Career and Family Decisions: Cohorts Born 1935-1975

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1. Introduction

2. Key Patterns in the Data

2.1. *Employment Rates by Marital Status*

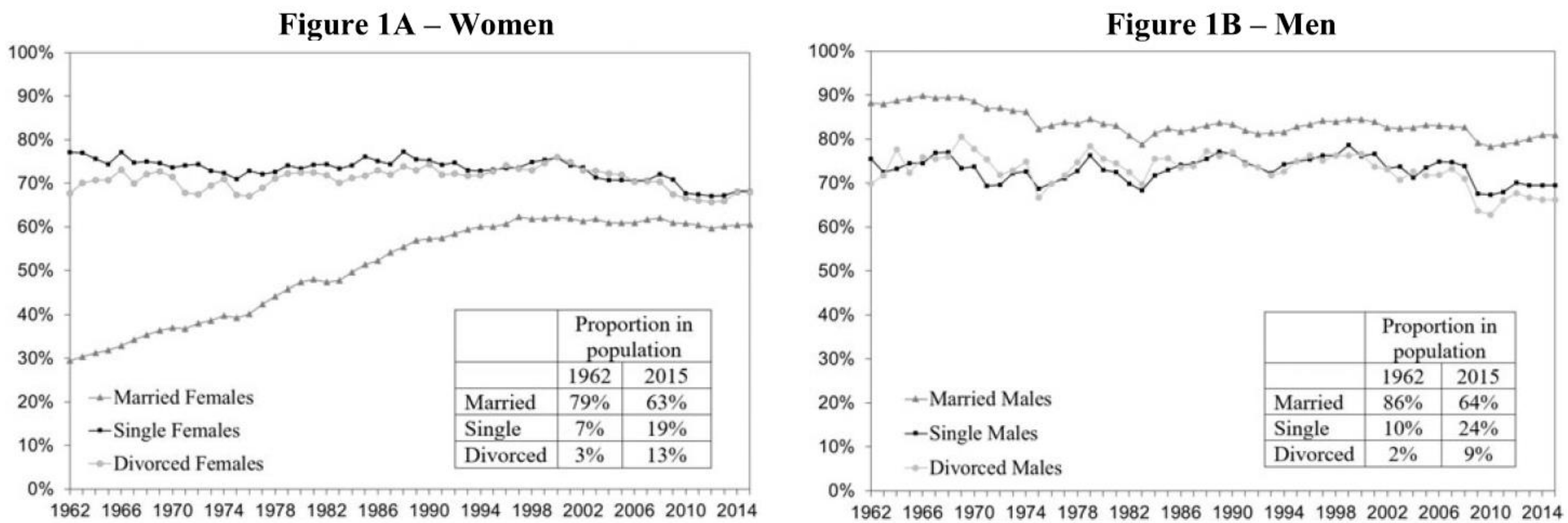

FIGURE 1.—Employment rate by marital status: 1962–2015. *Note*: Fraction employed of the Caucasian population aged 22–65. We define employed as working at least 10 hours a week.

