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The Effects of Health Shocks on Debt holdings by Older American Households

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Health Care, Debt and the Elderly in the US

- Percentage of GDP spent on heath care in 2008 (OECD)

  US 16%, illustrative comparators: France 10.5%, Netherlands 10%

- Percentage of US population aged 65+ (US Bureau of Census)

  2010: 13%; 2030 (est): 19.3%

- Vast majority of health care costs incurred after age 65:

  2002 Mean annual expenditure on health care:

  Age 65+ $11,089; Age 19-64: $3,352

- Large rise in mortgage debt and consumer debt outstanding since 1990

Related Literature

Asset portfolios of the elderly:

Venti & Wise (1989, 1990, 2004); Shiener & Weil (1993); Hurd (1999); Coile & Mulligan (2006); Yogo (2008)

Debt holdings of the elderly: Lee et al (2007)

Saving by the very old: Di Nardi et al (2009)

Equity withdrawal: Sinai & Souleles (2007)

Bucks et al (2008)

Theoretical Considerations

Assume PIH,

$$u'(c_t) = E_t\left(\frac{(u'(c_{t+1}))(1+r_{t+1})}{(1+\rho_{t+1})}\right),$$

If

$$\rho = r$$

$$s_t = -\sum_{j=1}^{\infty}(1+r)^{-j}E_t\Delta y_{t+j}$$

Borrowing occurs when .

$$s_t < 0$$

Implications

- Those predicting income to drop on retirement will prefer to save rather than hold debt.
- As individual comes closer to expected life end, discount rate rises, consumption increases and so does debt.
- If hyperbolic discounting the debt holding even higher.
- Model assumes zero bequests. If positive bequests then will consume so expected net assets equal desired bequest.
- Consumption, so debt, is a function of taste shifters.

Health Shocks

If retired and

- has health ins – demand for debt may be unaltered
- has no health ins – demand for debt may increase

If working and

- has health ins - Yp may fall and if cannot reduce consumption- short term debt increases
- has no health ins – Yp may fall and even more short term debt is taken on

Medicare

Available to eligible Americans aged >=65

Will pay for up to 4 types of benefits:

- Hospitalisation (Part A) – free (apart from $1068 deductible) for up to 60 days if paid 40 consecutive months of FIC Act taxes. (otherwise pay up to $423/m premium)
- Outpatient care (Part B) – need to pay up to $96.40/month as premium
- Contribution to outpatient and hospitalisation care (Part C) (rest paid for by private health care plan)
- Prescription charges (Part D)

Widowhood

If partner dies remaining partner may reduce mortgage debts by using life insurance payouts or by downsizing family home

Venti & Wise (1989, 1990, 2004), Merrill (1984), Shiener & Weil (1992), Coile & Mulligan (2006) find home equity declines after bereavement, but do not consider mortgage debt holdings.

May engage in equity withdrawal, especially if not bequest motive Souleles & Sinai 2007).

Debt Supply

- Incentive to default (finitely repeated game)
- Administrative data suggests probability of defaulting is lower for older debt applicants (Crook et al 1992, Bellotti & Crook 2009)
- Lenders aware of lower expected income of elderly so constrain debt supply
- Lenders often aware of net worth of applicants – may encourage supply to elderly

Data

Wave	Survey Year	Survey	Cohort	Survey	Cohort	Survey	Cohort	Survey	Cohort	Survey	Cohort
1	1992	HRS	1931-41								
	1993			AHEAD	≤ 1923						
2	1994	HRS									
	1995			AHEAD							
3	1996	HRS									
	1997										
4	1998	HRS				CODA	1923-31	WB	1942-47		
	1999										
5	2000	HRS				CODA		WB			
	2001										
6	2002	HRS				CODA		WB			
	2003										
7	2004	HRS				CODA		WB		EBB	1948-53
	2005										
8	2006	HRS				CODA		WB		EBB	

Variable Definitions

‘Severe$_{it}$’	either head or spouse, *i,* reports in period *t* that has ever been told the suffer from cancer, have had a heart attack or heart disease or a stroke.
‘Chronic$_{it}$’	either head or spouse, *i,* is reported in period *t* to have ever suffered from high blood pressure or hypertension or chronic lung disease (except asthma) or psychological problems or arthritis or diabetes.
Insurance	posses any type of health insurance

Controls

Age, martial status, whether in labour force, employment status, household income, gross housing wealth, wave specific dummies.

