

# Marriage and Misallocation: Evidence from 70 Years of U.S. History

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# Motivation

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(Lundberg and Pollak, 2007)
- ▶ Does this shift enhance productivity?
  - ▶ Specialization à la Becker (1981)
- ▶ Or does it lead to misallocation?
  - ▶ Traditional gender roles prevent married women from following their comparative advantage (market vs. home)

## Research question

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“Wives have to stay home and take care of the household”

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- ▶ **Build & calibrate structural model**
- ▶ **Reduced form analysis to validate model & explore dynamics**

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  - ▶ Measure by how much gender roles affect marrieds' LFP choice
    - ▶ 44% "norms wedge" in 1940 → 25% in 2010
- ▶ **Reduced form exercise to validate model & explore dynamics**



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- ▶ **Build & calibrate structural model**
  - ▶ Measure by how much gender roles affect marrieds' LFP choice
    - ▶ 44% "norms wedge" in 1940 → 25% in 2010
  - ▶ Perform counterfactuals to quantify effects of the norms wedges
    - ▶ If norms stayed at 1940 level, married women of 2010:  
18% ↓ LFP, 13% ↓ market earnings
    - ▶ Aggregate market and non-market output ↓ by 3.5%
- ▶ **Reduced form exercise to validate model & explore dynamics**

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  - ▶ Long-run effects of casualties consistent with model predictions

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  - ▶ WW2 casualties as a temporary shock to female LFP
  - ▶ Long-run effects of casualties consistent with model predictions
  - ▶ Augment the model with how norms evolve dynamically

# Contributions

## 1. Aggregate implications of misallocation

- ▶ Restuccia and Rogerson (2008), Hsieh and Klenow (2009), Hsieh et al (2019), Erosa et al (2017)

→ Misallocation due to gender norms associated with marriage

## 2. Rising Female LFP due to cultural change

- ▶ Fernandez and Wong (2014), Fernandez, Fogli, Olivetti (2004), Fernandez (2013), Fogli and Veldkamp (2011)

→ Quantify the effect of weakening gender roles on female LFP

## 3. Gender identity & Economics of the family

- ▶ Akerlof and Kranton (2000), Bertrand, Kamenica and Pan (2015)
- ▶ Chiappori, Salanie and Weiss (2017), Chiappori, Iyigun, and Weiss (2009)

→ Embed gender identity into model of household decision-making

## 4. How gender roles change

- ▶ Kuziemko, Pan, Shen, Washington (2017), Fernandez (2013), Fogli and Veldkamp (2011)

→ Use natural experiment to explore how norms change

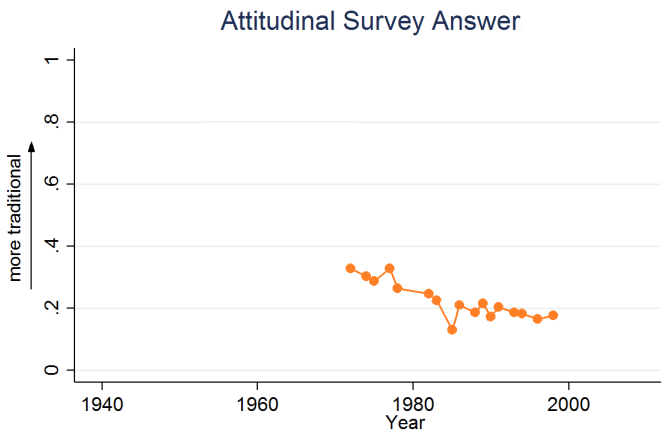
# Roadmap

1. Motivating facts
2. Model
3. Parameter identification
4. Counterfactuals
5. Reduced form analysis
6. Conclusions

# Motivating facts



# 1. Less traditional attitudes on gender roles over time



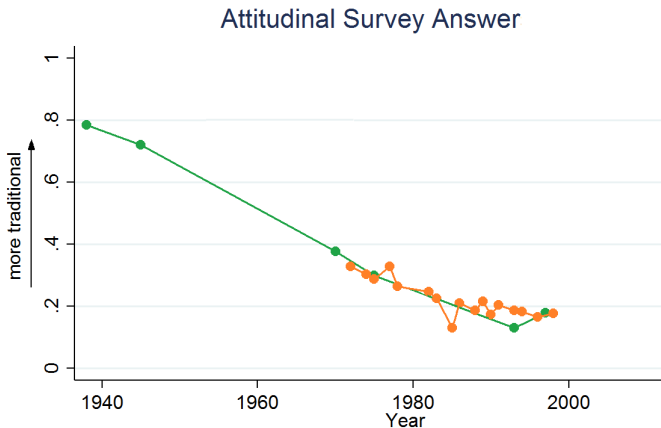
Do you approve of a married woman earning money in business or industry if she has a husband capable of supporting her? Yes 0, No 1

General Social Survey

[Other questions](#)

[World](#)

# 1. Less traditional attitudes on gender roles over time



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Gallup Polls



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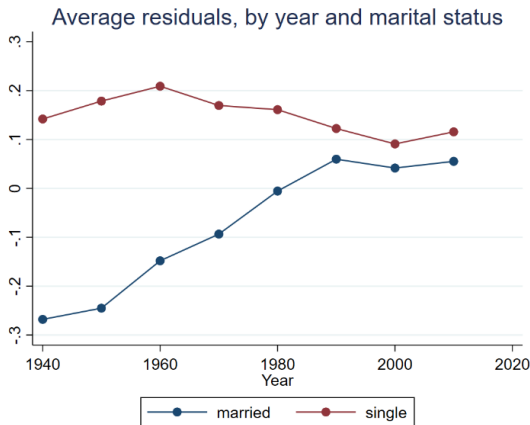
[World](#)

