The Lifetime Costs of Bad Health

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April 2022

Workshop on the Economics of Ageing

Economic outcomes and health

#A. Large difference in economic outcomes by health

Among men with high-school degree, on average ...

i. The healthy earn 37% more (conditional on working)...

ii. ...and have 65 % more wealth at the time of retirement

▸ Wealth gradient (HRS)

#B. Two important questions

- What generates this large difference?
- How costly it is to be unhealthy from the entire life-cycle perspective?

Linking health and economic outcomes

Ch.1: Health affects economic outcomes

Ch.2: Economic outcomes affect health

Ch.3: Healthy and unhealthy people are innately different

$\Rightarrow$ *Ch.3* is well-recognized but overlooked (or too simplified) in existing structural studies

$\Rightarrow$ Our paper combines *Ch.1* with detailed investigation of *Ch.3*

Innate differences between the healthy and unhealthy

What is *Ch.3*?

- People differ in genetics, personality traits, early life experiences, etc.
- Growing empirical literature emphasizes the importance of these factors for outcomes later in life. (Anda et al., 2006; Barth et al., 2020; Case et al., 2005; Conti et al.,2005; among many others)
- We introduce these complex unobserved heterogeneity into a structural life-cycle model
- People differ in fixed characteristics that are multi-dimensional and possibly correlated among each other.

What we do? .... The broad picture

1^{st} **Part** : Estimate health shock process

- New data facts related to *duration dependence of health status*
- Formulate and estimate heath shock process that is consistent with these facts
- Key Finding :
  - *Health types* are an important driver of health dynamics even controlling for long history-dependence

What we do? ... The broad picture (cont.)

2nd Part: Study interaction of health and economic outcomes in a structural model

- Estimate a life cycle model augmented with the health shock and correlated ex-ante heterogeneity:

  { *health type*, *fixed labor productivity*, *patience* }

- Show that the correlated heterogeneity is important in explaining disparity in economic outcomes by health

- Quantify how costly it is to be unhealthy

Data

1. Health and Retirement Study (HRS: 1994-2016)
2. Panel Study of Income Dynamics (PSID)
   - Annual data (1984-1997); bi-annual (1997-2017)
3. Medical Expenditure Panel Survel (MEPS: 1999-2017)

Outline of the presentation

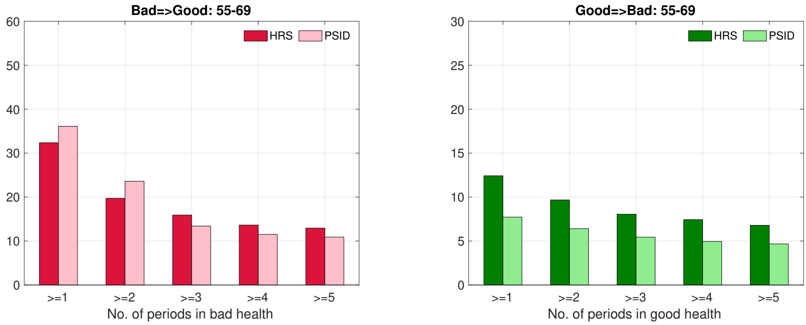
- Health process estimation
- Life-cycle model
- Model estimation *(MSM)*
- Results

Dynamics of health status data (PSID)

Duration-dependent profile by health status (55-69 years old)

Panel C1: % Transition from bad to good health

Panel C2: % Transition from good to bad health



- The difference between waves is 2 years

more stat | PSID sample

Health shock process

How we can account for these facts?

- Duration dependence
- Fixed health type
- Heterogeneity within bad health state

Formulate ordered logit model of health shock that allows for

- History-dependence (τ_B, τ_G) and discrete health type (η)
- Different transitions probabilities for two subcategories of bad health (B): *fair* (F) and *poor* (P)

Health shock process

- If $h_t \in \{P, F\}$ and duration of bad health $(P \text{ or } F)$ is τ_B:

$$logit\left[Pr\left(P_{t+1} \mid h_t, \tau_B, \eta\right)\right] = \underbrace{f^h_{age}(t)}_{\text{age polynomial}} + \underbrace{\sum_{\tau=1}^{T-1} a^B_\tau \mathbf{1}_{(\tau_B=\tau)} + a^B_T \mathbf{1}_{(\tau_B \geq T)}}_{\text{duration dependence}} + \underbrace{a^B_\eta \mathbf{D}_\eta}_{\text{health type}}$$

$$logit\left[Pr\left(F_{t+1} \cup P_{t+1} \mid h_t, \tau_B, \eta\right)\right] = f^h_{age}(t) + \sum_{\tau=1}^{T-1} a^B_\tau \mathbf{1}_{(\tau_B=\tau)} + a^B_T \mathbf{1}_{(\tau_B \geq T)} + b_1 + a^B_\eta \mathbf{D}_\eta$$

- If $h_t = G$ and duration of good health is τ_G:

$$logit\left[Pr\left(P_{t+1} \mid G_t, \tau_G, \eta\right)\right] = f^G_{age}(t) + \sum_{\tau=1}^{T-1} a^G_\tau \mathbf{1}_{(\tau_G=\tau)} + a^G_T \mathbf{1}_{(\tau_G \geq T)} + a^G_\eta \mathbf{D}_\eta$$

$$logit\left[Pr\left(F_{t+1} \cup P_{t+1} \mid G_t, \tau_G, \eta\right)\right] = f^G_{age}(t) + \sum_{\tau=1}^{T-1} a^G_\tau \mathbf{1}_{(\tau_G=\tau)} + a^G_T \mathbf{1}_{(\tau_G \geq T)} + b_2 + a^G_\eta \mathbf{D}_\eta$$

Health shock process (cont.)

