# Are marriage-related taxes and Social Security benefits holding back female labor supply?

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## U.S. marriage-related policies

- Taxes and old age Social Security benefits depend on marital status
  - Joint income tax
  - Social Security spousal benefit
  - Social Security survival benefit

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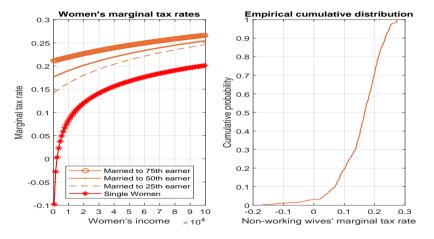
- Taxes and old age Social Security benefits depend on marital status
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- Question: how do marriage-related policies affect
  - Labor supply of women
  - Labor supply of men
  - Savings
  - Welfare

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- Question: how do marriage-related policies affect
  - Labor supply of women
  - Labor supply of men
  - Savings
  - Welfare
- Labor supply of married women has been changing over time. Do the effects of these policies depend on the cohort?
  - Two cohorts (1945 cohort and 1955 birth cohorts)

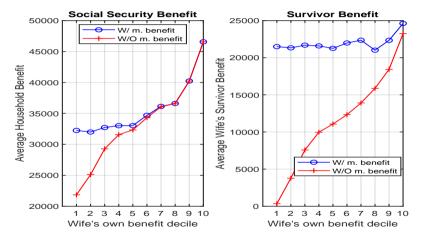


## Why might they matter? Marginal tax rate for women

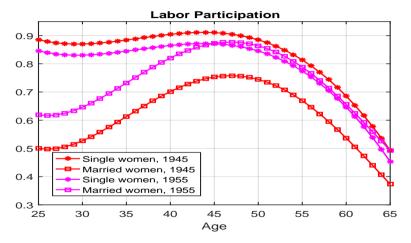




## Why might they matter? Social Security benefits



## Participation for women, 1945 and 1955 cohorts





## Participation for men, 1945 and 1955 cohorts





## Approach

• Partial equilibrium, cohort level analysis

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- Data
  - Panel Study of Income Dynamics (PSID): working period
  - Health and Retirement Study (HRS): retirement period

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- Partial equilibrium, cohort level analysis
- Data
  - Panel Study of Income Dynamics (PSID): working period
  - Health and Retirement Study (HRS): retirement period
- Estimate model on each cohort using the Method of Simulated moments (MSM)
- Counterfactuals: eliminate marriage-related provisions

- Single and married people
- Endogenous human capital
- Risks during working period and retirement
- Self-insurance: saving and labor supply (hours)



- Single and married people
- Endogenous human capital
- Risks during working period and retirement
- Self-insurance: saving and labor supply (hours)
- Government
  - ullet Taxes married and single people + tax progressivity
  - Social Security payments (survival and spousal benefits)
  - Old-age means-tested transfer programs



- Lifecycle model, period length: one year
- Working stage ( $t_0$ =25 to 61)
  - Alive for sure
  - Labor productivity shocks
  - Might get married if single
  - Risk divorce if married
  - Both spouses can work

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- Early retirement stage (62 to 65)
  - Can retire and claim Social Security. Couples retire at the same time.
  - No marriage and divorce risk
- Retirement stage (66 to T=99)
  - Health shocks
  - Medical costs
  - ullet Exogenous probability of death o married people might lose their spouse



## Wages

- Functions of
  - Human capital, measured as average past earnings
  - Wage shocks which follow an AR(1) that depends on gender

## Marriage and divorce

- Marriage
  - Probability of marrying: function of age, gender, and wage shock
  - Conditional on getting married, probability of meeting with a partner with a certain wage shock depends on your wage shock
  - Conditional partner's productivity, distribution of partner's characteristics are assets and human capital
- Divorce probability: function of age and wage shocks of both spouses



#### Children

- Exogenous fertility
- Number and age structure of children depends on maternal age and marital status
- Time costs of raising children
- Monetary costs of raising children



# Health risks (after age 66)

- Age, gender, marital status, and current health affect evolution of
  - Health
  - Medical expenses
  - Survival

## Government

Taxes income, progressive taxation of couples and singles

$$T(Y, i, j, t) = (1 - \lambda_t^{i,j} Y^{-\tau_t^{i,j}}) Y.$$

- Taxes labor income, up to Social Security cap  $\widetilde{y_t}$ , at rate  $\tau_t^{SS}$  to finance old-age Social Security
- Old age means-tested cons. floor  $\underline{c}(j)$  (Medicaid and SSI)

## Household preferences

- ullet eta= discount factor, i= gender, j= marital status
- Time endowment:  $L^{i,j}$
- Leisure  $I_t^{i,j} = L^{i,j} n_t^{i,j} \phi_t^{i,j} I_{n_t^{i,j}}$

