“Housing in Medicaid: Should it Really Change?”

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Online Appendix

Section A provides further details on the computation of Medicaid. Section B describes the solution to the intratemporal problem of allocating spending between consumption, medical consumption and housing. Section C describes how a reverse-mortgage-type loan is introduced in the model and how it is calibrated. Section D describes the model with exogenous medical expenditures. Section E provides additional details about the estimation. Section F presents the fit for the full set of targeted moments for the baseline specification. Section G provides additional details on the identification of the model. Section H discusses the robustness specifications and presents the results of the counterfactuals for them. Section I describes the model when individuals have time to adjust to the policy change and presents the counterfactual results in this case. Section J describes the computational method. Section K highlights that the low elasticity of medical consumption that I find is globally in line with the estimation results from the strategic survey questions in Ameriks et al. (2020).

A Additional Details on Medicaid Computations

A.1 Medicaid for the medically needy in the community

For the medically-needy pathway and for those outside of nursing homes, the Medicaid transfer is given by:

$$Medicaid_t^{mn} = \max\left\{0; \underline{x}_{mn}^{c,h,m}\left(\mu\left(\cdot\right), p_t^m, hs_t\right) - \max\left\{A_t^{med} + y_t + y_t^b - \tau_t; \underline{x}_{mn}^{c,h}\left(hs_t\right)\right\}\right\}$$

where $\underline{x}_{mn}^{c,h,m}\left(\cdot\right)$ is the overall Medicaid floor and (see section IV.F) $\underline{x}_{mn}^{c,h}\left(\cdot\right)$ is the part of this floor intented to cover non-medical consumption.

The second max operator is intented to account for the fact that there is no SSI-like income transfer through this pathway. In particular, the formula shows that a retiree with counted assets and income below $\underline{x}_{mn}^{c,h}\left(\cdot\right)$ will receive a transfer only intended to cover medical needs, equal to $\underline{x}_{mn}^{c,h,m}\left(\cdot\right) - \underline{x}_{mn}^{c,h}\left(\cdot\right)$.

Hence, this retiree could end up consuming less than $\underline{x}_{mn}^{c,h}(\cdot)$. A retiree with counted assets and income above $\underline{x}_{mn}^{c,h}(\cdot)$ will first have to deplete these resources and then will receive a transfer allowing him/her to spend at least $\underline{x}_{mn}^{c,h}(\cdot)$ on non-medical goods.

A.2 Medicaid and borrowing

To prevent homeowners receiving Medicaid from having total spending $x_t^{c,h,m}$ larger than what is normally intended by the program when new borrowing is allowed, I impose the following constraints for the categorically-needy:

$$Medicaid_t = 0 \text{ if } x_t^{c,h,m} > \max\left\{\underline{Y}, \underline{x}_{cn}^{c,h,m}(\cdot)\right\} + y^d + \min\left\{A_d, \max\left\{0, \tilde{A}_t^{med}\right\}\right\}$$

and for the medically-needy:

$$Medicaid_t = 0 \text{ if } x_t^{c,h,m} > \underline{x}_{mn}^{c,h,m}(\cdot) + \min\left\{A_d, \max\left\{0, \tilde{A}_t^{med}\right\}\right\}$$

Without such constraints, Medicaid recipients could potentially borrow large amounts and cumulate it with Medicaid. Such withdrawal of housing equity may however be considered as additional income and could thus make them ineligible. These equations account for this in a parsimonious way. Medicaid recipients are nonetheless allowed to consume their countable assets below the asset disregard A_d on top of the expenditure floors which reflects the fact that they do not have to run down all their countable assets to qualify for Medicaid.

A.3 Medicaid expenditure floors

I here further detail how the Medicaid expenditure floors are set. First, Medicaid is assumed to target a minimum level of non-medical consumption spending $\underline{x}_k^{c,h}(hs_t)$ $(k = cn, mn)$, where the latter is possibly allowed to be different in the community and in nursing homes: $\underline{x}_k^{c,h}(hs_t) = \underline{x}_{k,\cancel{nh}}^{c,h}$ for those in the community and $\underline{x}_k^{c,h}(hs_t) = \underline{x}_{k,nh}^{c,h}$ for nursing home residents. Medicaid is further assumed to consider the case of a typical renter to determine the amount $\underline{x}_k^{c,h,m}(\cdot)$ for medical and non-medical consumption corresponding to $\underline{x}_k^{c,h}(hs_t)$. A typical renter spending $\underline{x}_k^{c,h}(hs_t)$ on non-medical goods would have $c_t = \omega \underline{x}_k^{c,h}(hs_t)$ and $\tilde{h}_t = (1-\omega)\underline{x}_k^{c,h}(hs_t)/r^h(ty)$. Plugging this into equation (3) allows to compute the required expenditure floors:

$$\begin{aligned}\underline{x}_{cn}^{c,h,m}\left(\mu(\cdot), p_t^m, hs_t\right) + y_d =& \underline{x}_{cn}^{c,h}(hs_t) + \left(q(hs_t)\, p_t^m\right)^{(\sigma-1)/\sigma} \mu(\cdot)^{1/\sigma} \\ & \times \left(\omega^\omega (1-\omega)^{1-\omega} r^h(ty)^{\omega-1}\right)^{(\gamma-1)/\sigma} \left(\underline{x}_{cn}^{c,h}(hs_t)\right)^{\gamma/\sigma}\end{aligned}$$

$$
\begin{aligned}
\underline{x}_{mn}^{c,h,m}\left(\mu\left(\cdot\right),p_t^m,hs_t\right) =& \underline{x}_{mn}^{c,h}\left(hs_t\right)+\left(q\left(hs_t\right)p_t^m\right)^{(\sigma-1)/\sigma}\mu\left(\cdot\right)^{1/\sigma} \\
&\times\left(\omega^{\omega}\left(1-\omega\right)^{1-\omega}r^h\left(ty\right)^{\omega-1}\right)^{(\gamma-1)/\sigma}\left(\underline{x}_{mn}^{c,h}\left(hs_t\right)\right)^{\gamma/\sigma}
\end{aligned}
$$

The setting of these floors follows the logic of the simple model in section IV.F. Consistently with reality, Medicaid transfers increase with medical needs $\mu\left(\cdot\right)$. Considering the case of a typical renter ensures that Medicaid payments are independent of tenure status.

B Solution to intratemporal problem

The Lagrangean for the intratemporal problem is:

$$
\begin{aligned}
\mathcal{L} =& \frac{\left(\left(1+\phi_o d_t^o\right)c_t^{\omega}\tilde{h}_t^{1-\omega}\right)^{1-\gamma}}{1-\gamma}+\mu\left(\cdot\right)\times\frac{m_t^{1-\sigma}}{1-\sigma} \\
&+\lambda\left(x_t^{c,h,m}-c_t-d_t^o\psi^h p^h\left(ty\right)h_t-\left(1-d_t^o\right)r^h\left(ty\right)h_t-q\left(hs_t\right)p_t^m m_t\right)
\end{aligned}
$$

We have the two first order conditions relative to c_t and m_t:

$$
\omega\left(1+\phi_o d_t^o\right)c_t^{\omega-1}\tilde{h}_t^{1-\omega}\left(\left(1+\phi_o d_t^o\right)c_t^{\omega}\tilde{h}_t^{1-\omega}\right)^{-\gamma}=\lambda
$$

$$
\mu\left(\cdot\right)\times m_t^{-\sigma}=q\left(hs_t\right)p_t^m\lambda
$$

Implying:

$$
\begin{aligned}
q\left(hs_t\right)p_t^m\omega\left(1+\phi_o d_t^o\right)^{1-\gamma}c_t^{\omega(1-\gamma)-1}\tilde{h}_t^{(1-\omega)(1-\gamma)} &= \mu\left(\cdot\right)\times m_t^{-\sigma} \\
\Rightarrow m_t^{\sigma} &= \frac{\mu\left(\cdot\right)}{\omega q\left(hs_t\right)p_t^m}\left(1+\phi_o d_t^o\right)^{\gamma-1}c_t^{1+\omega(\gamma-1)}\tilde{h}_t^{(1-\omega)(\gamma-1)} \\
\Rightarrow m_t &= \left[\frac{\mu\left(\cdot\right)}{\omega q\left(hs_t\right)p_t^m}\left(\left(1+\phi_o d_t^o\right)\tilde{h}_t^{1-\omega}\right)^{\gamma-1}c_t^{1+\omega(\gamma-1)}\right]^{1/\sigma}
\end{aligned}
$$

For a renter who could pick any housing size, we further have the first-order condition relative to :

$$
\begin{aligned}
\left(1-\omega\right)c_t^{\omega}\tilde{h}_t^{-\omega}\left(c_t^{\omega}\tilde{h}_t^{1-\omega}\right)^{-\gamma} &= \lambda r^h\left(ty\right) \\
\Rightarrow\frac{c_t}{\tilde{h}_t} &= \frac{\omega}{1-\omega}r^h\left(ty\right)
\end{aligned}
$$

From this we can compute c_t and $\tilde{h}_t$ in nursing home for a given x_t^{nh}:

$$
\begin{aligned}
c_t =& \omega x_t^{nh} \\
\tilde{h}_t =& \left(1-\omega\right)x_t^{nh}/r^h\left(ty\right)
\end{aligned}
$$

From this we can compute the corresponding m_t:

$$
\begin{aligned}
m_t &= \left[\frac{\mu(\cdot)}{\omega q(hs_t)p_t^m}\left(\frac{(1-\omega)x_t^{nh}}{r^h(ty)}\right)^{(1-\omega)(\gamma-1)}\left(\omega x_t^{nh}\right)^{1+\omega(\gamma-1)}\right]^{1/\sigma} \\
\Rightarrow m_t &= \left[\frac{\mu(\cdot)}{\omega q(hs_t)p_t^m}\left(\frac{(1-\omega)}{r^h(ty)}\right)^{(1-\omega)(\gamma-1)}(\omega)^{1+\omega(\gamma-1)}\left(x_t^{nh}\right)^{(1-\omega)(\gamma-1)+1+\omega(\gamma-1)}\right]^{1/\sigma} \\
\Rightarrow m_t &= \left[\frac{\mu(\cdot)}{q(hs_t)p_t^m}\left(\frac{(1-\omega)}{r^h(ty)}\right)^{(1-\omega)(\gamma-1)}\omega^{\omega(\gamma-1)}\left(x_t^{nh}\right)^{\gamma}\right]^{1/\sigma} \\
\Rightarrow m_t &= \left[\frac{\mu(\cdot)}{q(hs_t)p_t^m}\left((1-\omega)^{(1-\omega)}\omega^{\omega}r^h(ty)^{(\omega-1)}\right)^{(\gamma-1)}\left(x_t^{nh}\right)^{\gamma}\right]^{1/\sigma}
\end{aligned}
$$

C Reverse Mortgages

This section describes how a reverse mortgage is introduced in the model and its calibration.

C.1 Modeling of reverse mortgages

Reverse Mortgages enter as an additional state variable RM_{t-1} indicating whether the retiree has a reverse mortgage. The constraints for those not using reverse mortgages are unchanged.

C.1.1 Homeowners getting a reverse mortgage

First, we consider the case of a homeowner who did not have a reverse mortgage ($RM_{t-1} = 0$) and decides to get one ($RM_t = 1$). To do so, she must not sell her home and needs to have $hs_t \neq nh$. She also has to pay a fixed transaction cost $\phi^{RM} p^h(ty) h_t$ which enters as an additional term on the right-hand side of (7) in the main text. In exchange, she faces the borrowing constraint:

$$b_t \geq -d_t^o \lambda_t^{RM} p^h(ty)\, h_t$$

instead of (6) in the main text. The interest of getting a reverse mortgage is that λ_t^{RM} is growing over time. However, in addition to the fixed cost, the extra interest rate on reverse mortgages μ^{RM} is larger than the one on standard forward mortgages μ. Hence, a reverse mortgage gives access to a looser borrowing constraint but this comes at a cost.

C.1.2 Homeowners with a reverse mortgage

For a homeowner who already had a reverse mortgage in the previous period ($RM_{t-1} = 1$), the budget constraint is:

$$\begin{aligned} b_t &= (1 - d_t^s) \left(R + \mu^{RM} \mathbf{1} \left\{ b_{t-1} < 0 \right\} \right) b_{t-1} \\ &+ d_t^s \max \left\{ \left(R + \mu^{RM} \mathbf{1} \left\{ b_{t-1} < 0 \right\} \right) b_{t-1} + p^h(ty) h_{t-1} \left(1 - \kappa_p \right) ; 0 \right\} \\ &+ y_t - \tau_t + Medicaid_t - x_t^{c,h,m} \end{aligned}$$

Compared to the equations in the main text, the first line simply indicates that a non-selling homeowner inherits her past debt or liquid assets. The second line makes explicit that reverse mortgages are non-recourse loans, i.e. the maximum repayment is bounded by the resale value of the home. Finally, if the homeowner does not sell her home the borrowing constraint is:

$$b_t \geq \min \left\{ -p^h \left(ty \right) h_t \lambda_t^{RM} ; \left(R + \mu^{RM} \right) b_{t-1} \right\}$$

It indicates that a reverse mortgage does not have to be repaid even if the previous loan balance plus interests gets larger than $p^h \left(ty \right) h_t \lambda_t^{RM}$. At this point, the line of credit just grows at the interest rate and, although the retiree cannot use the reverse mortgage to finance additional consumption anymore, she does not have to make payments on the loan.