Health type prediction

- η is distributed over 3 discrete points
- Ordered logit model of health type prediction:

$$logit\left[Pr(\eta_1 \mid \mathbf{X}_{t_0})\right] = \mathbf{B}_\eta \mathbf{X}_{t_0}$$

$$logit\left[Pr(\eta_1 \cup \eta_2 \mid \mathbf{X}_{t_0})\right] = \mathbf{B}_\eta \mathbf{X}_{t_0} + b_{\eta_2}$$

- $Pr(\eta_1 \cup \eta_2 \cup \eta_3 \mid \mathbf{X}_{t_0}) = 1$

- t_0 is the first age an individual was observed in the data.

- $\mathbf{X}_{t_0}$: initial health, initial wealth, fixed labor productivity (γ), age t_0, birth cohort (10-year bracket)

surv prob FE regression FE-health

Results : Key findings

- Health type is always significant even when controlling for long lagged health history (up to 8 years)
- Health type (η) is correlated with fixed labor productivity (γ)

	η_1	η_2	η_3
$Pr(\eta)$	0.08	0.35	0.57
$Pr(\eta \mid \gamma_L)$	0.13	0.44	0.43
$Pr(\eta \mid \gamma_M)$	0.08	0.36	0.56
$Pr(\eta \mid \gamma_H)$	0.04	0.24	0.72

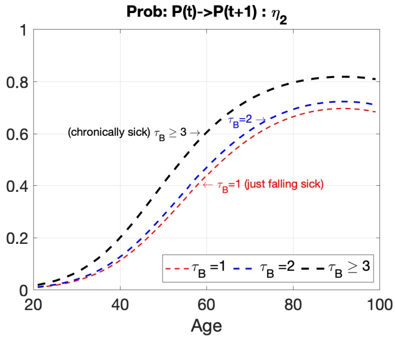
Measure of η at age 21 (T=3)

(* Use initial health, fixed labor productivity, wealth among people (21-24) in PSID)

Health type prediction model *vs* data

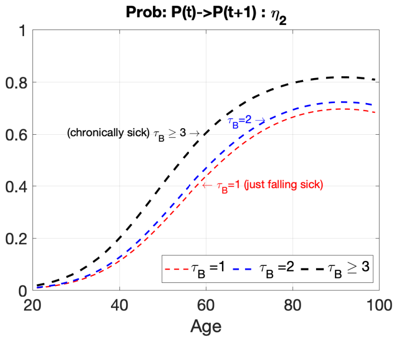
Results : Estimated health transition probabilities (T=3)

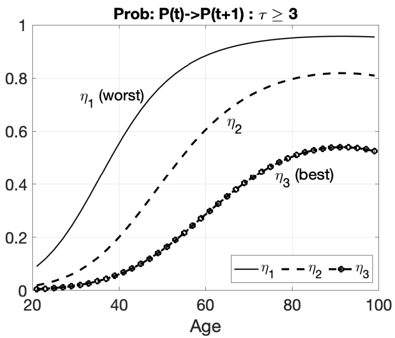
History dependence : fix health type to η_2



Results : Estimated health transition probabilities(T=3)

History dependence *vs.* Fixed health type





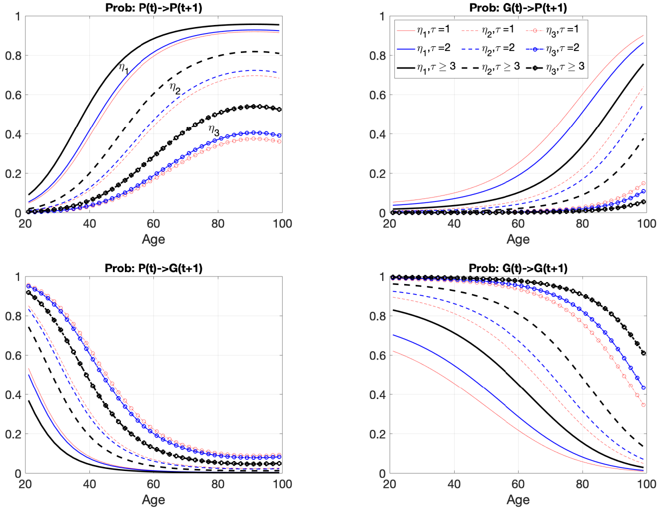
Key findings

- Variation in health transition probabilities across health types is much larger than that across health histories

Results : Estimated health transition probabilities(T=3)

validate with HRS

$F(t) \rightarrow$



How should we think about health type?