## 2. "Unexplained" LFP rose for married women

Residuals from:

$$LFP_{it} = X_{it}\beta + \varepsilon_{it}$$

$X_{it}$ : dummies for age, education, race, # of children



Source: U.S. Census

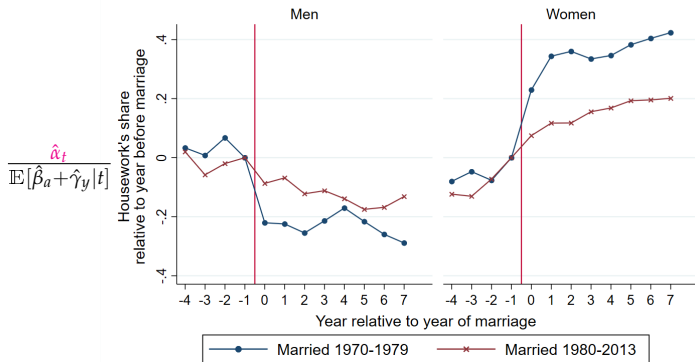
→ LFP trend for married and single women different. Maybe culture?

### 3. Once married, time use skewed towards traditional roles

Individual  $i$  of age  $a$  in year  $y$  at event time  $t$ :

$$\text{housework}_{iayt} = \sum_{j \neq -1} \alpha_j \cdot \mathbb{1}(j = t) + \beta_a + \gamma_y + v_{ist}$$

Housework's share of  
own housework and market hours

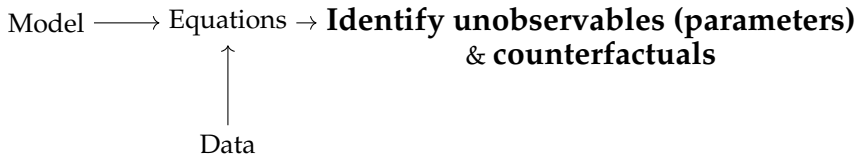


Source: Panel Survey of Income Dynamics, 1968-2015

Absolute diff-men

Absolute diff-women

## The need for a model

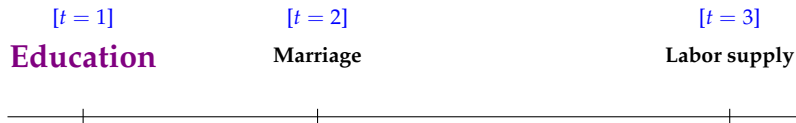


# Model

# Key features of the model

- ▶ Individuals choose to work in market vs. home  
(Roy, 1951; Eaton and Kortum, 2004; Hsieh et al., 2019)
- ▶ Norms wedges lower the value of nontraditional behavior among married couples  
(Akerlof and Kranton, 2000; Bertrand et al, 2015)
- ▶ Jointly model education, marriage, labor supply  
( Chiappori et al, 2017; Chiappori, et al, 2018)
- ▶ Can manage a very large number of household types & parameters

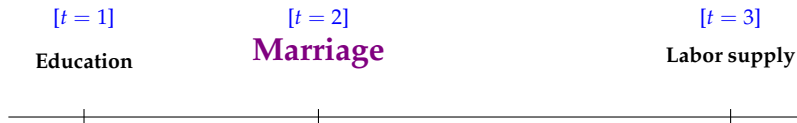
# Three-period model with three choices



**Forward-looking; returns to edu in marriage & labor market**

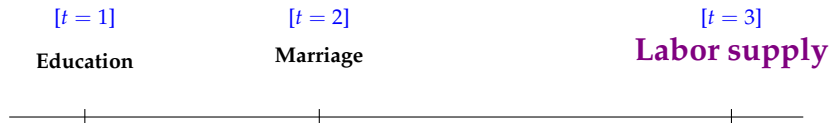


# Three-period model with three choices



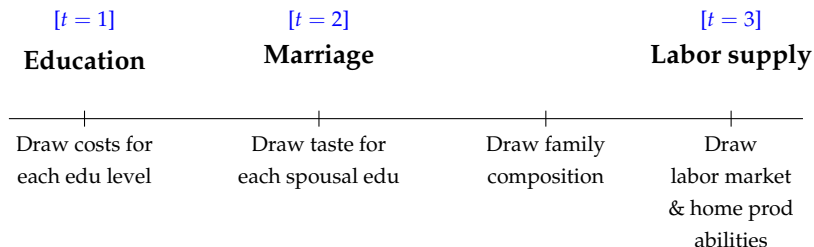
**Gains: public goods, risk sharing, marital bliss**  
**Costs: subject to gender roles**

# Three-period model with three choices

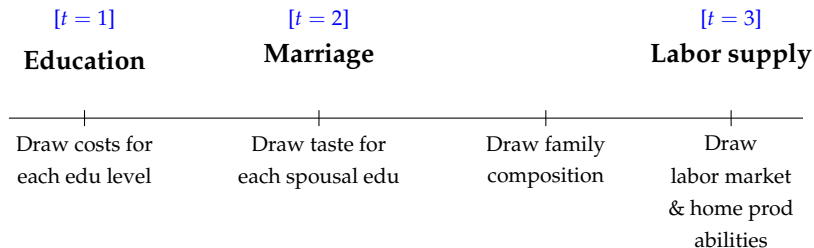


**Married couples get disutility (a.k.a. "norms wedge",  $\tau$ )  
from wives working in the market & husbands working at home**