C.1.3 Reverse mortgages and nursing home stays

A homeowner with a reverse mortgage and who moves to nh is constrained to repay her reverse mortgage, up to the limit of the resale value of her home. In most cases, this is done by selling the home but I also allow it to occur by paying the loan balance with pension income.

C.1.4 Medicaid

For Medicaid, introducing reverse mortgages changes only the formula for assets $\tilde{A}_t^{med}$ considered in Medicaid's asset-test:

$$\tilde{A}_t^{med} = \begin{cases} \mathbf{1}\left\{b_{t-1} \geq 0\right\} Rb_{t-1} + \overline{ph}_t^{med} & \text{if } d_{t-1}^o = 0 \text{ or } d_t^o = 1 \\ \max\Big\{ \left(R + \mu \times \mathbf{1}\left\{b_{t-1} < 0\right\}\right) b_{t-1} & \text{if } d_t^s = 1 \text{ and } RM_{t-1} = 0 \\ +p^h(ty)h_{t-1}\left(1-\kappa_p\right); 0\Big\} & \\ \max\Big\{ \left(R + \mu^{RM} \times \mathbf{1}\left\{b_{t-1} < 0\right\}\right) b_{t-1} & \text{if } d_t^s = 1 \text{ and } RM_{t-1} = 1 \\ +p^h(ty)h_{t-1}\left(1-\kappa_p\right); 0\Big\} & \end{cases}$$

C.1.5 Bequests

With reverse mortgages, the formula for bequests is:

$$\begin{aligned} Beq_{t+1} = \max\Big\{ & \left(R + \left(\mu\left(1 - RM_t\right) + \mu^{RM} RM_t\right) \mathbf{1}\left\{b_t < 0\right\}\right) b_t \\ & + p^h(ty+1)h_t\left(1-\kappa_p\right); 0\Big\} \end{aligned}$$

C.2 Parametrization of reverse mortgages

For reverse mortgages, I set the fixed cost ϕ_{RM} and the extra interest μ_{RM} to 5% and 1.7%. These numbers are from Nakajima and Telyukova (2017) but do not include the cost of the reverse mortgage loan insurance. Including it would result in a fixed cost and an interest rate 2 and 1.3 percentage points higher, which would make reverse mortgages worse substitutes for the homestead exemption. The constraint is based figures from the brochure "Reverse Mortgage Loans: Borrowing Against your Home" by the AARP and imposing $\lambda_t^{RM} \leq 0.8$. Figure C.1 plots the collateral constraint for the reverse mortgage which loosens with age.

D The model with exogenous medical spending

With exogenous medical spending, the latter are given by:

$$\ln m_t = \overline{\mu}\left(t, hs_t, gen, I\right) + \overline{\varsigma}\left(t, hs_t, gen, I\right)\varepsilon_t$$

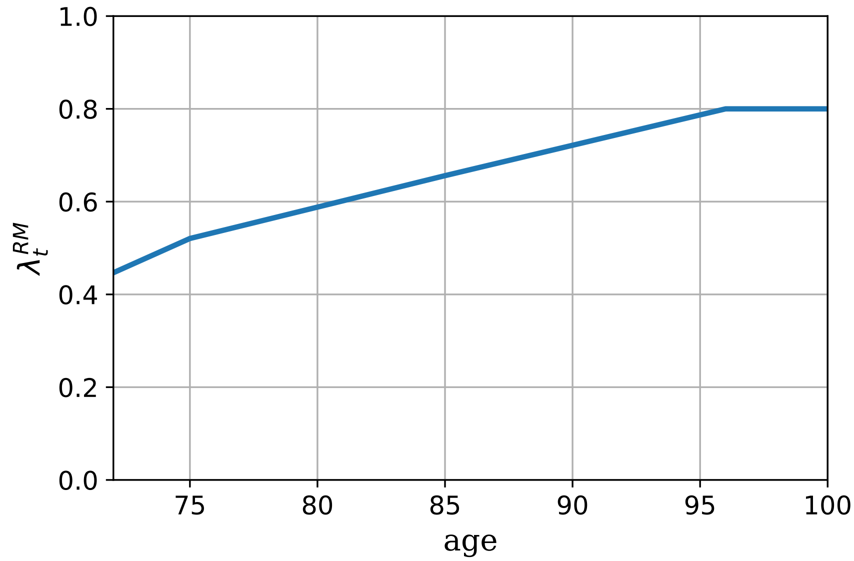


Figure C.1: Collateral constraint for reverse mortgages

With $\overline{\mu}(t, hs_t, gen, I)$ and $\log \overline{\varsigma}(t, hs_t, gen, I)$ being a function of the same variables as in the model with endogenous medical spending, and of pension permanent income quintile.

For retirees living in the community, utility is given by:

$$U(\cdot) = \frac{\left(\left(1 + \phi_o d_t^o\right) c_t^{\omega} \tilde{h}_t^{1-\omega}\right)^{1-\gamma}}{1-\gamma} \tag{D.1}$$

which is the same as for the endogenous case except for the medical part, which is absent here. Expenditures in this case are given by:

$$x_t^{c,h,m} = c_t + d_t^o \psi^h p^h (ty) h_t + (1 - d_t^o) r^h (ty) h_t + m_t$$

in which m_t is exogenous.

In nursing home, utility is given by:

$$U(\cdot) = \frac{\left(c_t^{\omega} \tilde{h}_t^{1-\omega}\right)^{1-\gamma}}{1-\gamma}$$

and we have:

$$x_t^{c,h,m} = x_t^{c,h} + d_t^o \psi^h p^h (ty) h_t + m_t$$
$$c_t = \omega \left(\underline{x}_{nh}^{c,h} + x_t^{c,h}\right)$$

$$\tilde{h}_t = (1-\omega)\left(\underline{x}_{nh}^{c,h} + x_t^{c,h}\right)/r^h\,(ty)$$

with $\underline{x}_{nh}^{c,h}$ the baseline level of consumption provided by a nursing home, which also corresponds to the spending-equivalent floor provided by Medicaid in nursing home.

Medicaid transfers are computed in a similar fashion as in the endogenous case, except that the overall expenditure floors are the sum of the expenditure floors for consumption and housing plus exogenous medical spending (vs endogenous for the model with endogenous medical spending).

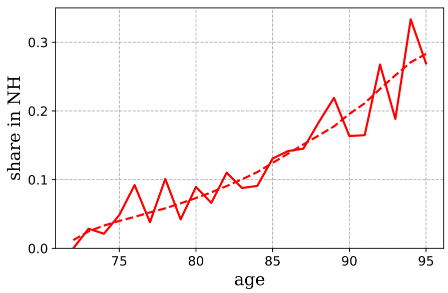
E Estimation

E.1 Additional results about health-transition matrices

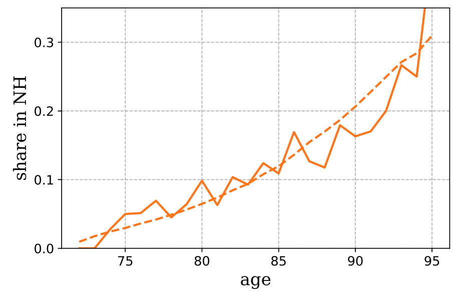
Figure E.1 plots the fraction of those in nursing home by age and income quintile. The solid lines use the true data, while the dotted lines use simulated data based on my estimated transition matrix. Figure E.2 is similar but plots the share of those with low disability (i.e. with 0 or 1 difficulty with ADLs). From these figures, we see that the transition matrix is successful not only in replicating the health patterns by age in the data, but also in replicating these health patterns by age separately for the different permanent income quintiles.

Table E.1 shows the life expectancy at 72 implied by the transition matrix. The implied (remaining) life expectancy is 12.2 years for females and 9.0 years for men. In comparison, De Nardi et al. (2016) find life expectancies at age 70 of 13.5 and 9.7 years respectively for men and women. According to Arias (2012), in 2008, life expectancy for females was 16.2 and 14.7 years at 70 and 72. For males the figures are 13.9 and 12.6 years respectively. So according to these figures, years of life expectancy decline by 9.25% $(1-14.7/16.2)$ and by 9.35% $(1-12.6/13.9)$ between 70 and 72 for females and males respectively. Applying these percentage declines to the figures in De Nardi et al. (2016) gives life expectancies at 72 of 12.3 and 8.8 respectively, which is in line with the figures I get.[1]

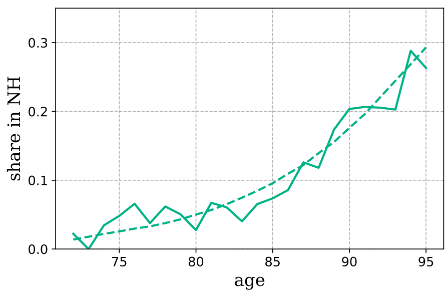
[1] Unsurprisingly, life expectancy generally increases with income. Life expectancy here is lower than for the whole US population as I consider only singles (see De Nardi et al. (2016)).



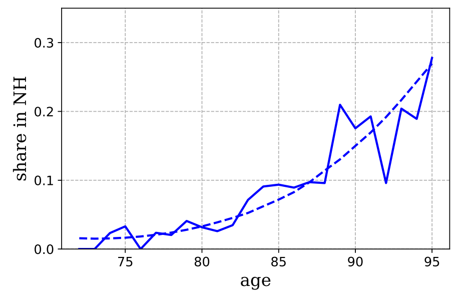
(a) Bottom income quintile



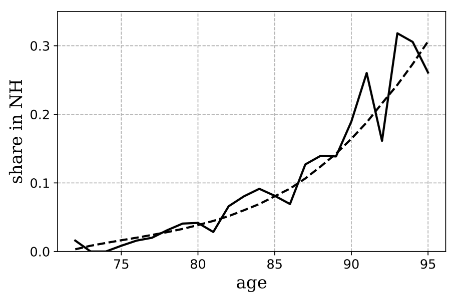
(b) Second income quintile



(c) Third income quintile



(d) Fourth income quintile



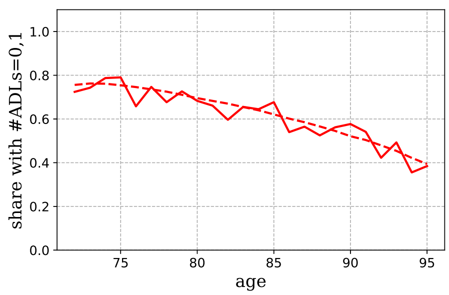
(e) Top income quintile

Figure E.1: Share in nursing home by income: data vs simulated

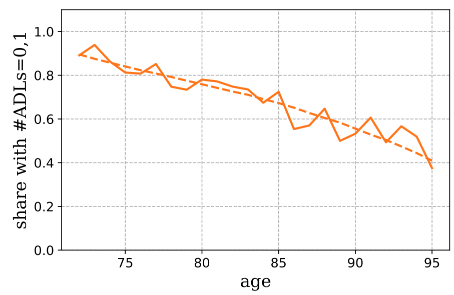
Notes: Solid lines: data ; dotted lines: simulated using estimated transition matrix and health distribution between 70 and 74.

Table E.1: Transition matrix implications for life expectancy at 72

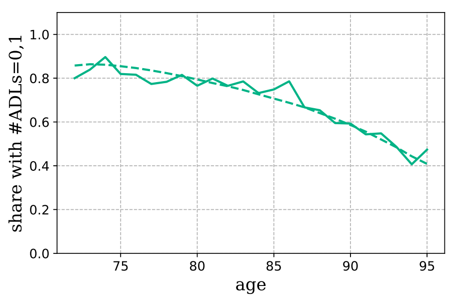
		Income quintile				
	All	Bottom	2	3	4	Top
female	12.2	9.2	11.4	12.0	13.9	13.8
male	9.0	6.4	8.1	8.7	8.9	10.2



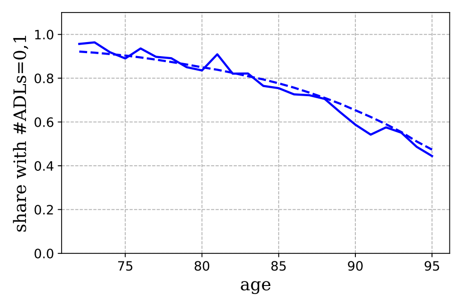
(a) Bottom income quintile



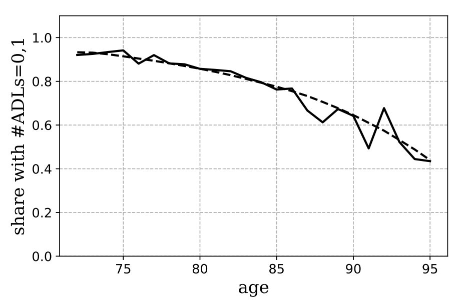
(b) Second income quintile



(c) Third income quintile



(d) Fourth income quintile



(e) Top income quintile

Figure E.2: Share with low disability: data vs simulated

Notes: Solid lines: data ; dotted lines: simulated using estimated transition matrix and health distribution between 70 and 74.

E.2 Variables definitions for second stage

First of all, we need to determine the model counterparts of the variables we are targeting, although the timing of the interview in the data will never align perfectly with the timing in the model.