2.2 *Wages by Marital Status*

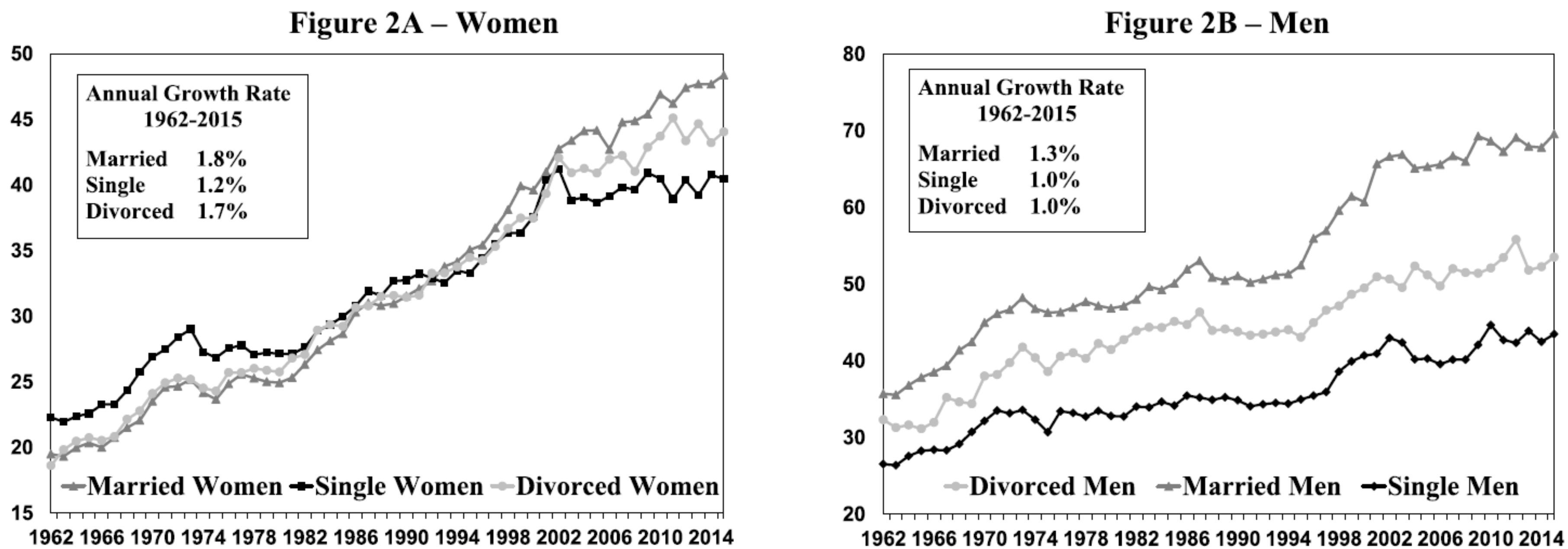

FIGURE 2.—Annual wages by marital status: 1962—2015. *Note*: Real annual wages (in thousands of dollars) of full-time full-year Caucasian workers aged 22–65 (2012 prices). For details, see Appendix A.

2.3. *Women's Education and the "Marriage Wage Gap"*

3. A Life-cycle Model of Education, Labor Supply, Marriage/Divorce, and Fertility

3.1. *The Decisions of a Married Couple*

Married couples have total gross income GY_t^M given by the equation

$$GY_t^M = (w_t^m h_t^m + w_t^f h_t^f) + b_m I[h_t^m = 0] + b_f I[h_t^f = 0]. \tag{1}$$

Here w_t^j and h_t^j for $j = f, m$ are annual full-time wage rates and the b_j are unemployment benefits plus values of home production. We will use the M superscript throughout to indicate values for married individuals. Net income is Y_t^M given by the equation

$$Y_t^M = GY_t^M - \tau_t^M((w_t^m h_t^m + w_t^f h_t^f), N_t), \tag{2}$$

where $\tau_t^M(\cdot, \cdot)$ is the tax function for married couples based on the time t tax rules.

$$C_t^M = \left(1 - \kappa(N_t)\right) Y_t^M. \tag{3}$$

Here $\kappa(N_t)$ is the fraction of Y_t^M spent on children, based on a square root equivalence scale.

The period utility of a married person of age t and gender j in state Ω_{jt} is given by

$$U_t^{jM}(\Omega_{jt}) = \frac{1}{\alpha}(\psi C_t^M)^\alpha + L_{jt}(l_t^j) + \theta_t^M + \pi_t^M p_t + A_j^M Q(l_t^f, l_t^m, Y_t^M, N_t), \quad j = m, f, \tag{4a}$$

$$L_{jt}(l_t^j) = \frac{\beta_{jt}}{\gamma}(l_t^j)^\gamma + \mu_{jt} l_t^j, \quad \gamma < 1, \alpha < 1. \tag{4b}$$

This is denoted by $\mu_{jt} l_t^j$, where μ_{jt} is a random variable. Our specification of the stochastic process for μ_{jt} is an important and novel aspect of our model. Specifically, we assume that

$$\ln(\mu_{jt}) = \tau_{0j} + \tau_{1j} \ln(\mu_{j,t-1}) + \tau_{2j} p_{t-1} + \varepsilon_{jt}^l \quad \text{where } \varepsilon_{jt}^l \sim \text{iidN}\left(0, \sigma_\varepsilon^l\right), \tag{5}$$

where $0 < \tau_{1j} < 1$.

$$\theta_t^M = d_1 + d_2 \cdot I\left[E^m - E^f > 0\right] + d_3 \cdot I\left[E^f - E^m > 0\right] + d_4\left(H_t^m - H_t^f\right)^2 + \varepsilon_t^M, \qquad (6)$$

where $\varepsilon_t^M \sim \text{iidN}(0, \sigma_\varepsilon^M)$ and E^j denotes education, rank ordered as high school dropout (HSD), high school (HSG), some college (SC), college (CG), and post-college (PC), and $H_t^j \in \{1, 2, 3\}$ denotes health (i.e., good, fair, or poor).

