

# Household Labor Supply and Taxes

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# Plan for today

- Dynamic labor supply of **couples**

Borella, De Nardi and Yang (forthcoming): “Are Marriage-Related Taxes and Social Security Benefits Holding Back Female Labor Supply?”

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- **Reading guide:**

1. What are the main *research questions*?
2. What is the (*empirical*) *motivation*?
3. What are the central *mechanisms in the model*?
4. What is the *simplest model* in which we could capture these?

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- **Reading guide:**

1. What are the main *research questions*?

- How does household-level taxes and transfers affect labor supply?
- Could individual taxes/transfers increase welfare?

2. What is the (*empirical*) *motivation*?

3. What are the central *mechanisms in the model*?

4. What is the *simplest model* in which we could capture these?

# Empirical Motivation: I

- High marginal tax rates for secondary earner (often women historically)
  - labor supply discouraged
  - specialization
  - intra-household inequality

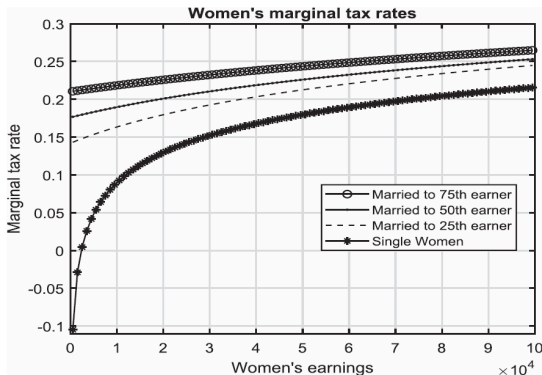
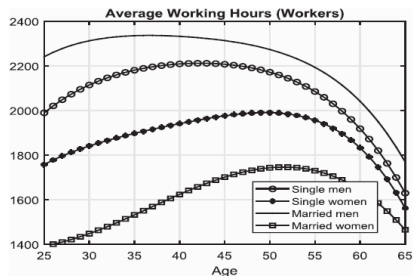
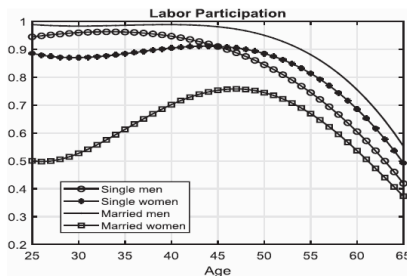


FIGURE 1

Women's marginal tax rates as a function of earnings (2016 dollars). Single (starred) and married to men at different

# Empirical Motivation: II



# Outline

## 1 Model and Mechanisms

## 2 Simulation Results

## 3 Simple Model

# Model Overview

- **Three stages**

1. Working (25–61)
2. Early retirement (62–65)
3. Retirement (66–99)



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Labor supply of both members,  $n_t^i$ ,  $i \in \{1, 2\}$  (1 = man)  
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- **States:**

Savings,  $a_t$   
Income shocks of both,  $\epsilon_t^i$   
Human capital of both,  $\bar{y}_t^i$

# Preferences

- **Individual preferences** are [my notation]

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

where

$l_t^{i,j} = L^{i,j} - n_t^i - \Phi_t^{i,j} \mathbf{1}(n_t^i > 0)$  is leisure.

(4 parameters estimated for each gender/marital status)

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- **Utility of a couple** is

$$w(c_t, l_t^1, l_t^2) = v(c_t, l_t^1, 1, 2) + v(c_t, l_t^2, 2, 2)$$

# Human Capital and Wages

- **Human capital** is previous avg. earnings, approximated as

$$\bar{y}_{t+1}^i = \frac{\bar{y}_t^i(t - t_0) + \min(Y_t^i, \tilde{y}_t)}{t + 1 - t_0} \quad (1)$$

where

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- **Wages** are

$$w_t^i = e_t^i(\bar{y}_t^i)\epsilon_t^i$$

where

$e_t^i(\bar{y}_t^i)$  : age, gender and HC. Table 1 in Appendix

$$\log \epsilon_{t+1}^i = \rho_\epsilon^i \log \epsilon_t^i + v_{i+1}^i, \quad v_{i+1}^i \sim \mathcal{N}(0, (\sigma_v^i)^2) \quad (2)$$



# Government: Taxes and Transfers

- Labor income taxes are approximated as

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

where

$Y = ra_t + Y_t^1 + Y_t^2$  is total *household* income

$\lambda_t^{ij}$  and  $\tau_t^{ij}$  are gender/marital specific tax-parameters (not reported).

