Career and Family Decisions: Cohorts born 1935 – 1975

Zvi Eckstein, Michael Keane and Osnat Lifshitz

December, 2018

THE VIII INTERNATIONAL CONFERENCE IN ECONOMICS AND FINANCE, Minsk, Belarus, December 20, 2018

Outline

- **Question: How marriage and divorce affected wages and employment of white US males and females born from 1930s to 1970s?**
- **Life-cycle decisions** of five cohorts in a unified econometric framework applied to CPS data
- **Data**: aggregate, by cohort and marriage
- **Household model**: education, marriage, employment and fertility
- **Exogenous changes by cohort**: Parents' education; marriage **opportunities; divorce costs**; wages; fertility control
- **Estimation and Results**: fit, parameters, answer the question
- **Counterfactual**: shift from joint to individual taxation

Labor Market Data for Married, Divorced and Single

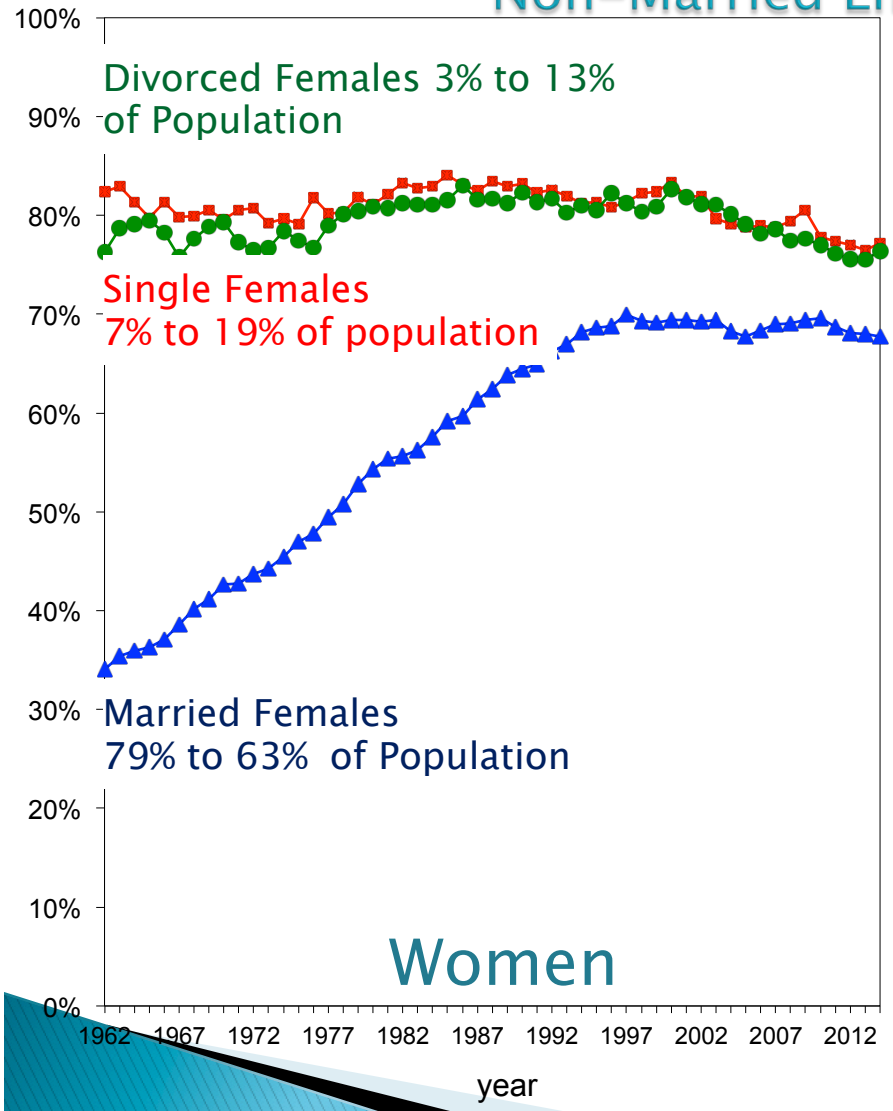
CPS Data, Caucasian 22-65: 1962-2015

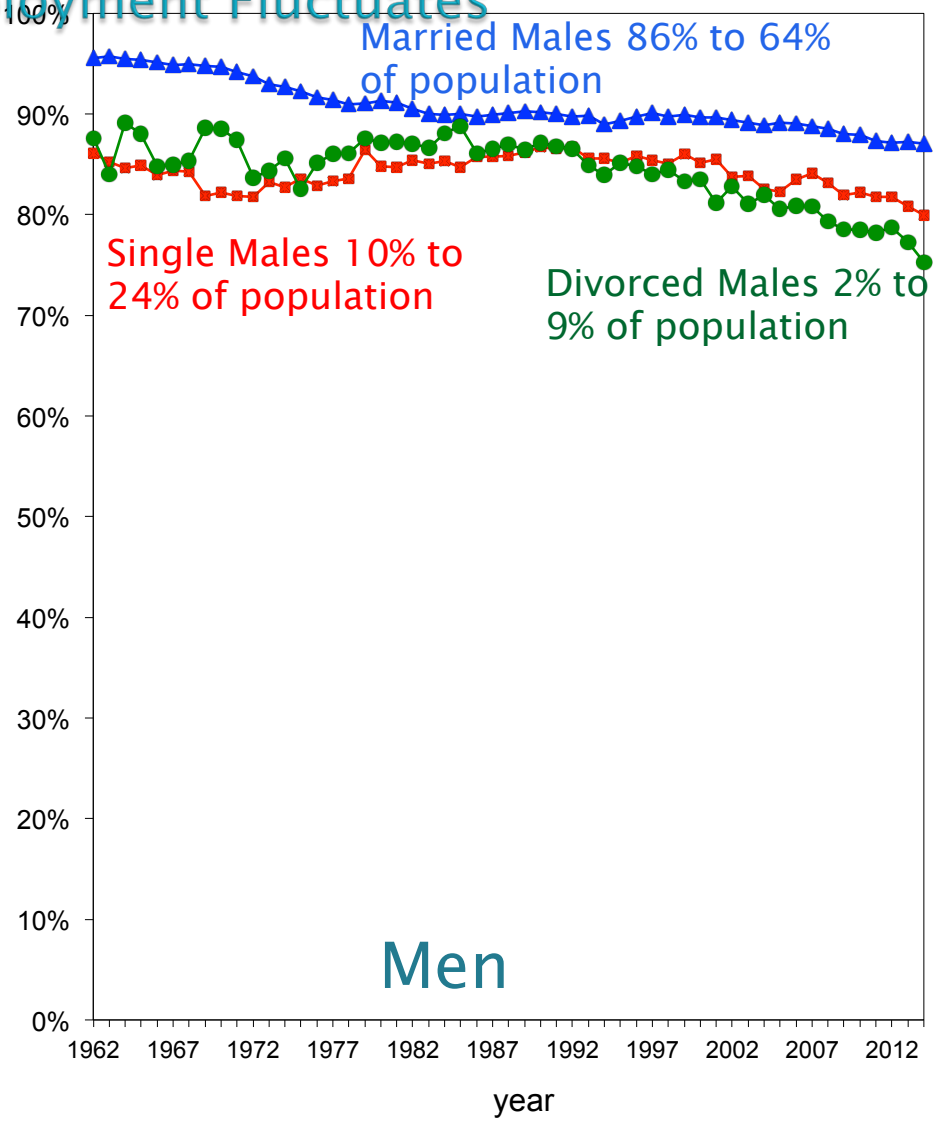
Motivation

Employment Rates

Married Female Employment Increased

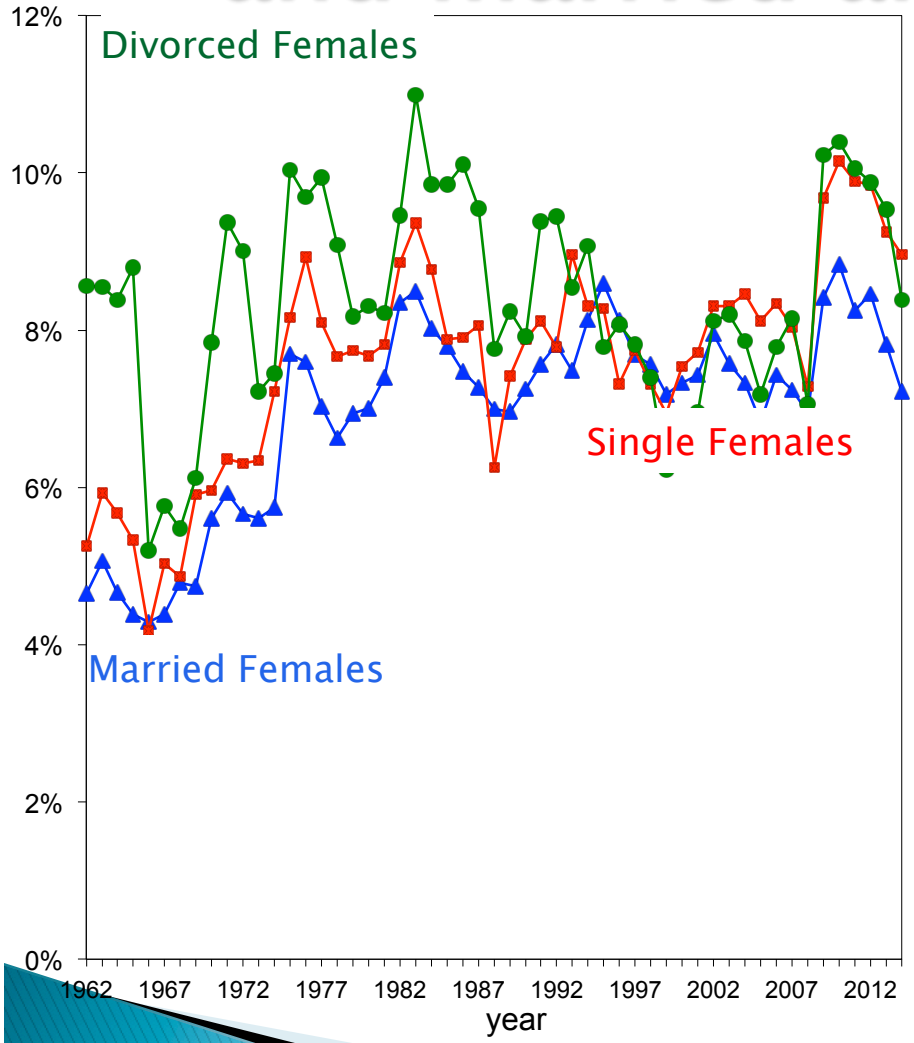
Non-Married Employment Fluctuates

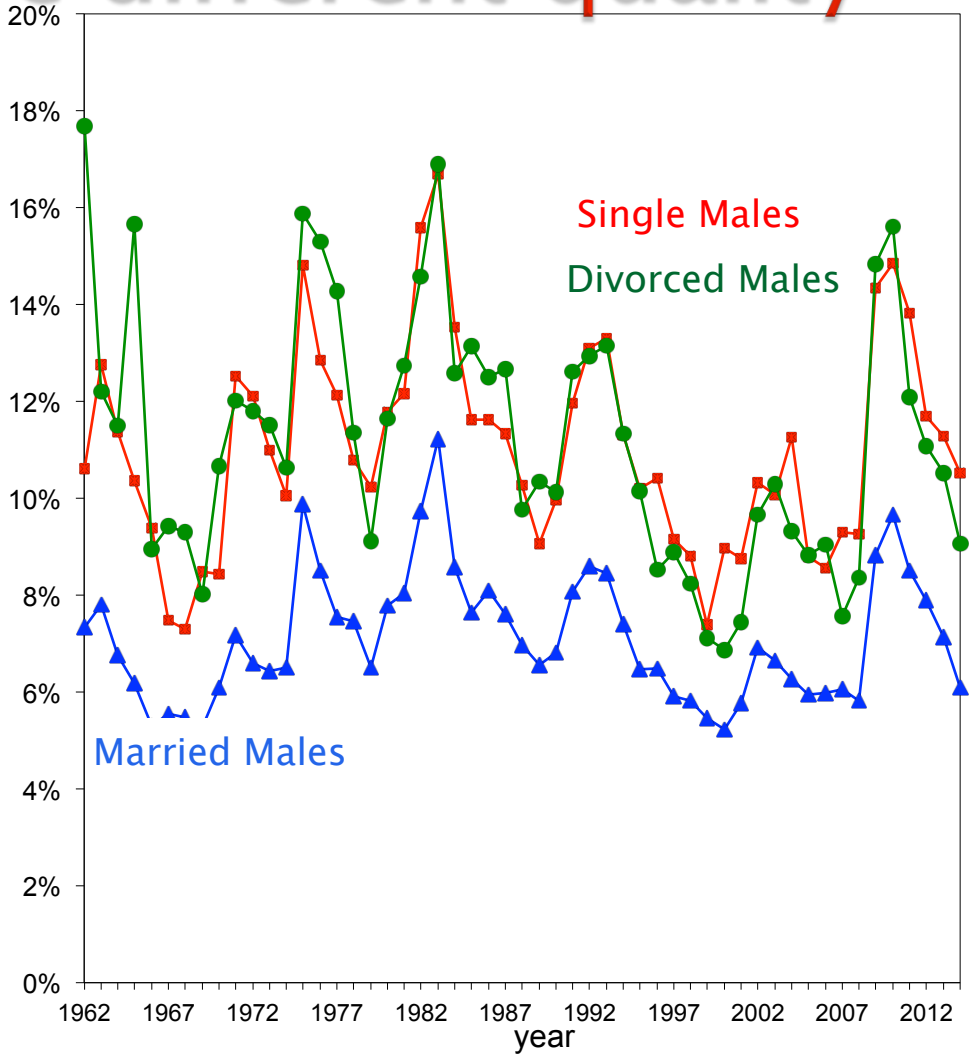




Caucasian, 22-65

Unemployment Rates: non-married and married are different quality



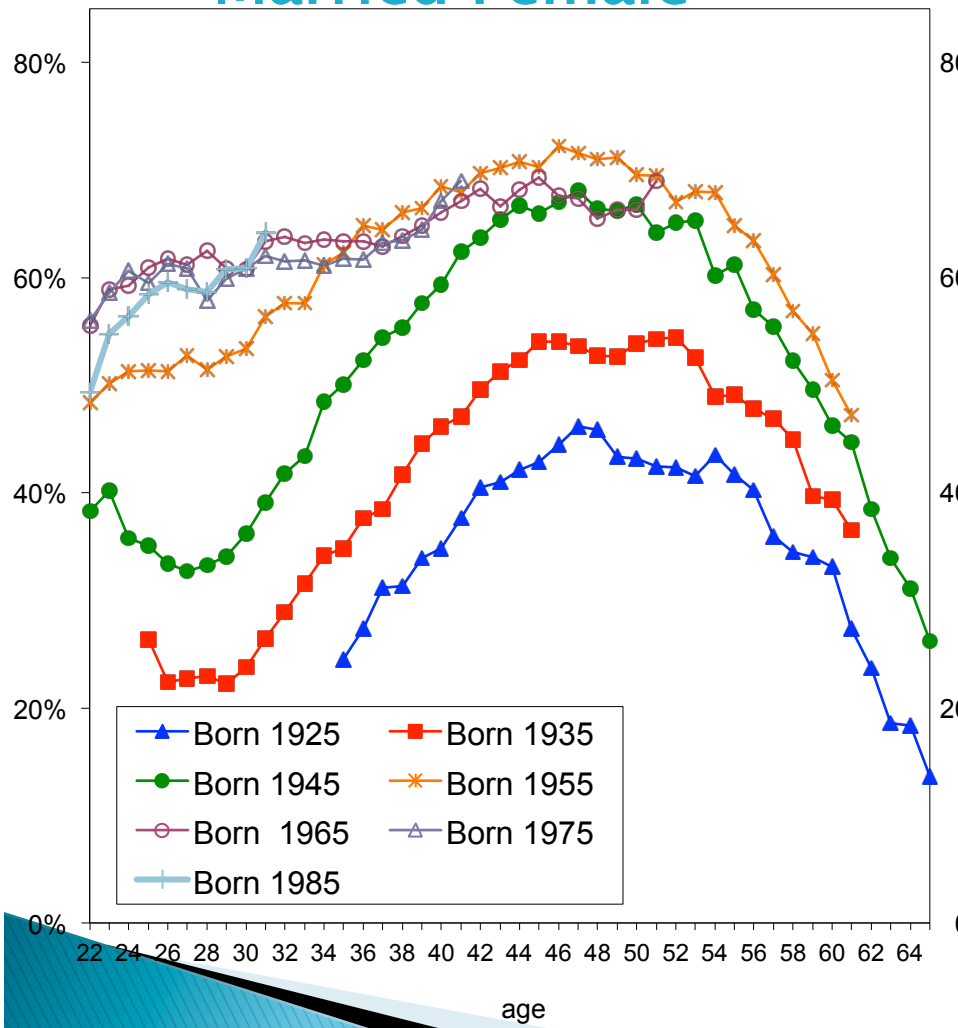


Caucasian, 22-65

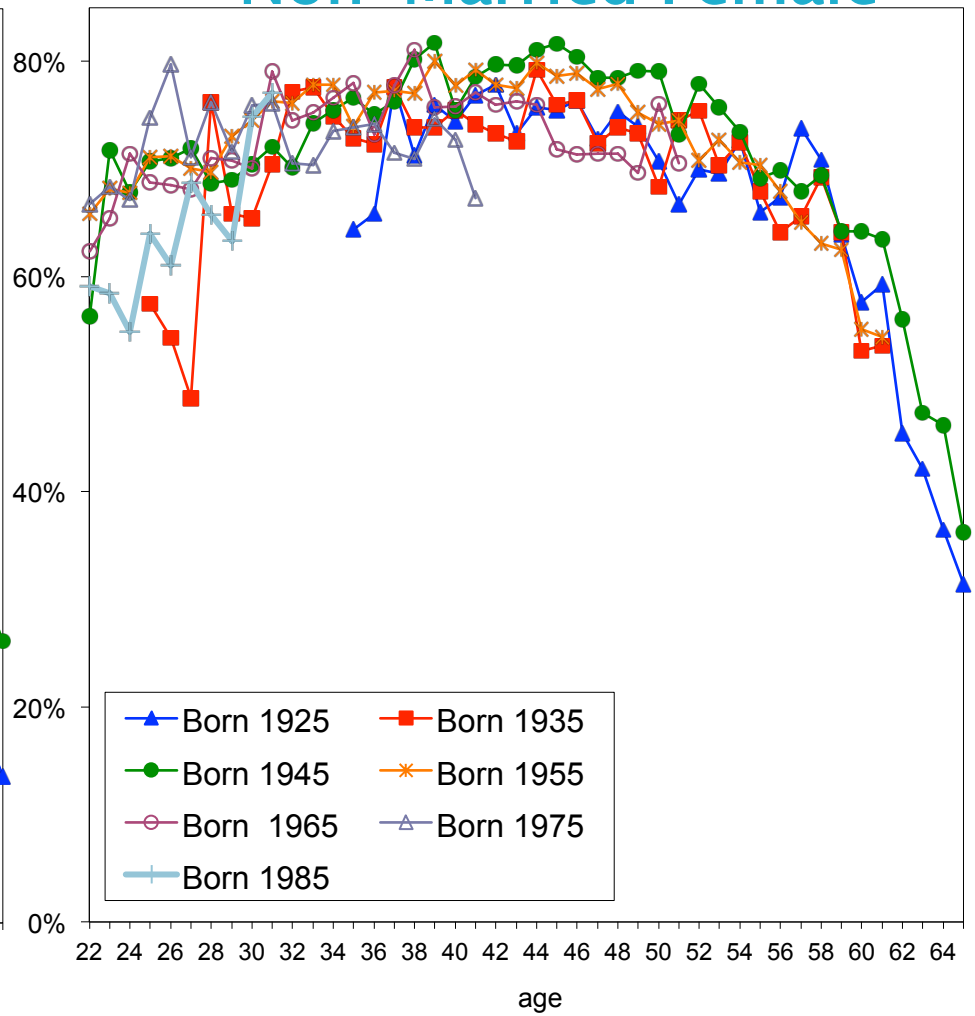
Female Employment Rates by Cohort

only Married Female Employment increased by cohort

Married Female



Non-Married Female



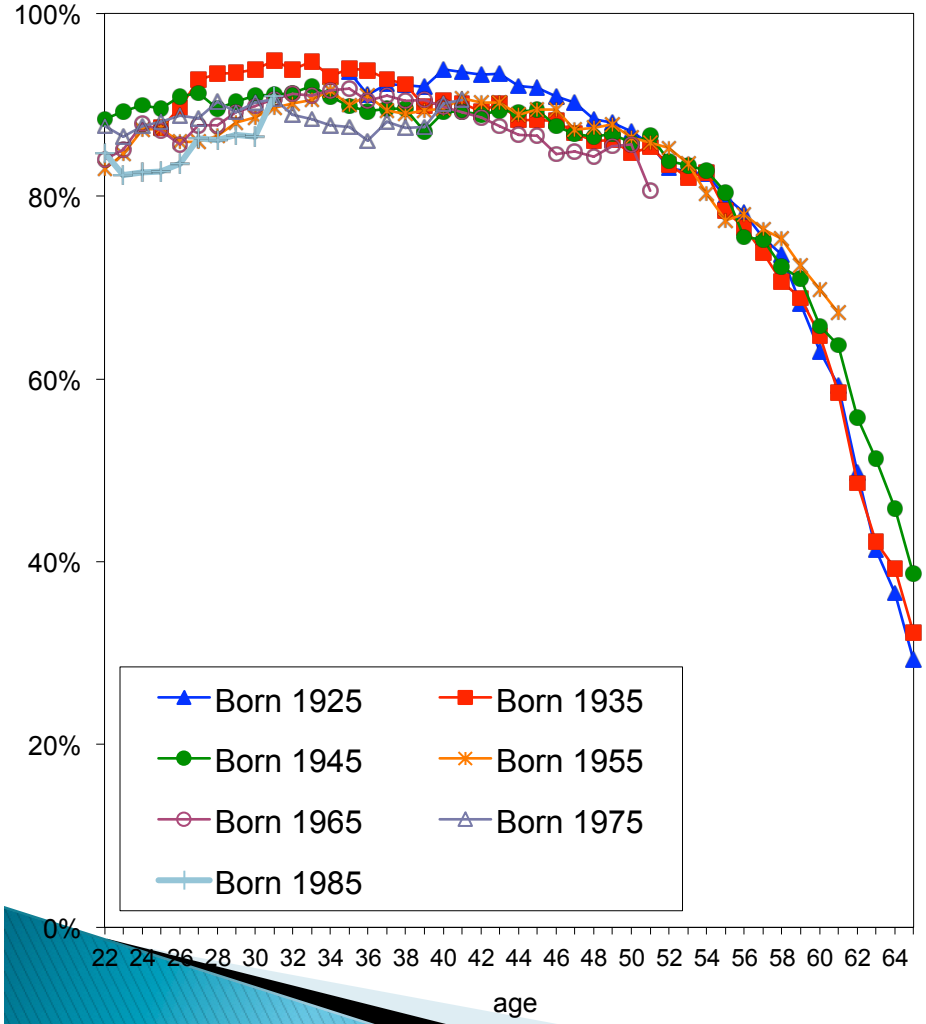
Years 1962-2014. Proportion of women working 10+ weekly hours.