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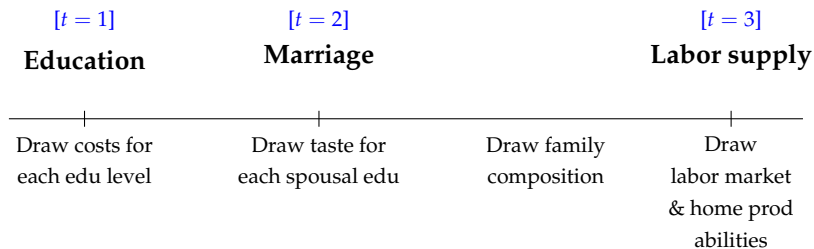


# Three-period model with three choices



→ **Recursive** structure simplifies parameter identification  
(300 or 420 groups of households each year)

# Three-period model with three choices



**Solve model backwards.**

- ▶ Compare wages and home productivities:
  1. group (G) component: (gender  $\times$  schooling pair  $\times$  family composition)
  2. idiosyncratic abilities:  $\varepsilon_i^w, \varepsilon_i^h \stackrel{i.i.d.}{\sim} \text{Fréchet}(\theta)$

$$w_i = \bar{w}_G \cdot \varepsilon_i^w, \quad h_i = \bar{h}_G \cdot \varepsilon_i^h$$

- ▶ **Single** (person  $i$ )

$$\hat{L}_i^* = \mathbb{1}(w_i \geq h_i)$$

- ▶ **Married** (husband  $m$ , wife  $f$ )

$$L_f^* = \mathbb{1}[(1 - \tau_G) \cdot w_f \geq h_f]$$

$$L_m^* = \mathbb{1}[w_m \geq h_m]$$

- ▶ After labor supply decisions, households consume and realize **economic** utilities

# Firms in the labor market

- ▶ A representative firm in this economy produces the aggregate market output  $Y^{mkt}$  from male and female labor:

$$Y^{mkt} = AL = A(L_M + L_F)$$

↑      ↑  
total efficiency units of  
labor by gender



## $[t = 2]$ Marriage market choice (Building on Choo and Siow, 2006)

- ▶ Men and women are defined by their edu level
- ▶ Taste for each spousal edu  $\overset{i.i.d.}{\sim}$  type I extreme-value
- ▶ In equilibrium (Supply = Demand),

num in  $(q, r)$  match rel. to single counterparts

$$= \frac{\overbrace{\mathbb{E}(v_m^{qr}) + \mathbb{E}(v_f^{qr})}^{\text{expected economic utility in match}} - \overbrace{[\mathbb{E}(\hat{v}_m^q) + \mathbb{E}(\hat{v}_f^r)]}^{\text{expected economic utility as singles}}}{2} + \underset{\substack{\uparrow \\ \text{marital bliss} \\ \text{of match}}}{\psi^{qr}}$$

## $[t = 1]$ Educational choice

- ▶ Taste for each edu level  $\overset{i.i.d.}{\sim}$  type I extreme-value
- ▶ Women's educational choice:

$$\text{share of women with edu } r = \frac{\exp\{U_F^r\}}{\sum_{s=1}^S \exp\{U_F^s\}}$$

where

$$U_F^r = \overbrace{\sum_{q=0}^S \left[ \frac{n^{qr}}{F^r} \mathbb{E}(v_F^{qr}) \right]}^{\text{expected utility from edu level } r} - \underset{\substack{\uparrow \\ \text{cost of attaining} \\ \text{edu level } r}}}{c_F^r}$$

# Parameter identification

# Taking the model to the data

- ▶ Model is fitted to
    - ▶ U.S. decennial census, 1940-2010
    - ▶ Men & women aged 25-54, household heads or spouses of heads
- Economically active age

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  - ▶ **Parameters to be inferred:**  
dispersion of market and home abilities ( $\theta$ ), market productivity ( $\bar{w}$ ),  
home productivity ( $\bar{h}$ ), norms wedge ( $\tau$ ), marital bliss in each marriage  
match ( $\psi$ ), cost of schooling ( $c$ )
  - ▶ **Variables needed:** market wage, LFP, marital status, education, children

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- ▶ Cross-validation
  - ▶ Various attitudinal surveys (1938-2017) in Roper Polls database

# Parameter identification: steps

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→ Close to similar estimates in literature (Hsieh et al, 2019)
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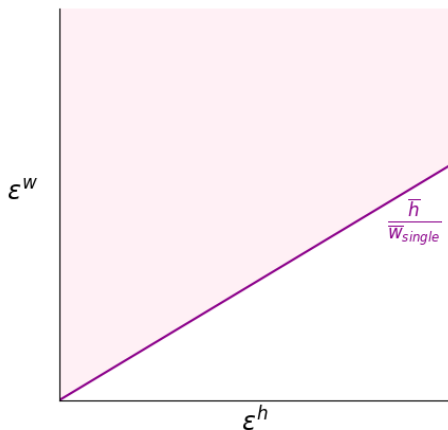
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→ Higher the closer the spousal education levels are
4.  $c_g^s$ : share of men & women in each edu level  
→ The cost of attaining the highest edu level was larger for women 1940-1990, and overturned in 2000