I assume that liquid wealth in year t is equal to ex-post liquid wealth in the model, that is liquid wealth that remains after all shocks have been observed and all decisions have been made. This is consistent with the fact that in the HRS we observe wealth at the time of the interview and out-of-pocket medical spending of the past two years. As a result:[2]

$$\text{liquid\_wealth}_t = b_t$$

I make similar assumptions for debt, homeownership and Medicaid recipiency:

$$\text{debt}_t = 1\{b_t < 0\}$$

$$\text{home\_ownership}_t = d_t^o$$

$$\text{receives\_medicaid}_t = 1\{Medicaid_t > 0\}$$

Medical expenditures in t are given by:

$$\text{med\_exp}_t = \begin{cases} q\left(hs_t\right) p_t^m m_t & \text{if } hs_t \neq nh \\ x_t^{c,h} + q\left(hs_t\right) p_t^m m_t & \text{if } hs_t = nh \end{cases}$$

so that I account for the fact that out-of-pocket medical spending on nursing homes also include the consumption and housing components.

In the HRS, we observe out-of-pocket medical expenditures of the last two years which I divide by 2 to have a yearly measure. The model counterpart of this out-of-pocket medical spending measure is given by:

$$\text{oop\_med\_exp}_t = \frac{1}{2}\sum_{j=0}^{1} \max\left\{0; \text{med\_exp}_{t-j} - Medicaid_{t-j}\right\}$$

As in the first wave the model is simulated, we do not have simulations for the year before this first wave. As a result, all moments related to medical spending are computed only from wave 5 (the second HRS wave used in the estimation). As a result, moments related to the autocorrelation of medical spending are computed from wave 6.

[2] In the first wave of the data (corresponding to year 1998), we observe ex-post liquid wealth b_{1998}. In order to simulate decisions in year 1998, which requires ex-ante liquid wealth b_{1997}, I add the yearly average of out-of-pocket medical spending in the last two years to b_{1998} to get b_{1997}.

E.3 Inflated Medicaid recipiency rates

French et al. (2017) provide evidence that Medicaid rates are underreported in the HRS with respect to the MBCS, which is more reliable as based on administrative records. To account for this, I target "inflated" Medicaid recipiency rates. To construct these inflated Medicaid rates, I implement the following procedure:

1. I estimate the probability to declare to receive Medicaid in the HRS conditional on health dummies, permanent income quintile dummies and homeownership dummies using a logit model. Homeownership dummies are included so that homeownership rates conditional on receiving Medicaid are globally preserved in the data with inflated Medicaid rates. Permanent income and health dummies enable to maintain the permanent-income and health gradients for Medicaid recipiency.[3]

2. I then compute the predicted probability for each individual who *does not* receive Medicaid: $\hat{p}_{i,Medicaid}$

3. I also compute the average Medicaid recipiency rate by permanent income quintile I: $\hat{p}^I_{Medicaid}$

4. I then compute an inflated probability to receive Medicaid as follow:

$$\hat{p}^{inflated}_{i,Medicaid} = \pi_I \times \frac{\hat{p}^I_{Medicaid}}{1-\hat{p}^I_{Medicaid}} \times \frac{\hat{p}_{i,Medicaid}}{\frac{\sum_{i\in I}\hat{p}_{i,Medicaid}}{\sum_{i\in I}1}} = \pi_I \times \frac{\hat{p}^I_{Medicaid}}{1-\hat{p}^I_{Medicaid}} \times \hat{p}^{normalized}_{i,Medicaid}$$

   where π_I is a multiplicative factor based on French et al. (2017) (see below).

5. Each individual who does not receive Medicaid in the HRS draws ϵ_i from a uniform distribution between 0 and 1. If $\epsilon_i < \hat{p}^{inflated}_{i,Medicaid}$, the Medicaid recipiency status of the individual is changed to 1. It is 0 otherwise.

As a result of this procedure, asymptotically the inflated Medicaid rate within an income group is (with $\overline{x_i}$ denoting the average of x_i within a permanent

[3] Also, as health is strongly associated with age, including health dummies enables to preserve the age gradient of Medicaid recipiency.

income quintile):

$$\begin{aligned}
\hat{p}^{I,inflated}_{Medicaid} =& \hat{p}^{I}_{Medicaid} + \left(1 - \hat{p}^{I}_{Medicaid}\right) \times \overline{\hat{p}^{inflated}_{i,Medicaid}} \\
=& \hat{p}^{I}_{Medicaid} + \left(1 - \hat{p}^{I}_{Medicaid}\right) \times \pi_I \times \frac{\hat{p}^{I}_{Medicaid}}{1 - \hat{p}^{I}_{Medicaid}} \times \overline{\hat{p}^{normalized}_{i,Medicaid}} \\
=& \hat{p}^{I}_{Medicaid} + \left(1 - \hat{p}^{I}_{Medicaid}\right) \times \pi_I \times \frac{\hat{p}^{I}_{Medicaid}}{1 - \hat{p}^{I}_{Medicaid}} \\
=& \hat{p}^{I}_{Medicaid} \left(1 + \pi_I\right)
\end{aligned}$$

So, for a permanent income quintile, the inflated Medicaid rate is $\frac{\pi_I}{100}$% higher than the initial Medicaid rate in the HRS data. I choose π_I based on the relative differences in Medicaid rates between the MCBS and the HRS reported in table 8 of French et al. (2017). Specifically the values of $1 + \pi_I$ I use are: 69.9/60.9, 41.8/28.1, 15.5/11.1, 8.0/5.6 and 5.4/3.0 for the bottom to top permanent income quintiles respectively. In all the model section, the inflated Medicaid rates are used except if stated otherwise.

E.4 Second-stage estimation procedure

The methodology for the second stage similar to the one in the online appendix of De Nardi et al. (2016). I summarize briefly the minimization procedure here. For more details, the interested reader can refer to their online appendix.

Let $\boldsymbol{\Delta}$ be the vector of second stage parameters and $\boldsymbol{\chi}$ the vector of first stage parameters. For each simulated individual, we compute liquid_wealth$_t$, debt$_t$, home_ownership$_t$, receives_medicaid$_t$ and oop_med_exp$_t$ which are functions of $(\boldsymbol{\Delta}, \boldsymbol{\chi})$. From the simulated data, we can then compute:

- liquid_wealth$^{med}_{cht,t,I}\left(\boldsymbol{\Delta}, \boldsymbol{\chi}\right)$: the median liquid wealth of individuals in year t in cohort cht and income group I;
- liquid_wealth$^{75th}_{cht,t,I}\left(\boldsymbol{\Delta}, \boldsymbol{\chi}\right)$: the 75^{th} percentile of liquid wealth of individuals in year t in cohort cht and income group I;
- $\overline{home\_ownership}_{cht,t,I}\left(\boldsymbol{\Delta}, \boldsymbol{\chi}\right)$: the homeownership rate of individuals in year t in cohort cht and income group I;
- $\overline{home\_ownership}_{hs,t}\left(\boldsymbol{\Delta}, \boldsymbol{\chi}\right)$: the homeownership rate of individuals in health hs_t in year t;
- $\overline{receives\_medicaid}_{cht,t,I}\left(\boldsymbol{\Delta}, \boldsymbol{\chi}\right)$: the medicaid rate of individuals in year t in cohort cht and income group I;

- $\text{oop\_med\_exp}^{med}_{cht,t,I}(\boldsymbol{\Delta},\boldsymbol{\chi})$: the median out-of-pocket medical expenditures of individuals in year t in cohort cht and income group I;

- $\text{oop\_med\_exp}^{90th}_{cht,t,I}(\boldsymbol{\Delta},\boldsymbol{\chi})$: the median out-of-pocket medical expenditures of individuals in year t in cohort cht and income group I.

- $\overline{\text{oop\_mex\_exp}}_{hs,t}(\boldsymbol{\Delta},\boldsymbol{\chi})$ ($\overline{\text{oop\_mex\_exp}}_{gen,t}(\boldsymbol{\Delta},\boldsymbol{\chi})$): the mean out-of-pocket medical expenditures in year t of individuals with health state hs (respectively gender gen).

Let's denote $\text{liquid\_wealth}^{hrs}_{i,t}$, debt_t, $\text{home\_ownership}^{hrs}_{i,t}$, $\text{receives\_medicaid}^{hrs}_{i,t}$ and $\text{oop\_med\_exp}^{hrs}_{i,t}$ be the observed values for liquid_wealth_t, debt_t, home_ownership_t, $\text{receives\_medicaid}_t$ and oop_med_exp_t in the data for an individual i aged t (or in year ty). The different moment conditions at the true value $\boldsymbol{\Delta}_0$ and $\boldsymbol{\chi}_0$ for $\boldsymbol{\Delta}$ and $\boldsymbol{\chi}$ are of the form:[4]

$$E\Bigg(\left(\mathbf{1}\left\{\text{liquid\_wealth}^{hrs}_{i,t} \leq \mathit{liquid\_wealth}^{med}_{cht,t,I}(\boldsymbol{\Delta}_0,\boldsymbol{\chi}_0)\right\} - \frac{1}{2}\right) \times \mathbf{1}\{cht_i = cht\} \\ \times \mathbf{1}\{I_i = I\} \times \mathbf{1}\{i \text{ observed in } t\} | t\Bigg) = 0$$

$$E\Bigg(\left(\mathbf{1}\left\{\text{liquid\_wealth}^{hrs}_{i,t} \leq \mathit{liquid\_wealth}^{75th}_{cht,t,I}(\boldsymbol{\Delta}_0,\boldsymbol{\chi}_0)\right\} - \frac{3}{4}\right) \times \mathbf{1}\{cht_i = cht\} \\ \times \mathbf{1}\{I_i = I\} \times \mathbf{1}\{i \text{ observed in } t\} | t\Bigg) = 0$$

$$E\Bigg(\left(\text{home\_ownership}^{hrs}_{i,t} - \overline{\mathit{home\_ownership}}_{cht,t,I}(\boldsymbol{\Delta}_0,\boldsymbol{\chi}_0)\right) \times \mathbf{1}\{cht_i = cht\} \\ \times \mathbf{1}\{I_i = I\} \times \mathbf{1}\{i \text{ observed in } t\} | t\Bigg) = 0$$

$$E\Bigg(\left(\text{home\_ownership}^{hrs}_{i,t} - \overline{\mathit{home\_ownership}}_{hs,t}(\boldsymbol{\Delta}_0,\boldsymbol{\chi}_0)\right) \times \mathbf{1}\{hs_i = hs\} \\ \times \mathbf{1}\{i \text{ observed in } t\} | t\Bigg) = 0$$

[4] I omit the computation of the moment condition for the autocorrelation of medical spending by permanent income which is described in the appendix of De Nardi et al. (2016).

$$E\Bigg(\left(\text{receives\_medicaid}_{i,t}^{hrs} - \overline{receives\_medicaid}_{cht,t,I}\left(\boldsymbol{\Delta}_0, \boldsymbol{\chi}_0\right)\right) \times \mathbf{1}\left\{cht_i = cht\right\}$$

$$\times \mathbf{1}\left\{I_i = I\right\} \times \mathbf{1}\left\{i \text{ observed in } t\right\} |t \Bigg) = 0$$

$$E\Bigg(\left(\mathbf{1}\left\{\text{oop\_med\_exp}_{i,t}^{hrs} \leq \text{oop\_med\_exp}_{cht,t,I}^{med}\left(\boldsymbol{\Delta}_0, \boldsymbol{\chi}_0\right)\right\} - \frac{1}{2}\right) \times \mathbf{1}\left\{cht_i = cht\right\}$$

$$\times \mathbf{1}\left\{I_i = I\right\} \times \mathbf{1}\left\{i \text{ observed in } t\right\} |t \Bigg) = 0$$

$$E\Bigg(\left(\mathbf{1}\left\{\text{oop\_med\_exp}_{i,t}^{hrs} \leq \text{oop\_med\_exp}_{cht,t,I}^{90th}\left(\boldsymbol{\Delta}_0, \boldsymbol{\chi}_0\right)\right\} - \frac{9}{10}\right) \times \mathbf{1}\left\{cht_i = cht\right\}$$

$$\times \mathbf{1}\left\{I_i = I\right\} \times \mathbf{1}\left\{i \text{ observed in } t\right\} |t \Bigg) = 0$$

$$E\Bigg(\left(\text{oop\_med\_exp}_{i,t}^{hrs} - \overline{\text{oop\_mex\_exp}}_{hs,t}\left(\boldsymbol{\Delta}_0, \boldsymbol{\chi}_0\right)\right) \times \mathbf{1}\left\{hs_i = hs\right\}$$

$$\times \mathbf{1}\left\{i \text{ observed in } t\right\} |t \Bigg) = 0$$

$$E\Bigg(\left(\mathbf{1}\left\{\text{oop\_med\_exp}_{i,t}^{hrs} \leq \text{oop\_med\_exp}_{hs,t}^{90th}\left(\boldsymbol{\Delta}_0, \boldsymbol{\chi}_0\right)\right\} - \frac{9}{10}\right) \times \mathbf{1}\left\{hs_i = hs\right\}$$

$$\times \mathbf{1}\left\{i \text{ observed in } t\right\} |t \Bigg) = 0$$

$$E\Bigg(\left(\text{oop\_med\_exp}_{i,t}^{hrs} - \overline{\text{oop\_mex\_exp}}_{gen,t}\left(\boldsymbol{\Delta}_0, \boldsymbol{\chi}_0\right)\right) \times \mathbf{1}\left\{gen_i = gen\right\}$$

$$\times \mathbf{1}\left\{i \text{ observed in } t\right\} |t \Bigg) = 0$$

Assuming that the first-stage parameters are set to their true values, the J moment conditions above are stored in a $J \times 1$ vector $\boldsymbol{\varphi}_N\left(\boldsymbol{\Delta}, \boldsymbol{\chi}_0\right)$ where N is the number of individuals in the data. The estimated value for $\boldsymbol{\Delta}$ is given by:

$$\hat{\boldsymbol{\Delta}} = \text{argmin}_{\boldsymbol{\Delta}} \frac{N}{1 + \frac{N}{N_S}} \hat{\boldsymbol{\varphi}}_N\left(\boldsymbol{\Delta}, \boldsymbol{\chi}_0\right)' \hat{\boldsymbol{W}}_N \hat{\boldsymbol{\varphi}}_N\left(\boldsymbol{\Delta}, \boldsymbol{\chi}_0\right)$$