- *Model:* People with bad health type experience multiple periods being unhealthy
- *HRS:* Characteristics of people by #periods being unhealthy

# unhealthy periods	Individuals' characteristics[a] (HRS)					% η_1 in model
	% smoking	BMI[b]	% father alive	% mother alive	parents' educ (yrs)[c]	
0-1	22.6	27.9	21.6	48.4	10.1 / 10.5	0.1
2-3	27.1	29.5	21.5	50.4	9.2 / 9.9	3.1
4-5	44.4	29.8	16.1	36.5	8.4 / 9.2	26.0

[a] All variables are reported at age 55-56.

[b] BMI is the average Body Mass Index.

[c] The first and second numbers are the average educational years of father and mother, respectively.

# unhealthy periods	Polygenic scores (HRS)			
	educational attainment	smoking	BMI	longevity
0-1	-0.120	0.003	-0.006	-0.06
2-3	-0.216	0.023	0.127	-0.065
4-5	-0.708	0.092	0.140	-0.250

Outline

- Health process estimation
- Life-cycle model
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Key mechanisms

- The observed correlation between health and life-cycle outcomes is generated by two mechanisms

1 Causal effects of bad health:

   a. Decreases productivity and increases disutility from work

   b. Increases OOP medical spending

   c. Lowers life expectancy

2 Composition effect:

   - Heterogeneity in health types (η), fixed productivity (γ), and patience (β)
   - $\{\eta, \gamma, \beta\}$ are correlated

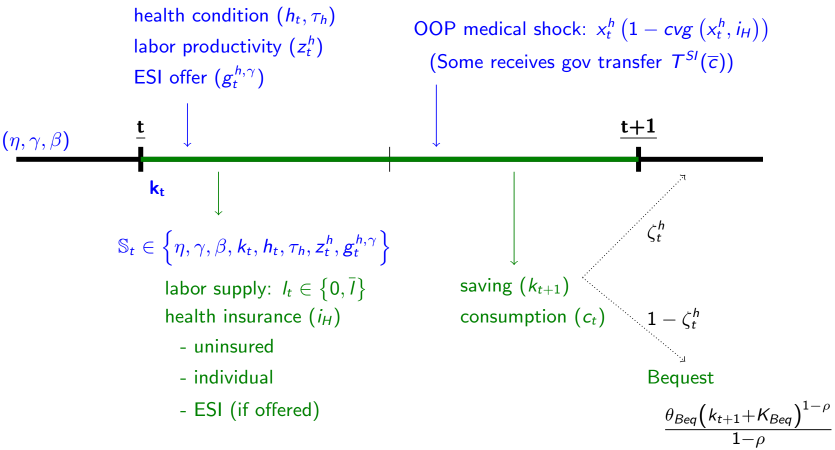
Life-cycle model

- 21-64→work, 65-99→retired ...(model period = 2 yrs)
- Health type: $\eta \in \{\eta_1, \eta_2, \eta_3\}$ and discount factor: $\beta \in \{\beta_{low}, \beta_{high}\}$

  $$0 \leq Pr(\beta_j|\eta_m) \leq 1; j \in \{low, high\}, m \in \{1, 2, 3\}$$

- People face productivity, health, medical expenses, and survival uncertainty
- Retired people receive Social Security benefits and are covered by Medicare

A working-age individual



$$u(c_t, l_t, h_t) = \frac{c_t^{1-\rho}}{1-\rho} - \phi_W \mathbf{1}_{\{l_t>0\}} - \phi_F \mathbf{1}_{\{h_t=F, l_t>0\}} - \phi_P \mathbf{1}_{\{h_t=P, l_t>0\}} + \overline{\mathbf{b}}$$

▸ HH prob

Outline

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Model parameters taken/estimated outside model

Parameters taken/estimated outside model

parameters		sources
Survival probability by health:	ζ_t^h	HRS (extrapolation from 21 to 50)
Health transition probability:		PSID
Labor productivity shock:	z_t^h	PSID
Health-dependent medical expenses:	x_t^h	MEPS
Insurance coverage:	$cvg(x_t^h, i_H)$	MEPS
ESI offer probability (logit) :	$g_t^{h,\gamma}$	MEPS
Risk aversion:	$\rho = 3.0$	common values $\in [1, 5]$

labor productivity shock

Parameters estimated inside model

parameters	value			targets
$\{\beta_{low}, \beta_{high}\}$	$\{0.877, 0.992\}$			"
$Pr(\beta_{low}\|\eta_i)$	η_1	η_2	η_3	net wealth profiles by health (PSID)
	0.78	0.79	0.38	
consumption floor (per year): $\bar{c}$	\$3,505			"

** η_1 is the worst health type*

- $\bar{\mathbf{b}} \Rightarrow$ Statistical Value of Life (SVL)
  - Compensation for adding 1 death among 10,000 adults:
  - Empirical *SVL = 1-16M USD*
  - Model: average *SVL* among working-age individuals = *2M USD*

matched weath profile

matched labor market outcomes

Results

R1. The importance of compositional difference

R2. Lifetime monetary losses due to bad health

R3. Lifetime welfare losses due to bad health

R1 : The importance of compositional difference

Re-estimate the model but restricting $Pr(\beta_{low}|\eta_i) = 0.50$.