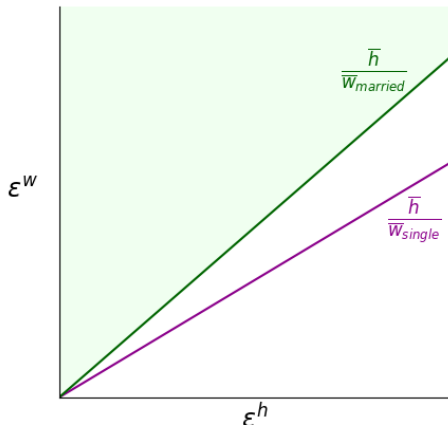
# Single women's labor supply decision

- ▶ **Single** (woman  $i$ ):  $\hat{L}_i^* = \mathbb{1}(\bar{w}_{single} \varepsilon_i^w \geq \bar{h} \varepsilon_i^h)$
- ▶ **Average wage:**  $\text{avrwage}_{single} = \bar{w}_{single} \left( \frac{1}{\text{LFP}_{single}} \right)^{\frac{1}{\theta}} \Gamma \left( 1 - \frac{1}{\theta} \right)$



# Married women's **predicted** labor supply decision

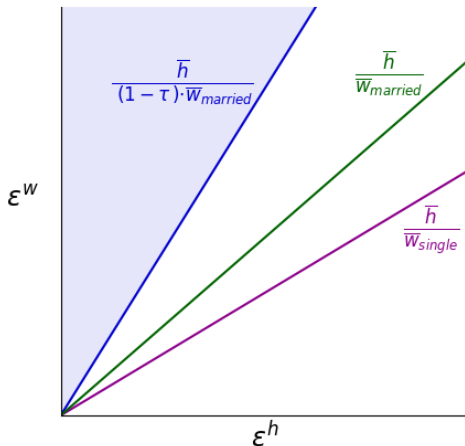
- ▶ **Married** (wife  $f$ ):  $L_f^* = \mathbb{1}[(1 - \tau) \cdot \bar{w}_{\text{married}} \varepsilon_f^w \geq \bar{h} \varepsilon_f^h]$
- ▶ **Average wage:**  $\text{avrwage}_{\text{married}} = \bar{w}_{\text{married}} \left( \frac{1}{\text{LFP}_{\text{married}}} \right)^{\frac{1}{\theta}} \Gamma \left( 1 - \frac{1}{\theta} \right)$



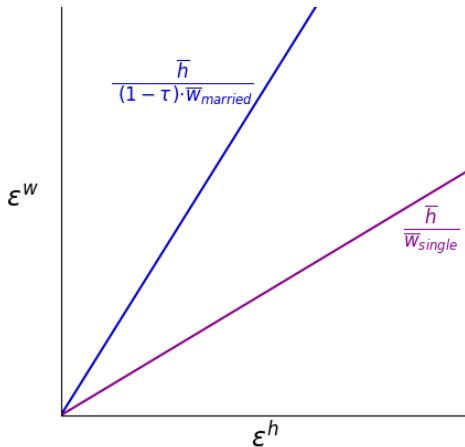


# Married women's **actual** labor supply decision

- ▶ **Married** (wife  $f$ ):  $L_f^* = \mathbb{1}[(1 - \tau) \cdot \bar{w}_{\text{married}} \varepsilon_f^w \geq \bar{h} \varepsilon_f^h]$
- ▶ **Average wage**:  $\text{avrwage}_{\text{married}} = \bar{w}_{\text{married}} \left( \frac{1}{\text{LFP}_{\text{married}}} \right)^{\frac{1}{\theta}} \Gamma \left( 1 - \frac{1}{\theta} \right)$



# Gender norms wedge, $\tau$



$$\tau = 1 - \frac{\text{avrwage}_{single}}{\text{avrwage}_{married}} \left( \frac{1 - \text{LFP}_{single}}{1 - \text{LFP}_{married}} \right)^{\frac{1}{\theta}}$$

# What $\tau$ captures

**$\tau$ : by how much LFP choice of marrieds differ from similar singles, not explained by wage differentials**

Includes

- ▶ Preference to conform with traditional identity as wife/husband
- ▶ Differential preference for home prod for marrieds relative to singles
- ▶ Differential non-wage treatment by firms
- ▶ Preference for more home-productive women as wife
- ▶ Interdependence between husband & wife's LFP spousal dependence

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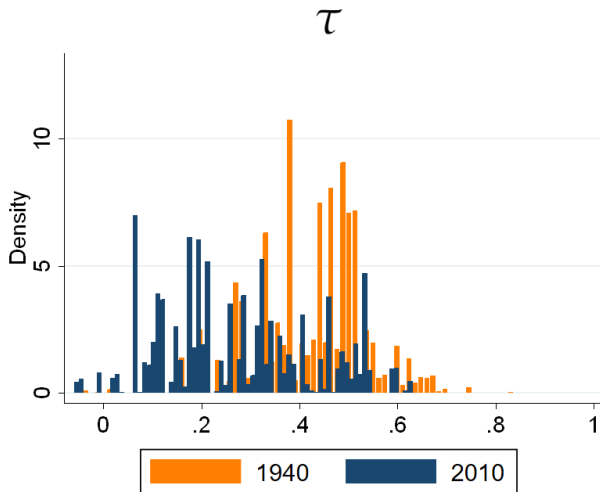
**$\tau$ : by how much LFP choice of married women differ from similar single women's, not explained by wage differentials**

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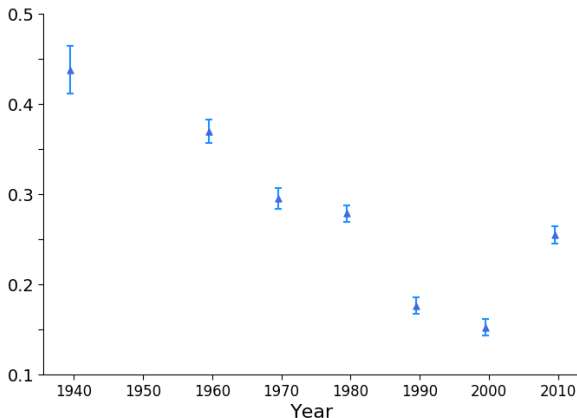
- ▶ Preference to conform with traditional identity as wife
- ▶ Differential preference for home prod for married women relative to single women
- ▶ Differential non-wage treatment by firms
- ▶ Preference for more home-productive women as wife
- ▶ Interdependence between husband & wife's LFP spousal dependence

