factor is of a similar order of magnitude
- At realistic levels of annuitization the risk of living beyond one's expected lifespan has huge effects on saving

Distinguishing precautionary motives versus bequest motives

- Focus on groups where we think might have a stronger bequest motive
  - Hurd (1987, 1989): those with and without children have similar asset decumulation rates

Distinguishing precautionary motives versus bequest motives

- Focus on groups where we think might have a stronger bequest motive
  - Hurd (1987, 1989): those with and without children have similar asset decumulation rates
- Discipline the importance of precautionary motives using insurance choices
  - Idea: strong precautionary motives $\Rightarrow$ strong demand for insurance
  - Examples: De Nardi, French, Jones (2016), Lockwood (2018).
  - But lots of reasons people do not purchase insurance (Braun et al. (2019)).

Distinguishing precautionary motives versus bequest motives

- Focus on groups where we think might have a stronger bequest motive
  - Hurd (1987, 1989): those with and without children have similar asset decumulation rates
- Discipline the importance of precautionary motives using insurance choices
  - Idea: strong precautionary motives $\Rightarrow$ strong demand for insurance
  - Examples: De Nardi, French, Jones (2016), Lockwood (2018).
  - But lots of reasons people do not purchase insurance (Braun et al. (2019)).
- Use stated preferences: answers to hypotheticals
  - Ameriks et al. (2018), Knoef and van Ooijen (2019)

Distinguishing precautionary motives versus bequest motives

- Focus on groups where we think might have a stronger bequest motive
  - Hurd (1987, 1989): those with and without children have similar asset decumulation rates
- Discipline the importance of precautionary motives using insurance choices
  - Idea: strong precautionary motives $\Rightarrow$ strong demand for insurance
  - Examples: De Nardi, French, Jones (2016), Lockwood (2018).
  - But lots of reasons people do not purchase insurance (Braun et al. (2019)).
- Use stated preferences: answers to hypotheticals
  - Ameriks et al. (2018), Knoef and van Ooijen (2019)
- Use transfer data prior to death
  - De Nardi, French, Jones, McGee (2021)

Distinguishing precautionary motives versus bequest motives

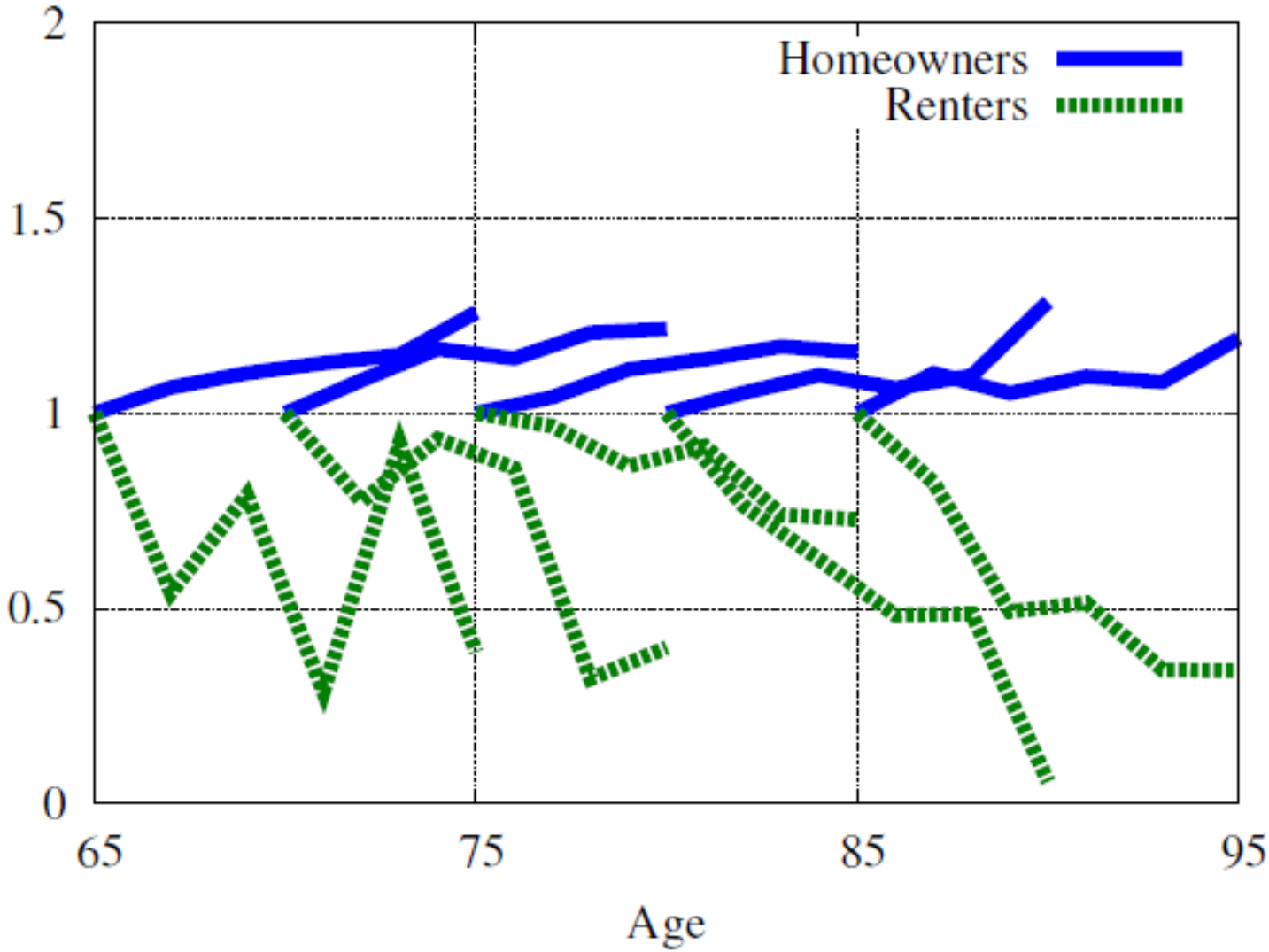
- Focus on groups where we think might have a stronger bequest motive
  - Hurd (1987, 1989): those with and without children have similar asset decumulation rates
- Discipline the importance of precautionary motives using insurance choices
  - Idea: strong precautionary motives $\Rightarrow$ strong demand for insurance
  - Examples: De Nardi, French, Jones (2016), Lockwood (2018).
  - But lots of reasons people do not purchase insurance (Braun et al. (2019)).
- Use stated preferences: answers to hypotheticals
  - Ameriks et al. (2018), Knoef and van Ooijen (2019)
- Use transfer data prior to death
  - De Nardi, French, Jones, McGee (2021)
- Focus on countries where precautionary motives unlikely to be important (Scandanavia)

