

# Spousal Labor Supply, Caregiving, and the Value of Disability Insurance

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# Motivation

For married households, spousal labor supply acts as a household insurance mechanism against earnings shocks.

- ▶ Wives increase working hours when husbands face an involuntary job loss (job displacement).
- ▶ In contrast, wives do **not** increase labor supply when husbands are hit by a disability shock.

# Question

1. How do married women allocate their time to market work and spousal care in the event of their husbands' earning shock?
2. What is the (ex-ante) insurance value that the Social Security Disability Insurance (SSDI) provides to married households relative to its costs?
  - ▶ Married households have an additional source of insurance from spousal labor supply,
  - ▶ but some of this is (potentially) attenuated due to spousal care.

# Overview

1. Empirical patterns
  - Background: “disability” and SSDI, dataset, and summary statistics
  - Event Study: wives’ time allocation patterns in response to their husbands’ layoff and disability shocks
2. Dynamic model of married households
  - Time allocation to spousal care
  - Institutional details of SSDI
  - Health state dependence in consumption utility
3. Model estimation
  - Indirect Inference using event study data patterns as moments
4. Counterfactual exercises

## Empirical Patterns

# Data

## Health and Retirement Study (HRS)

### 1. Core

- ▶ Biennial panel of individuals age 50+ and their spouses
- ▶ Rich information on health, assets, labor market outcomes, disability benefits, and caregiver usage
- ▶ 1992-2014, 12 waves
- ▶ Observation included if both husband and wife are less than age 65 (9,499 married HHs)

### 2. CAMS (Consumption and Activities Mail Survey)

- ▶ Off-year supplement on time use
- ▶ 2001-2015, 8 waves

### 3. Restricted Social Security data

- ▶ Social Security earnings history dating back to 1974
- ▶ Disability benefit claims data

# Background

- ▶ Disability = “having a health condition that limits the type or amount of work one can do”
  - e.g., arthritis, back pain, cancer, psychological conditions
- ▶ HRS: 21.5% of married men (ages 50 to 64) are disabled (11.5% moderate, 10% severe) [▶ def.](#)
- ▶ 20% of moderately disabled husbands and 56% of severely disabled husbands receive care from their wives [▶ sumstats](#)
- ▶ SSDI is the largest disability insurance program in the US
  - Benefits awarded based on medical / vocational considerations: “unable to engage in substantial gainful activity due to impairment expected to last at least 12 months”
  - Monthly benefit amounts based on earnings history (average=\$1,293 in 2016)
  - Spending on benefits (in 2017) = \$145 billion (0.8% of GDP)
    - SNAP: \$63B, UI: \$70B, EITC: \$60B

# Event Study Framework

Analysis restricted to earnings shock of the **husband**.

- ▶ Husbands are the “main earners” for 85% of married households.

For married household  $i$  at time  $t$ ,

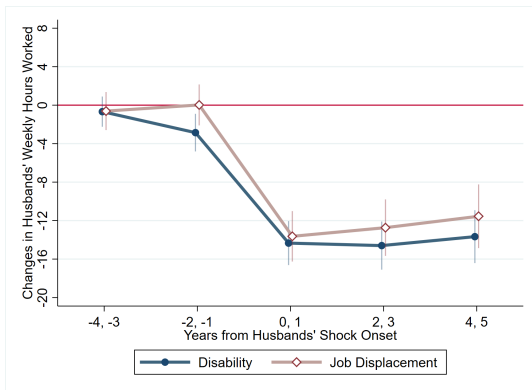
$$y_{it} = \alpha_i + \gamma_t + X'_{it}\beta + \sum_{k=-4}^5 \delta_k \cdot l_{itk} + \epsilon_{it}$$

- ▶  $y_{it}$ : various dependent variables
- ▶  $X_{it}$ : quartic of the husband and wife's age, dummies for age being +62, census division, household size, current length of marriage, wives' disability severity
- ▶  $l_{itk}$ : indicator for being  $k$  years since event onset (disability / job displacement)



## Event Study: Husbands' Labor Supply

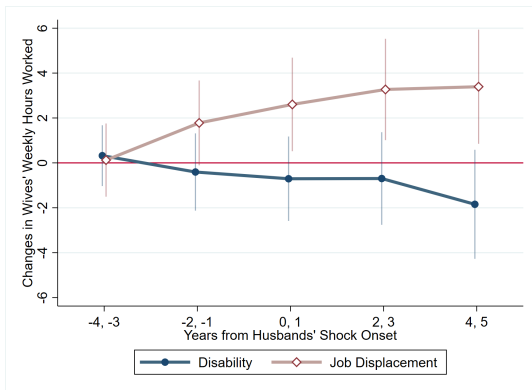
Large and persistent decrease in husbands' labor supply post onset of disability and job displacement shocks.



Pre-shock means: 36.3 (disability), 43.3 (job displacement)

# Event Study: Wives' Labor Supply

- ▶ Husbands' job displacement: Significant increase in spousal labor supply  
⇒ Consistent with intuition and previous works (Blundell et al., 2016; Stephens, 2002)
- ▶ Husbands' disability: **Small** labor supply responses from wives.



Pre-shock means: 23.7 (disability), 25.4 (job displacement)

# Wives' Weekly Hours in Caregiving

	Event Study (Core) <sup>†</sup>	Event Study (CAMS) <sup>‡</sup>	OLS (CAMS)
Year = -2, -1	0.029 (0.423)	0.845 (0.645)	
Year = 0, 1	2.205*** (0.829)	1.930** (0.857)	
Year = 2, 3	3.800*** (1.216)	1.806** (0.863)	
Moderate			2.246** (1.109)
Severe			5.277*** (1.607)
Observations	11,540	1,595	2,849

<sup>†</sup> Helping the spouse in performing ADL/IADLs. <sup>‡</sup> Treating or managing spouse's medical condition.