Age in interval linear slope splines

Debt in inverse hyperbolic sine values: $x' = \ln(\sqrt{1+x^2}+x)$

1992 prices

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Percentage Holding of Debt by Age and Health Shock 2006

Total Debt

Age Range	Ever had Severe Health Shock	Never had Severe Health Shock	Total
Under 50	79.21	71.99	75.01
50-54	73.48	75.66	75.12
55-59	72.92	73.93	73.62
60-64	64.13	62.38	63.13
65-69	57.68	54.98	56.31
70-74	43.46	48.28	42.97
75-79	34.56	32.68	33.86
80-84	23.86	19.84	22.51
85 and over	13.44	11.96	12.97

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Percentage Holding of Debt by Age and Sate of Health 2006

	Mortgage Debt			Other Debt and home Equity Lines		
Age Range	Ever had Severe Shock	Never had Severe Shock	Total	Ever had Severe Shock	Never had Sever Shock	Total
Under 50	59.58	52.83	55.66	16.19	19.46	18.09
50 – 54	53.94	56.05	55.52	16.94	14.03	14.76
55 – 59	46.79	53.75	51.58	15.97	17.01	16.69
60 – 64	41.81	42.14	42.00	13.09	11.25	12.04
65 – 69	36.59	34.96	35.77	12.28	10.12	11.19
70 – 74	21.10	22.92	21.84	9.36	7.10	8.44
75 – 79	14.80	16.47	15.43	5.05	5.72	5.31
80 – 84	9.80	9.61	9.74	3.90	3.71	3.83
85 and over	4.69	4.64	4.69	1.75	1.82	1.77

Consumer Debt

Age Range	Ever had Severe Shock	Never had Severe Shock	Total
Under 50	52.87	43.92	47.67
50 – 54	47.10	44.38	45.06
55 – 59	47.39	45.79	46.29
60 – 64	37.84	34.62	35.99
65 – 69	31.51	29.74	30.61
70 – 74	24.98	22.89	24.13
75 – 79	21.62	19.93	20.98
80 – 84	14.65	11.14	13.47
85 and over	8.22	6.78	7.7

Percentage Holding of Debt by Age and Health Shock in Last Two Years 2006

Total Debt

Age Range	Had Severe Health Shock	Not Had Severe Health Shock	Total
Under 50	n.a.	70.87	73.98
50-54	80.31	74.57	74.86
55-59	70.19	74.05	73.82
60-64	77.73	61.62	62.49
65-69	55.54	56.83	56.75
70-74	49.12	42.60	43.01
75-79	45.20	32.84	33.71
80-84	14.72	23.06	22.57
85 and over	11.24	13.10	12.98

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Percentage Holding of Debt by Age and Health Shock in Last Two Years 2006

	Mortgage Debt			Other Debt and home Equity Lines		
Age Range	Ever had Severe Shock	Never had Severe Shock	Total	Ever had Severe Shock	Never had Sever Shock	Total
Under 50	n.a.	53.98	56.49	n.a.	13.37	16.14
50 – 54	71.16	54.76	55.59	24.74	14.56	15.08
55 – 59	43.55	52.91	52.34	12.40	16.92	16.64
60 – 64	45.39	41.56	41.77	18.84	12.11	12.47
65 – 69	29.35	36.48	36.07	12.68	11.51	11.58
70 – 74	24.43	21.88	22.03	8.90	8.38	8.41
75 – 79	22.77	14.71	15.27	5.06	5.29	5.27
80 – 84	9.99	9.52	9.55	0	4.24	3.99
85 and over	5.73	4.42	4.51	0	2.02	1.89

Consumer Debt

Age Range	Ever had Severe Shock	Never had Severe Shock	Total
Under 50	n.a.	44.65	46.06
50 – 54	41.34	44.88	44.71
55 – 59	48.58	45.83	46.00
60 – 64	37.52	35.04	35.18
65 – 69	36.58	30.39	30.75
70 – 74	28.80	23.81	24.12
75 – 79	24.59	20.56	20.84
80 – 84	7.83	14.22	13.84
85 and over	5.51	7.95	7.79

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Conditional and Unconditional Mean Holding of Debt by Age and Health Shock 2006

Total Debt

	Unconditional on holding debt			Conditional on holding debt		
Age Range	Ever had Severe Shock	Never had Severe Shock	Total	Ever had Severe Shock	Never had Severe Shock	Total
Under 50	65,503	81,583	74,848	82,701	113,319	99,779
50 – 54	55,381	66,350	63,609	75,373	87,690	84,680
55 – 59	64,308	55,634	58,335	88,188	75,250	79,241
60 – 64	42,630	35,738	38,680	66,469	57,290	61,271
65 – 69	36,984	29,261	33,075	64,114	53,223	58,732
70 – 74	18,170	18,490	18,300	41,810	43,748	42,587
75 – 79	12,316	14,828	13,262	35,632	45,370	39,173
80 – 84	6,678	5,969	6,440	27,983	30,087	28,606
85 and over	2,150	4,800	2,983	15,996	40,134	22,994