Plan

Housing/home ownership

- Papers:
  - Yang (2009)
  - Nakajima and Telyuokova (2018)
  - McGee (2021)
  - Chang and Ko (2021)
- Findings: Housing/homeownership play a potentially important role that needs to be more fully understood.
- Key channels: (1) People like living in their own homes (2) it is expensive to sell/downsize (3) It is tax advantaged/shielded from means tested insurance programs

Median (normalized) housing, US



Source: Nakajima and Telyuokova (2018)

Median non-housing and housing wealth, US vs UK

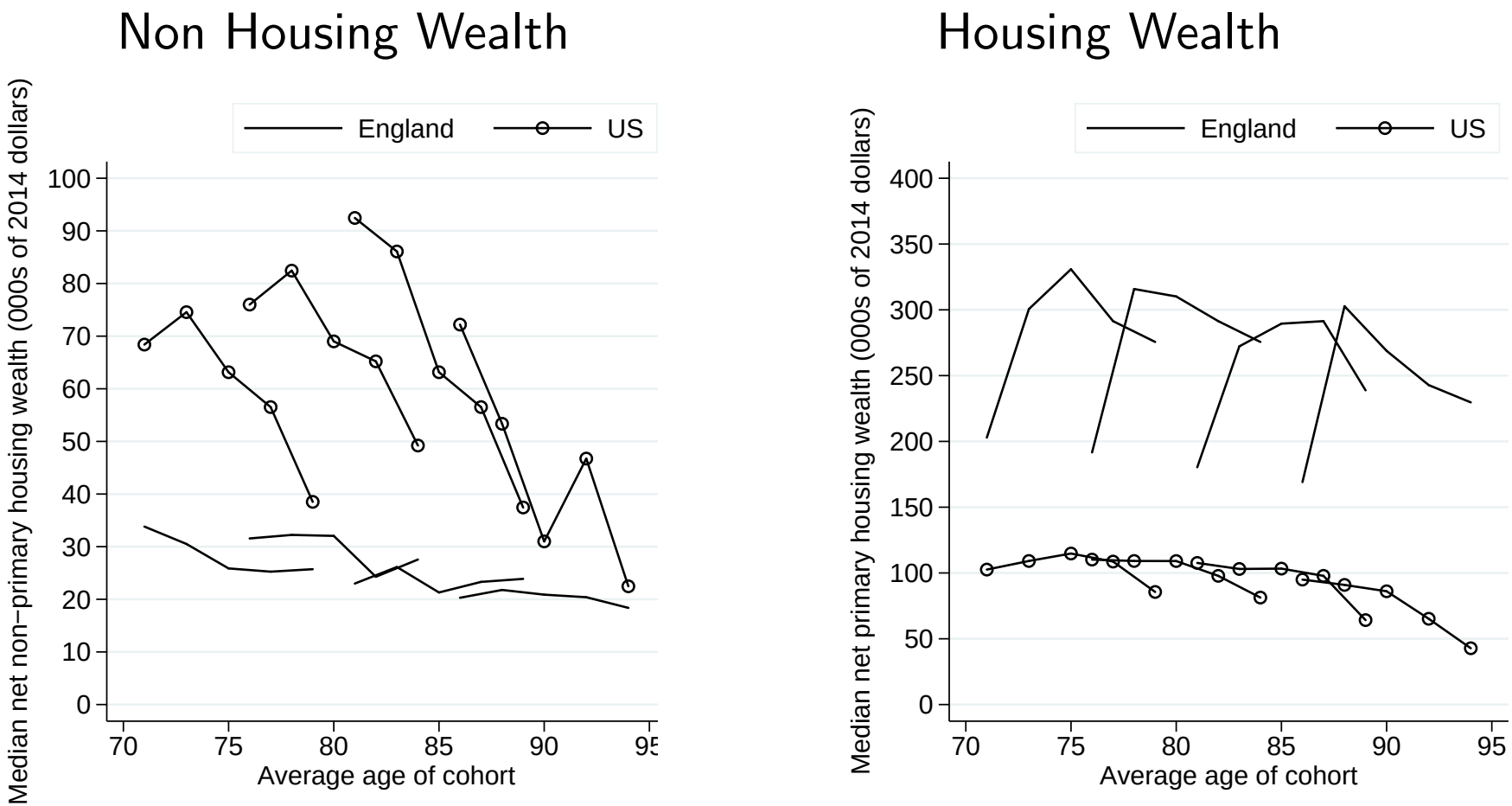
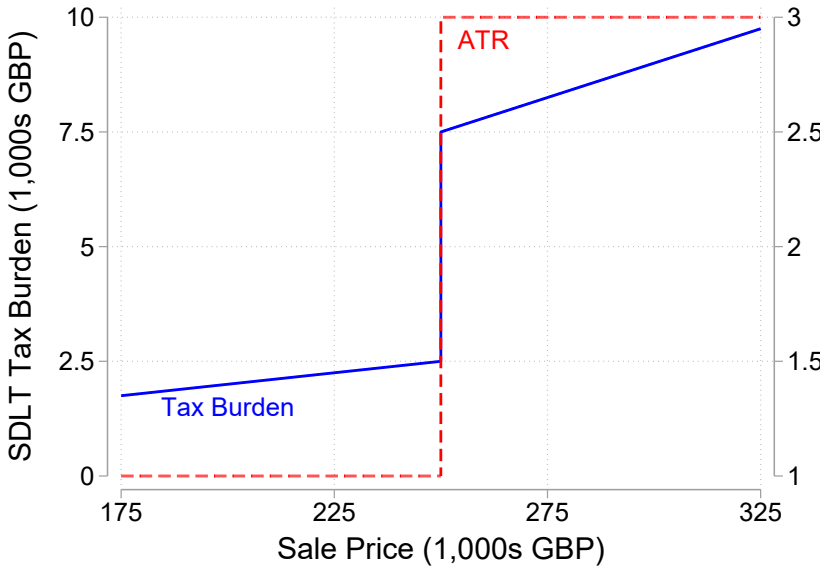