Caucasian, 22-65

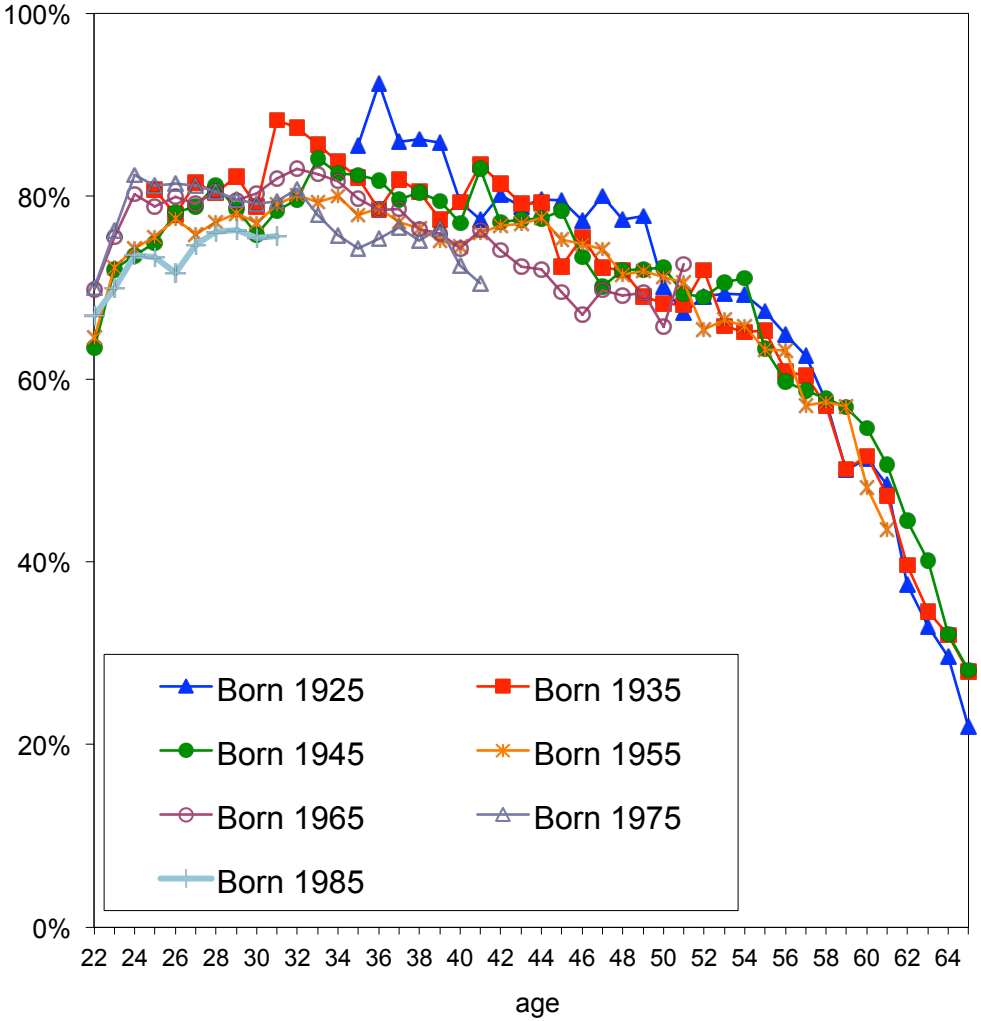
Male Employment Rates by Cohort

No Change by Cohort

Married Men



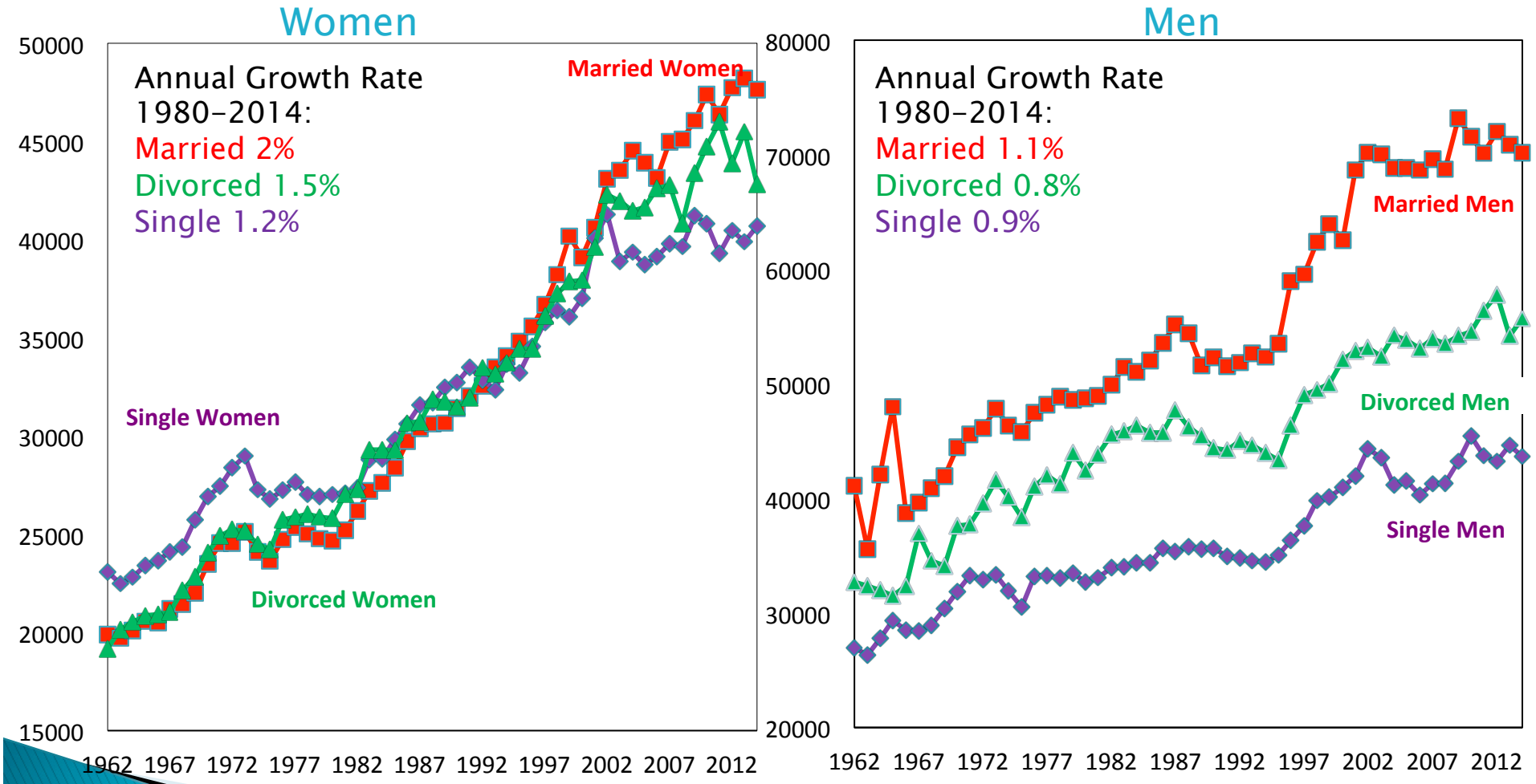
Non-Married Men



Years 1962-2014. Proportion of men working 10+ weekly hours.

Caucasian, 22-65

Annual Wages of Full-Time Workers: Married women become like men?

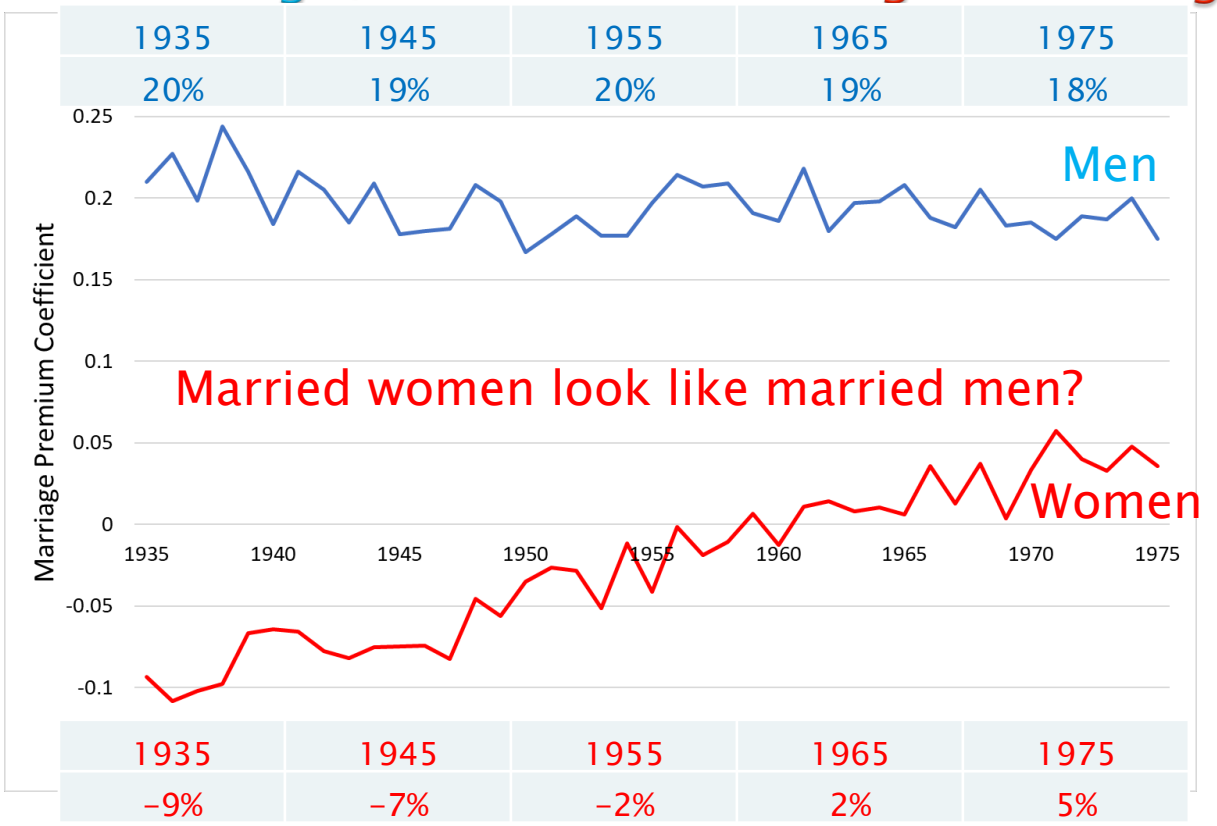


Full-time full-year workers with non-zero wages. 2006 Prices.

Caucasian, 22-65

"Marriage Premium" by Cohort

"Marriage premium" for males is ~constant and for females is increasing. Selection into marriage has changed



$$\ln(W) = \beta_0 + \beta_1 \exp_i + \beta_2 \exp_i^2 + \beta_3 HSG_i + \beta_4 SC_i + \beta_5 CG_i + \beta_6 PC_i + \beta_7 M_i + u_i$$

Caucasian, 22-65

"Marriage Premium" by Cohort

"Marriage premium" for males is ~constant and for females is increasing. Selection into marriage has changed

	1935	1945	1955	1965	1975
Women					
Average Wages - Married	21.9	26.7	31.3	37.3	43.9
Average Wages - Unmarried	24.6	29.4	33.3	36.6	40.5
Married/Unmarried Difference rate	-12.0%	-10.2%	-6.5%	1.8%	7.8%
Marriage Premium	-8.9%	-6.8%	-1.7%	2.0%	5.2%
Men					
Average Wages - Married	41.3	47.8	48.3	54.0	57.6
Average Wages - Unmarried	34.2	41.0	39.6	42.7	46.4
Married/Unmarried Difference rate	17.3%	14.2%	18.0%	20.8%	19.4%
Marriage Premium	19.7%	18.7%	19.5%	19.7%	18.3%

$$\ln(W) = \beta_0 + \beta_1 \exp_i + \beta_2 \exp_i^2 + \beta_3 HSG_i + \beta_4 SC_i + \beta_5 CG_i + \beta_6 PC_i + \beta_7 M_i + u_i$$

Caucasian, 22-65

Literature

- Chiappori (1992, 1988); Mazzocco, M. C.Ruis and S. Yamaguchi (2007); Gemici and Laufer (2011)
- Keane and Wolpin (1997, 2010)
- Eckstein and Lifshitz (2011)
- Mulligan and Rubinstein (2006)
- Fernandez and Wong (2011); Voena (2011)
- Goldin and Katz (2002)
- Greenwood and Seshardi (2005)
- Jones et. Al. (2015)

What do we do?