Figure 1

Mean Value Total Debt Holdings by Cohort

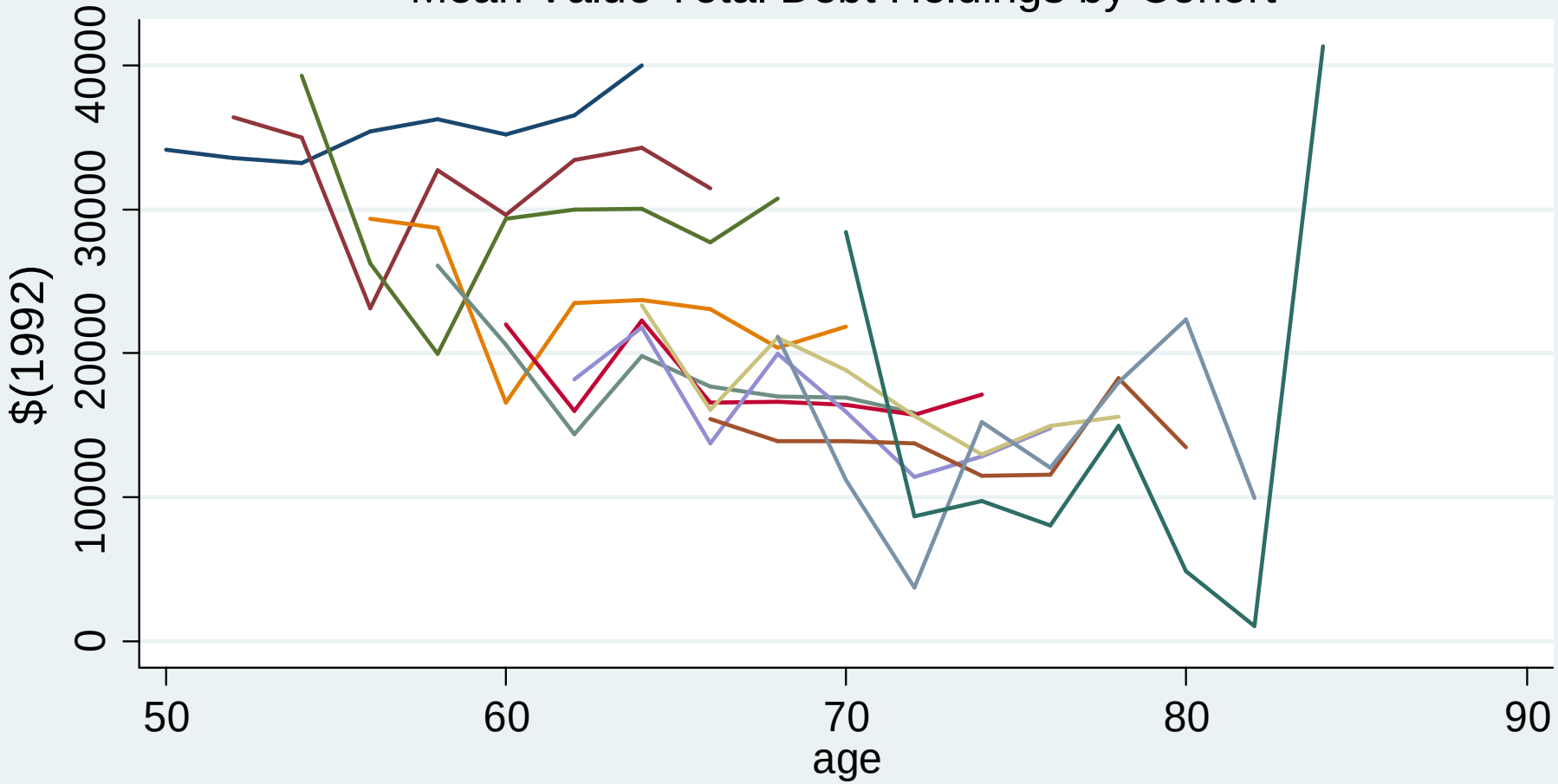


Figure 2

Incidence Total Debt Holdings by Cohort

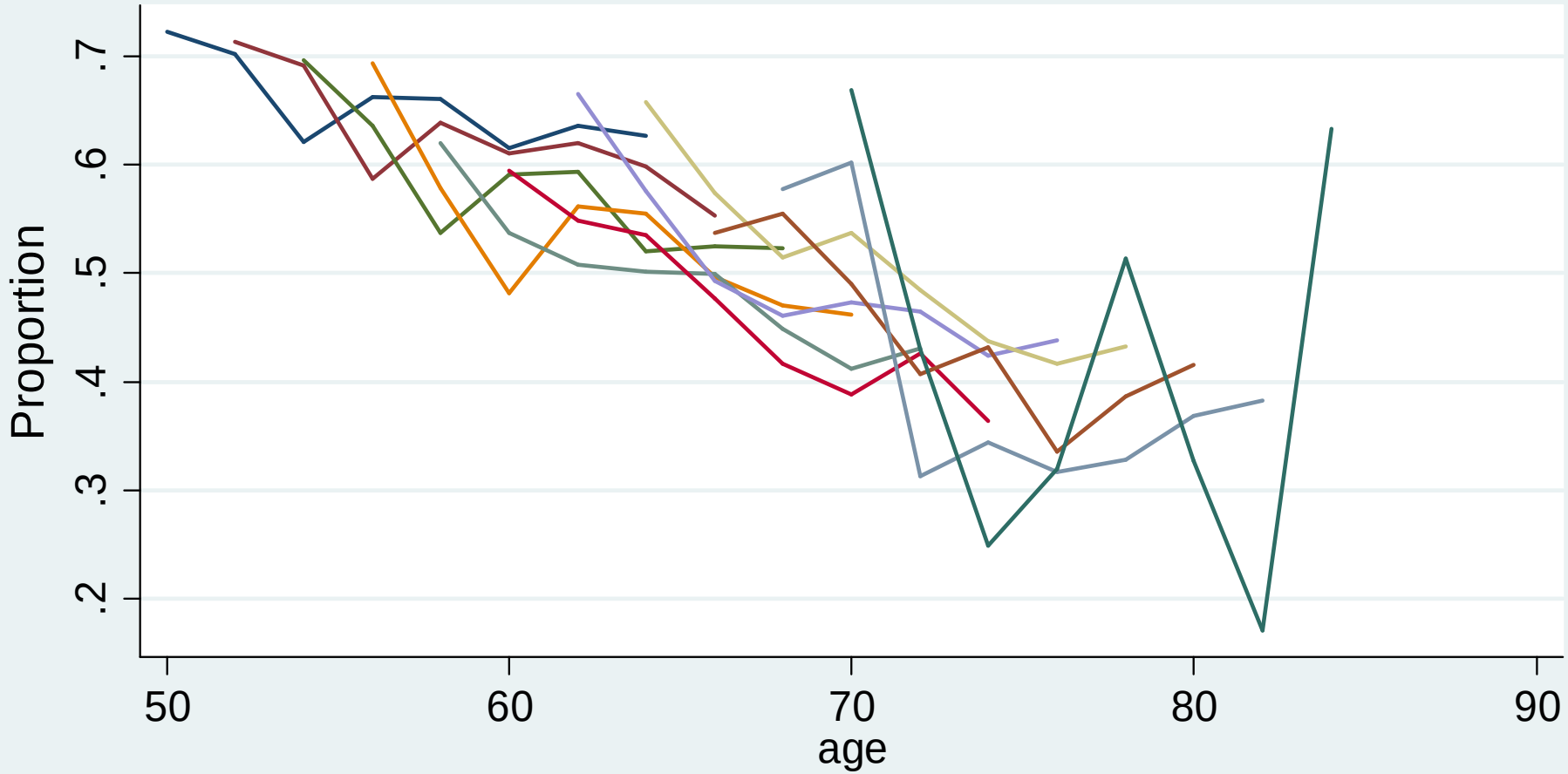


Figure 4