Next, consider the utility from pregnancy, π_t. We specify that

$$\pi_t = \pi_1 M_t + \pi_2 H_{ft} + \pi_3 N_t + \pi_4 p_{t-1} + \varepsilon_t^p + \exp(\varepsilon_t^{up}), \tag{7}$$

where $\varepsilon_t^p \sim \text{iidN}(0, \sigma_\varepsilon^p)$ and $\varepsilon_t^{up} \sim \text{iidN}(pr, 1)$.

Finally, consider the function $Q(\cdot)$ that determines the utility a couple receives from the quality and quantity of children. We assume it is a CES function of the inputs, as follows:

$$Q(l_t^f, l_t^m, Y_t^M, N_t) = \left(a_f (l_t^f)^\rho + a_m (l_t^m)^\rho + a_g \left(\kappa(N_t) Y_t^M\right)^\rho + (1 - a_f - a_m - a_g) N_t^\rho\right)^{1/\rho}. \quad (8)$$

We are now able to write the choice-specific value functions for married *individuals*. These depend on both a person's own state and that of their partner:

$$V_t^{jM}(l_t^m, l_t^f, p_t \mid \Omega_{mt}, \Omega_{ft})$$
$$= \frac{1}{\alpha}(\psi C_t^M)^\alpha + L(l_t^j) + \theta_t^M + \pi_t p_t + A_j^M Q(l_t^f, l_t^f, Y_t^M, N_t) \tag{9}$$
$$+ \delta E_{\text{MAX}}\big(M_{t+1} V_{t+1}^{jM}(\Omega_{m,t+1}, \Omega_{f,t+1}) + (1 - M_{t+1}) V_{t+1}^j(\Omega_{j,t+1})\big), \quad j = f, m.$$

In our collective model, the household value function is given by

$$V_t^M(l_t^m, l_t^f, p_t \mid \Omega_{mt}, \Omega_{ft}) = \lambda V_t^{fM}(l_t^m, l_t^f, p_t \mid \Omega_{mt}, \Omega_{ft}) + (1-\lambda) V_t^{mM}(l_t^m, l_t^f, p_t \mid \Omega_{mt}, \Omega_{ft}). \tag{10}$$

$$V_t^{jM}(l_t^m, l_t^f, p_t \mid \Omega_{mt}, \Omega_{ft}) \geq V_t^j(\Omega_{jt}) - \Delta_{jt} \quad \text{for } j = f, m, \tag{11}$$

where Δ_{jt} is the cost of divorce.[17] If $\mathcal{F} = \emptyset$, no choice vector $\{l_t^m, l_t^f, p_t\}$ satisfies (11).

$$\{l_t^{m*}, l_t^{f*}, p_t^*\} = \begin{cases} \arg \max_{\{l_t^m, l_t^f, p_t\} \in \mathcal{F}} V_t^M(l_t^m, l_t^f, p_t \mid \Omega_{mt}, \Omega_{ft}) & \text{if } \mathcal{F} \neq \emptyset, \\ \emptyset & \text{if } \mathcal{F} = \emptyset. \end{cases}$$

The form of (10) ensures that $\{l_t^{m*}, l_t^{f*}, p_t^*\}$ is a Pareto efficient allocation. If one or more parties prefer to remain single for all possible $\{l_t^m, l_t^f, p_t\}$, then $\mathcal{F} = \emptyset$ and a divorce occurs.