Wealth difference between healthy and unhealthy people at ages 60-64.

Wealth difference by health	PSID (HRS)	Baseline	No (β, η) correlation
25^{th} pct	\$56 (\$47)	\$67	**\$38**
50^{th} pct	\$142 (\$98)	\$146	**\$38**
75^{th} pct	\$210 (\$222)	\$260	**\$91**

in 1000USD

- No correlation between types and patience misses health-wealth gradient

- Income-health gradient does not imply wealth-health gradient

R1. The monetary cost of bad health

- Construct "*always healthy*" counterfactual
- Individuals always draw good health (unexpectedly)
- Let y_t^{BS} and y_t^{H} are income net of total medical expenses in baseline and "*always healthy*" cases.
- Measure of lifetime monetary losses :

$$\frac{1}{T} \sum_{t=1}^{T} \frac{y_t^H - y_t^{BS}}{(1+r)^t}$$

T is age at death

R2. Lifetime monetary losses due to bad health

	Over entire life-cycle (21-death)			
	All	η_1	η_2	η_3
% of time in bad health	15%	58%	23%	4%
Annual monetary losses	\$1,511	\$8,896	\$1,935	\$225
(% of avg earning)	*(3.9%)*	*(23%)*	*(5%)*	*(0.6%)*
Composition (%)				
- Medical losses paid by insurance	36%	33%	39%	39%
- Out-of-pocket medical losses	27%	22%	30%	36%
- Income losses	37%	45%	31%	24%

- Using 2% interest rate
- Average earning (2013) is \$38,648

- Losses vary a lot across η
- Income losses account for almost 40%

Losses (21-64)

R3. Lifetime welfare losses due to bad health

Again, construct "*always healthy*" counterfactual

Measure of lifetime welfare losses due to bad health

- Individual's life time utility in the baseline and "*always heathy*" cases:

$$U^{BS} = \sum_{t=1}^{T_d+1} \beta^t \Big(u(c_t^*, l_t^*, h_t) \times \mathbf{1}_{alive_t} + (1 - \mathbf{1}_{alive_t})\, \theta_{Beq} \frac{(k_t^* + k_{Beq})}{1-\rho}^{1-\rho} \Big),$$

$$U^G(\lambda_c) = \sum_{t=1}^{T_d^G+1} \beta^t \Big(u((1-\lambda_c) c_t^{**}, l_t^{**}, h_t = good) \times \mathbf{1}_{alive_t} + (1 - \mathbf{1}_{alive_t})\, \theta_{Beq} \frac{(k_t^{**} + k_{Beq})}{1-\rho}^{1-\rho} \Big)$$

- Lifetime welfare losses $= \lambda_c \overline{c}^{**}$ where
  - $\rightarrow U^{BS} = U^G(\lambda_c)$
  - $\rightarrow \overline{c}^{**}$ is the average consumption in "*always healthy*" case

variation in T^d

R3. Lifetime welfare losses

	all	η_1	η_2	η_3
Compensated consumption equivalence	\$1,933	\$6,380	\$2,690	\$854
(% consumption equivalence, λ_c)	*(10.6%)*	*(36.8%)*	*(14.8%)*	*(4.4%)*
Contribution (%)				
- Only medical expenses channel	25%	39%	22%	17%
- Only income channel	38%	57%	42%	9%
- Only survival channel	44%	32%	33%	77%

Using SVL=\$2M.

- Welfare losses vary a lot across η
- On average, survival channel is the most important channel for welfare loss
- Income channel is the most important for $\{\eta_1, \eta_2\}$ while the survival channel is the most important for η_3.

R3. Lifetime losses due to bad health: concentration and contribution of η

	Concentration			variation
	top 5%	top 10%	top 20%	due to η
Monetary losses (21-death)				
- Income losses + medical losses (Ins+OOP)	38%	56 %	75%	69%
Welfare losses				
- Compensated consumption equivalence	24%	42%	71%	30%

Use 2% interest rate for monetary loss.

- Highly concentrated
- A large variation in both monetary and welfare loss is due to η
- But the variation due to η is lower for welfare losses
  - η directly affects the number of periods being unhealthy
  - But η only indirectly affects life expectancy.