$\hat{\boldsymbol{W}}_N$ is the weighting matrix which is diagonal with each element being the inverse of the variance of the corresponding moment, and is estimated from the data.[5] $N_S = 20 \times N$ is the number of simulated individuals. The variance-covariance matrix of the estimated parameters and χ^2 statistics are computed in the usual way:

$$\boldsymbol{V} = \left(1 + \frac{N}{N_S}\right) \left(\boldsymbol{D}'\boldsymbol{W}\boldsymbol{D}\right)^{-1} \boldsymbol{D}'\boldsymbol{W}\boldsymbol{S}\boldsymbol{W}\boldsymbol{D} \left(\boldsymbol{D}'\boldsymbol{W}\boldsymbol{D}\right)^{-1} \tag{E.1}$$

with $\boldsymbol{D}$ is the gradient matrix and $\boldsymbol{S}$ is the variance-covariance matrix of the different moments. To find $\hat{\boldsymbol{\Delta}}$, I use a the a variant of the Tik-Tak algorithm described in Arnoud et al. (2019). I first conduct a grid search based on a sobol sequence.[6] In this step, I evaluate the model at 2,000 different vectors. I then run the BOBYQA algorithm developed by Powell (2009) from 20 different starting vectors.[7]

F Full set of moments for baseline specification

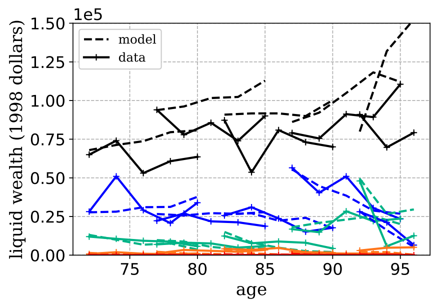
Figures F.1 shows the full set of moments for the baseline specification. Subfigure d shows that the model is successful in replicating homeownership rates by health status (each line on the figure corresponds to a wave). In particular, it replicates the fact that homeownership rates are much lower in nursing homes than in the community. Panel f shows that the model matches the limited debt rates in the data, although it tends to generate less person in debt than in the data as discussed in the text. Panels i, j and k show that the model does quite a good job at matching out-of-pocket medical spending by health and gender, and that it matches well the autocorrelation of medical spending by income.

Finally, table F.1 shows the estimates for medical needs. These parameters are usually quite tightly estimated. The estimated persistence of the medical needs shocks ε_t is 0.67 which is in line the autocorrelation moments in the data.

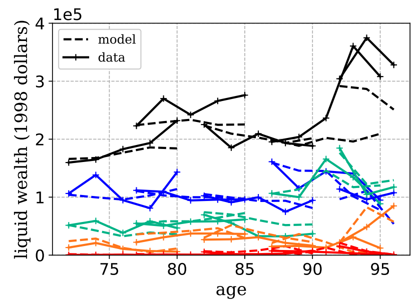
[5] I only keep the moments with a positive variance.

[6] The library sobol_seq0.1.2 was used: https://pypi.org/project/sobol_seq/.

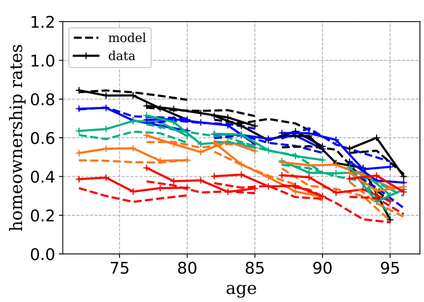
[7] I use the Py-BOBYQA package (Cartis et al., 2019). Previous estimations of the model were done using the Nelder-Mead simplex algorithm from the Scipy library. At the time I was going to run the final estimations for the paper, I found out about the paper by McGee (2019) who claim that the BOBYQA algorithm is usually faster than the Nelder-Mead simplex one. I thus did run both algorithms starting from the same (limited number of) vectors and I indeed found that in my case the BOBYQA algorithm converged significantly faster while giving as good results as the Nelder-Mead one. I am thankful to McGee (2019) for the hint as this has helped reduce estimation time.



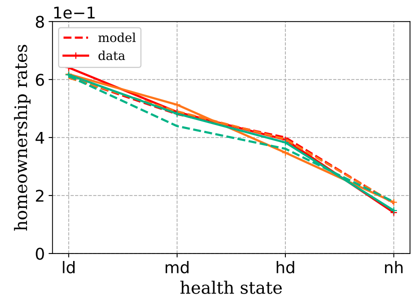
(a) Median liquid wealth



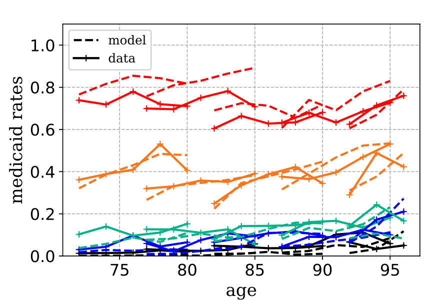
(b) 75^{th} percentile liquid wealth



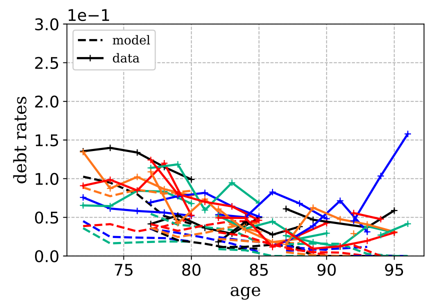
(c) Homeownership rates



(d) Homeownership rates by health

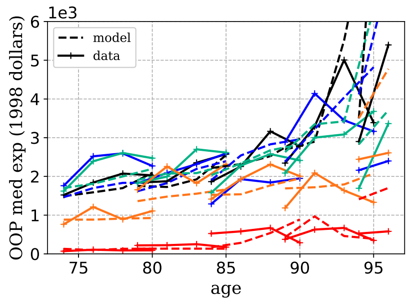


(e) Medicaid rates

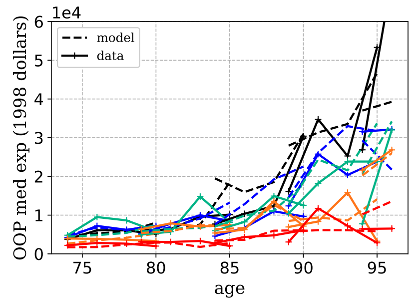


(f) Debt rates

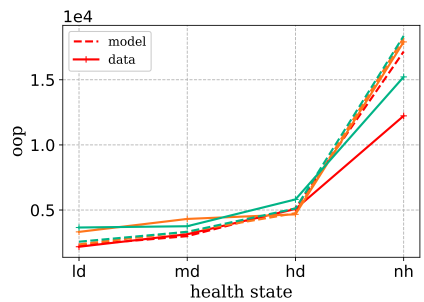
Figure F.1: Full set of targeted moments: main specification



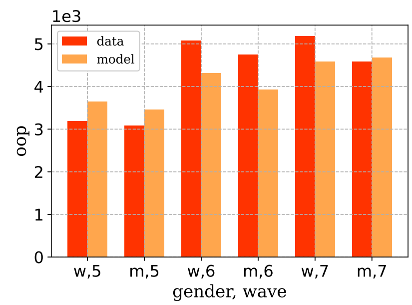
(g) Median out-of-pocket medical expenses



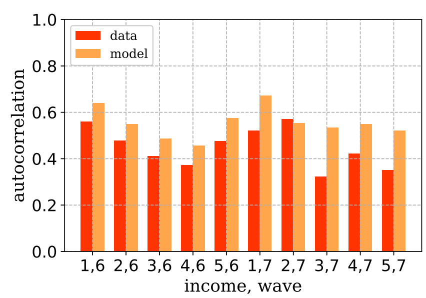
(h) 90^{th} percentile out-of-pocket medical expenses



(i) Mean out-of-pocket medical expenses



(j) Mean out-of-pocket medical expenses



(k) Autocorrelation of out-of-pocket medical expenses

Figure F.1: Full set of targeted moments: main specification (continued)

Table F.1: Medical needs parameters

	estimate	s.e.
μ_0	-1.20×10^{0}	1.00×10^{-2}
μ_{male}	-1.15×10^{-1}	2.02×10^{-2}
μ_1	4.96×10^{-2}	1.28×10^{-4}
μ_2	-2.45×10^{-4}	4.47×10^{-6}
μ_{md}	5.83×10^{-1}	1.10×10^{-2}
μ_{hd}	5.74×10^{-1}	2.83×10^{-2}
μ_{nh}	$1.63E \times 10^{0}$	1.77×10^{-2}
ς_0	-6.17×10^{-1}	8.93×10^{-3}
ς_{male}	5.45×10^{-2}	9.87×10^{-3}
ς_1	6.26×10^{-3}	1.23×10^{-4}
ς_2	-1.63×10^{-6}	3.57×10^{-6}
ς_{md}	7.46×10^{-2}	3.67×10^{-3}
ς_{hd}	5.98×10^{-1}	1.37×10^{-2}
ς_{nh}	-3.33×10^{-1}	1.49×10^{-2}
ρ_ε	6.65×10^{-1}	2.04×10^{-3}

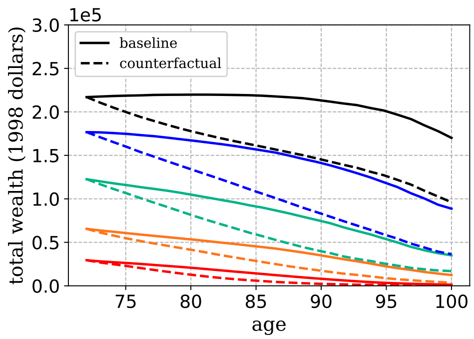
G Identification

In this section, I discuss further the identification of some parameters of the model and their influence on different variables of interest. To do so, I describe how sensitive are wealth, homeownership, Medicaid claiming and medical spending to changes in these parameters, and I show how the contribution of different moments to the GMM distance criterion changes when varying these parameters. This section also provides further details on the main saving motives in the baseline model.

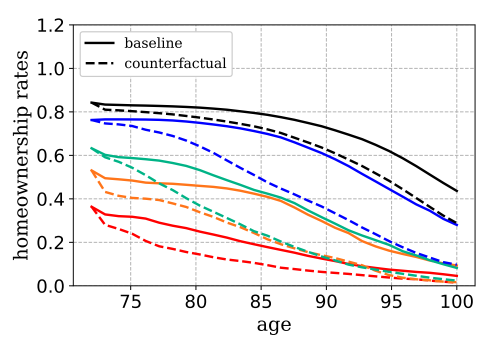
Higher impatience Figure G.1 shows the effect of reducing the time-preference parameter β by 10% on average wealth, homeownership, Medicaid claiming, and average medical spending. Not surprisingly a lower β generates a significant decline in wealth, and this higher willingness to dissave results in lower homeownership rates. As homeownership declines, Medicaid rates decline early in retirement. However, lower wealth results in increases in Medicaid rates later on. Overall medical expenses (i.e. the sum of out-of-pocket and Medicaid spending) vary little as the estimated elasticity of medical consumption is low. In contrast, out-of-pocket medical spending are slightly higher early in retirement because of lower reliance on Medicaid, but are much lower later on (when medical spending are highest) because of the increased reliance on Medicaid. Column 2 of table G.1 shows, in particular, that lowering β increase the contribution of wealth and homeownership moments to the GMM criterion. The increase for the latter is particularly large and affects debt rates substantially (as housing is the collateral necessary to have debt).

No bequest motives Figure G.2 shows the influence of bequest motives in the model. First, we see that lower bequest motives and lower β tend to affect the profiles for wealth, homeownership, Medicaid claiming and out-of-pocket medical spending in globally similar directions. This is one instance of the well known difficulty to separately identify bequest motives from other saving motives. There are however some differences linked to the fact that bequest motives here are luxury goods and are only operative at high consumption levels. While a fall in β has roughly similar proportional effects on wealth at different permanent income (PI) levels, bequest motives have larger effects on high-PI retirees as they are operative for a larger share of these retirees. In terms of contribution to the GMM criterion, column 3 of table G.1 shows that removing bequest motives worsen the fit for wealth and homeownership.