- Assume preferences are the same across the five cohorts (35, 45, 55, 65, 75). How much of the change in work/wage, marriage/divorce, education and fertility across the five cohorts are due to shifts in five potential factors?
- distribution of potential partners conditional on education: data and estimation
- divorce laws (cost): exogenous and estimated
- parent's education and individual talent: data and estimation
- the wage/job offer distribution that depends on experience and education: endogenous and estimated
- birth control technology: exogenous and estimated

Main Results

- **Fit** differences across all cohorts in: **education, marriage, divorce, work and fertility**
- **All five factors** have **significant contribution** for fit and change in above outcomes
- **Family formation** and unit of decision is **essential** for fit/ understanding of: employment, wages, education and fertility
- **Model account** for 90% of the women's **"marriage premium"**; 34% is due to "age" bias estimate of experience and 64% for **unobserved** skills of married women
- **Counterfactual**: shift from joint to individual taxation would increase employment of married women by 9% and the marriage rate by 8.1%
- **Labour supply elasticities:** High for married women (>1); Low for the others (<0.5)

The Model

Basics

- Females (*f*) and males (*m*) make annual decisions from age (*t*) 16 to 65.
- Choice variables:
  - Schooling
  - Employment: full time, part time, unemployment
  - Married / Divorce
  - Fertility

Basics (Cont.)

- Start as single ($M = 0$) in school ($sc = 1$) :
  - Schooling: $sc = 1$ if younger than 30 and single and not employed
  - Employment: $emp = 1$;
  - hours of work, $h\downarrow\uparrow j$: full time ($h = 1$), part time ($h = 0.5$) or 0;
  - Leisure: $l\downarrow\uparrow j = 1 - h\downarrow\uparrow j$ $j = f, m;$
  - Married: $M = 1;$
  - Fertility: $p = 1$; female get pregnant

- $?\downarrow jt$ = state space for $j = f, m$

Value functions for married

$$V_{t}^{M}(?_{mt}, ?_{ft}) = \lambda V_{t}^{fM}(?_{ft}) + (1-\lambda) V_{t}^{mM}(?_{mt})$$

Weighted average of individuals utilities ($\lambda = 0.5$).

Net Income: $Y_{t}^{M} = GY_{t}^{M} - \tau_{t}^{M}((w_{t}^{m} h_{t}^{m} + w_{t}^{f} h_{t}^{f}), N_{t})$;

$$GY_{t}^{M} = (w_{t}^{m} h_{t}^{m} + w_{t}^{f} h_{t}^{f}) + b_{m} I[h_{t}^{m} = 0] + b_{f} I[h_{t}^{f} = 0]$$

where τ_{t} is a function that calculate taxes according to the year and number of children, returning net wages. The function uses data from US tax system including deductions, exemptions and EICT rates.

b_{j} – unemployment benefit

Consumption: $C_{t}^{M} = (1 - \theta(N_{t}))Y_{t}^{M}$

Married person utility

$$V_{t}^{jM}(\Omega_{jt}) = 1/\alpha\,(\psi C_{t}^{M})^{\alpha} + L(l_{t}^{j})^{} + \theta_{t}^{M} + \pi_{t}^{M} p_{t} + A_{j}^{M} Q(l_{t}^{f}, l_{t}^{m}, Y_{t}^{M}, N_{t}) + \delta E_{MAX}(m_{t+1} V_{t+1}^{jM}(\Omega_{m,t+1}, \Omega_{f,t+1}) + (1-m_{t+1}) V_{t}^{j}(\Omega_{j,t+1}))$$

- $1/\alpha\,(\psi C_{t}^{M})^{\alpha}$ – Consumption ($\psi = 0.85$)
- $L(l_{t}^{j})$ – Leisure (depends on health, education, new born and stochastic shock)
- θ_{t} – utility from marriage (function of education and health gap and stochastic shock)
- $\pi_{t}^{M} p_{t}$ – utility from pregnancy (function of health, number of children, previous period pregnancy and stochastic shock)
- $A^{M} Q$ – quality and quantity of children (function of parents' leisure and consumption)

Married person utility (cont.)

$$V_{t}^{jM}(\Omega_{jt}) = 1/\alpha\,(\psi C_{t}^{M})^{\alpha} + L(l_{t}^{j})^{\gamma} + \theta_{t}^{\gamma} + \pi_{t}^{M} p_{t} + A_{j}^{M} + Q(l_{t}^{f}, l_{t}^{m}, V_{t}^{M}, N_{t})$$

$$+\delta E_{t}\,MAX\,(m_{t+1}\,V_{t+1}^{jM}(\Omega_{m,t+1}, \Omega_{f,t+1}) + (1-m_{t+1})V_{t+1}^{j}(\Omega_{j,t+1}))$$

Where

$L(l_{t}^{j}) = \beta_{jt}/\gamma\,(l_{t}^{j})^{\gamma} + \mu_{jt}\,l_{t}^{j}$ – Value of Leisure

- β_{jt} – tastes for leisure, depends on health(H_{jt}), education (E_{jt}) and pregnancy (for females)
- $\ln(\mu_{jt}) = \tau_{0j} + \tau_{1j}\ln(\mu_{jt-1}) + \tau_{2j}\,p_{t-1} + \varepsilon_{jt}^{l}$ and $\varepsilon_{jt}^{l} \sim iidN(0, \sigma_{\varepsilon}^{l})$
- μ_{jt} – marginal utility of leisure that increases with a new born and then slowly converge to the steady state value of τ_{1j} (ar(1)).

Married person utility (cont.)

$$V_{jt}^{M}(\Omega_{jt}) = 1/\alpha\,(\psi C_{jt}^{M})^{\alpha} + L(I_{jt}^{j})^{\alpha} + \theta_{jt}^{M} + \pi_{jt}^{M} p_{jt} + A_{j}^{M} Q(I_{jt}^{f}, I_{jt}^{m}, Y_{jt}^{M}, N_{jt}) + \delta EV(\Omega_{j,t+1})$$

θ_{jt}^{M} = utility from marriage:

- $\theta_{jt}^{M} = d_1 + d_2 \cdot \Lambda[E^{m} - E^{f} > 0] + d_3 \cdot \Lambda[E^{f} - E^{m} > 0] + d_4 (H_{jt}^{m} - H_{jt}^{f})^{2} + \varepsilon_{jt}^{M}$

Where: $\Lambda[E^{j} - E^{j'} > 0]$ is an indicator function
Education: E=1 if HSD, E=2 if HSG, E=3 if SC, E=4 if CG, E=5 if PC.

Health: H=1 if Good, H=2 if Fair, H=3 if Poor.

$\varepsilon_{jt}^{M} \sim iidN(0, \sigma_{\varepsilon}^{M})$ = stochastic shock to tastes for marriage.

Married person utility (cont.)

$$V_{ijMt}(\Omega_{jt}) = 1/\alpha\,(\psi C_{iMt})^{\alpha} + L(l_{it}, l_{jt})^{\alpha} + \theta_{it}^{\alpha} + \pi_{it}^{M} p_{it} + A_{jt}^{M} Q(l_{it}^{f}, l_{it}^{m}, Y_{it}^{M}, N_{it}) + \delta EV(\Omega_{j,t+1})$$

$\pi_{it}^{M} p_{it}$ = utility from pregnancy:

- $\pi_{it}^{\alpha} = \pi_1 m_{it} + \pi_2 H_{ft} + \pi_3 N_{it} + \pi_4 p_{t-1} + \varepsilon_{it}^{p} + \exp(\varepsilon_{it}^{up})$ – where

$\varepsilon_{it}^{p} \sim iidN(0, \sigma_{\varepsilon}^{p})$ $\varepsilon_{it}^{up} \sim iidN(pr, 1)$

π_1 = fixed utility of pregnancy when married;

H_{ft} = mother's health;

ε_{it}^{p} = shock to tastes for pregnancy; joint taste.

Uncontrolled pregnancy: ε_{it}^{up} a *positive* shock to equation (6) of size pr

Married person utility (cont.)

$$V_{t}^{M}(\Omega_{jt}) = 1/\alpha\,(\psi C_{t}^{M})^{\alpha} + L(l_{t}^{j})^{\alpha} + \theta_{t}^{\alpha} + \pi_{t}^{M} p_{t} + A_{j}^{M} Q(l_{t}^{f}, l_{t}^{m}, Y_{t}^{M}, N_{t})$$

$$+\delta E_{t} MAX\,(m_{t+1} V_{t+1}^{M}(\Omega_{m,t+1}, \Omega_{f,t+1}) + (1-m_{t+1}) V_{t}^{j}(\Omega_{j,t+1}))$$

$A_{j}^{M} Q(l_{t}^{f}, l_{t}^{m}, Y_{t}^{M}, N_{t})$ = utility from quality and quantity of children:

$$Q_{(l_{t}^{f}, l_{t}^{m}, Y_{t}^{M}, N_{t})} = (a_{f}(l_{t}^{f})^{\rho} + a_{m}(l_{t}^{m})^{\rho} + a_{g}(\theta(1) Y_{t}^{M})^{\rho} + (1-a_{f}-a_{m}-a_{g}) N_{t}^{\rho})^{1/\rho}$$

$\theta(1) Y_{t}^{M}$ = spending per child;

A^{M} = a scale parameter allowed to differ in the single state.

Health process

The health transition probability is a multinomial Logit function:

$$v_{tj}^{GOOD} = \chi_{1j}^{GOOD} \cdot I(H_{jt-1} = 1) + \chi_{2j}^{GOOD} \cdot I(H_{jt-1} = 2) + \chi_{3j}^{GOOD} \cdot I(H_{jt-1} = 3)$$

$$v_{tj}^{FAIR} = \chi_{1j}^{FAIR} \cdot I(H_{jt-1} = 1) + \chi_{2j}^{FAIR} \cdot I(H_{jt-1} = 2) + \chi_{3j}^{FAIR} \cdot I(H_{jt-1} = 3)$$

$$v_{tj}^{POOR} = 0$$

$$\Pr(H_{jt} = 1) = \frac{\exp(v_{tj}^{GOOD})}{1 + \exp(v_{tj}^{GOOD}) + \exp(v_{tj}^{FAIR})}$$

Value functions for singles

Female: $U_{t}^{f}(\Omega_{jt}) = 1/\alpha\,(C_{t}^{\alpha} + L(l_{t}^{f})^{\alpha} + \vartheta_{jft} s_{t} + \pi_{t}^{f} p_{t} + A_{jf}^{s} Q(l_{t}^{f}, 0, Y_{t}^{f}, N_{t})$

Male: $U_{t}^{m}(\Omega_{jt}) = 1/\alpha\,(C_{t}^{\alpha} + L(l_{t}^{f})^{\alpha} + \vartheta_{jmt} s_{t} + A_{jm}^{s} Q(0, l_{t}^{f}, Y_{t}^{f}, N_{t}) +$

$\vartheta_{jft} s_{t}$ = utility from school: $\vartheta_{jt} = \vartheta_{0j} + TC \cdot I(E_{t} > HSG) + \vartheta_{1j} PE + \vartheta_{2j} \mu_{jf}^{W}$

Where: *PE* – Parents Education; *TC* – college tuition; μ_{jf}^{W} – skill endowment

Income: $Y_{t}^{f} = Y_{t}^{fj} = GY_{t}^{fj} - \tau_{t}^{f} S(w_{t}^{fj} h_{t}^{fj}, N_{t})$