# Summary

- ▶ Disability is associated with significant decrease in husbands' earnings but wives do **not** increase working hours.
  - Contrary to job displacement shocks where wives increase weekly working hours by 3~4 hours.
  - Especially, wives spend a 2~3 hours per week in caregiving after their husbands' disability onset.
- ▶ In the absence of time loss to caregiving, how would spousal labor supply responses to husbands' disability shocks look like?
- ▶ When the insurance role of spousal labor supply is reduced due to time spent in spousal care, how valuable is social disability insurance relative to the cost of providing it?



Model

## Model Summary

- ▶ Dynamic model of married households: unitary households (i.e., single decision-making unit) which dissolve through death or divorce
- ▶ Annual time period (model start at age 50 and a married household dies with certainty at age 90)
- ▶ Exogenous shocks at the beginning of each period: mortality and divorce shocks, disability shocks (husband), job displacement shocks (husband), wage shocks (both spouses) ▶
- ▶ Choices: Household consumption (and next period savings), labor market hours (both spouses), the wife's caregiving hours, and SSDI application
- ▶ Institutional features of SSDI: moral hazard due to high allowance rate for moderate disabilities and termination of benefits when beneficiaries work ▶
- ▶ Retirement period: age 65 and onward ▶

# Household Preferences

$$u_t(c, l^h, l^w, tc, App; s) = \theta(s) \cdot \frac{c^{1-\gamma} - 1}{1-\gamma} + \psi_h \cdot \frac{(l^h)^{1-\gamma_h} - 1}{1-\gamma_h} + \psi_w \cdot \frac{(l^w)^{1-\gamma_w} - 1}{1-\gamma_w} \\ + \kappa_t(tc; s) - \iota(s) \cdot App$$

- ▶ Husband's disability status:  $s \in \{0, 1, 2\}$
- ▶  $\theta(s)$ : health state dependence in consumption utility ( $\theta(0) = 1$ )
  - ▶  $\theta(s) < 1$ : negative dependence (e.g., vacation, outings)
  - ▶  $\theta(s) > 1$ : positive dependence (e.g., transportation service, household services)
- ▶ Time constraints given fixed time endowments for each spouse 
- ▶ Caregiving utility  $\kappa_t$  increases with wife's time input  $tc$  and husbands' caregiving needs  $\eta(s)$  

# Estimation Method

1. First step: calibrate / estimate certain parameters that are identified without using the model
  - ▶  $r = 0.03$ ,  $\beta = \frac{1}{1.03}$ ,  $\gamma = 1.5$ ,  $\lambda = 0.99$ ,  $\gamma_h = \gamma_w = 1$
  - ▶ Job destruction rate  $\delta_j(s)$  and divorce rate  $\delta_m(s)$  [▶ details](#)
  - ▶ Mortality process [▶ details](#)
  - ▶ Husband's disability process [▶ details](#)
  - ▶ Wage offer function [▶ details](#)
  - ▶ SSDI award probabilities [▶ details](#)
  - ▶ Annual medical expenses [▶ details](#)
2. Second step: estimate remaining 21 parameters via indirect inference



# Data Moments

## $\theta(s)$ : Health state dependence in consumption

1. Changes in spousal labor supply across health states
  - Within each state, the wife chooses market hours such that it reveals how much the household values consumption in the form of spousal earning
  - This logic goes through if the wife's marginal disutility of work remains constant across her husband's health states!
2. Wife's caregiving choices

Simple FOC for static version (when  $l_w = \bar{L} - h_w$ )

$$\theta(s) \cdot c^{-\gamma} = \frac{\psi_w \cdot (\bar{L} - h_w)^{-\gamma_w}}{w_w}, \quad \forall s \in \{1, 2\}$$

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# Model Parameter Estimates

Parameter	Baseline	“No-caregiving” <sup>†</sup>
Health state dependence in $MU_c$		
$\theta(1)$	0.914 (0.009)	0.960 (0.012)
$\theta(2)$	1.446 (0.011)	1.083 (0.008)
Moments matched		
Spousal labor supply responses	Yes	Yes
Caregiving choices	Yes	No

<sup>†</sup> Model assuming that wives only allocate time between market hours and leisure (i.e., caregiving utility is always zero)

▸ other parameters

▸ caregiving utility

▸ moment fit

## Counterfactual Experiments

# Simulated Added-Worker-Effects Under Baseline Estimates

Husbands' Disability	(1) Wives' Weekly hours	(2) Wives' Employment
	With spousal care	
Moderate	-0.301	-0.023
Severe	0.012	-0.012
	Without spousal care	
Moderate	-0.257	-0.019
Severe	1.821	0.026

*Notes:* This table reports results from fixed effect regressions of wives' labor supply on indicators of husbands' disability severity, a quartic in both spouses' ages, and household fixed effects using model simulated data.