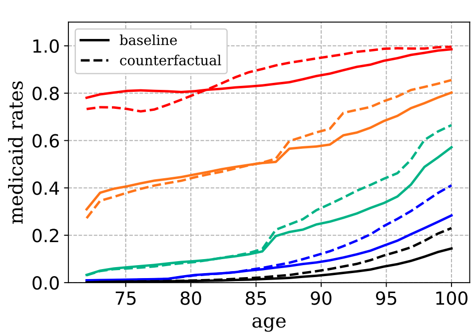
No extra utility of homeownership Figure G.3 shows the influence of the extra utility of homeownership in the model. Despite the fact that the model features a rental premium and further incentives to own because of the homestead exemption, an extra utility of homeownership is required to fit homeownership rates. This further has influence on savings, in part because of the interaction with collateral constraints as in Nakajima and Telyukova (2020). While bequest motives have influence on homeownership, they are not sufficient to explain why retirees with limited savings and income remain homeowners, in particular as for them bequest motives are not operative. As for when the homestead exemption is removed, the lower homeownership rates and higher dissaving tend to lower Medicaid rates early in retirement and increase them late in retirement. As previously seen for changes in β, these changes in Medicaid rates lead to changes in out-of-pocket medical spending. In terms of contribution to the GMM criterion, column 4 of table G.1 shows that removing the extra utility from homeownership worsens the fit for wealth, Medicaid recipiency, homeownership and debt.



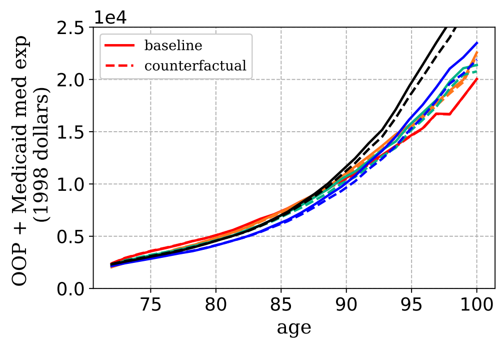
(a) Liquid wealth



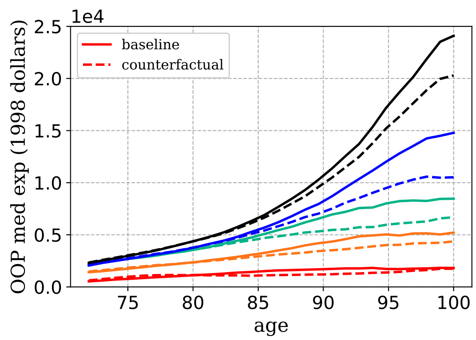
(b) Homeownership rates



(c) Medicaid rates



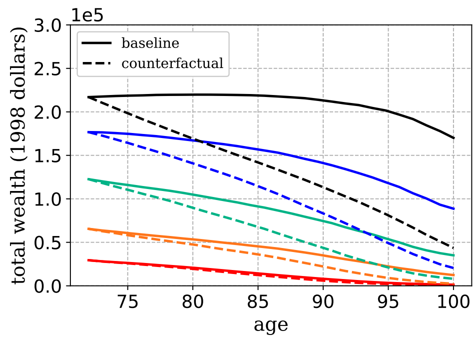
(d) Medical spending (including Medicaid payments)



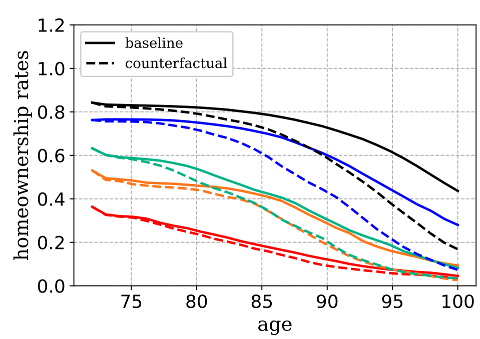
(e) Out of pocket medical spending

Figure G.1: Effect of decreasing β by 10%

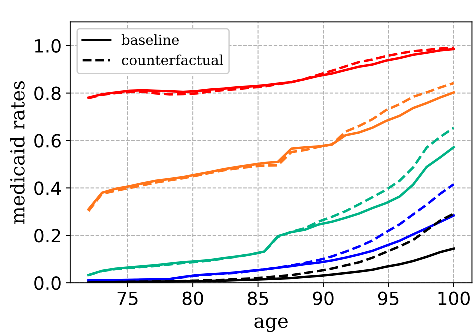
Notes: Solid lines: estimated model. Dotted lines: model with change in parameter. Each line corresponds to retirees in a given permanent-income (PI) quintile and cohort followed over time. Red, orange, green, blue, and black lines correspond to retirees in the bottom (first) to top (fifth) PI quintile.



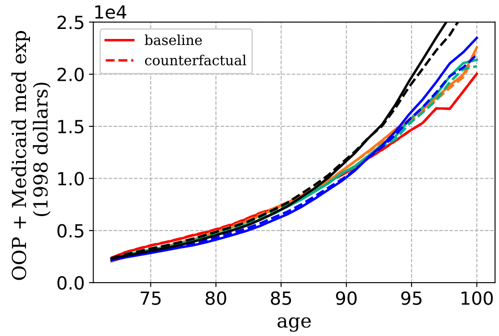
(a) Liquid wealth



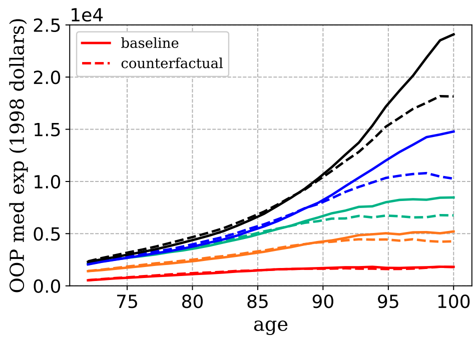
(b) Homeownership rates



(c) Medicaid rates



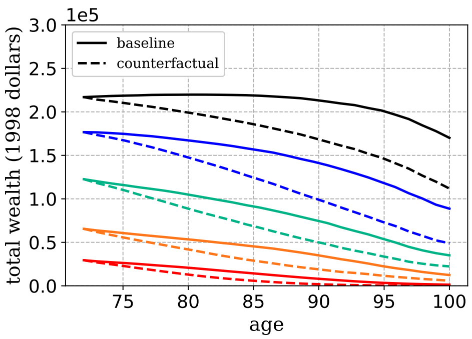
(d) Medical spending (including Medicaid payments)



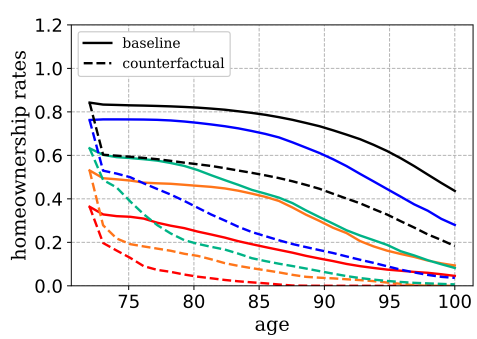
(e) Out of pocket medical spending

Figure G.2: Effect of turning off bequest motives ($\phi_W = 0$)

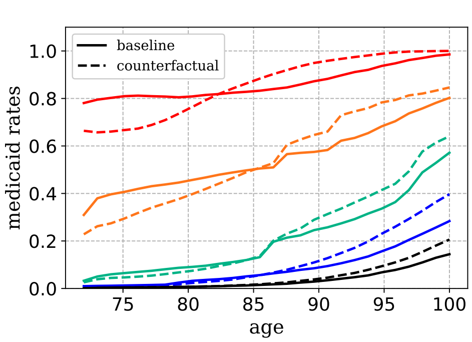
Notes: Solid lines: estimated model. Dotted lines: model with change in parameter. Each line corresponds to retirees in a given permanent-income (PI) quintile and cohort followed over time. Red, orange, green, blue, and black lines correspond to retirees in the bottom (first) to top (fifth) PI quintile.



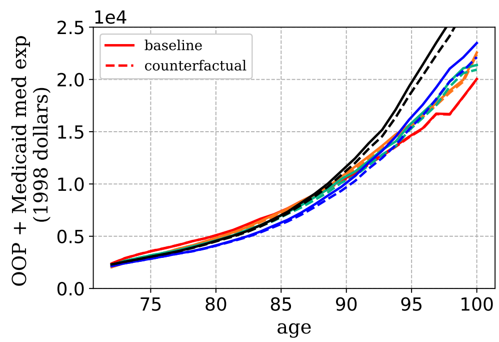
(a) Liquid wealth



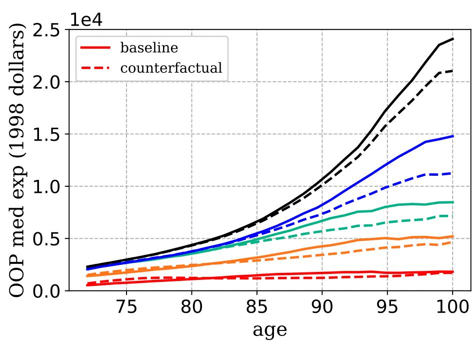
(b) Homeownership rates



(c) Medicaid rates



(d) Medical spending (including Medicaid payments)



(e) Out of pocket medical spending

Figure G.3: Effect of turning off extra utility of homeownership ($\phi_o = 0$)

Notes: Solid lines: estimated model. Dotted lines: model with change in parameter. Each line corresponds to retirees in a given permanent-income (PI) quintile and cohort followed over time. Red, orange, green, blue, and black lines correspond to retirees in the bottom (first) to top (fifth) PI quintile.

Lower medical needs Figure G.4 shows the effect of lowering medical needs and therefore reducing medical expense risk. Reducing medical expense risk can affect wealth profiles in two opposite directions. First, higher medical spending can lower savings through a direct effect. Second, higher risk of future medical spending can increase precautionary savings. The latter effect dominates in De Nardi et al. (2010) for instance. Here, given the large contribution of bequest motives to savings and the additional contribution of homeownership, the former dominates. This is globally in line with Lockwood (2018).[8] We see that medical needs affect mostly out-of-pocket medical spending and Medicaid rates. As a result, the medical spending parameters appear mostly identified by the moments related to these variables (and how they vary over different dimensions). This is confirmed in column 5 of table G.1.

Higher medical spending elasticity Figure G.5 shows the effect of having higher medical spending elasticity (I set σ to half its estimated value, which is still large). Its main effect is to generate larger dispersion in out-of-pocket medical spending.[9] A higher elasticity of medical spending also increases Medicaid rates by reinforcing moral hazard. This is further confirmed in column 6 of table G.1.

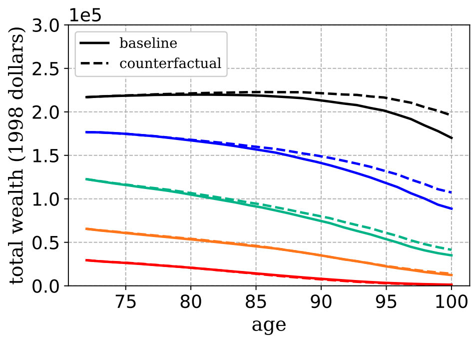
Higher Medicaid floors Figure G.6 shows that increasing Medicaid floors mostly affects Medicaid rates but has a relatively smaller influence on other variables. Hence, the medicaid floors are mostly identified by targeting Medicaid rates which is confirmed by column 7 of table G.1.

H Robustness Specifications

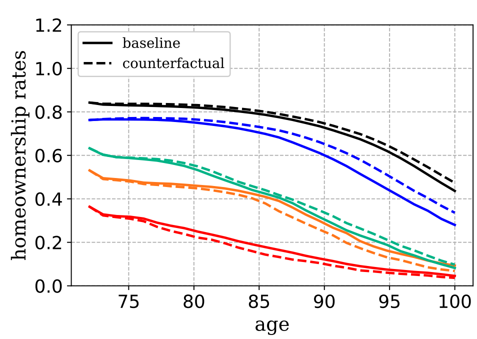
In this section, I consider different robustness specifications. First, I describe these different specifications. Second, I show the results of the counterfactuals for these specifications.

[8]See figure 6 of his paper. Importantly, as written in the figure's notes, the figure where medical spending is turned off only captures the precautionary effect. As this effect is not very large in his model, it is likely cancelled or dominated by the direct effect of turning off medical spending.

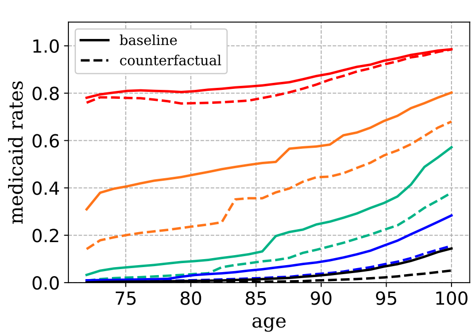
[9]This is consistent with the fact that De Nardi et al. (2016), using higher medical spending elasticity, tend to overestimate the gradient of out-of-pocket medical spending (see table 5 of their paper).