$GY_{t}^{fj} = w_{t}^{fj} h_{t}^{fj} + b_{j} \cdot I[h_{t}^{fj} = 0] + cb_{t}(N_{t}) \cdot I(j = f, N_{t} > 0)$ *: cd:* child benefit

Budget constraint $C_{t}^{fj} = (1 - \theta(N_{t}))Y_{t}^{f}$

Labor market

Wage equation : $lnw\downarrow et\uparrow j = \omega\downarrow 1 e\uparrow j + \omega\downarrow 2 e\uparrow j \, X\downarrow t - \omega\downarrow 3 e\uparrow j$

$X\downarrow t\uparrow 2 + \varepsilon\downarrow jt\uparrow W$

Where: X_t is work experience (in years) and $e \in \{HSD, HSG, SC, CG,$

$PC\}$

$\varepsilon\downarrow jt\uparrow W = \mu\downarrow j\uparrow W (PE) + \varepsilon \downarrow jt\uparrow W$ $\varepsilon\downarrow jt\uparrow W$

$\sim iidN(0, \sigma\downarrow \varepsilon\uparrow W)$

$\varepsilon\downarrow jt\uparrow W$ has permanent and transitory elements - $\mu\downarrow j\uparrow W$ - skill endowment

Job offers: each period ( ) a person can receive offers: only full time; only part

Marriage market

Marriage offer is a product of two probabilities:

1. Prob. for singles to get marriage offers, function of age and whether in school

2. Potential partner's education, a multinomial Logit probability function : $$\blacksquare v\downarrow jt\uparrow C$$

$$\&=\&\eta\downarrow 0 j\uparrow C+\eta\downarrow 1 j\uparrow C\cdot I[ed\uparrow m-ed\uparrow f=2]+\eta\downarrow 2 j\uparrow C\cdot I[ed\uparrow m-ed\uparrow f=1]+\epsilon\downarrow jt\uparrow C \ @\&\&\&@ v\downarrow jt\uparrow SC \ \&=\&\eta\downarrow 0 j\uparrow SC+\eta\downarrow 1 j\uparrow SC\cdot I[ed\uparrow m-ed\uparrow f=1]+\epsilon\downarrow jt\uparrow SC$$

Where: ed = 0 for HS and HSD; ed = 1 for SC; ed = 2 for CG and PC

3. Marriage offer for a female consists of the vector (same age):

$$M\downarrow ft=(E\uparrow m, H\uparrow m, X\uparrow m, N\uparrow m, PE\uparrow m, h\downarrow t-1\uparrow m, \mu\downarrow m\uparrow l, \mu\downarrow m\uparrow W, \varepsilon\downarrow mt\uparrow W, \varepsilon\downarrow t\uparrow M)$$

Marriage decision problem

Marriage: Given M_{ft}, the woman maximizes $V{\downarrow}t{\uparrow}f\,(?{\downarrow}ft\,)$ and

$V{\downarrow}t{\uparrow}fM\,(?{\downarrow}ft\,)$

The potential male does the equivalent

If there is at least one set of choices at the period of the match that satisfies

$V{\downarrow}t{\uparrow}fM\,(?{\downarrow}ft\,) > V{\downarrow}t{\uparrow}f\,(?{\downarrow}ft\,)$ and $V{\downarrow}t{\uparrow}mM\,(?{\downarrow}mt\,) >$

$V{\downarrow}t{\uparrow}m\,(?{\downarrow}mt\,)$, then marriage is formed.

If there is more than one, we choose the one that maximize the weighted values

Divorce occurs if:

Estimation

- DP problem is solved recursively – Age 65 to 17 with terminal value
- Estimate by simulated GMM and Identification is based on exogenous variations as in Heckman (1974) – wages; health; taxes; benefits; age
- CPS data (moments) of the cohorts of: 1945 (1943-1947); 1955; 1965
- Untargeted Cohorts: 1935; 1975
- Estimate model on unified sample 1945-55-65
- Keep all preferences parameters as estimated for the unified sample
- Estimate exogenous process for each cohort separately

Moments

moment	# of moments 1945	# of moments 1955	# of moments 1965
Married Women Employment	40*	40*	30**
Unmarried Women Employment	40*	40*	30**
Married Men Employment	40*	40*	30**
Unmarried Men Employment	40*	40*	30**
Married W			30**
Unmarrie			30**
Married M			30**
Unmarrie			30**
Married w			30**
Married n			30**
Unmarrie			30**
Unmarrie			30**
Men Scho			X 14***
Women S			X 14***
Marriage			30**
Divorce R			30**
Women #			24****
Married W			24****
Women W			30**
Married W			30**
Unmarrie			30**
Men Wag			30**
Assortati			5 X 5
Wage by			5 X 30**
Employm			5 X 30**
Women Health distribution	3 X 44*****	3 X 44*****	3 X 44*****
Men Health distribution	3 X 44*****	3 X 44*****	3 X 44*****

161 Parameters (unified sample)

1505 moments for 1945
1505 moments for 1955
1181 moments for 1965

1281 moments for 1935
861 moments for 1975

Model Fit and Parameters

Model Fit

- **Benchmark Model**: estimated on unified sample of 45-55-65 cohorts where only mother's education and health transition process differs by cohort.

  mother's education affects: tastes for school and ability type

  (cohort: college rate: 35:6%, 45:6%, 55:11%, 65:20%, 75:27%)

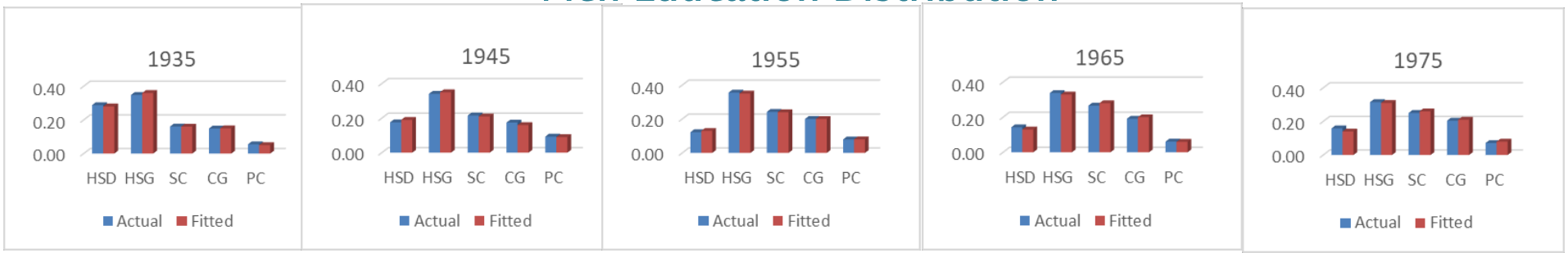
- **Adjusted Model by cohort: preferences parameters as estimated in Benchmark Model; But the 4 exogenous processes are per cohort:**
  - **Marriage Market**: parameters of the marriage market matching function and Divorce Costs by gender and number of children
  - **Labor Market**: wage offer functions and the job offer probabilities.
  - **Birth Control Technology**

Model Fit

- We fit well the moments of: (simple chi-square tests)
  - Employment and wages for married/unmarried: Fit increase in wages of married females above non-married in recent cohorts
  - Education distribution
  - Assortative matching matrix
  - Marriage and divorce rates
  - # of children for married/unmarried
- For the cohorts of:
  - 1935, 1945, 1955, 1965, 1975
- **All exogenous changes by cohort were needed**

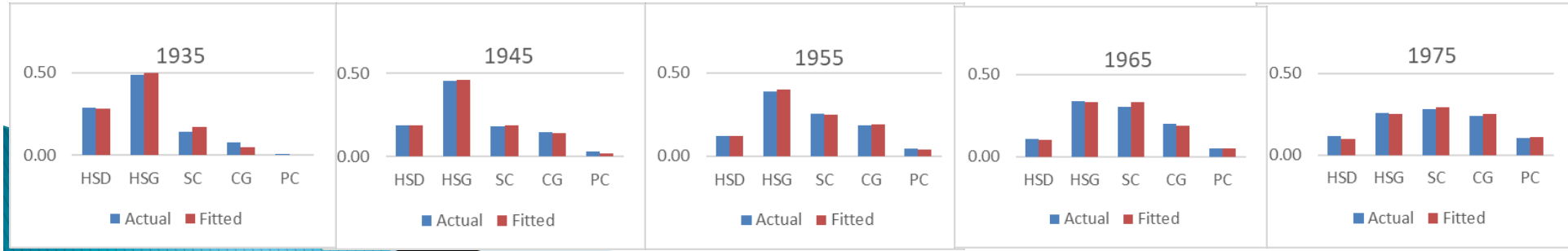
Model Fit: Education Distribution

Men Education Distribution

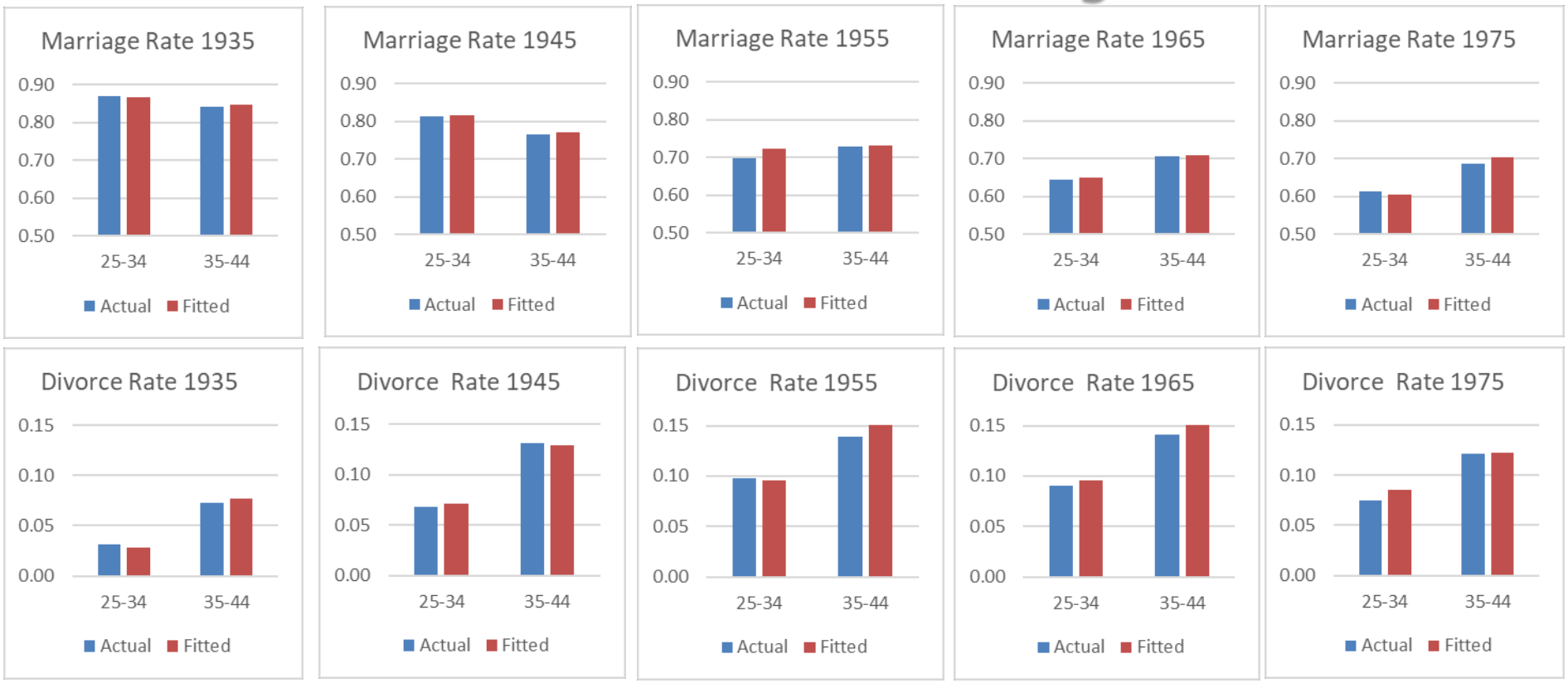


- **We fit the Education Distribution for both men and women for all cohorts**
- The distribution is mainly effected by the increase in mother's education and by the rise in return to education in the wage function