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- Singles

$$v(c_t, l_t) = \frac{((c_t/\eta_t^{i,j})^{\omega} l_t^{1-\omega})^{1-\gamma} - 1}{1-\gamma}$$

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- Singles

$$v(c_t, l_t) = \frac{((c_t/\eta_t^{i,j})^{\omega} l_t^{1-\omega})^{1-\gamma} - 1}{1-\gamma}$$

Couples

$$w(c_t, l_t^1, l_t^2) = rac{((c_t/\eta_t^{i,j})^{\omega}(l_t^1)^{1-\omega})^{1-\gamma} - 1}{1-\gamma} + rac{((c_t/\eta_t^{i,j})^{\omega}(l_t^2)^{1-\omega})^{1-\gamma} - 1}{1-\gamma}$$

# Value functions for couples and people in couples

- ► Early retirement
- ► Retirement
- People in couples

## Value functions for singles

- → Working period
- Early retirement
- Retirement

## Two-step estimation strategy

- First step inputs for each cohort
  - Estimate from data directly (taxes, demographics, wage risk, health risk, human capital accumulation function...)
  - Fix some parameters to calibrated or estimated values (externally to model)



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  - Fix some parameters to calibrated or estimated values (externally to model)
- Second step, 1945 cohort
  - Estimate other parameters matching data targets for 1945 cohort

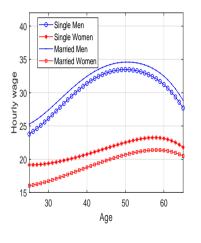


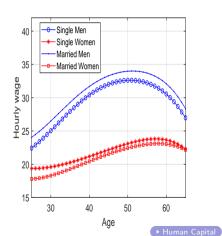
## Two-step estimation strategy

- First step inputs for each cohort
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  - Fix some parameters to calibrated or estimated values (externally to model)
- Second step, 1945 cohort
  - Estimate other parameters matching data targets for 1945 cohort
- Second step, 1955 cohort
  - Fix preference parameters and use rest of parameters to match data targets for 1955 cohort



## PSID: Wage profiles, 1945 and 1955 cohorts







## Other first-step inputs

- Marriage
- Divorce
- Children
- Health transitions
- Health cost
- ► Survival
- Calibrated parameters

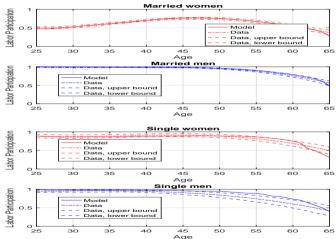
Estimated parameters	1945 cohort	1955 cohort
$\beta$ : Discount factor	0.990	0.990
$\omega$ : Consumption weight	0.406	0.406
$L^{2,1}$ : Time endowment (weekly hours), single women	107	112
$L^{1,2}$ : Time endowment (weekly hours), married men	107	101
$L^{2,2}$ : Time endowment (weekly hours), married women	88	88
$\tau_c^{0,5}$ : Prop. child care cost for children age 0-5	30%	25%
$ au_c^{6,11}$ : Prop. child care cost for children age 6-11	7%	19%
$\Phi_t^{i,j}$ : Partic. cost	Fig. 27	Fig. 27

Table: Second-step estimated model parameters

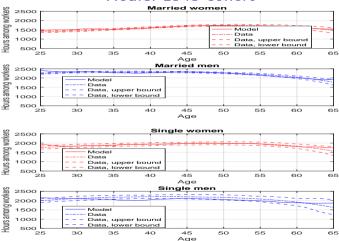




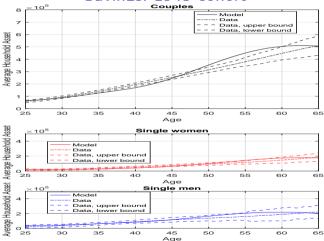
### Participation. 1945 cohort



## Hours. 1945 cohort





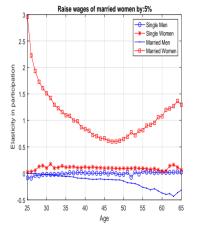


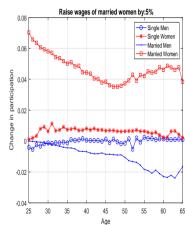
## Labor supply elasticity, temporary wage change

	Participation				Hours among workers			
	Married		Single		Married		Single	
	W	М	W	М	W	М	W	М
30	1.0	0.0	0.5	0.2	0.2	0.3	0.4	0.3
40	0.7	0.1	0.4	0.2	0.3	0.5	0.5	0.5
50	0.6	0.2	0.4	0.5	0.5	0.5	8.0	0.5
60	1.1	8.0	1.4	2.0	0.4	0.2	0.5	0.3