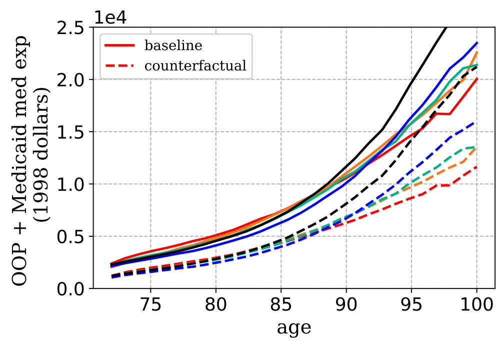
(a) Liquid wealth



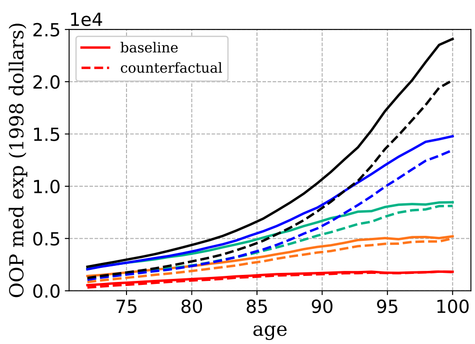
(b) Homeownership rates



(c) Medicaid rates



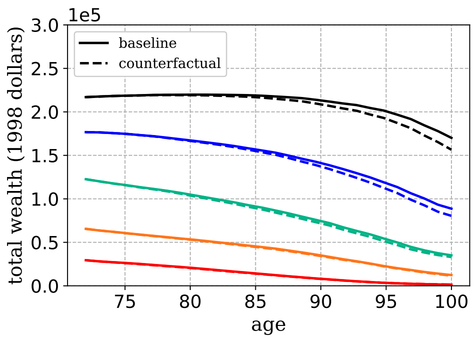
(d) Medical spending (including Medicaid payments)



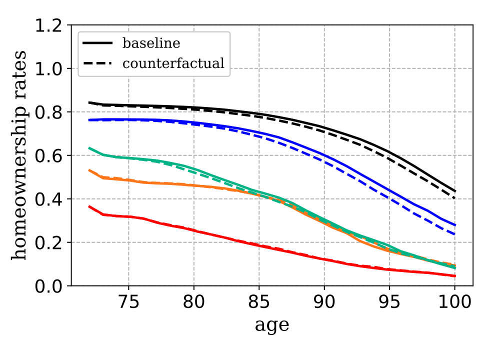
(e) Out of pocket medical spending

Figure G.4: Lower medical spending risk: $\mu_0 = \hat{\mu}_0 - \log(2)$

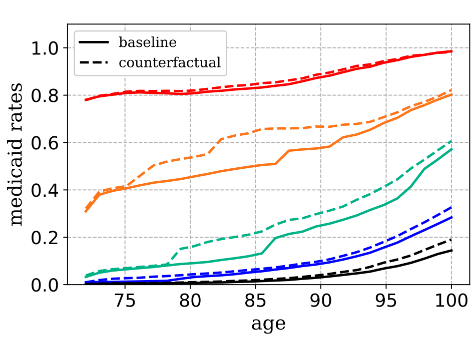
Notes: Solid lines: estimated model. Dotted lines: model with change in parameter. Each line corresponds to retirees in a given permanent-income (PI) quintile and cohort followed over time. Red, orange, green, blue, and black lines correspond to retirees in the bottom (first) to top (fifth) PI quintile.



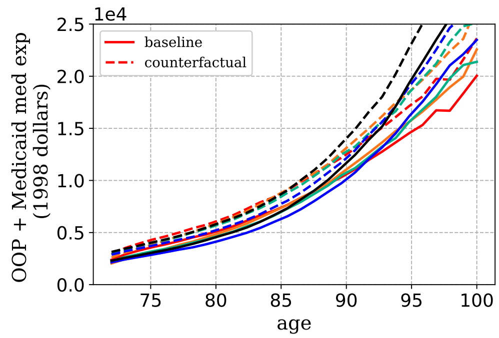
(a) Liquid wealth



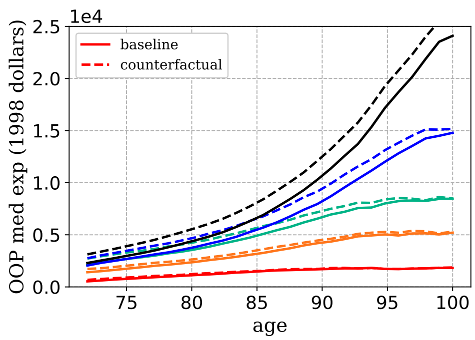
(b) Homeownership rates



(c) Medicaid rates



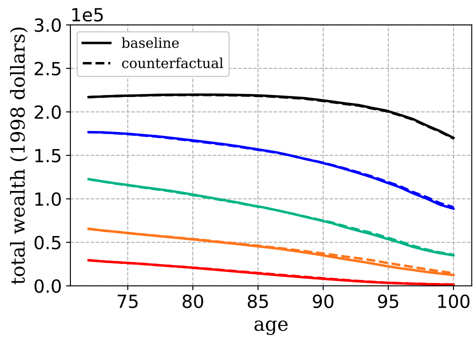
(d) Medical spending (including Medicaid payments)



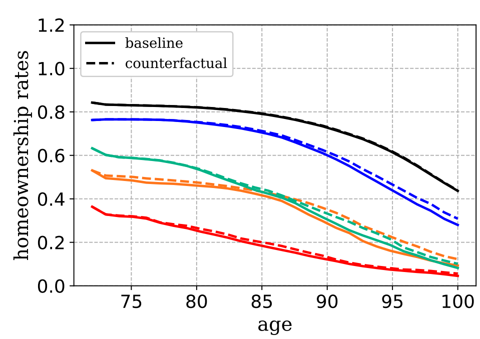
(e) Out of pocket medical spending

Figure G.5: Higher medical spending elasticity: $\sigma = \hat{\sigma}/2$

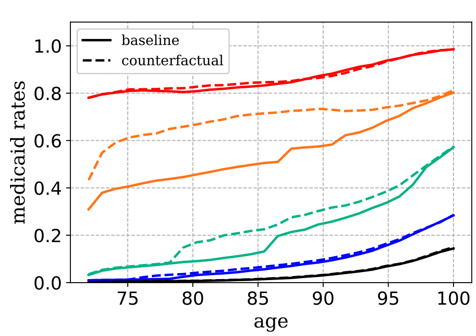
Notes: Solid lines: estimated model. Dotted lines: model with change in parameter. Each line corresponds to retirees in a given permanent-income (PI) quintile and cohort followed over time. Red, orange, green, blue, and black lines correspond to retirees in the bottom (first) to top (fifth) PI quintile.



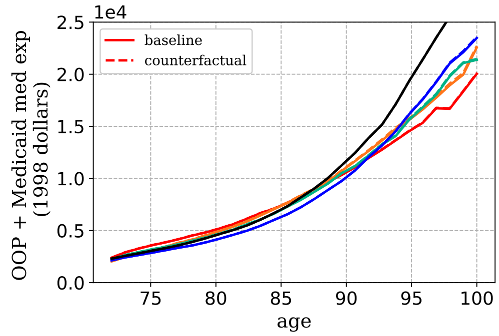
(a) Liquid wealth



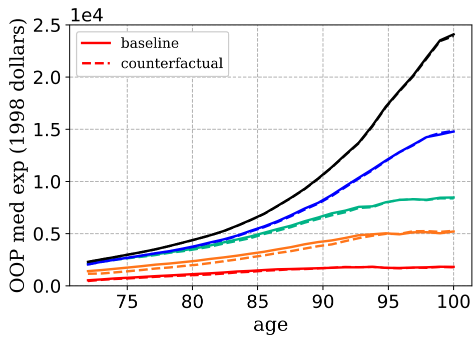
(b) Homeownership rates



(c) Medicaid rates



(d) Medical spending (including Medicaid payments)



(e) Out of pocket medical spending

Figure G.6: High medicaid floors (all increased by 10%)

Notes: Solid lines: estimated model. Dotted lines: model with change in parameter. Each line corresponds to retirees in a given permanent-income (PI) quintile and cohort followed over time. Red, orange, green, blue, and black lines correspond to retirees in the bottom (first) to top (fifth) PI quintile.

Table G.1: Sensivity of targeted moments to parameter changes

	(1) Baseline	(2) $\beta = 0.9\hat{\beta}$	(3) $\phi_W = 0$	(4) $\phi_o = 0$	(5) $\mu_0 = \hat{\mu}_0 - \log(2)$	(6) $\sigma = \hat{\sigma}/2$	(7) Medicaid floors up 10%
wealth	322	399	494	659	288	354	420
OOP med. exp.	750	734	938	757	6,686	1,929	975
Medicaid recipiency	526	546	523	716	1,326	797	1,216
homeownership	390	2,463	1,243	14,248	557	384	354
debt	624	918	675	1,441	530	664	601
total	2,612	5,059	3,873	17,822	9,387	4,129	3,565

H.1 Description of robustness specifications

H.1.1 Robustness 1: same floor in nursing home and in the community (and with estimated bequest motives)

One potential concern with the main specification is that the Medicaid floor in nursing homes is higher than the one in the community. As the former is relatively large, this tends to reduce the impact of medical expense risk on consumption. Also, the bequest motives considered is not very prevalent but is strong when operative. Possibly allowing for more impact of medical spending risk on consumption could lead to weaker bequest motives, which might impact the paper's conclusions.

To address these concerns, I estimate a specification in which I impose that the Medicaid floor in nursing homes is the same as the Medicaid floor in the community for the medically needy. Column 2 of table H.1 shows how the parameters for this specification compare with those in the baseline. We see that this specification leads to a lower nursing home floor and the estimated bequest motive is operative from lower levels of consumption (c_W is lower) but is weaker when operative (ϕ_W is lower).

This specification is less successful in matching the various moments (the minimized GMM criterion is 2,774 vs 2,612 for the baseline), although it fits the targeted moments quite well (figures available upon request). Imposing a lower floor in nursing home tends in particular to reduce the number of high PI retirees who rely on Medicaid late in life.

Table H.1: Main structural parameters - robustness specifications

	(1) baseline	(2) robustness 1	(3) robustness 2	(4) robustness 3	(5) robustness 4	(6) robustness 5
Estimated parameters						
β	0.950	0.978	0.946	0.950	0.950	0.967
σ	33.132	20.693	19.918	33.132	33.132	n.a.
ϕ_o	0.288	0.262	0.386	0.288	0.288	0.305
ϕ_W	0.950	0.640	0.950	0.950	0.950	0.950
c_W	20,000	11,282	20,000	20,000	20,000	20,000
$\underline{x_{cn}^{c,h}}\,(hs_t \neq nh)$	3,665	3,680	3,463	6,540	3,665	n.a.
$\underline{Y}$	3,665	3,680	4,122	6,540	3,665	n.a.
$\underline{x_{mn}^{c,h}}\,(hs_t \neq nh)$	6,578	6,514	6,475	6,578	6,578	5,845
$\underline{x_i^{c,h}}\,(hs_t = nh)$, $i = cn, mn$	9,936	6,514	10,000	9,936	9,936	9,433
ρ_ε	0.665	0.631	0.665	0.665	0.648	0.668
Contribution of different moments						
wealth	322	293	322	423	336	294
OOP med. exp.	750	860	773	903	738	784
Medicaid recipiency	526	591	569	757	528	497
homeownership	390	382	574	339	496	491
debt	624	647	575	596	997	638
total	2,612	2,774	2,813	3,019	3,095	2,704

H.1.2 Robustness 2: no exemption in nursing homes

The baseline model assumes that the homestead exemption also applies in nursing homes and is quite successful in replicating the fact that roughly a tenth of Medicaid beneficiaries in nursing homes are homeowners. However, the homestead exemption is in principle not intended for these individuals. I therefore consider an alternative specification in which the homestead exemption does not apply in nursing homes to see if it affects the paper's main conclusions.[10] I set the Medicaid floor in nursing homes to $10,000 so that it is roughly equal to the one in the baseline. The model is less successful in matching the targeted moments (see third column of table H.1) although it does a rather good job in matching them. More important, by construction this specification cannot account for the fact that about a tenth of Medicaid recipients in nursing homes benefit from the homestead exemption.

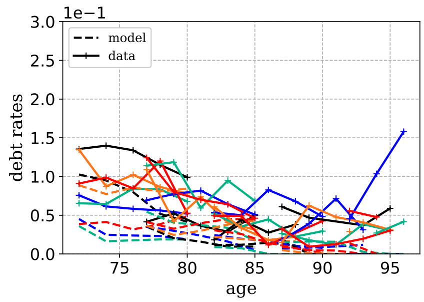
H.1.3 Robustness 3: higher SSI income threshold and categorically-needy floor

The estimated SSI income threshold and the categorically-needy floor are quite low in the baseline specification. I thus consider a specification in which I increase these floors to those used in Brown and Finkelstein (2008) (see fourth column of table H.1), while keeping other parameters at their values in the baseline specification. The main effect of this is to increase Medicaid rates for retirees in the bottom PI quintile, which worsens the fit of the model.

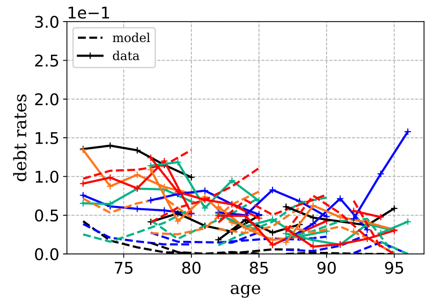
H.1.4 Robustness 4: collateral constraint as in Nakajima and Telyukova (2020)

I consider also the alternative collateral constraint in Nakajima and Telyukova (2020). In this specification, I keep the other parameters at their estimated values. Figure H.1 shows the difference in debt rates between the two specifications. As we see from these figures, both specifications lead to low debt rates. Table H.1 shows however a worse fit in terms of GMM distance criterion for the specification with the constraint in Nakajima and Telyukova (2020). This is because these moments have often low variance, so that even small deviations from the data can lead to rather large contributions to the

[10] This is also important to consider as I classify people in nursing homes by also including the days they spent in nursing homes between the current interview and the exit interview (if there is one). However, homeownership is observed at the time of the interview which means that possibly some might sell their homes when in nursing homes but might be considered in my dataset as keeping their homes while living in a nursing home. This bias is likely to be small, but considering this alternative ensures that it does not affect the main conclusions in a meaningful way.