Women Education Distribution



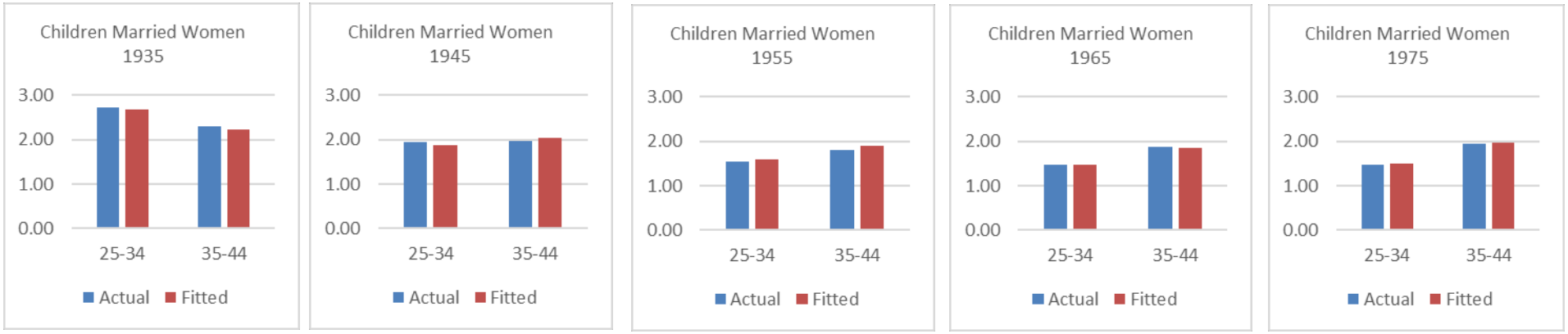
Model Fit: Divorce and Marriage rate



- We fit the marriage and divorce rates for all cohorts
- The marriage rate is mainly effected by the increase in mother's education that postpone marriages
- The divorce rate is mainly effected by the decrease in the women's divorce cost
- **Women's divorce cost by estimated parameter:**

1935	1945	1955	1965	1975
-2.93	-2.14	-1.80	-1.47	-1.57

Model Fit: Fertility



- **We fit the number of children for married and single household**
- The number of children in younger cohorts is mainly effected by the SBTC – the increase in return to education and experience
- The number of children in early cohorts (1935,1945) is mainly effected by the lack of contraception and the random shock.
- **Higher mean of the positive shock in the utility from pregnancy function represent unexpected pregnancies by size of mean:**

1935	1945	1955	1965	1975
0.80	0.39	0.06	0.02	0.02

Model Fit: Employment

- **We fit employment for married/ non married**
- The employment is mainly effected by the SBTC – the increase in return to education and experience by education
- In early ages, it is also effected by the availability of oral contraception

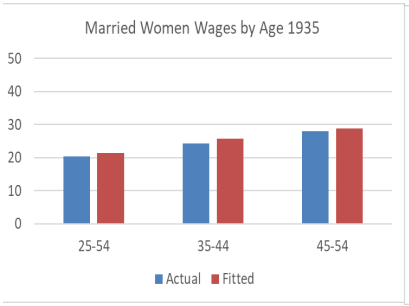
Wage Parameters

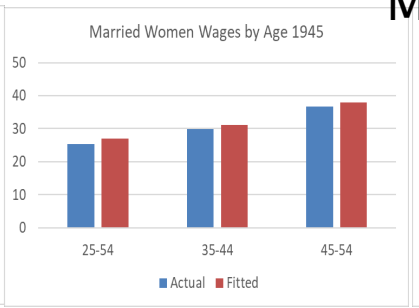
	Return to **Education** Coefficients					Return to **Experience** Coefficients				
women	HSD	HSG	SC	CG	PC	HSD	HSG	SC	CG	PC
1935	9.22	9.30	9.72	9.99	10.07	0.02	0.03	0.03	0.03	0.03
1945	9.28	9.59	9.83	10.17	10.16	0.03	0.03	0.03	0.04	0.04
1955	9.39	9.56	9.80	10.08	10.38	0.02	0.03	0.04	0.04	0.04
1965	9.22	9.50	9.73	10.12	10.19	0.03	0.05	0.05	0.06	0.07
1975	9.24	9.42	9.59	10.17	10.41	0.02	0.06	0.08	0.08	0.08
Men										
1935	9.52	9.72	9.96	10.11	10.13	0.04	0.04	0.05	0.05	0.06
1945	9.64	9.93	9.98	10.22	10.18	0.04	0.05	0.06	0.06	0.07
1955	9.77	9.92	9.99	10.15	10.28	0.03	0.05	0.06	0.06	0.07
1965	9.49	9.53	9.75	10.11	10.31	0.04	0.07	0.08	0.09	0.10
1975	9.33	9.56	9.71	10.18	10.43	0.05	0.07	0.08	0.09	0.09

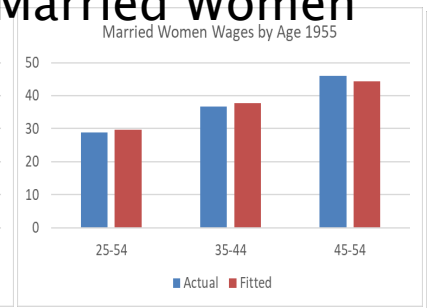
- Convergence in men and women return to education and experience by education
- Large SBTC for both men and women by cohorts