# Ex-ante Insurance Value of SSDI

- ▶ Compensating Variation  $x$ :

$$V_{50}(A_t, \Theta_t | \text{with SSDI}) = V_{50}(A_t + x, \Theta_t | \text{without SSDI})$$

- ▶ For each simulated household,  $x$  represents the consumption smoothing benefits of SSDI

# Ex-ante Insurance Value of SSDI

	Model	
	Baseline	"No-caregiving"
(1) Ex-ante insurance value of SSDI (mean)	\$7,760	\$6,998
(2) Ex-ante insurance value of SSDI per dollar of SSDI benefits	\$0.83	\$0.79
(3) Required % change in SSDI benefits such that (2) equals \$0.79	+8.27%	-
(4) Required % change in SSDI benefits such that (2) equals \$1	-20.95%	-

⇒ Omission of time spent in caregiving considerably underestimates the welfare benefits of SSDI

## Policy Reform: Supplementary Caregiver Benefits

Given the same government budget, social welfare is maximized when SSDI benefits are reduced by 7.6% but annual caregiver benefits of \$35,668 are provided to eligible beneficiaries (high caregiving needs with wives providing full-time care)

Quintiles of husbands' lifetime earnings	Fraction that prefers reform	Insurance value of current policy	Insurance value of reform policy
Q1 (bottom)	0.98	\$4,047	\$4,487
Q2	0.96	\$6,797	\$7,000
Q3	0.50	\$9,307	\$9,214
Q4	0.16	\$10,802	\$10,424
Q5 (top)	0.04	\$10,171	\$9,336



## Conclusion

# Summary

- ▶ Caregiving needs is an important channel that reduces the insurance role of wives' labor supply
  - (Event study) Small added-worker effects but large increases in wives' caregiving hours when husbands become disabled
  - (Model) Wives of severely disabled husbands would have substantially increased labor supply in the absence of caregiving
- ▶ Policy implications
  - Incorporating time loss due to caregiving increases the consumption smoothing benefits of DI given the costs
  - Policy reforms that adjust benefits based on the degree of required care could be a possible modification of the current SSDI system

Thank you!

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# Appendix

# Literature

[▶ return](#)

## ▶ “Added worker effects”

- Hyslop (2001), Stephens (2002), Juhn and Potter (2007), Haan and Prowse (2015), Blundell et al. (2016)
- Coile (2004), Gallipoli and Turner (2011), ?

## ▶ Married women’s time allocation to informal care

- Ettner (1996), Carmichael and Charles (2003), Heitmueller (2007), Bolin et al. (2008), Van Houtven et al. (2013)

## ▶ Social disability insurance

- Bound (1989), Chen and van der Klaauw (2008), ?, Maestas et al. (2013), French and Song (2014), ?
- Bound et al. (2004), Chandra and Samwick (2005), Bound et al. (2010), ?, Low and Pistaferri (2015), Jacobs (2015)

## ▶ Health state dependence

- Viscusi and Evans (1990), Lillard and Weiss (1997), Finkelstein et al. (2013), ?, ?



# Definition of Disability Severity [▶ return](#)

Severely disabled (a la Census definition) =

- Having certain health conditions (e.g. deaf, blind, speech problems, Alzheimer's, intellectual disabilities)
- Unable / need help in performing certain ADL/IADL's (e.g. walking, preparing meals, dressing, going outside the home)
- Requires using equipment (e.g. wheelchair, canes, crutches)

Conditional on being disabled,

- satisfies one or more criteria  $\Rightarrow$  Severe
- if not  $\Rightarrow$  Moderate

# Summary Statistics of Married Men by Disability Severity

	Healthy	Moderate	Severe
Person-Year Observations	28,908 (78.62%)	3,320 (11.48%)	2,860 (9.89%)
Employed (%)	85.64	43.75	18.40
Receiving SSDI (%)	0.28	20.75	45.98
Associated health condition (top 3) (%)			
Musculoskeletal system	-	58.26	43.43
Heart / circulatory / blood	-	18.52	15.98
Neurological / sensory	-	1.30	14.87
Respiratory system	-	6.68	4.48
Receiving Wife's care (%)			
Part-time: (0, 25] hours/week	-	18.53	41.76
Full-time: > 25 hours/week	-	1.53	14.40

[▶ return](#)

## Robustness: Change in Wife's Weekly Hours Worked

[▶ return](#)

	(1)	(2)	(3)	(4)
Year = -4, -3	0.318 (0.751)	0.800 (0.825)	0.810 (0.826)	-0.373 (1.266)
Year = -2, -1	-1.171 (0.996)	-0.858 (1.083)	-0.827 (1.085)	<b>-3.885</b> (1.818)
Year = 0, 1	-1.861 (1.157)	-0.707 (1.273)	-0.538 (1.323)	-1.391 (2.121)
Year = 0, 1 × Receiving SSI/DI			-1.648 (3.203)	
Year = 2, 3	-0.955 (1.322)	1.041 (1.412)	1.515 (1.519)	-1.252 (1.968)
Year = 2, 3 × Receiving SSI/DI			-3.232 (2.801)	
Controls wife's disability	No	Yes	Yes	Yes
Cause of disability	All	All	All	Accident / acute conditions
Observations	16,365	16,327	16,327	16,327

## Event Study: Changes in Employment

[▶ return to H](#)[▶ return to W](#)

	H's Disability		H's Layoff	
	H's emp	W's emp*	H's emp	W's emp*
Year = -4, -3	-0.024 (0.0169)	0.008 (0.0174)	<b>0.046</b> (0.0186)	-0.018 (0.0269)
Year = -2, -1	-0.033 (0.0227)	-0.017 (0.0262)	<b>0.138</b> (0.0195)	0.031 (0.0299)
Year = 0, 1	<b>-0.304</b> (0.0310)	-0.029 (0.0290)	<b>-0.176</b> (0.0361)	0.053 (0.0322)
Year = 2, 3	<b>-0.299</b> (0.0357)	-0.005 (0.0336)	<b>-0.171</b> (0.0421)	<b>0.099</b> (0.0379)
Year = 4, 5	<b>-0.295</b> (0.0497)	-0.014 (0.0544)	-0.009 (0.0473)	<b>0.104</b> (0.0454)
Observations	17,151	16,633	20,465	19,868
R-sq	0.180	0.102	0.180	0.106

\* Additionally controls for wife's disability and interaction terms of onset indicators and wife's disability indicator.