(a) Baseline



(b) With constraint in Nakajima and Telyukova (2020)

Figure H.1: Debt rates in baseline and in model with collateral constraint in Nakajima and Telyukova (2020)

GMM criterion. In terms of homeownership, the constraint in Nakajima and Telyukova (2020) which is quite tight forces homeowners who have initially significant debt to sell right away which lowers homeownership rates compared to my baseline. Visually however the differences are not very large (figures available upon request). In terms of the other moments, there is little changes with the baseline, in particular in terms of Medicaid recipiency and wealth, reflecting the fact that both my baseline constraint and the one in Nakajima and Telyukova (2020) imply significant illiquidity of housing.

H.1.5 Robustness 5: exogenous medical spending

Estimating a specification with exogenous medical spending gives similar parameter estimates compared with the baseline and a similar fit. Given the low elasticity of medical spending in my baseline model, it is not very surprising.[11]

H.2 Counterfactuals

Changes in Medicaid floors Table H.2 shows the results of changing the Medicaid floor for the robustness specifications. All these specifications indicate that a reduction of Medicaid generosity would lower welfare. In terms of magnitudes, the changes are quite similar to the baseline except for the specification in which the nursing home floor is constrained to be the same in

[11]The minimization algorithm converges to a point at which everyone qualifies through the medically-needy pathway (hence, the "n.a."s (for "non applicable") in the table. The resulting situation is close to the one in my baseline. Indeed, the estimated SSI income threshold in this baseline is low implying little SSI income transfers. With everyone qualifying through the medically-needy pathway, no one receives SSI income.

nursing homes as in the community. In this case, the welfare cost of reducing Medicaid generosity is much larger. This stems from the fact that the nursing home floor is lower and therefore provides worse insurance to relatively rich retirees. As a result, cutting the floor leads to a significant increase in precautionary savings relative to what occurs in the baseline model, which is costly. This confirms that the compensating variations relative to changes in Medicaid floors are quite conservative in the baseline as precautionary saving motives play a limited role in it.

Removing the homestead exemption Table H.3 shows the results of removing the homestead exemption for the robustness specifications. It shows that the conclusions reached with the baseline model are confirmed in these robsutness specifications. The percentage reduction in Medicaid costs is between 6.2% and 9.4%.

Removing the homestead exemption in nursing home Table H.4 shows the results of removing the homestead exemption in nursing home for the robustness specifications. Most specifications indicate that ensuring that the homestead exemption is not used by nursing home residents would improve welfare on average. An exception is for the specification with the same floors in nursing home and in the community. It is driven by higher-PI retirees who value insuring bequests because of the lower value of c_W than in the baseline and thus value benefiting from the homestead exemption in nursing homes (as nursing home costs create significant risk for bequests). The cost reduction to the Medicaid program represents 21%-39% of the reduction that occurs when the homestead exemption is removed completely.

Estate recovery Table H.5 shows the results for estate recovery for the robustness specifications. The results confirm the conclusions for the baseline. This is even the case for the specifications with the same floors in the community and in nursing homes because the overall savings to the Medicaid program are larger than in the previous experiment as recovery applies both for Medicaid spending in the community and in nursing homes. In principle, Medicaid could recover only the expenses made in the community. However, with endogenous care location, retirees would be incentivized to use nursing home care more, which is likely to increase Medicaid costs. I thus do not consider such case.

Table H.2: Costs and benefits of changing Medicaid generosity

		floors down 10%			floors up 10%		
PI	PDV	ΔPDV	CV	$-\frac{CV}{PDV}$	ΔPDV	CV	$-\frac{CV}{PDV}$
same floor in NH and in the community							
1	31,332	-2,290	5,633	2.46	1,906	-2,105	1.10
2	21,874	-2,583	9,176	3.55	3,517	-6,268	1.78
3	13,748	-1,025	10,376	10.12	1,091	-8,056	7.38
4	8,988	-576	15,687	27.23	636	-11,494	18.07
5	6,957	-442	27,252	61.66	505	-19,491	38.6
all	15,050	-1,260	15,030	11.93	1,429	-10,589	7.41
no exemption in nursing homes							
1	29,975	-2,185	3,973	1.82	1,594	-1,387	0.87
2	19,014	-2,608	5,172	1.98	3,411	-3,782	1.11
3	11,134	-1,008	3,886	3.86	1,114	-3,308	2.97
4	6,167	-564	4,156	7.37	592	-3,166	5.35
5	3,328	-254	5,232	20.60	274	-3,784	13.81
all	12,660	-1,196	4,562	3.81	1,301	-3,218	2.47
collateral constraint in Nakajima and Telyukova (2020)							
1	31,209	-2,200	3,482	1.58	1,963	-1,321	0.67
2	20,135	-2,977	5,184	1.74	3,861	-3,561	0.92
3	11,050	-1,172	2,807	2.40	1,385	-2,668	1.93
4	5,651	-612	2,252	3.68	812	-1,934	2.38
5	2,622	-287	1,915	6.67	331	-1,766	5.34
all	12,344	-1,322	3,017	2.28	1,555	-2,254	1.45
higher SSI income threshold and categorically-needy floor							
1	42,634	-4,823	11,402	2.36	5,808	-3,826	0.66
all	13,964	-1,706	4,138	2.43	2,126	2,573	1.21
exogenous medical spending							
1	27,436	-2,021	4,228	2.09	697	-782	1.12
2	24,404	-1,806	4,547	2.52	2,238	-3,155	1.41
3	12,334	-485	2,379	4.91	568	-2,312	4.07
4	6,724	-256	1,824	7.12	254	-1,601	6.30
5	4,757	-115	1,897	16.50	124	-1,615	13.02
all	13,664	-819	2,824	3.45	730	-1,921	2.63

Table H.3: Costs and benefits of removing of the homestead exemption

PI	PDV	ΔPDV	CV	$-\frac{CV}{PDV}$
same floor in NH and in the community				
1	31,332	-1,652	3,437	2.08
2	21,874	-1,614	3,507	2.17
3	13,748	-857	1,844	2.15
4	8,988	-613	1,776	2.90
5	6,957	-430	2,046	4.76
all	15,050	-953	2,438	2.56
no exemption in nursing homes				
1	29,975	-1,303	3,537	2.71
2	19,014	-1,392	3,781	2.72
3	11,134	-800	2,302	2.88
4	6,167	-551	1,780	3.23
5	3,328	-226	1,401	6.20
all	12,660	-783	2,421	3.09
collateral constraint in Nakajima and Telyukova (2020)				
1	31,209	-1,919	3,254	1.70
2	20,135	-1,796	3,079	1.71
3	11,050	-1,174	1,766	1.50
4	5,651	-747	1,288	1.72
5	2,622	-301	834	2.77
all	12,344	-1,077	1,890	1.75
higher SSI income threshold and categorically-needy floor				
1	42,634	-3,301	7,297	2.21
all	13,964	-1,312	2,558	1.95
exogenous medical spending				
1	27,436	-1,588	3,746	2.36
2	24,404	-1,763	4,513	2.56
3	12,334	-1,200	2,682	2.24
4	6,724	-928	2,122	2.29
5	4,757	-621	2,206	3.55
all	13,664	-1,156	2,949	2.55

Table H.4: Costs and benefits of removing of the homestead exemption in nursing homes

PI	PDV	ΔPDV	CV	$-\frac{CV}{PDV}$
same floor in NH and in the community				
1	31,332	-390	167	0.43
2	21,874	-353	276	0.78
3	13,748	-347	467	1.32
4	8,988	-390	1,007	2.58
5	6,957	-388	1,833	4.72
all	15,050	-375	861	2.30
collateral constraint in Nakajima and Telyukova (2020)				
1	31,209	-731	164	0.22
2	20,135	-621	143	0.23
3	11,050	-472	158	0.33
4	5,651	-344	154	0.45
5	2,622	-123	97	0.79
all	12,344	-415	139	0.33
higher SSI income threshold and categorically-needy floor				
1	42,634	-801	183	0.23
all	13,964	-443	146	0.33
exogenous medical spending				
1	27,436	-122	81	0.66
2	24,404	-191	133	0.69
3	12,334	-293	210	0.72
4	6,724	-345	283	0.82
5	4,757	-238	333	1.40
all	13,664	-245	225	0.92

Table H.5: Costs and benefits of (partial) estate recovery

PI	ex-ante PDV Medicaid payments	ΔPDV	PDV estate recovery w/o behavior	w. behavior	CV	$-\frac{CV}{\Delta PDV - PDV(recovery)}$
same floor in NH and in the community						
1	31,332	-106	1,800	1,671	317	0.18
2	21,874	-203	1,665	1,472	557	0.33
3	13,748	-157	816	680	590	0.70
4	8,988	-147	520	396	887	1.63
5	6,957	-124	317	220	1,539	4.47
all	15,050	-150	930	796	857	0.91
no exemption in nursing homes						
1	29,975	-15	1,540	1,449	179	0.12
2	19,014	-3	1,557	1,434	295	0.21
3	11,134	-59	840	711	354	0.46
4	6,167	-89	533	408	366	0.74
5	3,328	-41	189	127	363	2.16
all	12,660	-41	845	741	322	0.41
collateral constraint in Nakajima and Telyukova (2020)						
1	31,209	-235	2,107	1,829	251	0.12
2	20,135	-368	1,822	1,390	343	0.20
3	11,050	-340	1,129	750	387	0.36
4	5,651	-290	716	398	382	0.56
5	2,622	-131	256	123	298	1.17
all	12,344	-264	1,088	791	334	0.32
higher SSI income threshold and categorically-needy floor						
1	42,634	-458	2,794	2,256	539	0.20
all	13,964	-307	1,249	897	384	0.32
exogenous medical spending						
1	27,436	-47	1,833	1,721	233	0.13
2	24,404	-73	1,855	1,663	426	0.25
3	12,334	-150	1,138	924	536	0.50
4	6,724	-258	856	559	641	0.78
5	4,757	-194	522	308	892	1.78
all	13,664	-158	1,157	944	587	0.53

Table H.6: Costs and benefits of removing of the homestead exemption: specification with a reverse mortgage

PI	PDV	ΔPDV	CV	$-\frac{CV}{PDV}$
1	31,332	-2,293	4,758	2.08
2	20,271	-2,138	4,609	2.16
3	11,321	-1,222	2,668	2.18
4	5,890	-762	1,849	2.43
5	2,527	-339	1,091	3.22
All	12,478	-1,223	2,759	2.26

Reverse mortgage Table H.6 shows that the result for the homestead exemption are robust to introducing the possibility to get a reverse mortgage in the baseline specification. There are several effects at play here. First, introducing a reverse mortgage in the baseline specification drives up Medicaid costs as it leads to additional wealth decumulation as indicated by the PDV column in which amounts are larger than in the baseline. As a result of this the absolute change in Medicaid costs is also larger when removing the homestead exemption. Differences however are rather modest. More significant are the higher compensating variations in this experiment. This is because introducing a reverse mortgage in the baseline increases expected utility, which implies a lower marginal increase in utility for each dollar of compensation. As a result, for a given absolute change in utility the compensating dollar amount will be larger. This effect dominates the fact that reverse mortgages provide extra utility (although at significant costs).

I Additional robustness: more time to adjust to the policy change

The main welfare experiment in the paper consists in comparing the welfare of single households aged 72 with and without the homestead exemption, and to compare it to the change in Medicaid spending. However, if the homestead exemption were to be removed today, those (for instance) aged 55 today would have time to adjust to the change, which could reduce the welfare costs of the policy change. On the other hand, they would experience the negative implications of the policy over more periods, which would increase the welfare cost of the policy change. In this section, I provide evidence that allowing for more time to adjust to the policy change does not alter the main conclusions of the paper about the valuation of the homestead exemption with respect to its cost.

To do so, I consider a simple extension of my model starting at age 55. From age 55 to 64, I make the following assumptions: 1) the single household receives an exogenous labor income $y^w(I)$,[12] 2) there is no health risk (everyone has the same health) nor medical spending shocks (i.e. $\varepsilon_t = 0$ and $\mu_t = 0$), 3) there is no mortality risk and 4) there is no Medicaid-like program. Otherwise, the setting is identical to the one applying from aged 65 and detailed in the paper. At age 65, the individual draws a health state hs_t and a medical needs shock ε_t from its stationary distribution.[13] From then onwards, the model is identical to the one in the paper.

I consider female individuals with different combinations of income, housing and liquid wealth at age 55. First, I do simulations for these individuals with and without the homestead exemption, where the presence or absence of the homestead exemption is known at age 55. Then, I do simulations for the *same* individuals with and without the homestead exemption but starting this time at age 72. In these simulations, the distribution of housing and liquid wealth at 72 is taken from the simulations from age 55 with the homestead exemption. Therefore, the first set of simulations permits a welfare analysis at age 55 for a policy change which is anticipated. The second set of simulations permits to do a welfare analysis at age 72 for the *same* individuals who experience an unanticipated policy change at age 72. By comparing the two, we can get a sense of whether giving more time to adjust to the policy change results in different welfare conclusions.

Table I.1 shows the outcome of this exercise for different combinations of permanent income, home values, and liquid wealth at age 55. I consider home values of \$50,000 and \$85,000 (at 1998 prices) which correspond approximately to median home values in 1998 for those in the bottom and top permanent income quintiles.