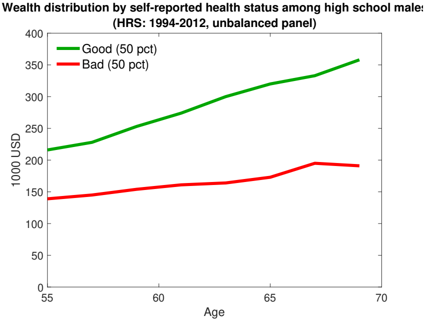
variation in T^d

Conclusions

- We quantify the effects of health in a life-cycle model of high school males that matches
  (1) Long-run health dynamics
  (2) Income-health gradient
  (3) Wealth-health gradient
- Health type: important to capture (1)
- Composition difference btw. the healthy and unhealthy: important for (3)
- We measure lifetime loss due to bad health
  i. Lifetime costs of bad health are highly concentrated
  ii. Survival channel attributes a lot to welfare loss
  iii A large variation in lifetime losses are pre-determined in early stage of life (69% for monetary loss, 30% for welfare loss)

Is the accumulated loss due to bad health large?

Wealth-health gradient among high school men (HRS: 1994-2016)



- good health ∈ {*excellent*, *very good*, *good*}; bad health ∈ {*fair*, *poor*}

- net worth: controlled for year effects and family sizes

- The wealth gap is large even among a relatively homogeneous group
- Bias measure of losses if there is a composition difference

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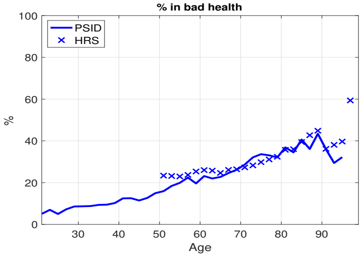
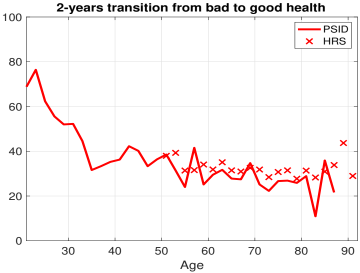
Health status data (PSID, HRS)

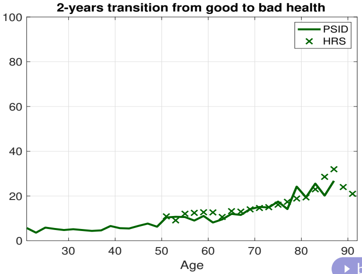
Panel A: % unhealthy people by ages



Panel B1: % transition *bad* → *good*



Panel B2: % transition *good* → *bad*



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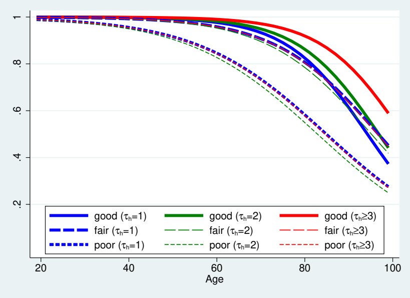
Logit regression of survival probability

$$logit\left(\zeta_t|h_t,\tau_h\right) = \begin{cases} \underbrace{f^{\zeta^h}_{age}}_{\text{age polynomial}} + \underbrace{\sum_{\tau=1}^{2} a^{\zeta B}_{\tau}\mathbf{1}_{(\tau_h=\tau)} + a^{\zeta B}_{3}\mathbf{1}_{(\tau_h=3)}}_{\text{spell of bad health}} & \text{if} \quad h_t \in \{P,F\}, \\ f^{\zeta^G}_{age} + \sum_{\tau=1}^{2} a^{\zeta G}_{\tau}\mathbf{1}_{(\tau_h=\tau)} + a^{\zeta G}_{3}\mathbf{1}_{(\tau_h=3)} & \text{if} \quad h_t = G. \end{cases}$$



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Predicting health type

What obserevables ($\mathbf{X}_{t_0}$) are informative about health type (η)?

- Initial health (h_{t_0})
- Fixed labor productivity (γ)

Fixed effect regression of log labor income

$$log(inc_{it}) = \sum_{age=20}^{65} \sum_{j=\{G,B\}} d_t^j \cdot D_{it}^{age} \cdot \mathbf{D}_{h_{it}=j} + \gamma_i + u_{it},$$

FE estimation

- Intitial net worth (k_{t_0})

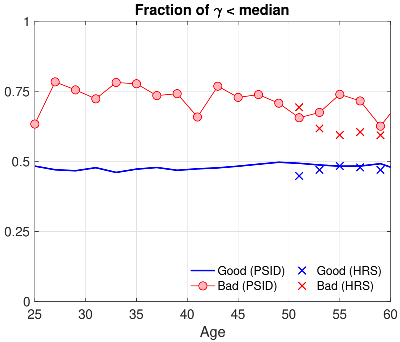
back

Health status and fixed productivity γ

Fixed effect regression of log labor income :

back

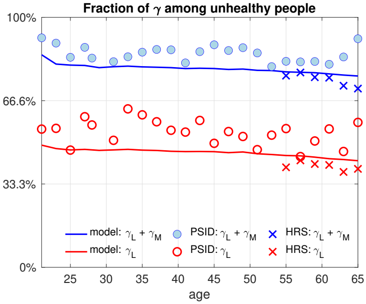
$$log(inc_{it}) = \sum_{age=20}^{65} \sum_{j=\{G,B\}} d_t^j \cdot D_{it}^{age} \cdot \mathbf{D}_{h_{it}=j} + \gamma_i + u_{it},$$



- more low fixed productivity among unhealthy

Fixed effect regression of log labor income :

$$log(inc_{it}) = \sum_{age=20}^{65} \sum_{j=\{G,B\}} d_t^j \cdot D_{it}^{age} \cdot \mathbf{D}_{h_{it}=j} + \gamma_i + u_{it},$$



- There are proportionately more γ_L among unheathy people.