Table: Labor supply elasticity, temporary wage change, 1945 cohort

#### Labor supply elasticity, permanent wage change, 1945 cohort







# What is the effect of marriage-related policies?

In all cases, adjust the proportional component of the income tax to maintain revenue neutrality

- (► Eliminating Social Security marital benefits, 1945 cohort
- Taxing everyone as singles, 1945 cohort
- Eliminating Social Security marital benefits and taxing everyone as singles, 1945 cohort
- ▶ Eliminating Social Security marital benefits and taxing everyone as singles, 1955 cohor

## Welfare, 1945 cohort

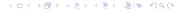
	All			V	Winners			Losers		
	Couples	SW	SM	Couples	SW	SM	Couples	SW	SM	
Remove Social Security spousal benefits, unbalanced budget										
Avg	-0.25	-0.23	0.31	0.00	0.00	0.31	-0.25	-0.23	-0.02	
%				0.0	0.0	100.0	100.0	100.0	0.0	
Remove	Social Secu	rity spoι	ısal ben	efits, balan	ced bud	get				
Avg	0.71	0.20	1.30	0.71	0.22	1.30	0.00	-0.04	0.00	
%				100.0	93.4	100.0	0.0	6.6	0.0	
Remove joint income taxation, balanced budget										
Avg	0.33	-0.10	1.25	0.45	0.11	1.25	-0.09	-0.15	0.00	
%				78.5	17.9	100.0	21.5	82.1	0.0	
Remove all marital related polices, balanced budget										
Avg	0.83	0.03	2.24	0.84	0.31	2.24	-0.04	-0.13	0.00	
%				98.9	35.8	100.0	1.1	64.2	0.0	

# Welfare, remove all marital related polices, balanced budget, 1945 and 1955 cohorts

	All			Winners			Losers		
	Couples	SW	SM	Couples	SW	SM	Couples	SW	SM
1945 coh	ort								
Avg	0.83	0.03	2.24	0.84	0.31	2.24	-0.04	-0.13	0.00
%				98.9	35.8	100.0	1.1	64.2	0.0
1955 coh	ort								
Avg	0.75	0.21	1.31	0.77	0.31	1.31	-0.05	-0.05	-0.02
%				97.2	70.9	100.0	2.8	29.1	0.0

#### **Conclusions**

- Estimate a rich life-cycle model of couples and singles with marriage-related policies:
  - Marital income tax,
  - Social Security spousal benefits
  - Social Security survival benefits



#### Conclusions

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  - Marital income tax.
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  - Social Security survival benefits
- Removal of marriage-related provisions
  - Increases participation of married women over their life cycle
  - Reduces participation of married men after age 55
  - Increases savings of couples
  - Is welfare improving for most



#### Conclusions

- Estimate a rich life-cycle model of couples and singles with marriage-related policies:
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- Removal of marriage-related provisions
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  - Is welfare improving for most
- Effects are also large for the 1955 cohort, who had much higher labor market participation of married women to start with

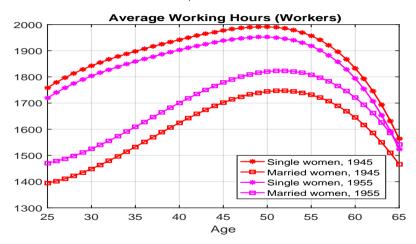


#### Contributions

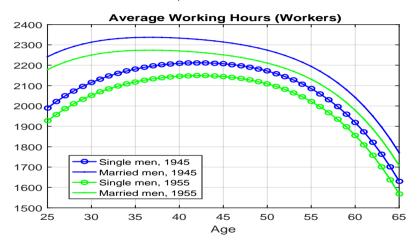
- First estimated structural model of couples and singles with participation and hours decisions (both men and women) and savings
- Study all marriage-related taxes and benefits in a unified framework
- Study two different cohorts
- Rich framework
  - Labor market experience can affect wages
  - Survival, health, and medical expenses in old age, heterogeneous by marital status and gender
  - Fit data for participation, hours worked, savings, and labor supply elasticities



#### Hours for women, 1945 and 1955 cohorts



#### Hours for men, 1945 and 1955 cohorts



# Recursive problem for working-age singles

$$W^{s}(t, i, a_{t}^{i}, \epsilon_{t}^{i}, \bar{y}_{t}^{i}) = \max_{c_{t}, a_{t+1}, n_{t}^{i}} \left( v(c_{t}, l_{t}^{i, j}) + \beta(1 - \nu_{t+1}(\cdot)) E_{t} W^{s}(t+1, i, a_{t+1}^{i}, \epsilon_{t+1}^{i}, \bar{y}_{t+1}^{i}) + \beta\nu_{t+1}(\cdot) E_{t} \xi_{t+1}(\cdot) \theta_{t+1}(\cdot) \hat{W}^{c}(t+1, i, a_{t+1}^{i} + a_{t+1}^{p}, \epsilon_{t+1}^{i}, \epsilon_{t+1}^{p}, \bar{y}_{t+1}^{i}, \bar{y}_{t+1}^{p}) \right)$$