The maximized value function of a married *individual* in state Ω_{jt} is given by

$$V_t^{jM}(\Omega_{mt}, \Omega_{ft}) \equiv \begin{cases} V_t^{jM}(l_t^{m*}, l_t^{f*}, p_t^* \mid \Omega_{mt}, \Omega_{ft}) & \text{for } j = f, m \text{ if } \mathcal{F} \neq \emptyset, \\ -\infty & \text{for } j = f, m \text{ if } \mathcal{F} = \emptyset. \end{cases} \tag{12}$$

3.2. *The Decisions of Single Households*

$$Y_t^j = GY_t^j - \tau_t^S(w_t^j h_t^j, N_t), \quad j = f, m, \tag{14}$$

where $\tau_t^S(w_t^j h_t^j, N_t)$ is the time t tax function for single individuals calculated using the tax rules described in Appendix B. Thus, the budget constraint for a single person is simply

$$C_t^j = \big(1 - \kappa(N_t)\big) Y_t^j. \tag{15}$$

Note that both single men and women may have children ($N_t > 0$). These may be children from a previous marriage or, in the case of single women, children born outside of marriage.

$$U_t^f(\Omega_{ft}) = \left(\frac{1}{\alpha}(C_t)^\alpha + L_j(l_t)\right)(1 - s_t) + \vartheta_{ft}s_t + \pi_t p_t + A_f^s Q(l_t, 0, Y_t, N_t), \qquad (16)$$

where s_t is a 1/0 indicator for school attendance. Provided the single woman is not in

$$\vartheta_{jt} = \vartheta_{0j} + TC \cdot I(E_t > HSG) + \vartheta_{1j}PE + \vartheta_{2j}\mu_j^W \quad \text{for } j = m, f. \qquad (17)$$

Here ϑ_{jt} is a function of tuition cost TC, which is only relevant for higher education, the skill endowment μ_j^W, and parents' education, denoted PE.

We can now write the choice-specific value functions for single females:

$$V_t^f(l_t, p_t, s_t \mid \Omega_{ft}) = \left(\frac{1}{\alpha}(C_t)^\alpha + L_f(l_t)\right)(1 - s_t) + \vartheta_{ft} s_t + \pi_t p_t + A_f^s Q(l_t, 0, Y_t, N_t) + \delta E_{\text{MAX}} V(\Omega_{f,t+1}), \tag{18a}$$

$$E_{\text{MAX}} V(\Omega_{f,t+1}) = E_{\text{MAX}}\left(M_{t+1} V_{t+1}^{fM}(\Omega_{m,t+1}, \Omega_{f,t+1}) + (1 - M_{t+1}) V_{t+1}^f(\Omega_{f,t+1})\right), \tag{18b}$$

where $E_{\text{MAX}} V(\Omega_{f,t+1})$ takes into account that the person may get married at $t + 1$.

Similarly, for single males, we have the choice-specific value function:

$$V_t^m(l_t, s_t \mid \Omega_{mt}) = \left(\frac{1}{\alpha}(C_t)^\alpha + L_m(l_t)\right)(1 - s_t) + \vartheta_{mt} s_t + A_m^s Q(0, l_t, Y_t, N_t) + \delta E_{\text{MAX}} V(\Omega_{m,t+1}). \tag{19}$$

To proceed, for women and men we have, respectively,

$$V_t^f(\Omega_{ft}) = \max_{\{l_t, p_t, s_t\} \in S_t^f} V_t^f(l_t, p_t, s_t \mid \Omega_{ft}), \tag{20}$$

$$V_t^m(\Omega_{mt}) = \max_{\{l_t, s_t\} \in S_t^m} V_t^f(l_t, s_t \mid \Omega_{mt}). \tag{21}$$

The wage offer functions have a standard Ben-Porath (1967), Mincer (1974) form:

$$\ln w^j_{et} = \omega^j_{1e} + \omega^j_{2e} X_t - \omega^j_{3e} X_t^2 + \varepsilon^W_{jt} \quad \text{for } j = f, m, \tag{22}$$

where X_t is work experience (years) and $e \in \{HSD, HSG, SC, CG, PC\}$ is education level.

The error term ε^W_{jt} in equation (22) has a permanent/transitory structure:

$$\varepsilon^W_{jt} = \mu^W_j(PE) + \tilde{\varepsilon}^W_{jt} \quad \text{where } \tilde{\varepsilon}^W_{jt} \sim \text{iidN}(0, \sigma^W_\varepsilon). \tag{23}$$

$$P_j(k \in D_t) = \frac{\exp\left(\phi_{j0k} + \phi_{j1k} e_t^r + \phi_{j2k} X_t + \phi_{j3k} H_t\right)}{1 + \exp\left(\phi_{j0k} + \phi_{j1k} e_t^r + \phi_{j2k} X_t + \phi_{j3k} H_t\right)} \quad \text{for } k = 1, 2, \qquad (24)$$

where $k = 1, 2$ denote full- and part-time, respectively, and $j = f, m$. Here $e_t^r = 1, \ldots, 5$ corresponds to the five education levels in ascending order, X_t is work experience, and H_t is health.