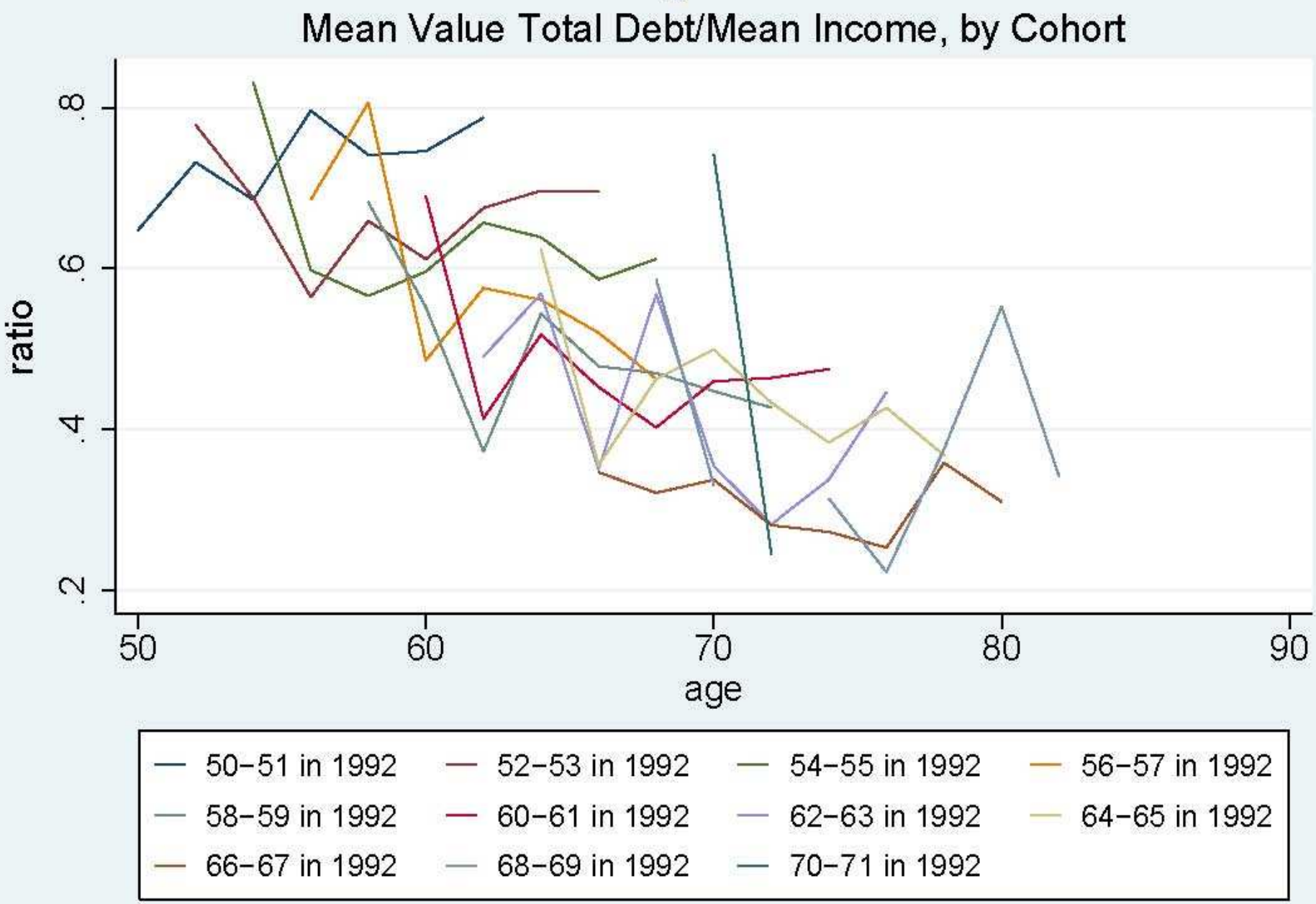

Mean Value Total Debt/Mean Income, by Cohort
ratio
.2
.4
.6
.8
50
60
70
80
90
age
50−51 in 1992
52−53 in 1992
54−55 in 1992
56−57 in 1992
58−59 in 1992
60−61 in 1992