→ Arguably "gender roles"

## $\tau$ : gender norms wedges (by group)



## $\tau$ : gender norms wedges



Matches the answers to various attitudinal survey questions on gender roles in marriage becoming less traditional over time

Attitude trend

## Cross-check: $\tau$ correlated with attitudes (state-level)

	Dependent variable $\tau$	
	average	median
Regressed on:		
Fraction disapproving of married women working	0.249** (2.21)	0.282** (2.21)
Regressed on:		
Composite attitudinal index	0.450*** (2.94)	0.439** (2.50)
<i>N</i>	51	51

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

*t* statistics in parentheses; robust standard errors

# Counterfactual simulations



# Quantifying the importance of norms

selection into marr

**What would have happened in 2010  
if norms wedge ( $\tau$ ) stayed at 1940 level (% change)?**

	Adjustment margins	
	Labor supply	Labor supply, marriage, and education
<b>Education</b>		
Women's years of schooling	-	-1.4
Men's years of schooling	-	-0.8
<b>Selection into marriage</b>		
Marriage rate	-	-32.2
Married women's edu/single women's edu	-	-4.1
Married men's edu/single men's edu	-	-1.2

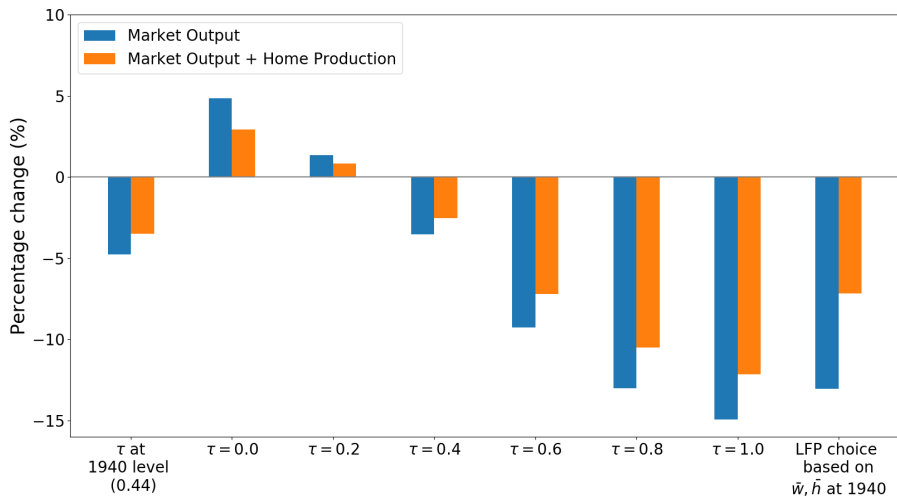
# Quantifying the importance of norms

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**What would have happened in 2010  
if norms wedge ( $\tau$ ) stayed at 1940 level (% change)?**

	Adjustment margins	
	Labor supply	Labor supply, marriage, and education
<b>Labor Force Participation</b>		
Married women's LFP	-14.3	-17.5
Married men's LFP	-	-0.03
Single women's LFP	-	0.6
Single men's LFP	-	0.1
<b>Output per head</b>		
Married women's market output	-7.0	-13.0
Married women's total output	-2.1	-6.5
Married men's market output	-	-0.8
Married men's total output	-	-0.8
Aggregate market output	-2.0	-4.8
Aggregate market & home output	-0.6	-3.5
<b>Within-household gender earnings gap</b>		
Wife's share of household market income	-11.5	-14.9

# Output effects of different counterfactuals $\bar{w}, \bar{h}$



# Reduced form exercise

# Reduced form exercise to validate model

- ▶ Want to verify model predictions when norms change
- ▶ BUT, difficult to find *direct* exogenous shock to norms
- ▶ Alternative approach: explore effects of a shock that *indirectly* affects norms & check that other variables change in the expected direction  
→ Model validation

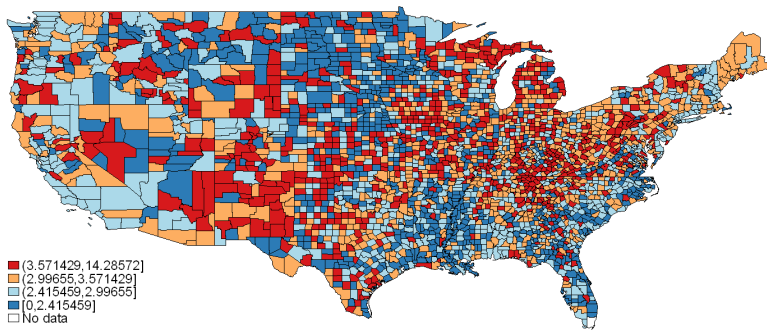
# WW2 casualties as an indirect shock to gender norms

- ▶ WW2 induced change in gender norms via temporarily higher FLFP (Fernandez, Fogli, and Olivetti, 2004)
- ▶ High draftee casualties have two direct effects:
  - ▶ labor market: male labor supply ↓
  - ▶ marriage market: widows ↑
- Through these effects, induce one-off increase in FLFP.
- ▶ Gender norms evolve as more women work (Fernandez, Fogli, and Olivetti, 2004; Fogli and Veldkamp, 2011; Fernandez, 2013; Bisin and Verdier, 2000 & 2011)
- ▶ One-off shock may propagate over the long-term via cultural change