Let's first focus on those in the top permanent income quintile. First, we see that the changes in the PDVs of Medicaid payments at 55 and 72 are quite

[12] To approximate pre-retirement income, I invert the formula linking Primary Insurance Amount (PIA) to Average Indexed Monthly Earnings (AIME) in the online appendix of French and Jones (2011). The result is that for social security income $y^p(I)$, pre-retirement earnings $y^w(I)$ are given by:

$$y^w(I) = \begin{cases} y^p(I)/0.9 & \text{if } y^p(I) < 5,151.6 \\ 5,724 + (y^p(I) - 5,151.6)/0.32 & \text{if } 5,151.6 \leq y^p(I) < 14,359.9 \\ 34,500 + (y^p(I) - 14,359.9)/0.15 & \text{if } 14,359.9 \leq y^p(I) \end{cases}$$

[13] At age 65, individuals draw either low disability ld or moderate disability md. The probability of ld is 0.75, 0.90, 0.90, 0.95 and 0.95 for those in the bottom to top income quintile respectively which is globally consistent with the numbers in the data. The probabilities to fall in the other categories at 65 are very small in reality, and I thus assume they are 0 for simplicity.

close to one another (NB: changes in PDVs and compensating variations at 72 are discounted to make them comparable to those at age 55). This reflects the fact that behavioral changes prior to retirement are not very large and thus do not translate to substantial changes in PDVs. Second, compensating variations are larger at age 55 than at age 72. Therefore the fact that the homestead exemption also provides benefits between ages 65 and 71 (which is not taken into account in the welfare computations in the main text) seem to dominate the additional time to adjust to the policy change. Finally, the ratio of compensating variations to changes in PDV is larger at age 55 than at age 72 suggesting that, for the top income quintile, the welfare computations in the main text are conservative with respect to the net benefits of the homestead exemption. Similar observations apply for the third permanent income group.

For the bottom income quintile, the changes in PDVs can be much larger in absolute value at age 55 than at age 72. This reflects the fact that these individuals, when they have low liquid wealth, are very likely to benefit from the homestead exemption through the categorically-needy pathway early in retirement. In contrast, for those who are in higher income quintiles, the probability to benefit from Medicaid between ages 65 and 72 is small, which contributes to the small differences in the PDV changes we saw for them (this also makes the homestead exemption a more valuable insurance for the latter as relying on it is a low probability event between 65 and 72). For the bottom income quintile, we also see that compensating variations are often much larger at age 55 than at age 72 for similar reasons. Finally, as for higher permanent-income quintiles, the ratio of compensating variations to changes in PDV is larger at age 55 than at age 72 suggesting that overall the welfare computations in the main text are conservative with respect to the net benefits of the homestead exemption.

J Computational method

The computational method is standard. I discretize the grid for b_t using 92 points with more density at low values. The maximum point on the grid is \$4 million. The grid for consumption has 160 points with more density at low values and goes from \$300 to \$213k (or 10 times the largest value for pension income $y(I)$). The housing grid has 9 points corresponding to house values in 1998 equal to \$12k, \$35k, \$50k, \$70k, \$85K, \$125k, \$175k, \$225k and \$400k. I discretize medical expenditures ε_t using Tauchen and Hussey method with 7 grid points. I solve the model backwards separately for each gender, income and cohort to find the value function $V_t(.)$ for each t. I then use this value

Table I.1: Costs and benefits of removing of the homestead exemption with more time to adjust to the policy change

PI quintile	home value at 1998 prices	liquid wealth at 55	welfare computations at age 55			welfare computations at age 72		
			ΔPDV	CV	$-\frac{CV}{PDV}$	ΔPDV	CV	$-\frac{CV}{PDV}$
1	50,000	5,000	-8,043	13,560	1.69	-4,818	5,269	1.09
1	50,000	25,000	-5,553	9,356	1.68	-5,041	5,773	1.15
1	50,000	50,000	-3,740	7,118	1.90	-4,325	5,015	1.16
1	50,000	100,000	-2,380	6,292	2.64	-3,050	4,060	1.33
1	85,000	5,000	-4,653	7,502	1.61	-1,910	1,389	0.73
1	85,000	25,000	-3,386	4,810	1.42	-2,506	1,979	0.79
1	85,000	50,000	-2,526	3,698	1.46	-2,713	2,142	0.79
1	85,000	100,000	-1,638	3,569	2.18	-2,057	2,096	1.02
3	50,000	5,000	-1,242	2,591	2.09	-1,407	2,001	1.42
3	50,000	25,000	-1,058	2,468	2.33	-1,253	1,880	1.50
3	50,000	50,000	-850	2,361	2.78	-988	1,841	1.86
3	50,000	100,000	-539	1,988	3.69	-675	1,581	2.34
3	85,000	5,000	-746	1,282	1.72	-910	907	1.00
3	85,000	25,000	-596	1,261	2.12	-705	942	1.33
3	85,000	50,000	-523	1,322	2.53	-607	1003	1.65
3	85,000	100,000	-376	1,240	3.3	-483	1014	2.10
5	50,000	5,000	-349	1,074	3.08	-381	830	2.17
5	50,000	25,000	-301	995	3.31	-315	829	2.63
5	50,000	50,000	-235	998	4.25	-272	856	3.14
5	50,000	100,000	-166	934	5.63	-179	818	4.56
5	85,000	5,000	-302	852	2.82	-303	681	2.24
5	85,000	25,000	-231	831	3.6	-266	738	2.77
5	85,000	50,000	-216	888	4.11	-237	803	3.39
5	85,000	100,000	-132	880	6.67	-141	794	5.61

Notes: Changes in expected values and compensating variations at age 72 are divided by $(1+r)^{72-55}$ to make them comparable to those for age 55. Simulations at age 55 start in year 1981, so that these individuals are 72 in 1998. Age 72 simulations start in 1998. The results are based on 5,000 simulations for each combination of permanent income group, housing and liquid wealth.

function to simulate the model forward. For values of b_t which lie within the grids I use linear interpolation. Given that the highest value for b_t is large compared with the wealth in my sample, I assume that for $b_t \geq b_{max}$, the value function is equal to the one at b_{max}. When allowing for estate recovery, I use bi-dimensional linear interpolation. The grid for $\Sigma_t^{Medicaid}$ has 20 points with more density at low values. The grid ranges from 0 to one million dollars.

To solve for the maximization problem I use standard grid search. For renters, I limit the range of values to look for on the consumption grid by using the (intratemporal) first order condition between c_t and h_t. The codes for the model are in Python 3. I use the Anaconda distribution (2019) which can be downloaded freely from https://www.continuum.io/downloads, and includes the most popular libraries for numerical work or data analysis (mainly Numpy (Oliphant., 2006; van der Walt et al., 2011), Scipy (Virtanen et al., 2019), Matplotlib (Hunter, 2007), Numba (Lam et al., 2015), Pandas (McKinney, 2010)). The most computationally-intensive part of the program (which is to simulate the model for a given set of parameters) uses the just-in-time compiler capabilities of Numba. Solving one iteration of the model in the estimation step takes about 3 minutes on a iMac Pro (2017) with a 3GHz Intel Xeon W Processor (featuring 20 virtual processors) and 64Go of RAMs. For the counterfactuals, the simulation of the model without estate recovery takes about 8 minutes and the one with estate recovery takes about 1 hour.

K Comparison with Ameriks et al. (2020)

In this section, I show that the low estimated elasticity of medical expenditures that I estimate is in line with the estimates, obtained using strategic survey questions (SSQs), of the utility when needing long-term care in Ameriks et al. (2020). As the SSQs in Ameriks et al. (2020) intend to directly pin down preferences, this brings further support for such a low elasticity of medical spending.

First, I show that their specification of the utility in long-term care can possibly be interpreted as a limit case of the type of utility I consider, when $\sigma >> \gamma$. To see this, consider the type of SSQs that they use to estimate the marginal utility of spending (including long-term care) when needing help with activities of daily living (ADLs) (see section IV.A in their paper), but considering a utility specification similar to the one in my paper with, in addition, a marginal utility of consumption when needing help with ADLs which is allowed to vary.

Suppose that a retiree is asked to solve the following allocation problem:

$$\max_{c_1,c_2,m_2} \pi \frac{c_1^{1-\gamma}}{1-\gamma} + (1-\pi)\left[\delta \frac{c_2^{1-\gamma}}{1-\gamma} + \mu \frac{m_2^{1-\sigma}}{1-\sigma}\right] \tag{K.1}$$

$$s.t.\ c_1 + p_2\left(c_2 + q m_2\right) \leq W$$

where π is the probability to be healthy (implicitly with $\mu = 0$) and $1-\pi$ is the probability to need help with ADLs. δ allows for the marginal utility of consumption to vary when needing help with ADLs and μ affects the marginal utility of medical or long-term care spending.

The first order conditions are:

$$\pi c_1^{-\gamma} = \lambda \tag{K.2}$$

$$(1-\pi)\,\delta c_2^{-\gamma} = \lambda p_2 \tag{K.3}$$

$$(1-\pi)\,\mu m_2^{-\sigma} = \lambda p_2 q \tag{K.4}$$

with λ the multiplier on the constraint. With $p_2 = (1-\pi)$ as in their SSQs, we get:

$$c_2 = (\delta/\pi)^{1/\sigma}\, c_1 \tag{K.5}$$

$$m_2 = (\mu/(\delta q))^{1/\sigma}\, c_2^{\gamma/\sigma} \tag{K.6}$$

If $\sigma >> \gamma$, (K.6) implies:

$$m_2 = (\mu/(\delta q))^{1/\sigma}\, c_2^{\gamma/\sigma} \simeq (\mu/(\delta q))^{1/\sigma} \tag{K.7}$$

Notice that μ (which is unobservable) can be arbitrarily large (for a given large σ) in order to generate a given level of medical spending qm_2. As a consequence, the term $(\mu/(\delta q))^{1/\sigma}$ does not need to converge to 1 when σ is large.

By plugging (K.6) into the allocation problem (K.1), we see that, when $\sigma >> \gamma$, (K.1) is approximately equivalent to:

$$\max_{c_1,c_2} \pi \frac{c_1^{1-\gamma}}{1-\gamma} + (1-\pi)\left[\delta \frac{c_2^{1-\gamma}}{1-\gamma} + \mu \frac{(\mu/(\delta q))^{(1-\sigma)/\sigma}}{1-\sigma}\right] \tag{K.8}$$

$$s.t.\ c_1 + p_2\left(c_2 + q\,(\mu/\delta q)^{1/\sigma}\right) \leq W$$

which can be rewritten as:

$$\max_{z_1,z_2} \pi \frac{z_1^{1-\gamma}}{1-\gamma} + (1-\pi)\,\delta \frac{\left(z_2 - q\,(\mu/(\delta q))^{1/\sigma}\right)^{1-\gamma}}{1-\gamma} \tag{K.9}$$

$$s.t.\ z_1 + p_2 z_2 \leq W$$

with $z_1 \equiv c_1$ and $z_2 = c_2 + qm_2$. Doing an additional change of notation with $(\theta_{ADL})^{-\gamma} \equiv \delta$ and $\kappa_{ADL} \equiv -q\left(\mu/\left(\delta q\right)\right)^{1/\sigma}$ gives rise to the same setting as in section IV.A in Ameriks et al. (2020) (see their equation 4 page 2397).

We can now show that the very negative κ_{ADL} they find is globally in line with the estimates I find for σ. To see this consider, the initial allocation problem but with this time $\sigma = \gamma$ (a case close to De Nardi et al. (2016)). In this case, (K.5), (K.6) and the budget constraint in (K.1) write:

$$c_2 = \left(\delta/\pi\right)^{1/\gamma} c_1$$

$$m_2 = \left(\mu/\left(\delta q\right)\right)^{1/\gamma} c_2$$

$$W = c_1 + (1-\pi)\left(c_2 + qm_2\right)$$

implying:

$$c_1 = \frac{W}{1 + (1-\pi)\left(\delta/\pi\right)^{1/\gamma} + (1-\pi)\, q\left(\mu/\left(q\pi\right)\right)^{1/\gamma}} \tag{K.10}$$

On the other hand, the allocation problem (K.8) similar to the one in Ameriks et al. (2020) gives:

$$c_1 = \frac{W - (1-\pi)\, q\left(\mu/\left(\delta q\right)\right)^{1/\sigma}}{1 + (1-\pi)\left(\delta/\pi\right)^{1/\gamma}}$$

or using their notations (see (K.9)):

$$z_1 = \frac{W + (1-\pi)\,\kappa_{ADL}}{1 + (1-\pi)\left(1/\pi\right)^{1/\gamma}\left(\theta_{ADL}\right)^{-1}}$$

Their estimates rest on how much money z_1 individuals choose to allocate to the healthy state rather than to the unhealthy state in their experiment. If they estimated κ_{ADL} small or close to 0, this would tend to reject a model with $\sigma >> \gamma$ and would favor estimates in which $\sigma \simeq \gamma$. Indeed, in this case it would suggest that the decision rules that they observe are close to those in (K.10), and that c_1 is proportional to wealth W (c_1/W constant). However, the fact that they estimate a largely negative $\kappa_{ADL} = -\$37,000$ is more in line with a model with $\sigma >> \gamma$ in which c_1/W is increasing in wealth, reflecting that in old age medical/long-term care spending are necessities.

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