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Results : health type prediction

	T=5	T=4	T=3	T=2	T=1
$h_{t_0} = P$	1.463	2.072*	2.410	2.386	1.022
$h_{t_0} = G$	-1.457***	-1.429***	-1.879***	-1.921***	-2.250***
2^{nd} tercile of γ	-0.247	-0.337	-0.509**	-0.546**	-0.642***
3^{rd} tercile of γ	-1.203***	-1.374***	-1.188***	-1.286***	-1.355***
2^{nd} quintile of k_{t_0}	-0.002	-0.129	-0.048	-0.459*	-0.469*
3^{rd} quintile of k_{t_0}	-0.620	-0.429	-0.367	-0.378	-0.603**
4^{th} quintile of k_{t_0}	-0.749	-0.606	-0.691*	-0.701**	-0.759***
5^{th} quintile of k_{t_0}	-2.348***	-1.616***	-1.169***	-1.280***	-1.264***

- *A lower coefficient means lower probability of worst health type (η_1)*
- *We control for age t_0 and cohorts (10-year bracket)*

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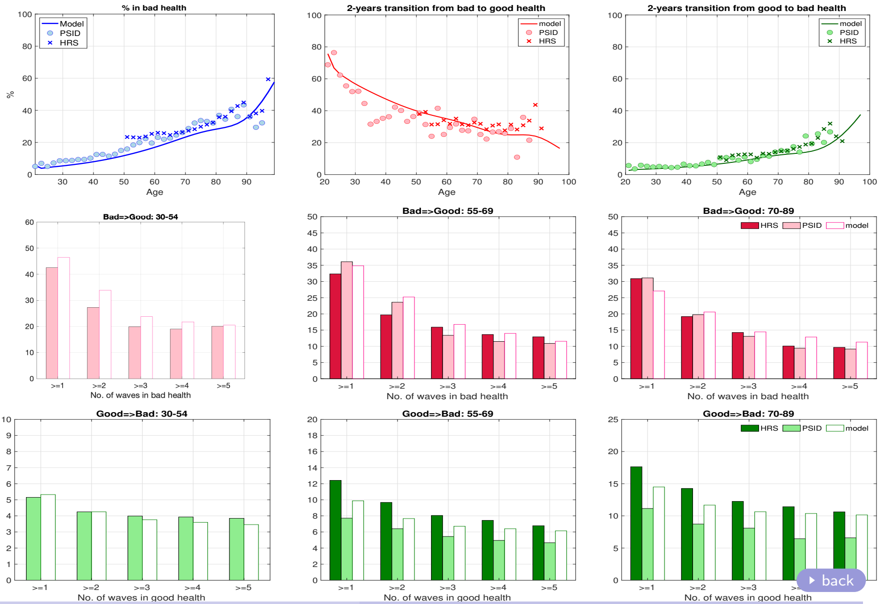
Results : Dynamics of health status: model (T=3) vs data (PSID, HRS)



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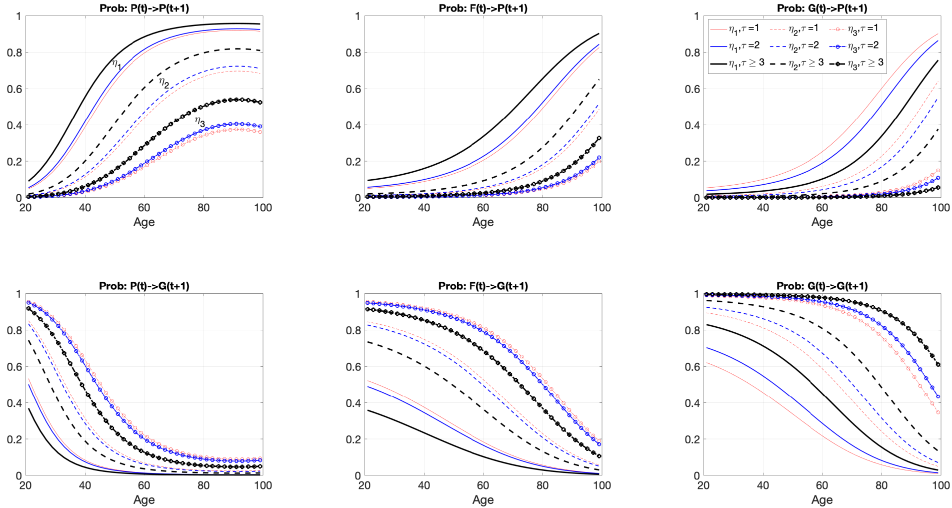
Estimated health shock process