# Spousal Labor Supply: PSID

Similar post-disability pattern observed (?). [▶ return](#)

Hours of Work by Spouse Before and After Disability Onset of Head,  
All Disabled and Extent of Disability Groups

Year from onset	All Disabled	Extent of Disability Groups			
		One-Time	Temporary	Chronic Not Severe	Chronic Severe
	(1)	(2)	(3)	(4)	(5)
-5	21 (25)	-1 (47)	33 (48)	21 (47)	48 (58)
-4	-35 (28)	-73 (54)	11 (50)	-50 (50)	0 (66)
-3	-16 (28)	-33 (50)	-33 (52)	2 (51)	23 (73)
-2	19 (29)	-6 (59)	36 (52)	17 (52)	43 (64)
-1	-16 (30)	-65 (58)	41 (52)	-30 (53)	-3 (76)
0	-11 (32)	-70 (62)	30 (55)	-6 (54)	22 (76)
1	-23 (32)	-76 (60)	18 (56)	-10 (55)	-25 (79)
2	-59 (34)	-124 (64)	-50 (58)	-23 (61)	-33 (86)
3	-61 (34)	-95 (63)	-47 (59)	-26 (58)	-73 (80)
4	-60 (36)	-143* (69)	-30 (60)	-22 (62)	-44 (88)
5	-43 (36)	-89 (67)	-33 (60)	-35 (60)	-2 (83)
6	-65 (38)	-103 (72)	-63 (65)	-6 (64)	-110 (91)
7	-78* (38)	-149* (70)	-64 (63)	-9 (65)	-124 (92)
8	-69 (40)	-71 (70)	-105 (65)	8 (68)	-149 (95)
9	-65 (42)	-43 (78)	-128 (70)	54 (70)	-216* (98)
10	-51 (44)	-53 (76)	-100 (72)	57 (71)	-193 (113)

# Spousal Labor Supply: PSID

Similar post-displacement effects found in the PSID (Stephens, 2002). [▶ return](#)

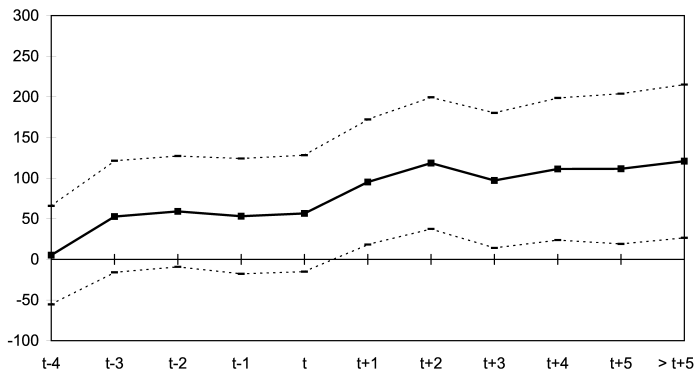


FIG. 3.—Effect of displacement on wife's hours of work, with layoffs and plant closings combined. The solid line represents the point estimates. The dashed lines represent the upper and lower limits of the 95% confidence interval.

# Event Study: Changes in Weekly Hours By DI Receipt

Added worker effects are small and statistically insignificant event among non-receiving households. [▶ return to H](#) [▶ return to W](#)

	DI receiving		Non-DI receiving	
	Husband	Wife	Husband	Wife
Year = -4, -3	0.110 (1.855)	-0.260 (3.070)	-0.991 (0.944)	0.921 (0.841)
Year = -2, -1	0.062 (2.937)	0.845 (2.457)	<b>-2.991</b> (1.235)	-1.068 (1.176)
Year = 0, 1	<b>-25.79</b> (2.669)	-2.302 (2.999)	<b>-11.45</b> (1.580)	-0.402 (1.395))
Year = 2, 3	<b>-26.97</b> (2.436)	-1.257 (2.309)	<b>-9.259</b> (1.878))	1.509 (1.573)
Year = 4, 5	<b>-31.19</b> (3.229)	<u>-9.600</u> (5.367)	<b>-10.28</b> (2.728)	1.350 (2.983)
Observations	16,730	16,327	16,730	16,327
R-sq	0.244	0.114	0.244	0.114

\* Additionally controls for wife's disability and interaction terms of onset indicators and wife's disability indicators.

# Event Study: Changes in Employment By DI Receipt

Added worker effects are small and statistically insignificant event among non-receiving households. [▶ return to H](#) [▶ return](#)

	DI receiving		Non-DI receiving	
	Husband	Wife	Husband	Wife
Year = -4, -3	0.015 (0.0301)	-0.011 (0.0523)	-0.029 (0.0187)	0.010 (0.0183)
Year = -2, -1	-0.024 (0.0519)	0.019 (0.0503)	-0.035 (0.0248)	-0.022 (0.0286)
Year = 0, 1	<b>-0.575</b> (0.0515)	-0.031 (0.0546)	<b>-0.247</b> (0.0338)	-0.029 (0.0323)
Year = 2, 3	<b>-0.658</b> (0.0480)	-0.051 (0.0718)	<b>-0.216</b> (0.0395)	0.003 (0.0365)
Year = 4, 5	<b>-0.683</b> (0.0590)	-0.054 (0.104)	<b>-0.200</b> (0.0541)	-0.006 (0.0606)
Observations	17,131	16,633	17,131	16,633
R-sq	0.191	0.103	0.191	0.103

\* Additionally controls for wife's disability and interaction terms of onset indicators and wife's disability indicators.