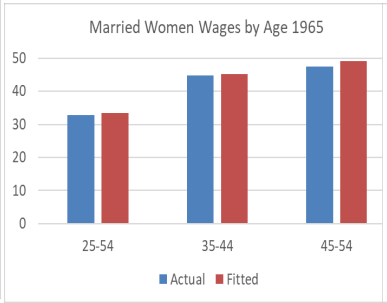
Model Fit: Wages

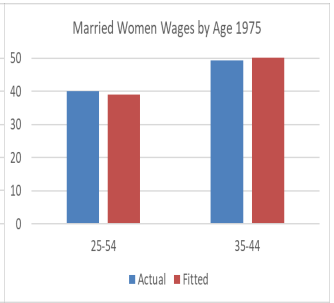
Married Women



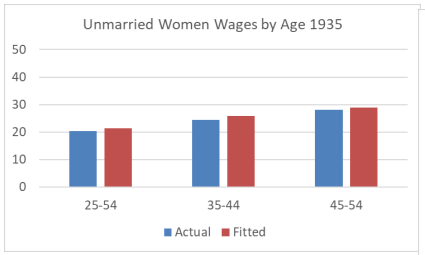


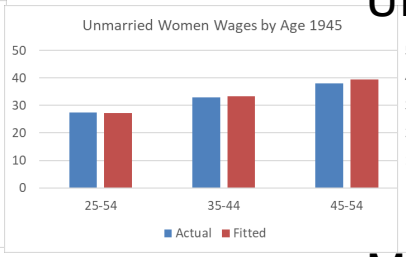


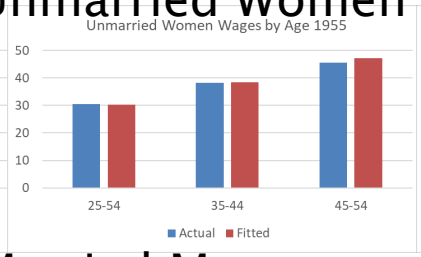


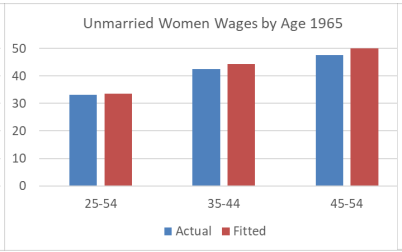


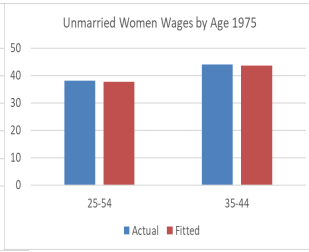
Unmarried Women



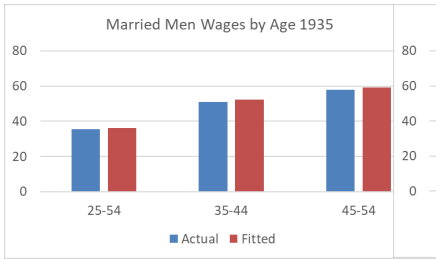


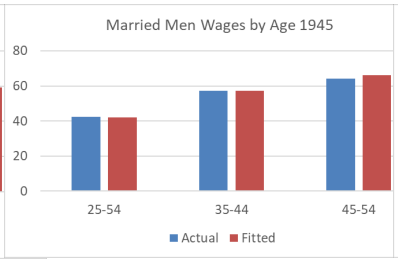


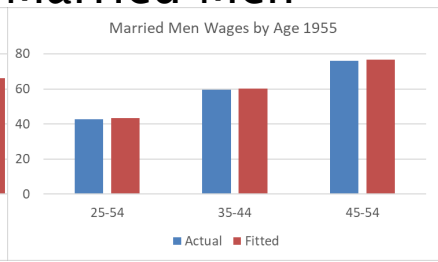


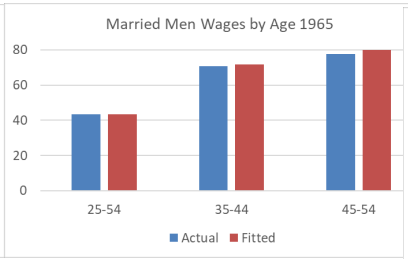


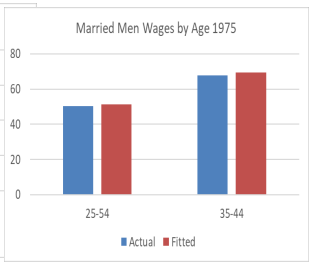
Married Men



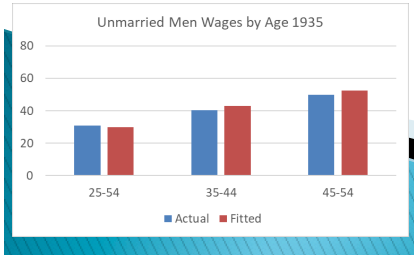


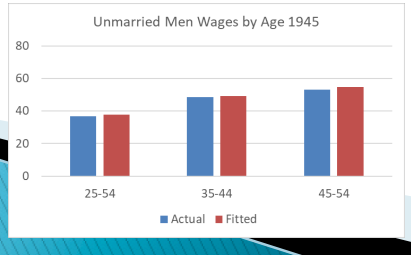


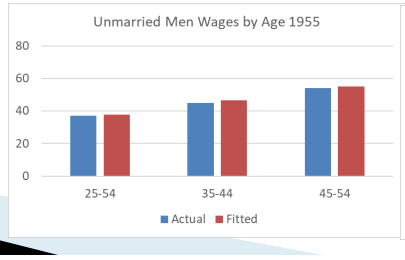


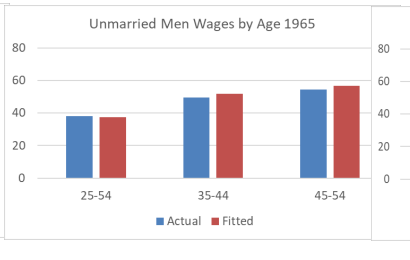


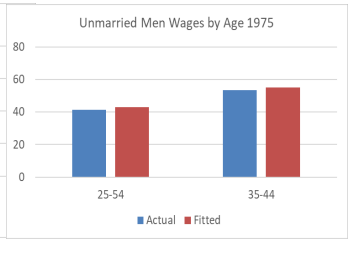
Unmarried Men



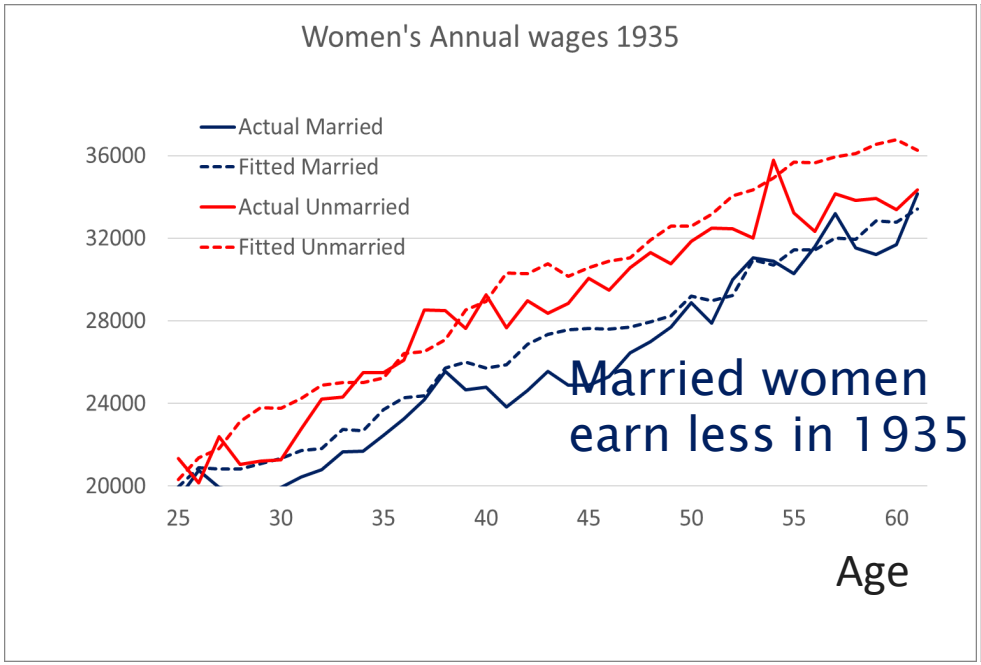


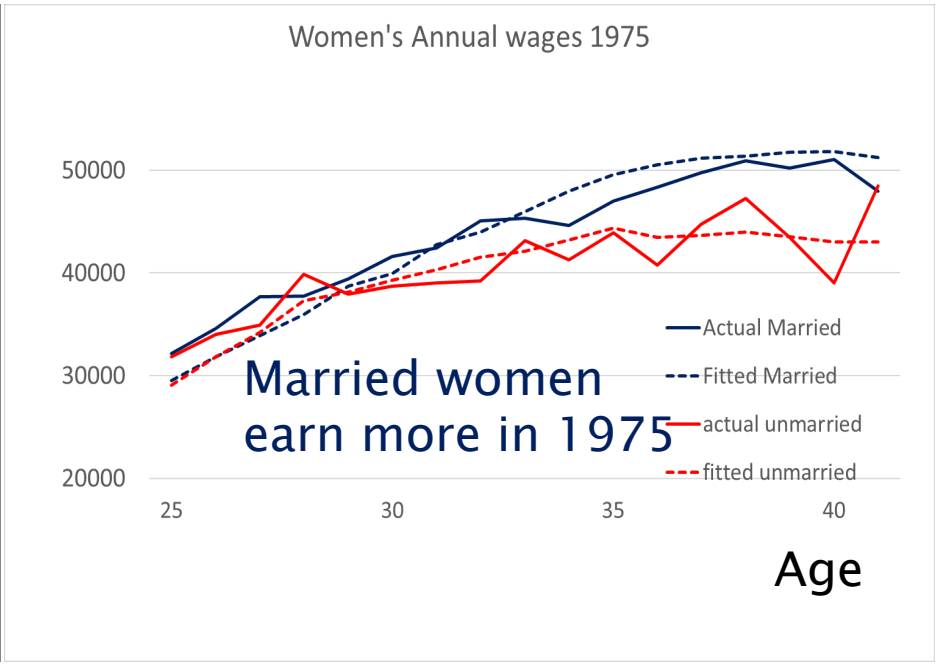






Model Fit: Wages

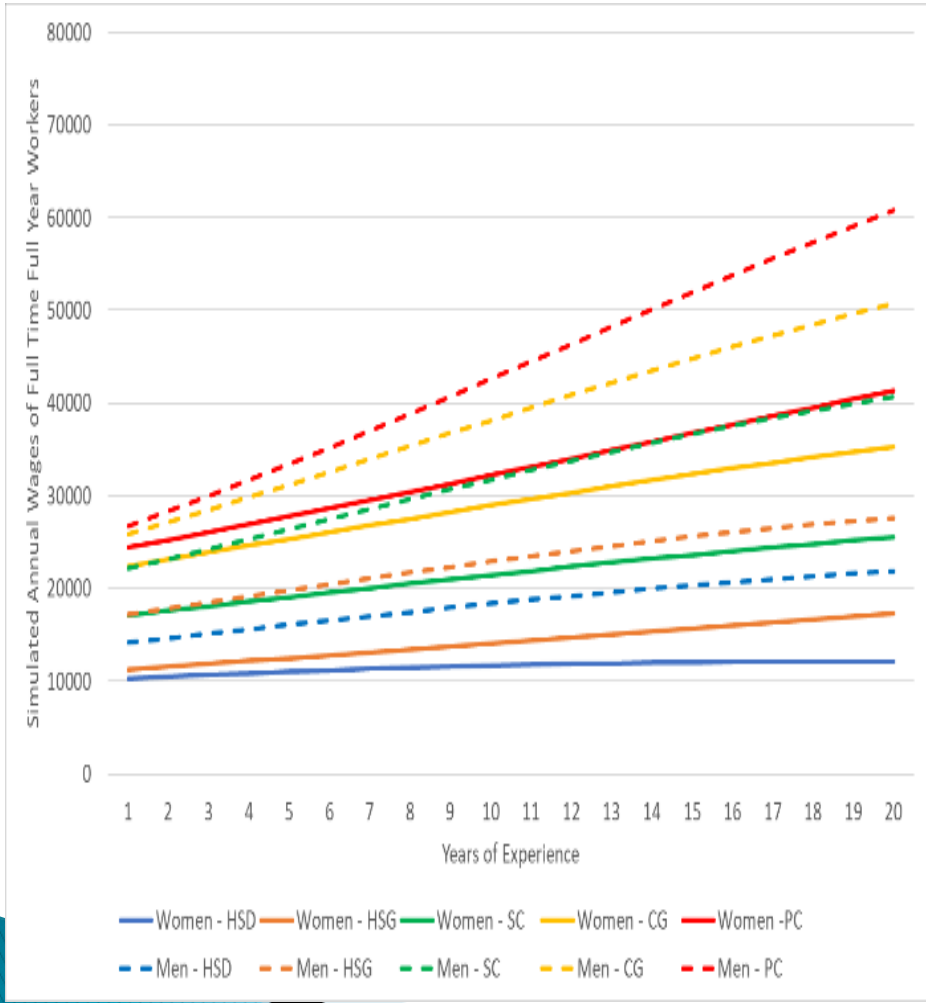




- **We fit Wages for married/ non married, women and men**
- We fit the increasing wage of married compared to unmarried, even though the wage equation is the same for married/unmarried

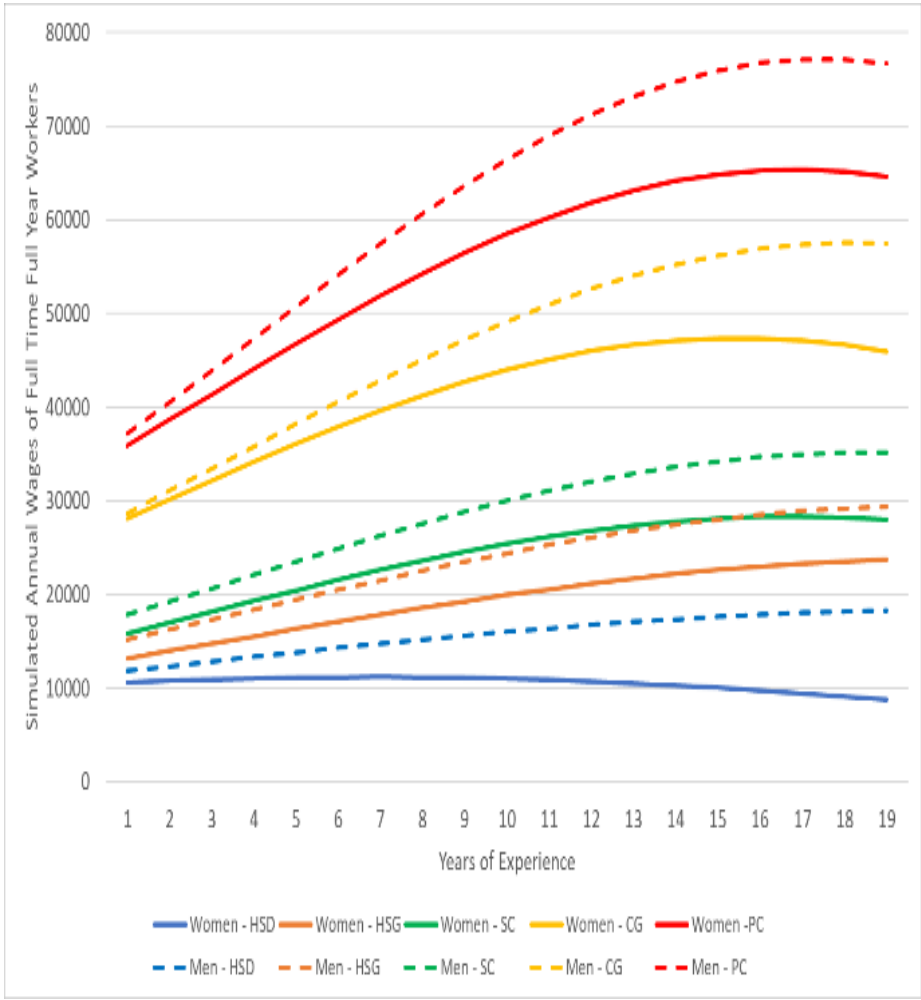
Simulated Annual Wages by Education level and years of Experience

Cohort of 1935



Cohort of 1975

last



“Marriage Premium”: Data vs. Model’s simulated data

Marriage Premium

Untargeted moment

Men

	1935	1945	1955	1965	1975
Actual	20%	19%	20%	20%	18%
Fitted	13%	14%	14%	14%	14%

70% -75% of men premium is captured by the model: Other factors?