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Sample from PSID: 1984-2017

% Transition from bad to good health conditioned on being in bad health

	>= 1	>= 2	>= 3	>= 4	>= 5	>= 6
	number of individual-waves					
30-54	1420	646	375	230	141	83
55-69	512	296	196	146	106	74
70+	166	87	57	39	29	22
# individual	1194	610	373	242	166	111

% Transition from good to bad health conditioned on being in good health

	>= 1	>= 2	>= 3	>= 4	>= 5	>= 6
	number of individual-waves					
30-54	11984	10338	8855	7461	6065	4698
55-69	2624	2330	2113	1942	1763	1572
70+	692	630	602	560	541	509
# individual	2877	2554	2301	2041	1770	1505

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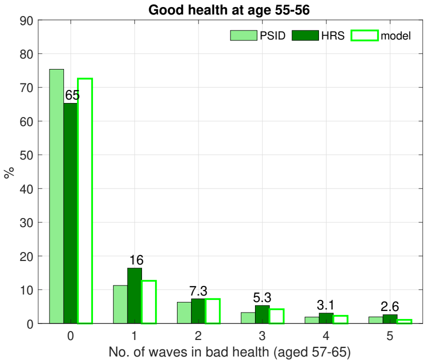
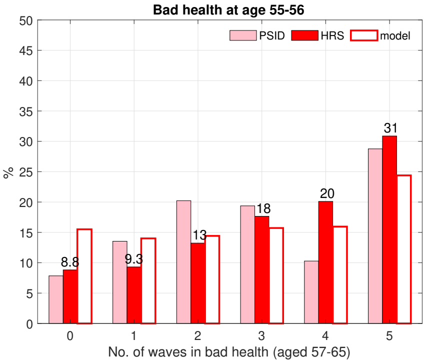
Distribution of unhealthy periods between 57-65: Model vs HRS

(Additional validation)





HRS: balanced panel of *healthy* individuals at 55

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- Consumption-saving problem

$$\max_{c_t, k_{t+1}} u(c_t, l_t, h_t) + \beta \left({\zeta_t}^h E_t V_{t+1}(\mathbb{S}_{t+1}) + \left(1 - {\zeta_t}^h\right) \theta_{Beq} \left(\frac{k_{t+1} + k_{Beq}}{1-\rho} \right)^{1-\rho} \right)$$

$$\underbrace{k_t(1+r)}_{\text{total asset}} + \underbrace{exp\left(z_t^h\right) \ l_t}_{\text{labor inc}} - \text{OOP med}_{it} - \text{Ins prem} - Tax + T^{SI}(\overline{c}) = c_t + k_{t+1}$$

back

Stochastic processes estimated outside the model

Fixed effect regression of log labor income (PSID) :

$$log(inc_{it}) = \sum_{age=20}^{65} \sum_{j=\{G,B\}} d_t^j \times D_{it}^{age} \times \mathbf{D}_{h_{it}=j} + (\gamma_i + y_{it}),$$

- Health-dependent labor income process $\left(z_t^h\right)$

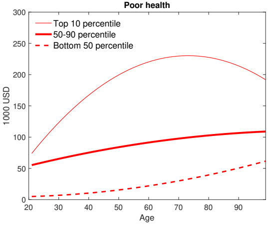
$$z_{it}^h = \lambda_t^h + \gamma_i + y_{it}$$
$$y_{it} = \rho_y y_{it-1} + \varepsilon_{it}; \quad \varepsilon_{it} \sim iid\ N\left(0, \sigma_\varepsilon^2\right)$$

- $\rho_y = 0.947,\ \sigma_\varepsilon^2 = 0.02,\ \sigma_{z_0}^2 = 0.09,\ \sigma_\gamma^2 = 0.05$
- λ_t^h is used to match average labor income among worker with good, fair, and poor health

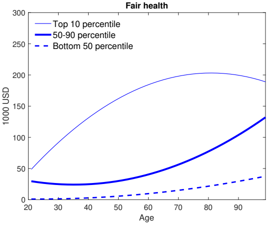
back

Health-dependent total medical expenses (x_t^h)

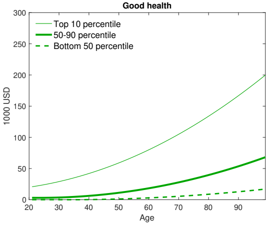
- x_t^h is directly estimated from MEPS



$h_t =$ Poor health



$h_t =$ Fair health

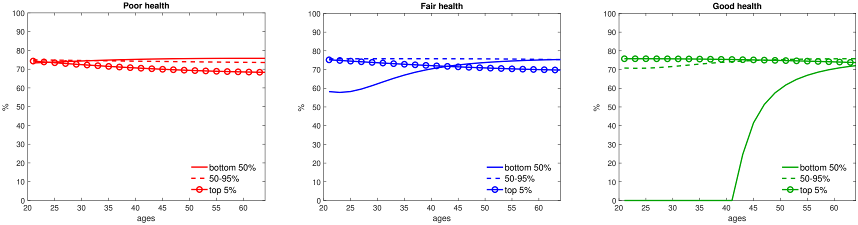


$h_t =$ Good health

- $cvg(x_t^h, i_H)$ is estimated from people with ESI or ind insurance
- $g_t^{h,z}$ is parameterized as a logit function and estimated from MEPS

back

Insurance coverage : $cvg(x_t^h, i_H)$



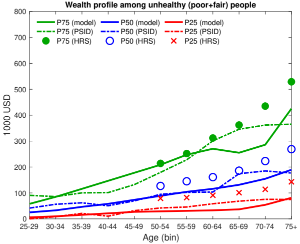
$h_t =$ Poor health $h_t =$ Fair health $h_t =$ Good health