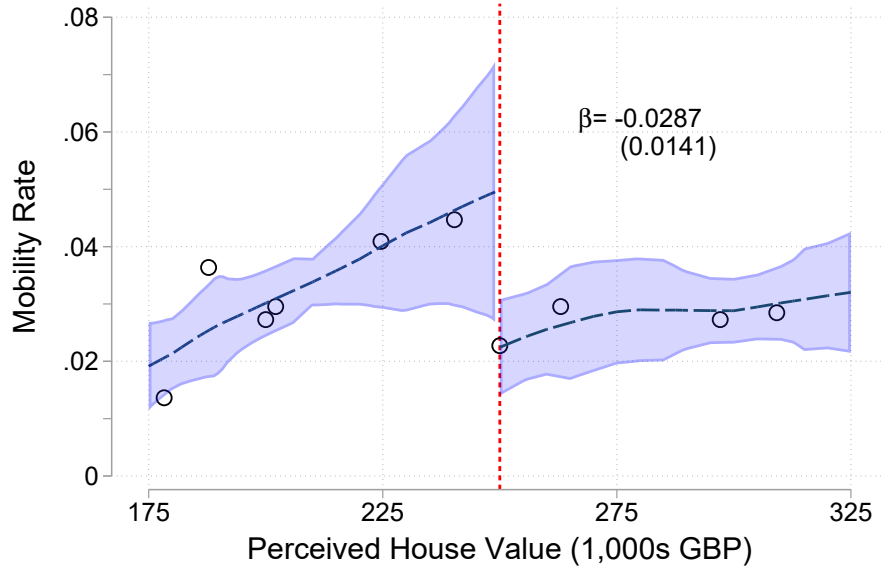
Figure: Blundell et al. (2016), 2002-2012, in thousands of 2014 dollars.

Estimating Adjustment Costs

- Adjustment costs are key for understanding why people hold onto their homes
- But they are very difficult to measure (utility versus monetary costs)

Identifying Adjustment Costs Using Price Changes





Using stamp duties to identify adjustment costs (McGee 2021)

Family structure

- Retirement:
  - Blau and Gilleskie (2008)
  - Casanova (2012)
  - Gallipoli and Turner (2010)
- Savings:
  - De Nardi, French, Jones, McGee (2021).

Some ideas for more research

- Evaluating more the role of the family and savings in various contexts. How should we model the family? How does the family affects risks and insurance?
- Do children help parents? Do they do it for money? Are bequests for altruism or exchange?
- Cross-country comparisons.