62−63 in 1992
64−65 in 1992
66−67 in 1992
68−69 in 1992
70−71 in 1992

Figure 5B

Health Index: Chronic Conditions, by Cohort

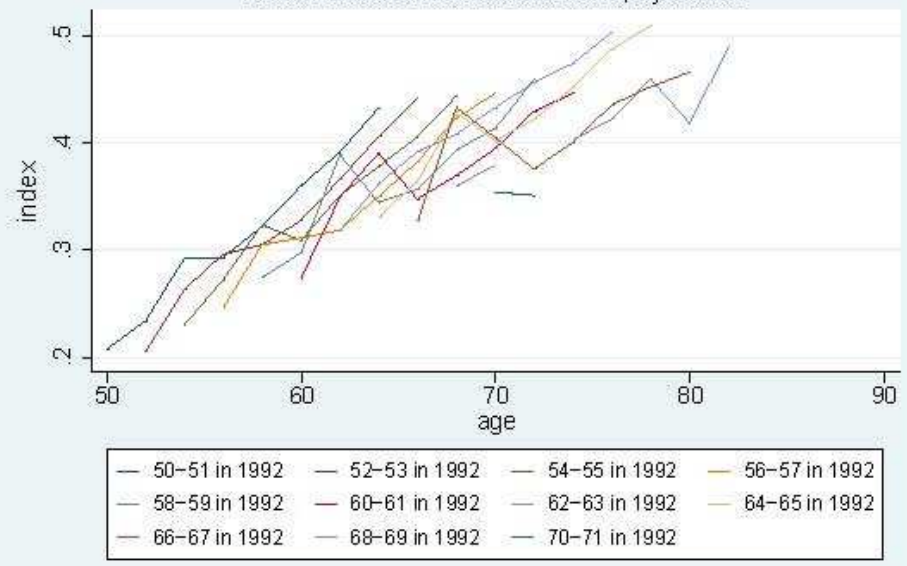
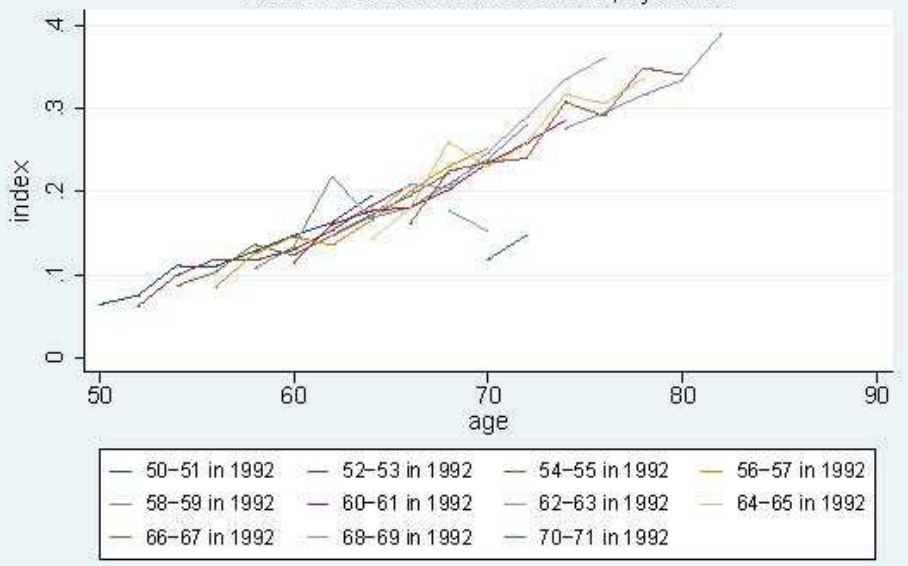