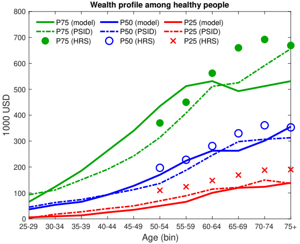
- $cvg(x_t^h, i_H)$ is estimated from people with ESI or ind insurance

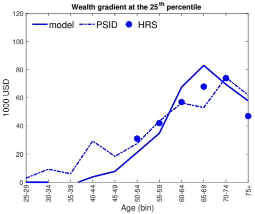
back

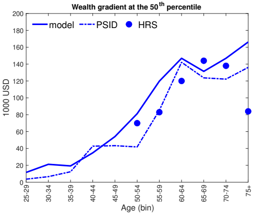
Targeted moments : model vs PSID (HRS)

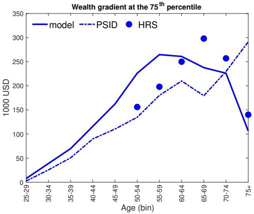
- Wealth health gradient







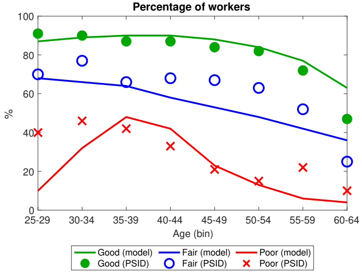




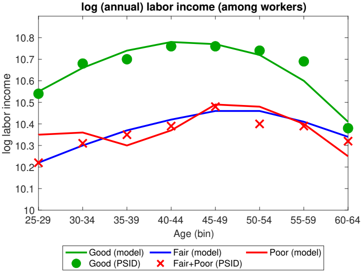
back

Targeted moments: Model vs PSID

- Health and labor market outcomes



% Workers by health status



Average labor income (among workers) by health

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Implied health gradients: Model vs PSID (HRS)

- % unhealthy individuals in each earnings tercile

	PSID (HRS)			Model		
	bottom 1/3	middle 1/3	top 1/3	bottom 1/3	middle 1/3	top 1/3
25-34	12%	5%	2%	16%	2%	0%
35-44	21%	8%	4%	22%	4%	2%
45-54	22%	12%	8%	28%	9%	5%
55-64	30% (36%)	15% (20%)	14% (13%)	33%	24%	11%

- % unhealthy individuals in each wealth tercile

	PSID (HRS)			Model		
	bottom 1/3	middle 1/3	top 1/3	bottom 1/3	middle 1/3	top 1/3
25-34	10%	10%	5%	8%	5%	3%
35-44	17%	10%	5%	14%	7%	5%
45-54	23%	13%	9%	24%	10%	8%
55-64	33% (36%)	17% (21%)	12% (14%)	34%	17%	13%
65-74	36% (38%)	26% (24%)	17% (16%)	41%	27%	19%
75+	46% (41%)	37% (29%)	24% (25%)	47%	38%	29%

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R1. Life-time monetary loss due to bad health (working age)

	Over entire life-cycle (21-death)				Over working periods (21-64)			
	All	η_1	η_2	η_3	All	η_1	η_2	η_3
% of time in bad health	15%	58%	23%	4%	10%	55%	14%	1%
Annual monetary losses	\$1,511	\$8,896	\$1,935	\$225	\$1,031	\$7,147	\$1,201	\$76
(% of avg earning)	*(3.9%)*	*(23%)*	*(5%)*	*(0.6%)*	*(2.7%)*	*(18%)*	*(3%)*	*(0.2%)*
Composition (%)								
- Medical loss paid by insurance	36%	33%	39%	39%	32%	33%	33%	18%
- Out-of-pocket medical loss	27%	22%	30%	36%	20%	20%	21%	11%
- Income losses	37%	45%	31%	24%	48%	47%	46%	71%

- Using 2% interest rate
- Average earning (2013) is $38,648

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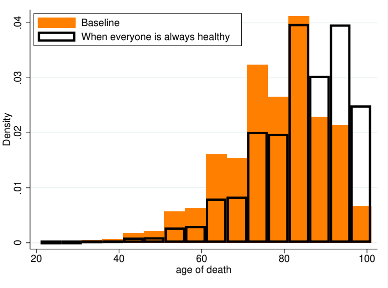
Variation due to age at death



	Baseline					When everyone are always healthy
	all	η_1	η_2	η_3	variation due to η	
Average age at death	77.4	63.0	73.8	81.5	21 %	83.4

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