- t : Age
- *i* : Gender
- a<sub>t</sub>: Net worth from previous period
- $\epsilon_t^i$ : Current productivity shock

Borella, De Nardi, Yang

•  $\bar{y}_t^i$ : Annual accumulated Social Security earnings



# Recursive problem for working-age singles

$$egin{aligned} Y_t^i &= e_t^i ar{y}_t^i \epsilon_t^i n_t^i \ & \mathcal{T}(\cdot) &= au(r a_t + Y_t^i, j) \end{aligned}$$

## Recursive problem for working-age singles

$$egin{aligned} Y_t^i &= e_t^i ar{y}_t^i \epsilon_t^i n_t^i \ &T(\cdot) = au(ra_t + Y_t^i, j) \ \\ & au_c(i, j, t) = au_c^{0.5} f^{0.5}(i, j, t) + au_c^{6.11} f^{6.11}(i, j, t) \ \\ c_t + a_{t+1} &= (1+r) a_t^i + Y_t^i (1 - au_c(i, j, t)) - au_t^{SS} \min(Y_t^i, \widetilde{y}_t) - T(\cdot) \ &ar{y}_{t+1}^i &= (ar{y}_t^i (t - t_0) + (\min(Y_t^i, \widetilde{y}_t))) / (t + 1 - t_0), \ \\ a_t &\geq 0, \quad n_t \geq 0, \quad orall t \end{aligned}$$

N back



# Early retirement stage, singles

- Single individuals don't get married anymore.
- Decide whether to retire or not.

$$egin{split} V^s(t,i,a_t^i,\epsilon_t^i,ar{y}_t^i) &= \max_{D_t^i} \Biggl( (1-D_t^i) N^s(t,i,a_t^i,\epsilon_t^i,ar{y}_t^i) + \ D_t^i S^s(t,i,a_t^i,ar{y}_t^i,t) \Biggr) \end{split}$$

• If retire, no longer able to work.

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#### Early retirement stage, singles who decided not to claim SS

$$\begin{split} \mathcal{N}^{s}(t,i,a_{t}^{i},\epsilon_{t}^{i},\bar{y}_{t}^{i}) &= \max_{c_{t},a_{t+1},n_{t}^{i}} \left( v^{i}(c_{t},l_{t}^{i,j}) + \beta E_{t}V^{s}(t+1,i,a_{t+1}^{i},\epsilon_{t+1}^{i},\bar{y}_{t+1}^{i}) \right) \\ Y_{t} &= e_{t}^{i,j}(\bar{y}_{t}^{i})\epsilon_{t}^{i}n_{t}^{i}, \\ &T(\cdot) = T(Y_{t} + ra_{t},j) \\ &\bar{y}_{t+1}^{i} = (\bar{y}_{t}^{i}(t-t_{0}) + (\min(Y_{t}^{i},\tilde{y_{t}})))/(t+1-t_{0}), \\ &c_{t} + a_{t+1} = (1+r)a_{t}^{i} + Y_{t}^{i} - \tau_{t}^{SS}\min(Y_{t},\tilde{y_{t}}) - T(\cdot), \end{split}$$

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

## Early retirement stage, singles who have claimed SS

$$S^{s}(t, i, a_{t}^{i}, \bar{y}_{r}^{i}, tr) = \max_{c_{t}, a_{t+1}} \left( v^{i}(c_{t}, L^{ij}) + \beta E_{t} S^{s}(t+1, i, a_{t+1}^{i}, \bar{y}_{r}^{i}, tr) \right)$$
 $Y_{t} = SS(\bar{y}_{r}^{i}, tr)$ 
 $T(\cdot) = T(Y_{t} + ra_{t}, j)$ 
 $c_{t} + a_{t+1} = (1+r)a_{t} + Y_{t} - T(\cdot)$ 
 $a_{t+1} \geq 0$ .

N. Incomb



# Recursive problem for retired singles

$$R^{s}(t, i, a_{t}, \psi_{t}^{i}, \bar{y}_{r}^{i}, tr) = \max_{c_{t}, a_{t+1}} \left( v(c_{t}, L^{i,j}) + \beta s_{t}^{i,j}(\psi_{t}^{i}) E_{t} R^{s}(t+1, i, a_{t+1}, \psi_{t+1}^{i}, \bar{y}_{r}^{i}, tr) \right)$$

- *t* : Age
- *i* : Gender
- a<sub>t</sub> : Net worth from previous period
- $\bar{y}_r^i$ : Annual accumulated social security earnings (PI)
- $\psi_t^i$ : Health status (good or bad)
- tr: Retirement age