# HH Income: Disability

Significant decrease in HH income, even after government transfers [▶ return](#)

	All disabled		Work-preventing disabled	
	Pre-Transfer	Post-Transfer	Pre-Transfer	Post-Transfer
Year = -2	-0.0510 (0.0381)	-0.0360 (0.0369)	-0.0630 (0.0475)	-0.0339 (0.0453)
Year = -1	-0.0369 (0.0485)	-0.0506 (0.0452)	-0.0414 (0.0742)	-0.0502 (0.0672)
Year = 0	<b>-0.111</b> (0.0430)	<b>-0.0896</b> (0.0413)	<b>-0.111</b> (0.0445)	<b>-0.0813</b> (0.0417)
Year = 1	<b>-0.170</b> (0.0625)	<b>-0.154</b> (0.0615)	<b>-0.231</b> (0.0946)	<b>-0.206</b> (0.0948)
Year = 2	<b>-0.163</b> (0.0454)	<b>-0.126</b> (0.0430)	<b>-0.279</b> (0.0536)	<b>-0.189</b> (0.0512)
Year = 3	<b>-0.225</b> (0.0742)	<b>-0.172</b> (0.0728)	<b>-0.319</b> (0.131)	<b>-0.224</b> (0.133)
Year = 4	<b>-0.187</b> (0.0483)	<b>-0.135</b> (0.0461)	<b>-0.286</b> (0.0617)	<b>-0.140</b> (0.0610)
N	24128	23902	24128	23902
R-sq	0.038	0.025	0.038	0.025

FE event study specification includes year -4 to 6. Implied percentages based on average HH income 5 years before disability (Pre-transfer: \$104,436, Post-transfer: \$107,924).

## DI Award Rates

50% of applicants receive benefits in the first year, even for the severely disabled. [▶ return](#)

	All disabled		Work-preventing disabled	
	Applied	Receiving	Applied	Receiving
Year = 0,1	0.150	0.071	0.403	0.191
Year = 2,3	0.232	0.144	0.546	0.382
Year = 4,5	0.285	0.188	0.661	0.542
<i>N</i>	24497	24497	24497	24497

Proportion of disabled husbands who applied or received SSDI and/or SSI.

[▶ DI processing time](#)

# Event Study: Husband's Earnings

[▶ return](#)

	Husband's Annual Earnings	
	Disability	Layoff
Year = -4, -3	-0.028 (0.034)	-0.004 (0.037)
Year = -2, -1	-0.070 (0.044)	0.023 (0.047)
Year = 0, 1	<b>-0.254</b> (0.054)	<b>-0.313</b> (0.064)
Year = 2, 3	<b>-0.205</b> (0.065)	<b>-0.280</b> (0.068)
Year = 4, 5	<b>-0.353</b> (0.160)	-0.079 (0.102)
R-sq	0.127	0.128
N	14629	17466

Implied percentage changes based on average earnings 5+ years before onset (laid off sample: \$59,368, disabled sample: \$51,994 in \$2015).

# Robustness: Wives' Caregiving and Working Hours

[▶ return](#)

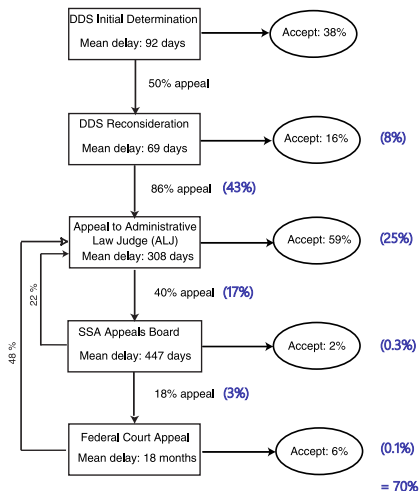
	W's Employment*	W's Employment	W's Weekly Hours
W provides care	<b>-0.043</b> (0.0163)		
H Moderate		-0.018 (0.0116)	0.518 (0.544)
Moderate $\times$ Intensive <sup>†</sup>		0.012 (0.0387)	-0.310 (1.611)
H Severe		-0.012 (0.0163)	0.121 (0.771)
H Severe $\times$ Intensive <sup>†</sup>		-0.073 (0.0386)	-3.086 (1.918)
Observations	5,438	22,258	21,856

\* Conditional on having severely disabled husbands.

<sup>†</sup> Health conditions which more than 80% of husbands reported having difficulty in at least one ADL/IADL and the average number of weekly hours of care received is greater than 20. Includes cancer, stroke, asthma kidney conditions, certain neurological/sensory problems, and Alzheimer's disease.

# DI Application Process [▶ return](#)

Figure 2: Summary of SSA's Disability Application and Appeal Process



## Summary Statistics for Severely Disabled Men Receiving Care

- ▶ Wives are the main caregivers for married males.
- ▶ Formal caregivers and Medicaid play an important role for single males but not for husbands.