- Payroll tax:  $\min(Y, \tilde{y}_t) \tau_t^{SS}$
- Consumption floor,  $c(j)$ . See table 10 in Appendix.

# Children

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- $f^{0,5}(i, j, t)$ : number of children in age-group 0-5  
 $\tau_c^{0,5}$ : child care cost, pct of income (estimated)
- $f^{6,11}(i, j, t)$ : number of children in age-group 6-11  
 $\tau_c^{6,11}$ : child care cost, pct of income (estimated)
- $f(1, 1, t) = 0$  (single men)

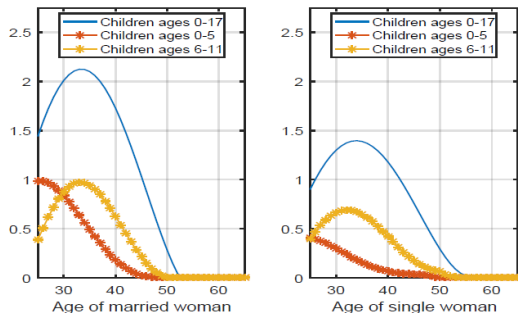


Figure: Figure 5 in Online Appendix. 1945 cohort.

# Marriage and Divorce

- **Marriage** probability depends on wage-shock

$$v_{t+1}(i, \epsilon_t^i) = \Pr(j_{t+1} = 2 | j_t = 1, t, i, \epsilon_t^i)$$

- Probability of *matching* a partner with states  $(a_{t+1}^p, \bar{y}_{t+1}^p, \epsilon_{t+1}^p)$ :

$$\Pr(a_{t+1}^p, \bar{y}_{t+1}^p, \epsilon_{t+1}^p | \epsilon_t^i, i) = \theta_{t+1}(a_{t+1}^p, \bar{y}_{t+1}^p | \epsilon_{t+1}^p) \cdot \zeta_{t+1}(\epsilon_{t+1}^p | \epsilon_t^i, i)$$

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- **Divorce** probability depends on both members wage shocks

$$\zeta_{t+1}(\epsilon_t^1, \epsilon_t^2) = \Pr(j_{t+1} = 1 | j_t = 2, t, \epsilon_t^1, \epsilon_t^2)$$

- Wealth *equally split* + no alimony.

# Recursive Formulation: Working-Stage Couple

- **Bellman Equation** for couple is (subject to (1) and (2))

$$\begin{aligned}
 W_t^c(a_t, \epsilon_t^1, \epsilon_t^2, \bar{y}_t^1, \bar{y}_t^2) = & \max_{c_t, n_t^1, n_t^2} w(c_t, l_t^1, l_t^2) \\
 & + (1 - \zeta_{t+1})\beta \mathbb{E}_t[W_{t+1}^c(a_{t+1}, \epsilon_{t+1}^1, \epsilon_{t+1}^2, \bar{y}_{t+1}^1, \bar{y}_{t+1}^2)] \\
 & + \zeta_{t+1}\beta \sum_{i=1}^2 \mathbb{E}_t[W_{t+1}^s(i, a_{t+1}/2, \epsilon_{t+1}^i, \bar{y}_{t+1}^i)]
 \end{aligned}$$

s.t.

$$\begin{aligned}
 a_{t+1} = & (1 + r)a_t + Y_t^1 + Y_t^2(1 - \tau_c(2, 2, t)) - c_t \\
 & - \tau_t^{SS} \sum_{i=1}^2 \min(Y_t^i, \tilde{y}_t) - T(r a_t + Y_t^1 + Y_t^2, 2, t)
 \end{aligned}$$

where

$W_{t+1}^s(\bullet)$  is value of being single

$$\begin{aligned}
 \mathbb{E}_t[W_{t+1}^c(a_{t+1}, \epsilon_{t+1}^1, \epsilon_{t+1}^2, \bar{y}_{t+1}^1, \bar{y}_{t+1}^2)] = \\
 \int \int W_{t+1}^c(\bullet, \underbrace{\exp(\rho_\epsilon^1 \log \epsilon_t^1 + v_{t+1}^1)}_{\epsilon_{t+1}^1}, \underbrace{\exp(\rho_\epsilon^2 \log \epsilon_t^2 + v_{t+1}^2)}_{\epsilon_{t+1}^2}, \bullet) \phi(dv_{t+1}^1) \phi(dv_{t+1}^2)
 \end{aligned}$$