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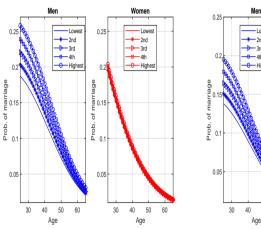
# Recursive problem for retired singles

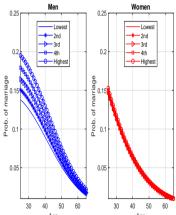
$$Y_t^i = SS(ar{y}_r^i)$$
 $T(\cdot) = au igg(Y_t^i + ra_t, jigg)$ 
 $B(a_t, Y_t, \psi_t^i, \underline{c}(j)) = \max igg\{0, \underline{c}(j) - igg\{(1+r)a_t + Y_t - m_t^{i,j}(\psi_t^i) - T(\cdot)igg\}igg\}$ 
 $c_t + a_{t+1} = (1+r)a_t + Y_t + B(a_t, Y_t^i, \psi_t^i, \underline{c}(j)) - m_t^{i,j}(\psi_t^i) - T(\cdot)$ 
 $a_{t+1} \geq 0, \quad \forall t$ 

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# PSID: Marriage, 1945 and 1955 cohorts

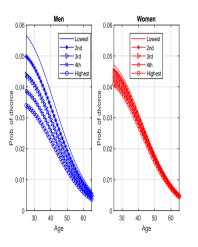


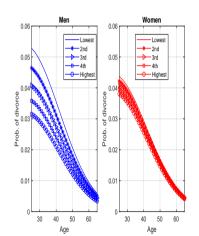


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#### PSID: Divorce, 1945 and 1955 cohorts

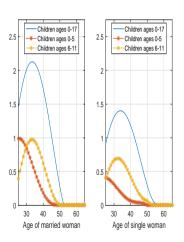


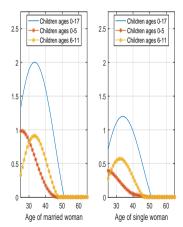


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#### PSID: number of children, 1945 and 1955 cohorts





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# Recursive problem for working-age couples

$$W^{c}(t, a_{t}, \epsilon_{t}^{1}, \epsilon_{t}^{2}, \bar{y}_{t}^{1}, \bar{y}_{t}^{2}) = \max_{c_{t}, a_{t+1}, n_{t}^{1}, n_{t}^{2}} \left( w(c_{t}, l_{t}^{1,j}, l_{t}^{2,j}) + (1 - \zeta_{t+1}(\cdot)) \beta E_{t} W^{c}(t+1, a_{t+1}, \epsilon_{t+1}^{1}, \epsilon_{t+1}^{2}, \bar{y}_{t+1}^{1}, \bar{y}_{t+1}^{2}) + \zeta_{t+1}(\cdot) \beta \sum_{i=1}^{2} \left( E_{t} W^{s}(t+1, i, a_{t+1}/2, \epsilon_{t+1}^{i}, \bar{y}_{t+1}^{i}) \right) \right)$$

- *t* : Age
- ullet  $a_t$ : Net worth from previous period
- ullet  $\epsilon_t^i$ : Current productivity shock for each spouse
- $\bar{y}_t^i$ : Annual accumulated SS earnings for each spouse
- Divorce probability  $\zeta_t(\cdot) = \zeta_t(\epsilon_t^1, \epsilon_t^2)$



Marriage-related policies

# Recursive problem for working-age couples

$$egin{aligned} Y_t^i &= e_t^i(ar{y}_t^i)\epsilon_t^i n_t^i, \ T(\cdot) &= au(ra_t + Y_t^1 + Y_t^2, j) \end{aligned}$$

# Recursive problem for working-age couples

$$\begin{split} Y_t^i &= e_t^i(\bar{y}_t^i) \epsilon_t^i n_t^i, \\ T(\cdot) &= \tau(r a_t + Y_t^1 + Y_t^2, j) \\ \\ \tau_c(i,j,t) &= \tau_c^{0,5} f^{0,5}(i,j,t) + \tau_c^{6,11} f^{6,11}(i,j,t), \\ c_t + a_{t+1} &= (1+r) a_t + Y_t^1 + Y_t^2 (1 - \tau_c(2,2,t)) \\ -\tau_t^{SS}(\min(Y_t^1, \widetilde{y}_t) + \min(Y_t^2, \widetilde{y}_t)) - T(\cdot) \\ a_t &\geq 0, \quad n_t^1, n_t^2 \geq 0, \quad \forall t \end{split}$$



# Early retirement stage, couples

- Couples don't get divorced anymore.
- Decide whether to retire or not at the same time.
- If retire, no longer able to work.