3.4. *Health Status*

3.5. *The Marriage Market*

Putting this all together, the marriage offer for a single female consists of the vector

$$\mathcal{M}_{ft} = \left(E^m, H^m, X^m, N^m, PE^m, h^m_{t-1}, \mu_{mt}, \mu^W_m, \tilde{\varepsilon}^W_{mt}, \varepsilon^M_t\right). \tag{26}$$

Marriage offers for males ($\mathcal{M}_{mt}$) have an analogous form.

Given a marriage offer $\mathcal{M}_{jt}$, a single person can construct the vector $(\Omega_{ft}, \Omega_{mt})$ that characterizes the state of the couple if they marry. That is, $(\Omega_{jt}, \mathcal{M}_{jt}) \rightarrow (\Omega_{ft}, \Omega_{mt})$ for $j = f, m$. The potential partner also knows $(\Omega_{ft}, \Omega_{mt})$. Both parties calculate the value of marriage, denoted by $V_t^{jM}(\Omega_{mt}, \Omega_{ft})$ for $j = f, m$ in equation (12). A marriage is formed if and only if

$$V_t^{fM}(\Omega_{mt}, \Omega_{ft}) > V_t^{f}(\Omega_{ft}) \quad \text{and} \quad V_t^{mM}(\Omega_{mt}, \Omega_{ft}) > V_t^{m}(\Omega_{mt}). \tag{27}$$

3.6. *Terminal Period and Retirement*

4. Solution of the Model

5. Estimation and Identification

6. Estimation Results and Interpretation

6.1. *Wages and Employment by Cohort*

TABLE I

DECOMPOSING SOURCES OF COHORT DIFFERENCES—WAGES AND EMPLOYMENT

	1935 Fitted	1975 Fitted	Total % Change	Contribution of Each Factor: Benchmark	Marriage Market	Labor Market	Contra-ception
Wages (Thousands of $)							
Married Women—Ages 25–34	20.5	39.0	90%	11%	7%	65%	8%
Married Women—Ages 35–44	25.1	51.2	104%	12%	5%	81%	5%
Unmarried Women—Ages 25–34	23.3	37.7	62%	4%	1%	55%	1%
Unmarried Women—Ages 35–44	28.4	43.5	53%	3%	1%	49%	0%
Married Men—Ages 25–34	36.2	51.3	42%	1%	1%	40%	0%
Married Men—Ages 35–44	52.2	69.8	34%	1%	1%	32%	0%
Unmarried Men—Ages 25–34	30.0	42.9	43%	3%	1%	39%	0%
Unmarried Men—Ages 35–44	42.9	56.3	31%	2%	1%	28%	0%
Employment							
Married Women—Ages 25–34	0.27	0.63	130%	13%	13%	67%	36%
Married Women—Ages 35–44	0.44	0.66	50%	4%	5%	35%	6%
Unmarried Women—Ages 25–34	0.68	0.75	11%	1%	0%	8%	1%
Unmarried Women—Ages 35–44	0.70	0.72	2%	0%	0%	2%	0%
Married Men—Ages 25–34	0.91	0.89	−2%	0%	−1%	−1%	0%
Married Men—Ages 35–44	0.92	0.90	−2%	0%	−1%	−2%	0%
Unmarried Men—Ages 25–34	0.78	0.79	2%	0%	0%	2%	0%
Unmarried Men—Ages 35–44	0.79	0.75	−5%	0%	0%	−5%	0%