	Single*	Married
Caregivers' relationship (in %)		
Wives	-	97.35
Daughters	18.54	9.95
Sons	8.64	9.62
Other relatives	44.54	11.84
Non-relatives <sup>†</sup>	51.49	5.02
Has Medicaid coverage	43.23%	16.05%
Receives care from Medicaid-covered caregiver(s)	17.07%	1.45%
Person-year observations	495	1,152

▶ return: wife's time use

▶ return: model

# Event Study: Weekly Hours by Husband's Severity

	Husband's Weekly Hours		Wife's Weekly Hours*	
Year = -4, -3	-0.585 (0.919)		0.950 (0.883)	
Year = -2, -1	<u>-2.081</u> (1.231)		-0.718 (1.154)	
	<i>Moderate</i>	<i>Severe</i>	<i>Moderate</i>	<i>Severe</i>
Year = 0, 1	<b>-11.96</b> (1.765)	<b>-20.19</b> (2.367)	-0.569 (1.451)	-2.853 (2.541)
Year = 2, 3	<b>-10.21</b> (2.001)	<b>-22.97</b> (2.278)	1.543 (1.678)	-1.492 (2.105)
Year = 4, 5	<b>-13.10</b> (2.756)	<b>-24.96</b> (4.405)	-1.205 (3.295)	-0.326 (3.277)
Observations	15,162		14,774	
R-sq	0.240		0.114	

\* Additionally controls for wife's disability and interaction terms of onset indicators and wife's disability indicators.

# Shocks and choices

[▶ return](#)

Exogenous shocks realized at the beginning of each period  $t$

1. Mortality ( $\delta_{m,t}^h(s_{t-1})$ ,  $\delta_{m,t}^w$ ) and divorce shocks  $\delta_d(s_{t-1})$
2. Disability shock (Husband): depends on  $t$ ,  $s_{t-1}$ ,  $y_{t-1}$   
 $s_t \in \{0 \text{ (healthy)}, 1 \text{ (moderate)}, 2 \text{ (severe)}\}$
3. Job displacement shock (Husband): job destruction  $\delta_j(s_{t-1})$   
 and job arrivals  $\lambda$  (no job search).
4. Idiosyncratic wage shocks (both members)

## Choices

Household consumption ( $c_t$ ), labor market hours ( $h_t^h$ ,  $h_t^w$ ), the wife's caregiving hours ( $tc_t$ ), and DI application ( $App_t$ ).



# Time Constraints

[▶ return](#)

$l^h$ ,  $l^w$ , and  $tc$  are chosen subject to the following time constraints,

$$\begin{aligned}
 l^h &= \bar{L} - (\phi(s) + \phi_\eta(s) \cdot g(\eta, s)) \\
 &\quad - (\phi^{emp}(s) + \phi_\eta^{emp}(s) \cdot g(\eta, s)) \cdot \mathbf{1}(h^h > 0) - h^h \\
 l^w &= \bar{L} - h^w - tc
 \end{aligned}$$

$\bar{L}$ : annual time endowment

$h^h$  and  $h^w$ : hours worked in the labor market

$tc$ : wife's caregiving hours

# Caregiving Utility

[▶ return](#)

Conditional on disability status  $s$ , husbands have caregiving needs,  $\eta$ .

$$\eta_t(s) = \begin{cases} 0 & \text{if } s = 0 \\ \mu_\eta(s) + \epsilon_t & \text{if } s \in \{1, 2\} \end{cases}$$

$$\epsilon_t = \rho_\eta(s) \cdot \epsilon_{t-1} + \xi_t, \quad \xi_t \sim N(0, \sigma_{\xi,s}^2) \quad \text{if } s \in \{1, 2\}$$

Caregiving utility increases with husbands' caregiving needs and wife's time input  $tc$

$$\kappa_t(tc; s) = \begin{cases} 0 & \text{if } s = 0 \text{ or } tc \leq 1 \\ \eta_t(s) \cdot \log(tc) & \text{if } s \in \{1, 2\} \text{ and } tc > 1 \end{cases}$$

# Household Preferences

Individual behavior after a dissolution of a married household (either through death or divorce) is not modeled. Instead, the surviving member  $j$  receives a terminal utility  $v_t^j(a^j, y)$ .

$$v_t^j(a^j, y) = \frac{\left(W_t^j(a^j, y)\right)^{1-\gamma}}{1-\gamma}$$

- ▶  $W_t^j(a^j, y)$ : Present discounted value of current wealth ( $a$ ) and future retirement benefits (computed from  $y$ )
- ▶  $a^j$ : HH wealth given to the individual member.
  - 100% for widow/ers, 50% for divorcees
- ▶  $y$ : Husband's average lifetime earnings (for retirement benefits). Spouses receive spousal benefits based on head's earnings.
  - Widows: 100% of husband's PIA, divorcees: 50% of husband's PIA

## Disability Insurance [▶ return](#)

Households decide whether to apply for SSDI ( $App_t \in \{0, 1\}$ ). SSDI application is costly in the sense of requiring  $h_{ht} = 0$  and not being able to receive wage offers during application as well as incurring a utility cost (“stigma cost”)  $\iota(s)$ .

- ▶ SSDI is awarded based on probability  $Pr(DI_{t+1} = 1 | s_t, App_t)$ 
  - Assume  $Pr(DI_{t+1} = 1 | s_t = 0, App_t) = 0$
- ▶ Benefit amount is a monotonic function of the husband's average lifetime earnings  $y_t$ .
- ▶ Receiving SSDI is an absorbing state (i.e., husband does not work and continues receiving benefits)

# Labor Market

## Labor Market Frictions

- ▶ Husbands are laid off with probability  $\delta_j(s)$  and receive jobs at rate  $\lambda$ .
- ▶ Laidoff husbands receive a one-period UI benefit (23% of previous period's earnings).