$$V^{c}(t, a_{t}, \epsilon_{t}^{1}, \epsilon_{t}^{2}, \bar{y}_{t}^{1}, \bar{y}_{t}^{2}) = \max_{D_{t}} \left( (1 - D_{t}) N^{c}(t, a_{t}, \epsilon_{t}^{1}, \epsilon_{t}^{2}, \bar{y}_{t}^{1}, \bar{y}_{t}^{2}) + D_{t} S^{c}(t, a_{t}, \bar{y}_{t}^{1}, \bar{y}_{t}^{2}, t) \right)$$

▶ back



# Early retirement stage, couples who decided not to claim SS

$$\begin{split} N^{c}(t,a_{t},\epsilon_{t}^{1},\epsilon_{t}^{2},\bar{y}_{t}^{1},\bar{y}_{t}^{2}) &= \max_{c_{t},a_{t+1},n_{t}^{1},n_{t}^{2}} \left( w(c_{t},l_{t}^{1,j},l_{t}^{2,j}) \right. \\ &+ \beta E_{t} V^{c}(t+1,a_{t+1},\epsilon_{t+1}^{1},\epsilon_{t+1}^{2},\bar{y}_{t+1}^{1},\bar{y}_{t+1}^{2}) \right), \\ l_{t}^{i,j} &= L^{i,j} - n_{t}^{i} - \Phi_{t}^{i,j} I_{n_{t}^{i}}, \\ Y_{t}^{i} &= e_{t}^{i,j} (\bar{y}_{t}^{i}) \epsilon_{t}^{i} n_{t}^{i}, \\ T(\cdot) &= T(ra_{t} + Y_{t}^{1} + Y_{t}^{2}, i, j, t) \\ c_{t} + a_{t+1} &= (1+r)a_{t} + Y_{t}^{1} + Y_{t}^{2} - \tau_{t}^{SS}(\min(Y_{t}^{1}, \tilde{y}_{t}) + \min(Y_{t}^{2}, \tilde{y}_{t})) - T(\cdot) \\ \bar{y}_{t+1}^{i} &= (\bar{y}_{t}^{i}(t-t_{0}) + (\min(Y_{t}^{i}, \tilde{y}_{t})))/(t+1-t_{0}), \end{split}$$

## Early retirement stage, couples who decided to claim SS

$$\begin{split} S^c(t,a_t,\bar{y}_r^1,\bar{y}_r^2,tr) &= \max_{c_t,a_{t+1}} \Biggl( w(c_t,L^{1,j},L^{2,j}) + \beta E_t S^c(t+1,a_{t+1},\bar{y}_r^1,\bar{y}_r^2,tr) \Biggr), \\ Y_t &= \max \Bigl\{ (SS(\bar{y}_r^1,tr) + SS(\bar{y}_r^2,tr), \frac{3}{2} \max(SS(\bar{y}_r^1,tr),SS(\bar{y}_r^2,tr)) \Bigr\} \\ T(\cdot) &= T(Y_t + ra_t,i,j,t) \\ c_t + a_{t+1} &= (1+r)a_t + Y_t - T(\cdot) \\ a_{t+1} &> 0. \end{split}$$

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# Recursive problem for retired couples

$$R^{c}(t, a_{t}, \psi_{t}^{1}, \psi_{t}^{2}, \bar{y}_{r}^{1}, \bar{y}_{r}^{2}) = \max_{c_{t}, a_{t+1}} \left( w(c_{t}, L^{1,j}, L^{2,j}) + \beta s_{t}^{1,j}(\psi_{t}^{1}) s_{t}^{2,j}(\psi_{t}^{2}) E_{t} R^{c}(t+1, a_{t+1}, \psi_{t+1}^{1}, \psi_{t+1}^{2}, \bar{y}_{r}^{1}, \bar{y}_{r}^{2}) + \beta s_{t}^{1,j}(\psi_{t}^{1})(1 - s_{t}^{2,j}(\psi_{t}^{2})) E_{t} R^{s}(t+1, 1, a_{t+1}, \psi_{t+1}^{1}, \bar{y}_{r}^{1}) + \beta s_{t}^{2,j}(\psi_{t}^{2})(1 - s_{t}^{1,j}(\psi_{t}^{1})) E_{t} R^{s}(t+1, 2, a_{t+1}, \psi_{t+1}^{2}, \bar{y}_{r}^{2}) \right)$$

- *t* : Age.
- $a_t$ : Net worth from previous period.
- $\bar{y}_r^1$  : PI for men.
- $\bar{y}_r^2$ : PI women.
- $\psi_t^i$ : Health status (good or bad) for each spouse.