Figure 3.A. – Cohort of 1935

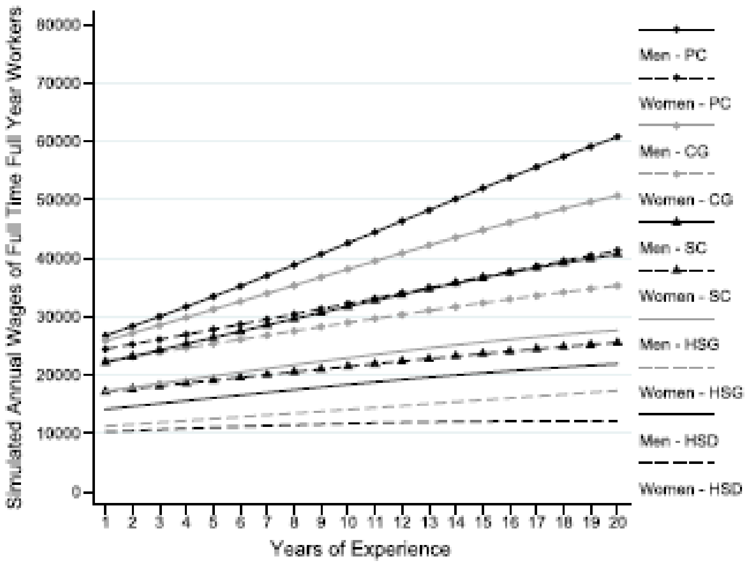

Figure 3.B. – Cohort of 1975

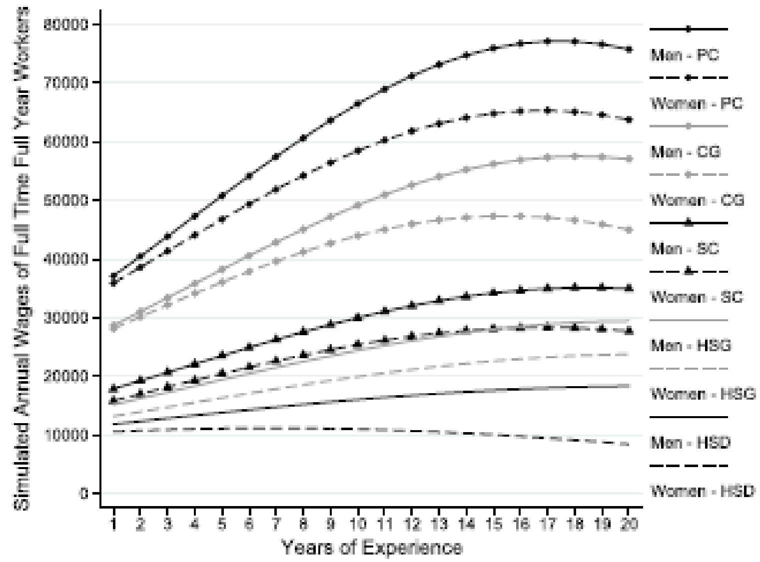

FIGURE 3.—Simulated annual wages by education and years of experience.

6.2. *The Marriage Wage Gap*

TABLE II

MARRIAGE WAGE GAP BY GENDER AND COHORT

	Women Marriage Wage Gap					Men Marriage Wage Gap				
	1935	1945	1955	1965	1975	1935	1945	1955	1965	1975
Data	−8.9%	−6.8%	−1.7%	2.0%	5.2%	19.7%	18.7%	19.5%	19.7%	18.3%
Benchmark Model	−3.6%	−3.7%	−1.1%	0.8%	1.3%	11.9%	12.3%	12.0%	12.9%	12.3%
Full Model	−8.4%	−6.4%	−1.0%	2.3%	4.4%	12.9%	13.8%	13.6%	13.8%	13.7%
Control for Experience	−3.3%	−2.8%	2.0%	3.2%	5.0%	4.3%	4.4%	5.5%	6.5%	6.4%
Control for Ability	0.8%	0.8%	1.1%	0.7%	1.0%	1.2%	0.8%	0.9%	1.4%	0.9%