# Labor Market

## Offered wages

Household  $i$  receive wage offers  $w_{it}^h$ ,  $w_{it}^w$  such that:

$$\begin{aligned}\log w_{it}^h &= \alpha_1 \cdot t + \alpha_2 \cdot t^2 + \sum_{s=1}^2 \varphi_s \cdot \mathbf{1}(s_{it} = s) + f_i^h + \zeta_{it}^h \\ \log w_{it}^w &= \tilde{\alpha}_1 \cdot (t-3) + \tilde{\alpha}_2 \cdot (t-3)^2 + f_i^w + \zeta_{it}^w \\ \zeta_{it}^j &= \zeta_{i,t-1}^j + \eta_{it}^j, \quad j \in \{h, w\} \\ \eta_{it}^j &\sim N(0, \sigma_{\eta,j}^2), \quad \text{Cov}(\eta_{it}^h, \eta_{it}^w) = \sigma_{\eta_{h,w}}, \quad j \in \{h, w\}\end{aligned}$$

# Retirement Period

[▶ return](#)

- ▶ A couple retires at age 65 (62 for wives) and receives Social Security Retirement benefits based on the husband's average lifetime earnings ( $y_{65}$ ) until death (husband's benefit + spousal benefit).
- ▶ DI benefits are automatically converted to Retirement benefits upon retirement.
- ▶ Household consumption ( $c_t$ ) is the only choice during this period.

# Budget Constraint

$$A_{t+1} = (1 + r)A_t + \sum_{j \in \{h, w\}} w_t^j h_t^j + UI_t + b_t(y_t, DI_t) \\ - \tau(A_t, w_t^h h_t^h, w_t^w h_t^w) + T_t - c_t$$

- ▶  $b_t(y_t, DI_t)$ : DI or retirement benefits as a function of  $y_t$
- ▶  $\tau(A_t, w_t^h h_t^h, w_t^w h_t^w)$ : payroll and federal income taxes
- ▶ Government transfers  $T_t$  provides minimum consumption level  $\underline{c}$

$$T_t = \max \left\{ 0, \underline{c} - \left( (1 + r)A_t + \sum_{j \in \{h, w\}} w_t^j h_t^j + UI_t + b_t(y_t, DI_t) \right. \right. \\ \left. \left. - \tau(A_t, w_t^h h_t^h, w_t^w h_t^w) \right) \right\}$$

- ▶ Assume no borrowing:  $A_t \geq 0$



# First stage parameters

[▶ return](#)

	Job destruction rate	Divorce rate
$s = 0$	.052	.0056
$s = 1$	.042	.0056
$s = 2$	.075	.0094

# Mortality and Health Processes

[▶ return](#)

## 1. Mortality process:

- Males: logit regression model using reported death dates in the HRS.
  - Covariates: age quadratic, whether average lifetime earnings is above median, and current disability status
- Females: survival rates by age for females of birth year 1930 reported in the SSA Life Tables

## 2. Husbands' disability process: multinomial logit using HRS data

- Covariates: age quadratic, whether average lifetime earnings is above median, and current disability status

# Wage Offer Function

[▶ return](#)

Offered log hourly wages are estimated via Heckman two-step using state x year variation in potential UI benefits and Food Stamps as exclusion restrictions.  $\sigma_{\eta,h}^2, \sigma_{\eta,w}^2, \sigma_{\eta_{h,w}}$  estimated by GMM.

	Male	Female
$s = 1$ (Moderate)	-0.154** (0.065)	-
$s = 2$ (Severe)	-0.222* (0.120)	-
Age	0.101* (0.057)	0.121*** (0.031)
Age sq./100	-0.102*** (0.053)	-0.112*** (0.033)
High productivity type	0.278*** (0.016)	-
Variance of wage shock ( $\sigma_{\eta,j}^2$ )	0.022*** (0.002)	0.020*** (0.001)
Covariance of spouses' wage shocks ( $\sigma_{\eta_{h,w}}$ )		0.024*** (0.009)

## Annual SSDI Award Probabilities

[▶ return](#)

Husbands' Disability	Husbands' Age	
	Age < 55	55 ≤ Age ≤ 64
Moderate ( $s = 1$ )	.426	.620
Severe ( $s = 2$ )	.631	.640

*Notes:* This table reports the probability that husbands who applied for SSDI in year  $t$  would be awarded with benefits in year  $t + 1$ . Results are based on a sample of husbands in the HRS (1992-2014) who are white, under age 65, and hold less than a bachelor's degree. Merged administrative data on HRS respondents' disability benefit claims is primarily used. If information is not available from the administrative data, it is supplemented with the SSDI episodes data available in the public RAND HRS data.