#### Recursive problem for retired couples

$$\begin{split} \bar{y}_{r}^{i} &= \max(\bar{y}_{r}^{1}, \bar{y}_{r}^{2}), \\ Y_{t} &= \max \left\{ (SS(\bar{y}_{r}^{1}) + SS(\bar{y}_{r}^{2}), \frac{3}{2} \max(SS(\bar{y}_{r}^{1}), SS(\bar{y}_{r}^{2})) \right\} \\ T(\cdot) &= \tau(Y_{t} + ra_{t}, j) \\ B(a_{t}, Y_{t}, \psi_{t}^{1}, \psi_{t}^{2}, \underline{c}(j)) &= \max \left\{ 0, \underline{c}(j) - \left[ (1 + r)a_{t} + Y_{t} - m_{t}^{1,j}(\psi_{t}^{1}) - m_{t}^{2,j}(\psi_{t}^{2}) - T(\cdot) \right] \right\} \\ c_{t} + a_{t+1} &= (1 + r)a_{t} + Y_{t} + B(\cdot) - m_{t}^{1,j}(\psi_{t}^{1}) - m_{t}^{2,j}(\psi_{t}^{2}) - T(\cdot) \\ a_{t+1} &> 0, \quad \forall t \end{split}$$

# Individual's Discounted Present Value of Being in a Marriage

#### Evaluated under optimal policies

$$\hat{W}^{c}(t, i, a_{t}, \epsilon_{t}^{1}, \epsilon_{t}^{2}, \bar{y}_{t}^{1}, \bar{y}_{t}^{2}) = v(\hat{c}_{t}(\cdot)/\eta_{t}^{i,j}, \hat{l}_{t}^{i,j}) + \beta(1 - \zeta(\cdot))E_{t}\hat{W}^{c}(t+1, i, \hat{a}_{t+1}(\cdot), \epsilon_{t+1}^{1}, \epsilon_{t+1}^{2}, \bar{y}_{t+1}^{1}, \bar{y}_{t+1}^{2}) + \beta\zeta(\cdot)E_{t}W^{s}(t+1, i, \hat{a}_{t+1}(\cdot)/2, \epsilon_{t+1}^{i}, \bar{y}_{t+1}^{i})$$

$$\begin{split} \hat{R}^{c}(t,i,a_{t},\psi_{t}^{1},\psi_{t}^{2},\bar{y}_{r}^{1},\bar{y}_{r}^{2}) &= v(\hat{c}_{t}(\cdot)/\eta_{t}^{i,j},L^{i,j}) + \\ \beta s_{t}^{i,j}(\psi_{t}^{i})s_{t}^{p,j}(\psi_{t}^{p})E_{t}\hat{R}^{c}(t+1,i,\hat{a}_{t+1}(\cdot),\psi_{t+1}^{1},\psi_{t+1}^{2},\bar{y}_{r}^{1},\bar{y}_{r}^{2}) + \\ \beta s_{t}^{i,j}(\psi_{t}^{i})(1-s_{t}^{p,j}(\psi_{t}^{p}))E_{t}R^{s}(t+1,i,\hat{a}_{t+1}(\cdot),\psi_{t+1}^{i},\bar{y}_{r}^{i}) \end{split}$$

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# Individual's Discounted Present Value of Being in a Marriage

#### Evaluated under optimal policies

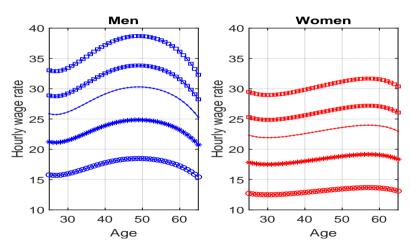
$$\hat{N}^{c}(t, i, a_{t}, \epsilon_{t}^{1}, \epsilon_{t}^{2}, \bar{y}_{t}^{1}, \bar{y}_{t}^{2}) = v^{i}(\hat{c}_{t}(\cdot), \hat{l}_{t}^{i,j}) \\ + \beta E_{t} \hat{V}^{c}(t+1, i, \hat{a}_{t+1}(\cdot), \epsilon_{t+1}^{1}, \epsilon_{t+1}^{2}, \bar{y}_{t+1}^{1}, \bar{y}_{t+1}^{2})$$

$$\hat{S}^{c}(t, i, a_{t}, \bar{y}_{r}^{1}, \bar{y}_{r}^{2}, tr) = v^{i}(\hat{c}_{t}(\cdot), L^{i,j}) + \beta E_{t} S^{c}(t+1, i, \hat{a}_{t+1}(\cdot), \bar{y}_{r}^{1}, \bar{y}_{r}^{2}, tr)$$

$$\hat{V}^{c}(t, i, a_{t}, \epsilon_{t}^{1}, \epsilon_{t}^{2}, \bar{y}_{t}^{1}, \bar{y}_{t}^{2}) = (1 - \hat{D}_{t}(\cdot)) \hat{N}^{c}(t, i, a_{t}, \epsilon_{t}^{1}, \epsilon_{t}^{2}, \bar{y}_{t}^{1}, \bar{y}_{t}^{2}) + \hat{D}_{t}(\cdot) \hat{S}^{c}(t, i, a_{t}, \bar{y}_{r}^{1}, \bar{y}_{r}^{2}, t)$$
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#### PSID: Wage profiles, 1945 cohort