6.3. *Marriage, Divorce, Assortative Mating, Fertility, and Education*

TABLE III

DECOMPOSING SOURCES OF COHORT DIFFERENCES—MARRIAGE, CHILDREN, EDUCATION

				Contribution of Each Factor			
	1935 Fitted	1975 Fitted	Total % Change	Benchmark	Marriage Market	Labor Market	Contra-ception
Family moments							
Marriage Rate—Ages 25–34	0.86	0.60	−30%	−20%	−7%	−3%	0%
Marriage Rate—Ages 35–44	0.84	0.70	−16%	−7%	−7%	−2%	−1%
Divorce Rate—Ages 25–34	0.03	0.09	206%	31%	144%	13%	17%
Divorce Rate—Ages 35–44	0.08	0.12	62%	3%	54%	5%	0%
Married Women # of Children—Ages 25–34	2.54	1.51	−41%	−8%	−12%	0%	−20%
Married Women # of Children—Ages 35–44	2.24	1.94	−14%	−2%	−4%	0%	−6%
Unmarried Women # of Children—Ages 25–34	0.92	0.32	−66%	−6%	−6%	−1%	−53%
Unmarried Women # of Children—Ages 35–44	0.75	0.51	−32%	−3%	−4%	−1%	−24%
Education Distribution at 30							
Women's CG + PC Rate	0.05	0.36	620%	180%	220%	200%	20%
Men's CG + PC Rate	0.20	0.29	45%	5%	10%	30%	0%
Assortative Mating							
HSD With HSD	0.55	0.56	2%	0%	2%	2%	−2%
HSG With HSG	0.64	0.49	−23%	−9%	−8%	−5%	−2%
SC With SC	0.24	0.53	121%	−4%	25%	100%	0%
CG With CG	0.33	0.49	48%	6%	15%	27%	0%
PC With PC	0.12	0.43	258%	33%	33%	183%	8%
HSG Women With CG Men	0.34	0.08	−76%	−9%	−21%	−47%	0%
CG Women With HSG Men	0.02	0.12	500%	100%	150%	250%	0%

6.4. *Robustness Checks: Home Production and Savings*

7. Policy Analysis: Tax Reform and Labor Supply

TABLE IV

IMPLEMENTING INDIVIDUAL TAXATION OF INCOME FOR 1965 COHORT[a]

	1965				
	Baseline	Individual Tax	Percentage Change	Ind. Tax Revenue Neutral	Percentage Change
Gross Wages (Thousands of $)					
Married Women	41.9	42.4	1.3%	42.4	1.2%
Unmarried Women	42.0	42.3	0.6%	42.3	0.7%
Married Men	63.4	63.3	−0.2%	63.3	−0.2%
Unmarried Men	47.6	47.7	0.0%	47.7	0.1%
Employment					
Married Women	0.65	0.70	8.3%	0.71	9.0%
Unmarried Women	0.75	0.76	0.9%	0.76	1.2%
Married Men	0.89	0.89	0.6%	0.89	0.9%
Unmarried Men	0.76	0.76	−0.1%	0.76	0.2%
Family Moments					
Marriage Rate	0.68	0.73	8.0%	0.73	8.1%
Divorce Rate	0.12	0.12	−4.3%	0.12	−5.1%
Married Women # of Children	1.66	1.60	−3.9%	1.59	−4.0%
Unmarried Women # of Children	0.40	0.40	−1.1%	0.40	−1.3%
Education					
Women's CG + PC Rate	0.24	0.25	4.2%	0.25	4.2%
Men's CG + PC Rate	0.26	0.26	0.0%	0.26	0.0%

[a] Gross Wages—Average simulated annual wages of full-time workers aged 25 to 55. Employment—Average simulated employment rate of workers aged 25 to 55. Family moments—Average simulated rates for people aged 25 to 55. Education—Simulated college and post-college graduation rates at age 30.

TABLE V

LABOR SUPPLY ELASTICITIES BY GENDER, MARITAL STATUS, AGE, AND COHORT

Elasticities	1935	1945	1955	1965	1975
Married Women—Ages 25–34	1.80	1.84	1.27	1.25	1.13
Married Women—Ages 35–44	1.12	1.32	1.13	1.12	1.18
Married Women—Ages 45–54	1.20	1.10	1.04	1.06	
Unmarried Women—Ages 25–34	0.21	0.23	0.19	0.18	0.22
Unmarried Women—Ages 35–44	0.19	0.28	0.21	0.21	0.17
Unmarried Women—Ages 45–54	0.16	0.16	0.20	0.20	
Married Men—Ages 25–34	0.15	0.15	0.20	0.17	0.19
Married Men—Ages 35–44	0.14	0.17	0.20	0.15	0.17
Married Men—Ages 45–54	0.16	0.19	0.20	0.15	
Unmarried Men—Ages 25–34	0.16	0.16	0.20	0.18	0.23
Unmarried Men—Ages 35–44	0.17	0.20	0.21	0.16	0.16
Unmarried Men—Ages 45–54	0.21	0.18	0.16	0.22	

8. Conclusion