# Reduced form empirical specification

- ▶ County-level casualty measure:

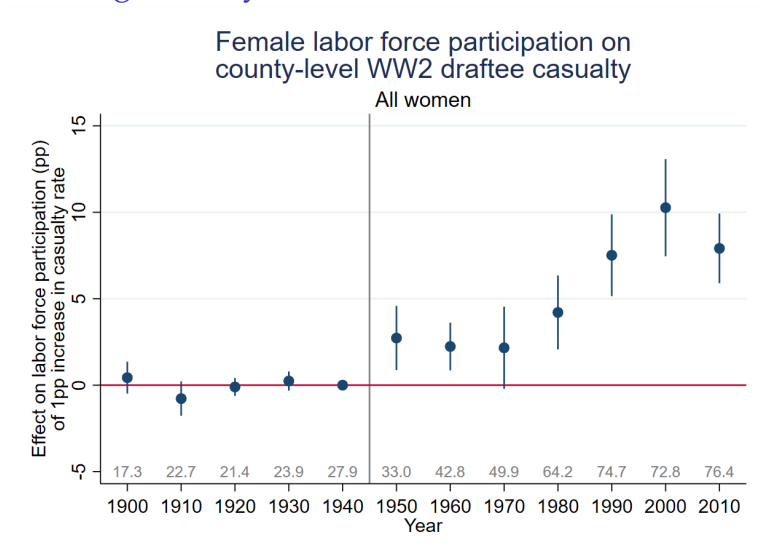
$$casualty_c = \frac{\text{drafted and killed}}{\text{drafted}}$$



- ▶ Difference-in-differences framework

$$Y_{ict} = \alpha_c + \lambda_t + \sum_{t \neq 1940} \beta_t \times casualty_c + X_{ict}\gamma + \varepsilon_{ict}$$

# Female LFP gradually increases



Source: U.S. Decennial Census, 1900-2010



# Story of one-off shock to FLFP → long-term cultural change

## ▶ Attitudes

alternative channels

- ▶ Attitude index less traditional

## ▶ Women's work

- ▶ Gradual ↑ in married women's market work
- ▶ Within household, gradual ↑ in wife's share of hours & income
- ▶ Temporary ↑ in single women's market work

Only married women affected in the long term

## ▶ Men's work

- ▶ Men's employment barely affected

## ▶ Marriage

- ▶ Marriage rate ↑
- ▶ Gradual ↑ in average edu of married women

Gender norm as cost to marriage, stronger for higher ability women

## ▶ Wages

- ▶ Female wage ↓

As more women work, working women less positively selected

## Back to model - adding dynamics, using WW2 results

- ▶ **Economywide** dynamics:  $\tau$  responds to past female LFP

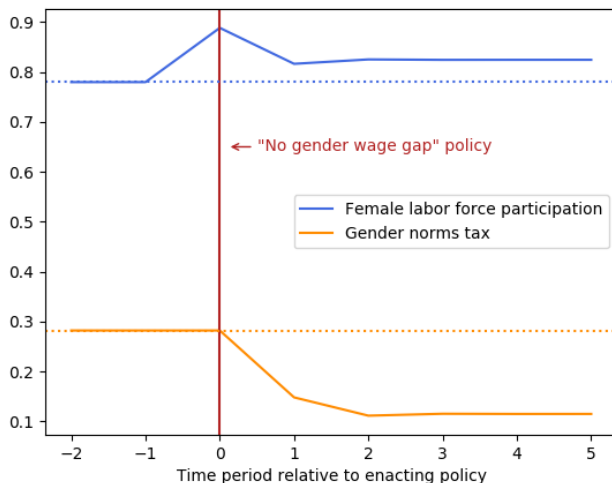
$$\underline{\Delta}\tau_t = f(\underline{\Delta}FLFP_{t-1}, FLFP_{t-1}) + v_t$$

- ▶ Assumptions:
  - ▶ Casualties changed FLFP in 1950 and nothing else
  - ▶ Effect only propagates via changes in norms
- ▶ Estimation strategy:
  - ▶ minimize

$$\sum_t (\text{DiD coeff, } FLFP_t - \text{change in } FLFP_t \text{ in model due to } \underline{\Delta}\tau_t)^2$$

# Dynamic counterfactuals

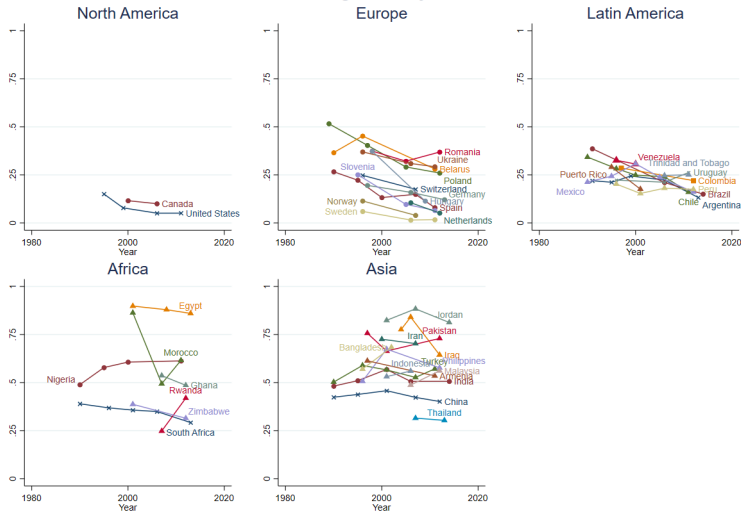
What would happen in 2010 if women were paid male wages, one-off?