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## PSID: Wage processes

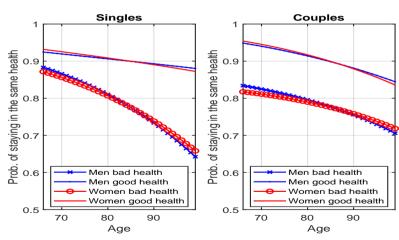
Parameter	Men	Women
Persistence	0.941	0.946
Variance prod. shock	0.026	0.015
Initial variance	0.114	0.095

Table: Estimated processes for the wage shocks for men and women, PSID data





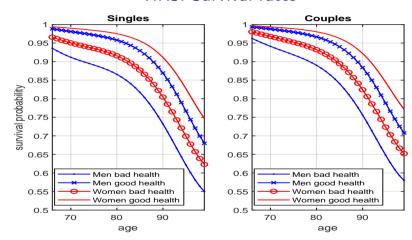
#### HRS: Health transition probabilities



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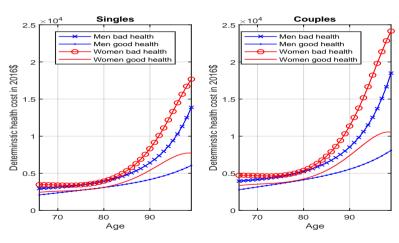
#### HRS: Survival rates



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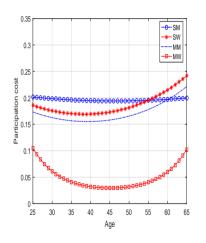


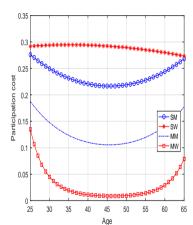
#### HRS: Health costs





# Second-step participation cost estimates





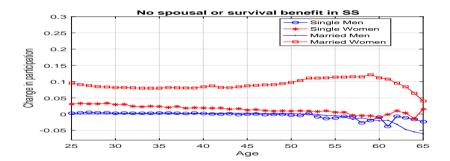
Fixed param	eters	Source		
Preferences and returns				
r	Interest rate	4% De Nardi et al. (2016)		
$\gamma$	Utility curvature parameter	2.5 see text		
$\eta_t$	Equivalence scales	PSID		
Government	policy			
$\lambda_t^{i,j},  au_t^{i,j}$	Income tax	See text		
$SS(\bar{y}_r^i)$	Social Security benefit	See text		
$ au_t^{SS}$	Social Security tax rate	See text		
$\widetilde{y}_t$	Social Security cap	See text		
<u>c</u> (1)	Minimum consumption, singles	\$8,687, De Nardi et al. (2016)		
<u>c</u> (2)	Minimum consumption, couples	\$8,687*1.5 Social Security rules		

Table: Additional first-step inputs

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#### Remove both Social Security benefits, 1945 cohort

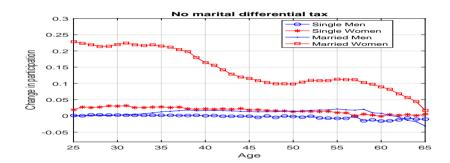


Percentage asset change	Couples	Single men	Single women
Balanced government budget	14.9%	7.8%	11.2%

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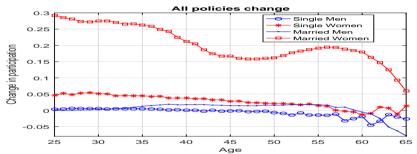
#### Taxing everyone as singles, 1945 cohort



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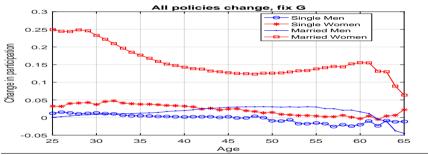


#### Remove Social Security benefits + joint tax, 1945 cohort



Percentage asset change	Couples	Single women	Single men
Balanced government budget	20.3%	14.8%	8.8%

#### Remove Social Security benefits + joint tax, 1955 cohort



% asset change	Couples	Single women	Single men
Balanced government budget	19.7%	14.9%	8.4%

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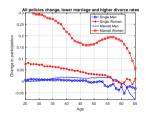


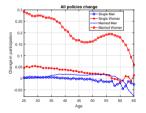
# Remove Social Security benefits + joint tax, 1945 cohort

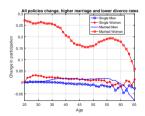
• Left: 
↓ the marriage prob. and 
↑ the divorce rate by 20%

Middle: benchmark

Right: 
 ↑ the marriage prob. and 
 ↓ the divorce rate by 20%







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