Figure 5A

Health Index: Severe Conditions, by Cohort



Effects of Health Shocks

Econometric Specification 1

$$debt_{it} = \alpha + \beta_1 health\ state_{it} + \boldsymbol{\beta}_2 \mathbf{x}_{it} + \boldsymbol{\delta}_t + \upsilon_i + \varepsilon_{it}$$

$\mathbf{x}_{it}$ = vector of demographic control variables
δ_t = wave dummy fixed effects
ε_{it} = individual specific effect for household i

To get to health shocks

•first difference ,

•allow change in debt to be partial,

•assume levels of demographics affects changes in debt not levels,

•include interactions between age 65 and having insurance (price of health care effect)

•Include interactions between state of health and having insurance

•Include interactions between health state and possession of debt in previous period

Econometric Specification 2

$$debt_{it} = \gamma debt_{it-1} + \beta_1 \Delta health\ state_{it} + \beta_2 healthstate_{it-1} + \beta_3 I(age65_{it} = 1).I(insurance_{it} = 1)$$

$$+ \beta_4 healthstate_{it}.I(insurance_{it} = 1) + \beta_5 \Delta healthstate_{it}.I(debt_{it-1} = 1) + \boldsymbol{\beta}_6 \mathbf{x}_{it} + \boldsymbol{\delta}_t + \lambda_i + \zeta_{it}$$

Assuming

$E(\varepsilon_{it} \mid \mathbf{z}_{it}, \lambda_i) = 0$ and $E(\lambda_i \mid \mathbf{z}_{it}) = 0$ $\Rightarrow$ Random effects

$E(\varepsilon_{it} \mid \mathbf{z}_{it}, \lambda_i) = 0$ and possibly $E(\lambda_i \mid \mathbf{z}_{it}) \neq 0$ $\Rightarrow$ Fixed effects

Estimation strategy

Consider $$y_{it} = \gamma y_{it-1} + \mathbf{x}_{it}^T \boldsymbol{\beta} + \lambda_i + \zeta_{it}$$

Lagged dependent variable implies endogeneity

Estimation strategies

Anderson Hsaio (1981): first difference

$$\Delta y_{it} = \gamma \Delta y_{it-1} + \Delta \mathbf{x}_{it} \boldsymbol{\beta} + \Delta \zeta_{it}$$ y_{it-2} correlated with Δy_{it-1} but not with $\Delta \zeta_{it}$

Use y_{it-2} as instrument and 2sls or GMM. This is consistent assuming $\Delta \zeta_{it}$ is not serially correlated

Arellano Bond (1991) General Method of Moments Estimator

Find $\mathbf{z}_{it}$ such that $E(z^T_{it}, \Delta \zeta_{it}) = \mathbf{0}$ $t = 2, \ldots, T$ where $\mathbf{z}_{it} = (y_{it-2}, x_{it-2}, y_{it-3}, x_{it-3} \ldots . y_{i1}, x_{i1})^T$ - a Moment condition

That is if $E(\zeta_{it}) = 0$ and $E(\zeta_{it}, \zeta_{is}) = 0$ then $\Delta \zeta_{it}$ will have zero cov with all y_{it} and x_{it} for t-2, t-3,….1
Since are many instruments, instruments may be overidentified. Use an estimator that *minimises* $E(\mathbf{z}^T_{it}, \Delta \zeta_{it})$
Consistent and more efficient that Anderson Hsaio because more instruments
Test for serial correlation in ζ_{it}, (AR(2) test for error in first differences) and for exogeneity of instruments (Sargan test)

Estimation Strategy 2

Arellano Bover (1995) Forward Orthogonal Deviations Estimator

Consider $y_{it} = \gamma y_{it-1} + \mathbf{x}_{it}^T \boldsymbol{\beta} + \lambda_i + \zeta_{it}$

assume $E(\lambda_i . y_{it}) = E(\lambda_i . y_{is}) \qquad \forall t, s$

$E(y_{it-1}, \lambda_{is}) = 0 \qquad t-1 < s$

Can treat as part of a system of 2 equations:

$$\Delta y_{it} = \gamma \Delta y_{it-1} + \Delta \mathbf{x}_{it}^T \boldsymbol{\beta} + \Delta \zeta_{it}$$
$$y_{it} = \gamma y_{it-1} + \mathbf{x}_{it}^T \boldsymbol{\beta} + \lambda_i + \zeta_{it}$$

Use moment conditions for levels and first differences

Especially helpful when γ close to 1.