# Outline

1 Model and Mechanisms

2 **Simulation Results**

3 Simple Model

# Labor Supply Elasticities

- **Frisch:** Anticipated transitory income changes

TABLE 4  
*Model-implied elasticities of labour supply*

	Participation				Hours among workers			
	Married		Single		Married		Single	
	W	M	W	M	W	M	W	M
30	1.0	0.0	0.5	0.2	0.2	0.3	0.4	0.4
40	0.7	0.1	0.4	0.2	0.4	0.5	0.4	0.5
50	0.6	0.2	0.4	0.5	0.4	0.5	0.8	0.5
60	1.1	0.8	1.8	1.4	0.3	0.3	0.5	0.4

- Highest for women
- Extensive margin important



# Labor Supply Elasticities

- **Marshall:** permanent increase in *wages of women* from age 25 ( $t_0$ ), I think, i.e. “regime shift”.



- Large for married women
- U-shaped
- Small negative cross-elasticity for men.

# Counterfactual Policy Simulations

- **Remove the Joint taxation.**

Unclear exactly how, but I think it is like

$$a_{t+1} = (1+r)a_t + Y_t^1 + Y_t^2(1 - \tau_c(2, 2, t)) - c_t - \tau_t^{SS} \sum_{i=1}^2 \min(Y_t^i, \tilde{y}_t) \\ - T(ra_t/2 + Y_t^1, 1, 1, t) - T(ra_t/2 + Y_t^2, 2, 1, t)$$

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- **Balance government budget** by changing  $\lambda_t^{i,j}$  in

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- **Also: Remove spousal dependence** on social and survivor benefits  
Only affects in later life stages (ignore a bit here)

# Simulation Results: Participation

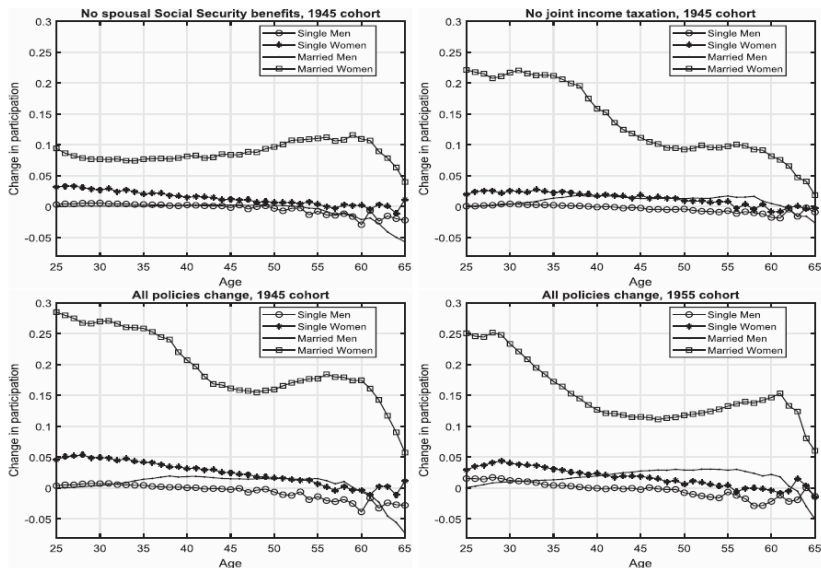


FIGURE 9

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$$V^{reform} = \frac{1}{S} \sum_{s=1}^S V_{t_0}(a_{s,t_0}, \epsilon_{s,t_0}^1, \epsilon_{s,t_0}^2, \bar{y}_{s,t_0}^1, \bar{y}_{s,t_0}^2; reform)$$

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- Let baseline value be

$$V^{base}(a) = \frac{1}{S} \sum_{s=1}^S V_{t_0}(a_{s,t_0} + a, \epsilon_{s,t_0}^1, \epsilon_{s,t_0}^2, \bar{y}_{s,t_0}^1, \bar{y}_{s,t_0}^2)$$

as a function of additional initial wealth,  $a$ .



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- Asset compensation required

$$a^* = \{a : V^{reform} - V^{base}(a) = 0\}$$

(normalized by avg income:  $\frac{1}{2}a^* / (\bar{y}_{s,t_0}^1 + \bar{y}_{s,t_0}^2)$  (??))