Women

	1935	1945	1955	1965	1975
Actual	-9%	-7%	-2%	2%	5%
Fitted	-8%	-6%	-1%	2%	4%

- 14% change from 1935 to 1975
- Model explains 90% of the marriage premium and the change for females
- Married women of recent cohorts have much higher **observed** and **unobserved** skills compared both to unmarried women and the married women of past cohorts

AGE (OLS) vs. EXPERIENCE (MODEL)

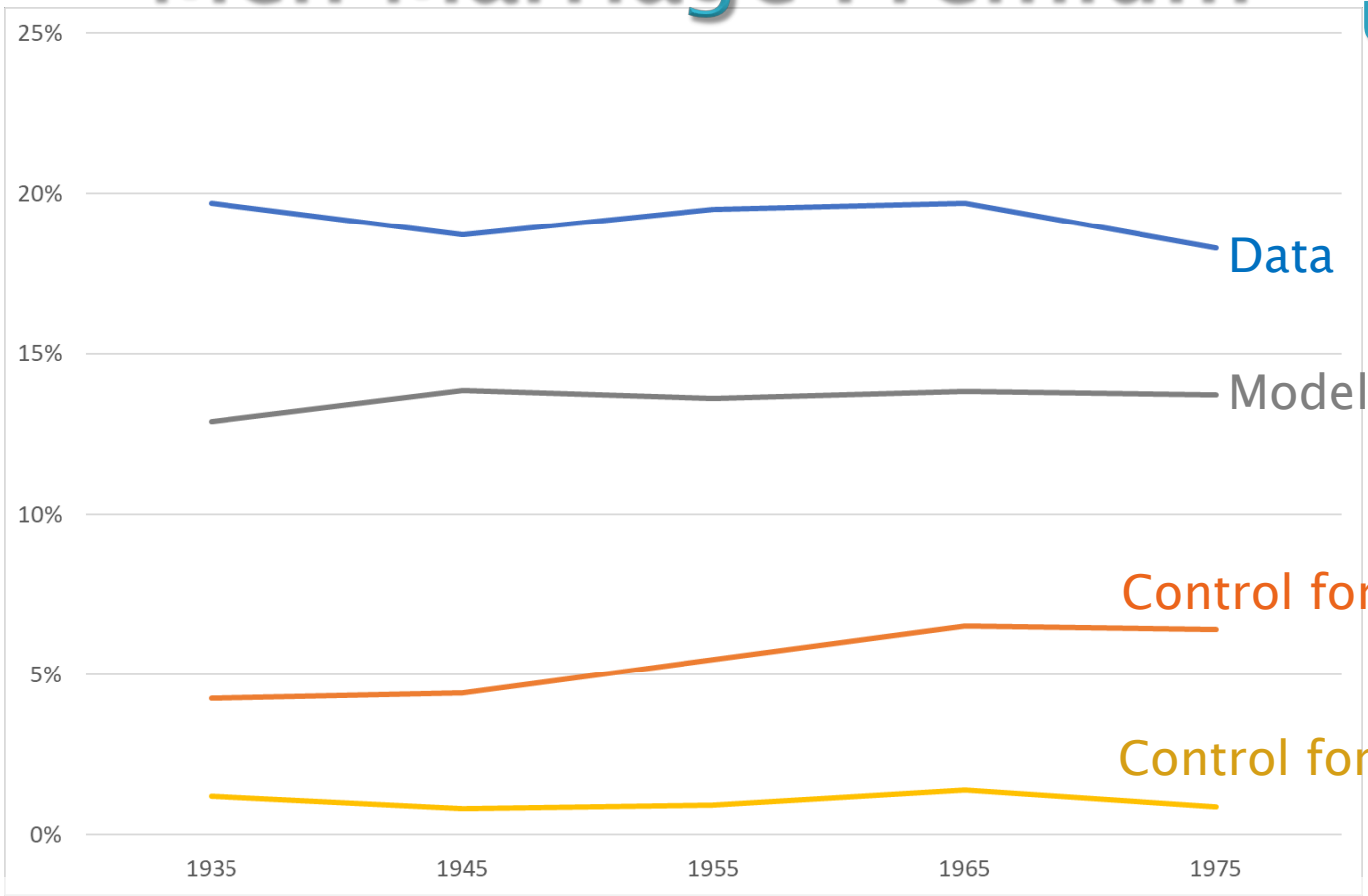
	Women's Return to **Experience** Coefficients									
	HSD		HSG		SC		CG		PC	
	OLS	Model	OLS	Model	OLS	Model	OLS	Model	OLS	Model
1935	0.04	0.02	0.01	0.03	0.00	0.03	0.00	0.03	0.01	0.03
1945	0.01	0.03	0.00	0.03	0.01	0.03	0.01	0.04	0.01	0.04
1955	0.00	0.02	0.02	0.03	0.03	0.04	0.05	0.04	0.05	0.04
1965	0.02	0.03	0.03	0.05	0.04	0.05	0.05	0.06	0.07	0.07
1975	0.00	0.02	0.02	0.06	0.05	0.08	0.05	0.08	0.06	0.08

- OLS using age as proxy to experience underestimate the return to experience. Especially when employment rates are low.
- The bias is high in earlier cohorts were women's employment rates were lower.
- The bias is smaller for men

Women Marriage Premium

- Model explained 90% of the 14% increase in marriage
  - 34% of the increase in marriage premium is due to the increase in women's employment (experience) over time
  - 64% of the increase is due to the increase in unobserved ability (selection)

Men Marriage Premium



- Predicted marriage Premium is 71% of Actual marriage premium
- 60% of the marriage premium is explained by the fact that married men work more
- 40% is explained by selection into marriage of men with higher unobserved ability

The Impact of changes in Exogenous Factors on Life-Cycle outcomes: 1935 cohort vs. 1975 cohort

Compare outcome of 1935 to 1975 using alternating exogenous factors

4 experiments to measure impact: each experiment we re-estimated group of parameters to fit 1935 moments, but the rest of the parameters are those of the 1975 cohort:

- 1: mother's education: simulate the 1935 cohort moments using 1975 parameters but 1935 mother's education
- 2: marriage market: re-estimate with the marriage market parameters of 1935 cohort all other parameters of 1975 cohort
- 3: labor AND marriage market: re-estimate the labor market AND marriage market parameters of 1935 holding all other parameters of 1975
- 4: pregnancy shock – re-estimate the labor market AND marriage market parameters AND pregnancy shock of 1935 holding all other parameters of 1975

1: Mother's Education Effect

- How much of the change is due to the increase in mother's education?
- 29% of the increase in the rate of CG women
- 11% of the increase in the rate of CG men
- 55% of the **decrease** in marriage rate
- 20% of the decrease in married women fertility
- 10% of the increase in married women's employment and 7% for unmarried
- 12% of the increase in Married Women's wages vs. 6% for unmarried (minor effect on men's wages)
- **Different effect for Married/Unmarried – due to Selection!**

2: Marriage Market Effect

- How much of the change is due to the change in marriage market?
- Experiment 2: re-estimate with the marriage market parameters of 1935 holding all other parameters at 1975 values
- 35% of the increase in the rate of CG women
- 22% of the increase in the rate of CG men
- 30% of the decrease in marriage rate
- 75% of the increase in divorce rate
- 30% of the decrease in married women fertility
- 7% of the increase in married Women's wages vs. 2% for unmarried
- **Different effect for married/unmarried – Selection!**

3: Labor Market Effect

- How much of the change is due to the change in labor market (both wages and job offers)?
- Experiment 3: re-estimate the labor market AND marriage market parameters of 1935 holding all other parameters at 1975 values
- 32% of the increase in the rate of CG women
- 67% of the increase in the rate of CG men
- 30% of the decrease in married women fertility
- Above 90% of the increase in men and unmarried women's wages vs. 75% for married women
- Different effect for Married/Unmarried – Selection!

4: Contraception Effect

- **How much of the change is due to the Pill?**
- Experiment 4: re-estimate the labor market AND marriage market parameters AND pregnancy shock of 1935 holding all other parameters at 1975 values
- 50% of the decrease in married women fertility vs. 80% for unmarried
- 25% of the increase in Married Women's employment vs. 10% for unmarried
- Above 4% of the increase in married women's wages vs. 2% for unmarried women
- **Different effect for Married/Unmarried – Selection!**

What accounts for the change in married women wages?

Women's Wages	1935	1975
Married	21k	39k
Unmarried	23k	37k
Marriage Premium	**−8%**	**+4%**

- How the change in wages is distributed between the exogenous processes?
  - Mother's education: 6%
  - Marriage market: 22%
  - Labor market: 52%
  - Contraception: 20%

Necessary and Sufficient

- The changes in:
  - Mother education
  - Marriage market
  - Labor market
  - Contraception
- are “Necessary and Sufficient" to explain **all** the changes from 1935 to 1975
- Necessary – We had to change all 4 to explain the change
- Sufficient – We didn’t need to change ANY of the preferences parameters!

Policy Analysis: Tax Reform and Labour Supply

Implementing Individual Taxation of Income for 1965 cohort

	1965				
	Fitted	Ind. Tax taxes fixed	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%

Labour Supply Elasticities

- Marshallian labour supply elasticities by gender, marital status, age and cohort.
- Simulating permanent 5% increases in offer wages in all states

	1935	1945	1955	1965	1975
Elasticities					
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	

Summary and Conclusions

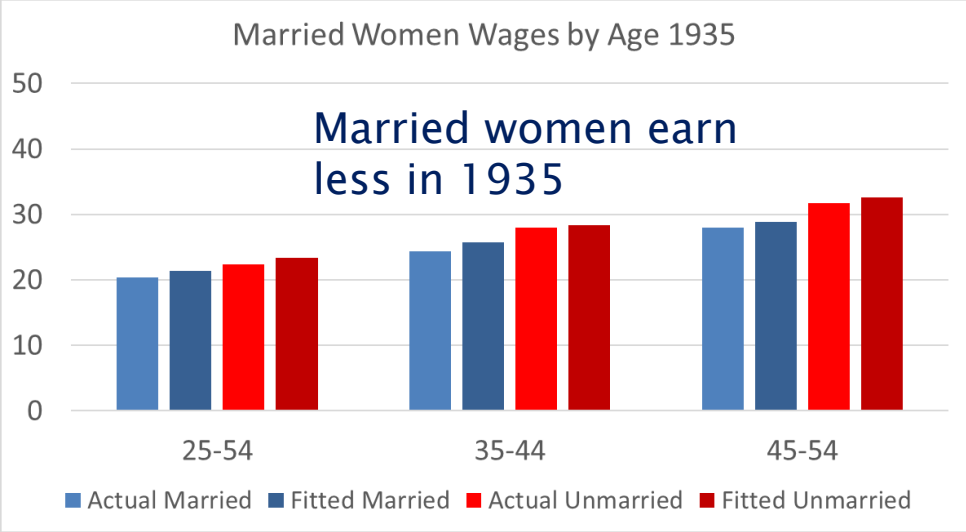
- The change in household formation is **essential** for understanding labor supply, education and fertility.
- **Married women of recent cohorts** have much **higher** observed and unobserved skills compared both to unmarried women and the married women of past cohorts
- **The marriage matching selection is an important factor in explaining individual outcomes of wages, employment, education and fertility.**

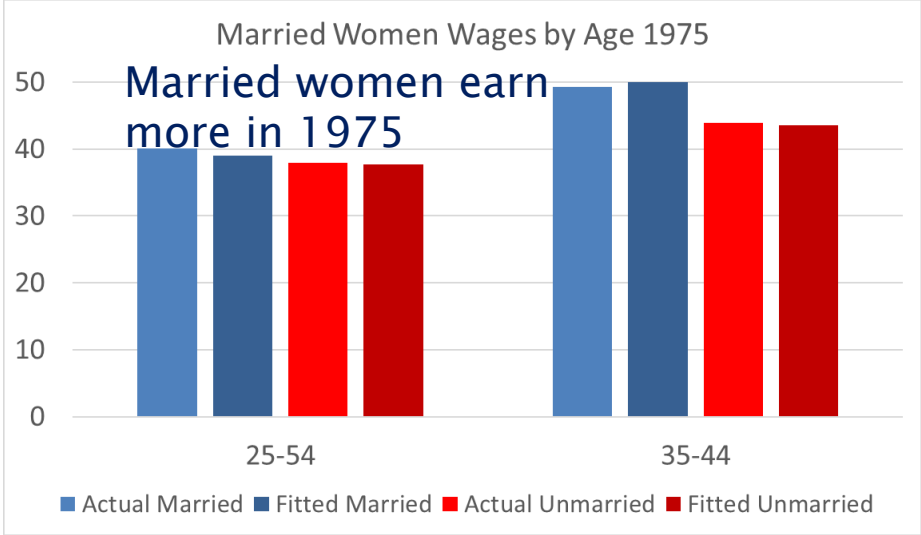
Potential Extensions

- Add Blacks and Hispanics for aggregate analysis
- Savings and retirement? Need faster/stronger computer processers
- How important is assortative mating for household inequality?
- Forecast macro changes in the socio-demographic structure into the future cohorts

Thanks

Model Fit: Wages





- **We fit Wages for married/ non married, women and men**
- We fit the increasing wage of married compared to unmarried, even though the wage equation is the same for married/unmarried