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Dynamic Fixed Effects Models with Health Shocks (Anderson Hsiao)

	Total	Mortgage	Housing equity	Consumer
debt t-1	0.181 **	0.328**	0.102**	0.120**
Age < 65	-0.106*	-0.017	0.018	-0.118*
Age 65 plus	-0.079	0.043	-0.024	-0.091
Divorced	-0.747*	-0.663*	-0.245	-0.089
Widow	-0.512	-0.533	-0.154	-0.056
Single	-0.660	-0.613	-0.060	-0.326
Out of lab force	-0.237*	-0.267**	-0.039	-0.154
Unemployed	0.080	-0.174	-0.290*	0.503*
Retired	-0.235**	-0.307**	-0.024	-0.124
Has health insurance	0.110	0.005	-0.025	0.104
Age65 & insurance	-0.079	-0.064	-0.041	-0.029
Occurrence of severe shock	1.811**	0.418	0.220	1.755**
Occurrence of chronic shock	1.246**	0.890**	0.225	0.910**
Ever had severe shock$_{t-1}$	0.797**	-0.196	-0.073	0.884**
Ever had chronic shock$_{t-1}$	0.051	0.189	-0.131	0.112
Ever severe*has any insurance	-0.687**	0.245	-0.004	-0.743**
Ever chronic*has any insurance	-0.074	-0.215	0.074	-0.021
Severe shock*has debt$_{t-1}$	-1.881**	-1.893**	-2.639**	-2.710**
Chronic shock*has debt$_{t-1}$	-1.706**	-1.588**	-2.661**	-2.219**
IH HH income	0.053**	0.012	0.010	0.023
IH Gross Value of homes	0.296**	0.419**	0.037**	0.006
Dummy 1996	-0.094	-0.241*	0.050	0.100
Dummy 1998	-0.061	-0.191	0.001	-0.011
Dummy 2000	-0.012	-0.283	-0.120	0.253
Dummy 2002	-0.113	-0.532	-0.043	0.206
Dummy 2004	0.145	-0.554	0.056	0.506
Dummy 2006	0.191	-0.616	0.077	0.590
No of obs	41,641	41,641	41,755	41,755

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Dynamic Fixed Effects Models with Health Shocks (Arellano Bover)

	Total	Mortgage	Home Equity	Consumer
debt t-1	0.619**	0.788**	-0.039	0.316
debt-2	0.094	0.042	0.150**	-0.019
Age < 65	-0.051**	-0.043**	-0.002	-0.054**
Age 65 plus	-0.034	0.001	-0.026**	-0.061**
Divorced	0.252**	0.496**	-0.306**	0.064
Widow	0.199*	0.397**	-0.201**	-0.016
Single	0.050	0.491**	-0.309**	-0.382**
Out of lab force	-0.377*	-0.288**	-0.070	-0.544**
Unemployed	0.194	-0.299	-0.388*	0.569
Retired	-0.352**	-0.300**	-0.096*	-0.326**
Has health insurance	0.107	-0.191	0.350*	0.145
Age65 & insurance	-0.154*	-0.059	-0.151**	-0.062
Occurrence of severe shock	2.161**	0.719*	0.069	1.706**
Occurrence of chronic shock	1.541*	1.047**	0.146	0.806
Ever had severe shock$_{t-1}$	0.892**	-0.120	0.107	0.311
Ever severe*has any insurance	-0.832*	0.188	-0.097	-0.822**
Ever chronic*has any insurance	0.056	0.054	-0.092	-0.008
Severe shock*has debt$_{t-1}$	-2.182*	-2.487**	0.505	-1.973
Chronic shock*has debt$_{t-1}$	-2.210*	-2.481**	0.205	-1.472
IH income	0.006	-0.058*	0.054**	0.005
IH Value of homes	0.157**	0.182**	0.061**	-0.001
+ Wave dummies & Constant				
Arellano-Bond test for AR(2)	0.509	0.086	0.047*	0.282
Hansen test (chi-square(18))	0.416	0.130	0.310	0.638
No of obs	42,186	42,186	42,424	42,424
No of panels	12353	12353	12369	12369

Influence of Health Insurance

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Dynamic Fixed Effects Models with Health Shocks and Medicare (Anderson Hsaio)

	Total	Mortgage	Home Equity	Consumer
$debt_{t-1}$	0.184**	0.325**	0.101**	0.128**
deb_{t-2}				
Age < 65	-0.101	-0.012	0.013	-0.109*
Age 65 plus	-0.073	0.047	-0.027	-0.086
Divorced	-0.869**	-0.616*	-0.281	-0.175
Widow	-0.594	-0.497	-0.172	-0.133
Single	-0.750	-0.652	-0.100	-0.334
Out of lab force	-0.229*	-0.262**	-0.039	-0.138
Unemployed	0.086	-0.142	-0.289*	0.504*
Retired	-0.234**	-0.319**	-0.024	-0.115
Has health insurance				
Age65 & has medicare insurance	0.011	-0.100	0.045	0.031
Occurrence of severe shock	1.669**	1.067**	0.435**	1.369**
Occurrence of chronic shock	1.432**	0.900**	0.346**	1.003**
Ever had severe shockt-1	0.306	-0.040	0.065	0.268
Ever had chronic shockt-1	-0.008	0.005	-0.051	0.112
Severe shock*has medicare	-0.430*	-0.674*	-0.146	-0.312
Chronic shock*has medicare	-0.423*	-0.387*	-0.115	-0.160
Ever severe*has medicare	-0.231	0.139	-0.183*	-0.141
Ever chronic*has medicare	0.002	0.020	-0.003	-0.051
Severe shock*has debtt-1	-2.030**	-2.023**	-2.673**	-2.809**
Chronic shock*has debtt-1	-1.86**	-1.719**	-2.704**	-2.299**
IH income	0.053**	0.034	0.011	0.023
IH Value of homes	0.297**	0.417**	0.037**	0.007
+ Wave dummies				
No of obs	41653	41653	41766	41766