# Conclusions

# Relevance of changing norms around the world

Fraction agreeing that when jobs are scarce, men have more right to a job than women



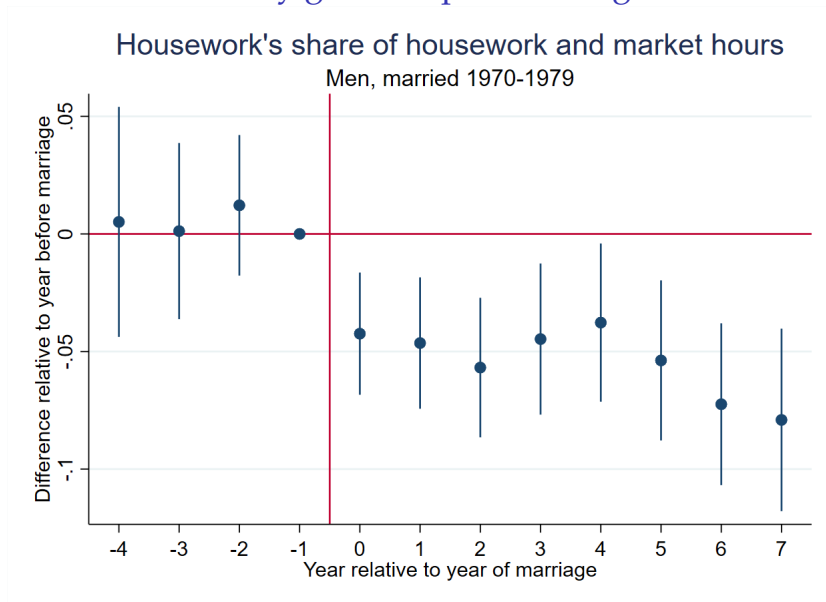
Source: IPUMS International

# Conclusion

- ▶ We do not learn about development *only* from developing countries
- ▶ Rather, we can also learn from a developed country that has undergone large historical changes
  - ▶ Gender norms wedges declined significantly in U.S.
  - ▶ Gender norms matter for aggregate output
  - ▶ One-off policy inducing a large rise in female LFP may bring economy to a new equilibrium with higher female LFP
- ▶ 1 in 10 countries of the world have female LFP lower than 1940 U.S.

# APPENDIX

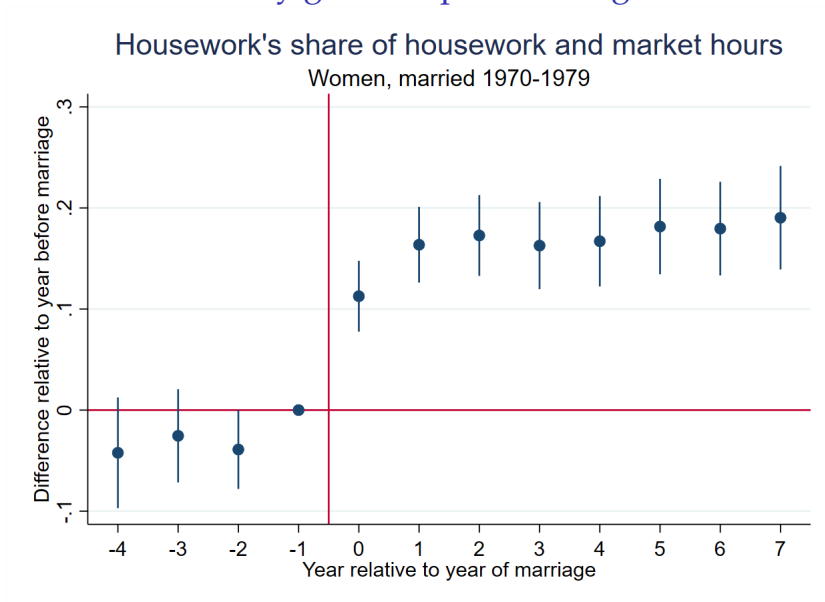
# Division of labor by gender upon marriage



Source: PSID [Return](#)



# Division of labor by gender upon marriage



Source: PSID [Return](#)

## Cross-country corr: traditional attitudes & low married women's LFP

	Dependent variable	
	Married women's LFP	Single women's LFP
	(1)	(2)
Fraction agreeing that when jobs are scarce, men have more right to a job than women	-0.436*** (-3.49)	-0.959* (-1.75)
Wave in sample	5 (2005-2009)	All (1989-2014)
Wave dummies	-	✓
Country dummies	-	✓
N	41	149

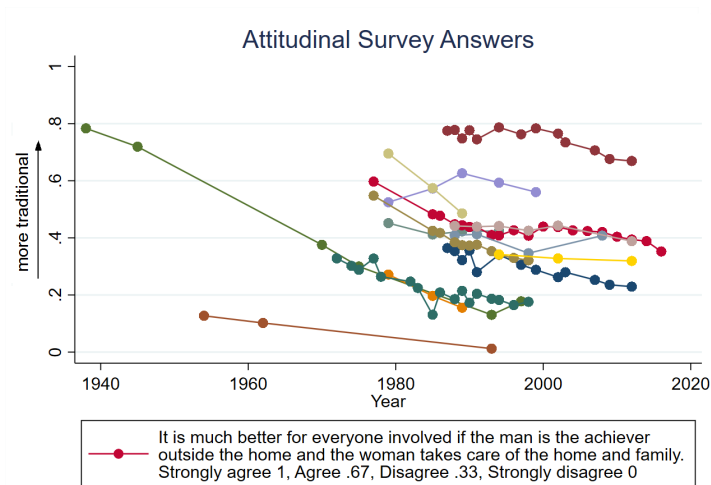
*t* statistics in parentheses; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Robust SE for column (1), and SE clustered by country for column (2)