## Annual HH Medical Expenses (OLS)

[▶ return](#)


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Dependent variable: log(household out-of-pocket medical expenses)

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$s = 1$ (Moderate)	0.193*** (0.019)
$s = 2$ (Severe)	0.269*** (0.019)
Husbands' Age	0.0094*** (0.0008)
High type <sup>†</sup>	0.087*** (0.015)
Constant	6.664*** (0.049)
Observations	37,403

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# Identification of Preference Parameters

$\psi_h, \psi_w$ : H and W's weight on leisure utility

- H and W's employment rate when H is in the healthy state

$\phi(s)$ : H's fixed cost for working in the disabled state

- Change in H's employment post-disability shock (FE regression coefficients)

$\gamma$ : CRRA parameter

- Median asset profiles by H's age and health status

$\underline{c}$ : Minimum HH consumption floor

- 25th percentile asset profiles by H's age in the healthy state

$Pr(DI_{t+1} = 1 | App_t, s_t)$ : SSDI award probabilities

- % of SSDI applicants by health status

▶ return

## Model Parameter Estimates I

[▶ return](#)

Parameters	(a) Baseline		(b) "No-caregiving" <sup>†</sup>	
	$s = 1$	$s = 2$	$s = 1$	$s = 2$
Husbands' leisure time costs (in hours)				
$\phi(s)$	1,536 (145.2)	1,838 (140.1)	1,631 (140.7)	1,787 (97.97)
$\phi_{\eta}(s)$	32.80 (42.37)	38.49 (38.32)	-	-
$\phi^{emp}(s)$	173.8 (76.57)	371.0 (25.03)	176.3 (11.70)	288.4 (16.16)
$\phi_{\eta}^{emp}(s)$	40.13 (14.46)	181.2 (73.06)	-	-

## Model Parameter Estimates II

[▶ return](#)

Parameters	(a) Baseline		(b) “No-caregiving” <sup>†</sup>	
	$s = 1$	$s = 2$	$s = 1$	$s = 2$
Husbands' weight on leisure utility ( $\times 10^{-3}$ ), $\psi_h$	3.162 (0.148)		2.979 (0.179)	
Wives' weight on leisure utility ( $\times 10^{-3}$ ), $\psi_w$	2.846 (0.077)		2.814 (0.092)	
Weight on terminal utility, $\psi_v$	4.081 (0.223)		6.115 (0.450)	
Minimum consumption floor (\$2015), $\underline{c}$	25,375 (1,043)		26,658 (748.7)	
Disutility of SSDI application when $s = 1$ ( $\times 10^{-4}$ ), $\iota(1)$	3.692 (1.736)		2.912 (1.530)	



# Caregiving Utility Parameter Estimates

Caregiving utility weight parameters	Baseline
Moderately disabled	
$\mu_{\eta}(1)$ Average ( $\times 10^{-5}$ )	4.008 (0.097)
$\rho_{\eta}(1)$ Auto-regressive persistence	0.125 (0.130)
$\sigma_{\xi,1}$ Variance of white noise ( $\times 10^{-4}$ )	0.009 (0.009)
Severely disabled	
$\mu_{\eta}(2)$ Average ( $\times 10^{-5}$ )	19.01 (3.433)
$\rho_{\eta}(2)$ Auto-regressive persistence	0.811 (0.049)
$\sigma_{\xi,2}$ Variance of white noise ( $\times 10^{-4}$ )	6.040 (0.857)

[▶ return](#)

# Model Fit: Changes in Wives' Labor Supply [▶ return](#)

Matches FE regression coefficients by husbands' severity of the disability.

	Model	Data	Model	Data
	Wives' Employment		Wives' Weekly Hours	
Moderate	-0.023	-0.021 (0.014)	-0.301	-0.223 (0.540)
Severe	-0.012	-0.009 (0.018)	0.012	-0.213 (0.644)

## Model Fit: Caregiving choices [▶ return](#)

Matches wives' caregiving choices by husbands' disability severity.

	Model	Data	Model	Data
	Moderate		Severe	
Part-time care	0.200	0.203 (0.040)	0.440	0.430 (0.0232)
Full-time care	0.000	0.000 (0.000)	0.139	0.131 (0.017)
Transition Rates by Husbands' Disability ( $t \rightarrow t + 2$ )				
No Care $\rightarrow$ No Care	0.884	0.910 (0.045)	0.634	0.629 (0.046)
Care $\rightarrow$ Care	0.466	0.420 (0.171)	0.717	0.732 (0.036)

[▶ other moments](#)

# Model Fit: Other moments I [▶ return](#)

	Model	Data	Model	Data
HH Assets (\$1,000)	50th Percentile		25th Percentile	
Age 50 - 54	175.34	170.52 (5.803)	77.58	78.16 (3.317)
Age 55 - 59	197.10	205.03 (4.749)	101.84	96.57 (2.825)
Age 60 - 64	233.08	232.00 (5.373)	123.65	121.10 (3.525)
DI Application Rate	Moderate		Severe	
	0.083	0.083 (0.007)	0.139	0.142 (0.009)

# Model Fit: Other moments II

[▶ return](#)

	Model	Data	Model	Data
H's Emp Rates	Total		Part-time	
Healthy	0.837	0.839 (0.006)	-	-
Moderate	0.437	0.436 (0.018)	0.106	0.109 (0.011)
Severe	0.192	0.200 (0.014)	0.044	0.043 (0.006)
W's Emp Rate				
	0.723	0.716 (0.009)		

# Insurance Value of SSDI [▶ return](#)

▶ Compensating Variation  $x$ :

$$V_{50}(A_t, \Theta_t | \text{with SSDI}) = V_{50}(A_t + x, \Theta_t | \text{without SSDI})$$

	Model	
	Baseline	“No-caregiving”
$(\theta(1), \theta(2))$	(1.08, 1.18)	(0.98, 0.91)
(a) $\frac{\text{Compensating Variation}}{\text{SSDI benefits (PDV)}}$ when wives' labor supply is:		
(a1) Unconstrained	1.21	1.07
(a2) Perfectly inelastic	1.26	1.14
(b) Total fiscal costs per \$ of SSDI benefits	1.44	1.39
(c) (a1) / (b)	0.84	0.77