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Dynamic Fixed Effects Models with Health Shocks and Types of Insurance (Anderson Hsaio)

	Total	Mortgage	Home Equity	Consumer
Has government health insurance	-0.109	0.091	0.155	-0.189
Has private health insurance	0.157	0.235	0.006	-0.051
Age65 & has private insurance	0.064	-0.017	-0.082	0.132
Occurrence of severe shock	1.729**	0.960**	0.235	1.553**
Occurrence of chronic shock	1.629**	1.129**	0.360*	0.935**
Ever had severe shock$_{t-1}$	0.493*	-0.043	0.056	0.386
Ever had chronic shock$_{t-1}$	0.091	0.253	-0.011	0.059
Severe shock*has govt insurance	**-0.370****	**-0.575****	-0.094	-0.343
Chronic shock*has govt insurance	**-0.475***	-0.273	-0.118	-0.237
Severe shock*has private insurance	0.110	0.070	0.236**	-0.063
Chronic shock*has private insurance	-0.133	-0.042	0.074	0.070
Ever severe*has govt insurance	**-0.370****	0.045	-0.199*	-0.178
Ever chronic*has govt insurance	0.097	-0.162	-0.057	0.132
Ever severe*has private insurance	-0.095	0.099	0.031	-0.080
Ever chronic* has private insurance	-0.166	-0.223	-0.012	-0.026
Severe shock*has debt$_{t-1}$	-2.008**	-2.040**	-2.712**	-2.814**
Chronic shock*has debt$_{t-1}$	-1.788**	-1.670**	-2.720**	-2.314
IH income	0.054**	0.012	0.014	0.022
IH Value of homes	0.298**	0.421**	0.037	0.005
No of obs	40,938	40,938	41,048	41,048

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Dynamic Fixed Effects Models with Health Shocks and Types of Insurance (Arellano Bond)

	Total	Mortgage	Home Equity	Consumer
Has govt health insurance	-0.085	0.207	0.099	-0.108
Has private health insurance	0.015	-0.097	0.328**	-0.069
Age65 & has private insurance	-0.062	-0.089	-0.151**	0.003
Occurrence of severe shock	2.278**	1.455**	-0.021	1.374*
Occurrence of chronic shock	2.436**	1.724**	0.241	0.739
Ever had severe shock$_{t-1}$	0.372*	0.063	0.207*	0.330*
Ever had chronic shock$_{t-1}$	0.156	0.140	0.179	0.228
Severe shock*has govt insurance	**-0.648***	**-0.830****	0.107	-0.325
Chronic shock*has govt insurance	-0.960*	-0.861**	-0.005	-0.132
Severe shock*has private insurance	0.053	0.199	0.048	-0.105
Chronic shock*has private insurance	-0.170	-0.055	-0.118	0.056
Ever severe*has govt insurance	**-0.340****	-0.051	-0.250**	-0.118
Ever chronic*has govt insurance	0.226	-0.008	-0.088	0.086
Ever severe*has private insurance	-0.088	0.012	-0.025	-0.093
Ever chronic*has private insurance	-0.115	-0.020	-0.137	0.065
Severe shock*has debt$_{t-1}$	-2.589*	-2.800**	0.322	-1.989
Chronic shock*has debt$_{t-1}$	-2.663*	-2.824**	0.157	-1.477
IH income	0.006	-0.053*	0.052**	0.004
IH Value of homes	0.154**	0.183**	0.058**	-0.002
Arellano-Bond test for AR(2)	0.458	0.068	0.113	0.289
Hansen test (chi-square(18))	0.523	0.143	0.466	0.577
No of obs	41,749	41,749	41,873	41,981
No of panels	12279	12279	12289	12293

Conclusions

- **Households use debt and in particular mortgage debt and consumer debt to smooth consumption in the face of severe health problems and severe health shocks**
- **If a hh has a severe health shock and Medicare they have less debt than if it does not have Medicare or does not have a shock or neither.**
- **If a hh has a severe health shock and any form of government insurance it has less debt than if it has no government insurance or no shock or neither.**
- **Simply having government insurance does not reduce debt, a hh has to have a severe health shock as well.**
- **If a hh has a severe health shock and private insurance it has neither more nor less debt than not having private insurance**
- **Experiencing a severe health shock when a household already has debt leads it to have less debt which may be due**
  - to the household deciding to repay debt in the face of anticipated income decreases due to deterioration in health
  - financial institutions willing to lend less to those who already have debt and then suffer a severe shock