# Simulation Results: Welfare

TABLE 7

*Asset compensation required for staying in the benchmark economy, normalized as a fraction of average income*

	All			Winners			Losers		
	Couples	SW	SM	Couples	SW	SM	Couples	SW	SM
1945 cohort									
(1) Remove Social Security spousal benefits, unbalanced budget									
Average	-0.24	-0.20	0.25	0.00	0.00	0.25	-0.24	-0.20	-0.02
Percentage				0.0	0.0	100.0	100.0	100.0	0.0
(2) Remove Social Security spousal benefits, balanced budget									
Average	0.66	0.19	1.15	0.66	0.20	1.15	0.00	-0.03	0.00
Percentage				100.0	92.5	100.0	0.0	7.5	0.0
(3) Remove joint income taxation, unbalanced budget									
Average	0.06	-0.18	0.81	0.29	0.06	0.81	-0.19	-0.19	0.00
Percentage				52.8	4.9	100.0	47.2	95.1	0.0
(4) Remove joint income taxation, balanced budget									
Average	0.31	-0.08	1.06	0.42	0.12	1.06	-0.09	-0.13	0.00
Percentage				78.8	20.6	100.0	21.2	79.4	0.0
(5) Remove all marital-related policies, balanced budget									
Average	0.80	0.05	1.97	0.80	0.33	1.97	-0.03	-0.12	0.00
Percentage				98.8	37.4	100.0	1.2	62.6	0.0
1955 cohort									
(6) Remove all marital-related policies, balanced budget									
Average	0.73	0.21	1.14	0.74	0.30	1.14	-0.04	-0.04	-0.03
Percentage				98.2	74.1	100.0	1.8	25.9	0.0

*Notes:* Top line for each experiment: average welfare gain or loss. Bottom line for each experiment: fraction in that group gaining or losing welfare. SM, single men; SW, single women.

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# Our simple model

- **Dual-earner model**
- **Simplifications:**
  - No savings
  - Couple cannot divorce (no singlehood)
  - Deterministic (no shocks)
- **Taxes:**
  - On household level
- **Reform** of interest:
  - Individual taxation

# Our simple model

- **Recursive formulation**

$$V_t(K_{1,t}, K_{2,t}) = \max_{h_{1,t}, h_{2,t}} U(c_t, h_{1,t}, h_{2,t}) + \beta V_{t+1}(K_{1,t+1}, K_{2,t+1})$$

$$c_t = \sum_{j=1}^2 w_{j,t} h_{j,t} - T(w_{1,t} h_{1,t}, w_{2,t} h_{2,t})$$

$$\log w_{j,t} = \alpha_{j,0} + \alpha_{j,1} K_{j,t}, \quad j \in \{1, 2\}$$

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$$U(c_t, h_{1,t}, h_{2,t}) = 2 \frac{(c_t/2)^{1+\eta}}{1+\eta} - \rho_1 \frac{h_{1,t}^{1+\gamma}}{1+\gamma} - \rho_2 \frac{h_{2,t}^{1+\gamma}}{1+\gamma}$$

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- **Taxes** are

$$T(Y_1, Y_2) = (1 - \lambda(Y_1 + Y_2)^{-\tau}) \cdot (Y_1 + Y_2)$$

# Next Time

- **Next time:**

Labor supply and children.

- **Literature:**

Guner, Kaygusuz and Ventura (2020): "Child-Related Transfers, Household Labor Supply and Welfare"

- **Read** before lecture

- **Reading guide:**

(focus on types child-related transfers + policy experiments)

Section 1: Introduction + topic. Super important - Read.

Section 2: Background, US. Read.

Section 3: Model. Complex. Get the idea. Focus on married couples and childcare costs.

Section 4: Calibrations. Skim.

Section 5: Understanding childcare subsidies. Key - read.

Section 6: Counterfactual policies. Key - read.



# References I

BORELLA, M., M. DE NARDI AND F. YANG (forthcoming): “Are Marriage-Related Taxes and Social Security Benefits Holding Back Female Labor Supply?,” *Review of Economic Studies*.

GUNER, N., R. KAYGUSUZ AND G. VENTURA (2020): “Child-Related Transfers, Household Labor Supply and Welfare,” *Review of Economic Studies*, 87(5), 2290–2321.