Source: World Values Survey

Return

# Less conservative attitudes on gender roles over time, U.S.

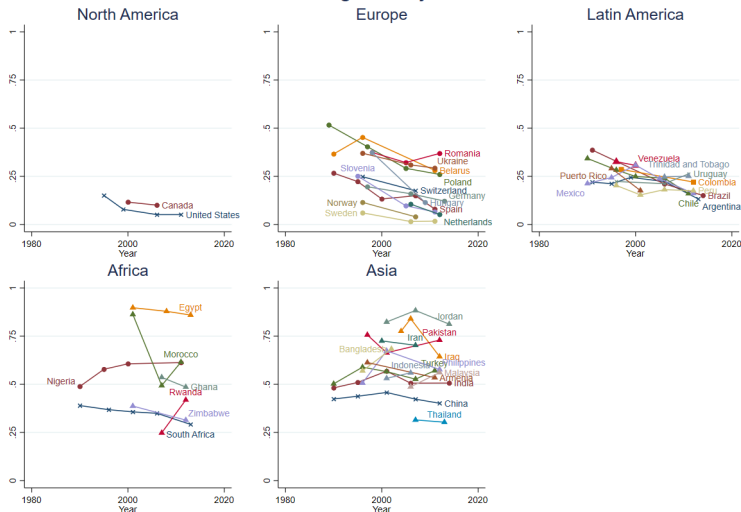


Source: Gallup Polls, Virginia Slims Survey, PEW Values Survey, General Social Survey

[return](#)

# Less conservative attitudes on gender roles over time, world

Fraction agreeing that when jobs are scarce, men have more right to a job than women



Source: World Values Survey

[Return](#)

# Variation in attitudes by individual characteristics

Do you approve of a married woman working in industry/business if she has a husband capable of supporting her?

	Average	F-statistic	Shapley decomp (%)		Average	F-statistic	Shapley decomp (%)
<b>Year</b>				<b>Education</b>			
1930-1939	0.77			Middle school or lower	0.41		
1940-1949	0.71			High school drop-out	0.29		
1970-1979	0.26	6.5	20.1	High school	0.20	88.1	64.6
1980-1989	0.16			College drop-out	0.14		
1990-1999	0.14			College or higher	0.09		
<b>Marital status</b>				<b>Number of children</b>			
Married	0.19			0	0.14		
Widowed	0.28			1	0.17		
Divorced	0.18	4.5	3.2	2	0.18	4.0	13.6
Separated	0.19			3	0.21		
Never married	0.15			4 or more	0.27		
<b>Sex</b>				<b>Age</b>			
Male	0.20			20-29	0.23		
Female	0.18	7.4	0.8	30-39	0.26	1.0	6.7
<b>Race</b>				40-49	0.29		
White	0.28			50-59	0.33		
Black	0.25	13.5	5.5				
Other	0.21						

Return

# Economic utilities (Adaptation of Chiappori et al, 2017)

## Married

- ▶ Husband  $m$  and wife  $f$ .  $i \in \{m, f\}$  gets

$$u_i(Q, C_i, L_f) = \ln(Q) + \ln(C_i - \tau_i w_f L_f)$$

↑  
public  
goods

↑  
private  
goods

↑  
disutility from  
wife's market work

## Single

- ▶ Not subject to gender roles.  $i$  gets

$$\hat{u}_i(\hat{Q}_i, \hat{C}_i) = \ln(\hat{Q}_i) + \ln(\hat{C}_i)$$

general form

# Economic utilities (Adaptation of Chiappori et al, 2017)

## Married

- ▶ Husband  $m$  and wife  $f$ .  $i \in \{m, f\}$  gets

$$u_i(Q, C_i, L_f, L_m) = \ln(Q) + \ln(C_i - \tau_i w_f L_f)$$

- ▶ Couple maximizes **joint** output together **UMP**

➔ Resulting utilities denoted  $v_i$

## Single

- ▶ Not subject to gender roles.  $i$  gets

$$\hat{u}_i(\hat{Q}_i, \hat{C}_i) = \ln(\hat{Q}_i) + \ln(\hat{C}_i)$$

➔ Resulting utilities denoted  $\hat{v}_i$

general form

public consumption

indirect utilities

# The general form of the utility function

return

$$u_i = H\left(f(Q)C_i - r(Q) \cdot \tau w_f L_f + g_i(Q)\right)$$

where the following conditions hold:

## Conditions

- C1)  $H$  is strictly increasing and strictly concave
- C2)  $(H')^{-1}$  is homogeneous or logarithmically homogeneous
- C3)  $2p(f')^2 - p \cdot f \cdot f'' + [(1 - \tau)w_f L_f](r''f' - r'f'') - f'g'' + g'f'' > 0$ , where  $g(Q) \equiv g_m(Q) + g_f(Q)$



# Married couple's utility maximization problem

return

$$\begin{aligned} & \max_{Q, C_f, C_m} Q(C_f + C_m - \tau w_f L_f) \\ \text{s.t. } & pQ + C_f + C_m = w_m L_m + w_f L_f + h_m(1 - L_m) + h_f(1 - L_f) \end{aligned}$$

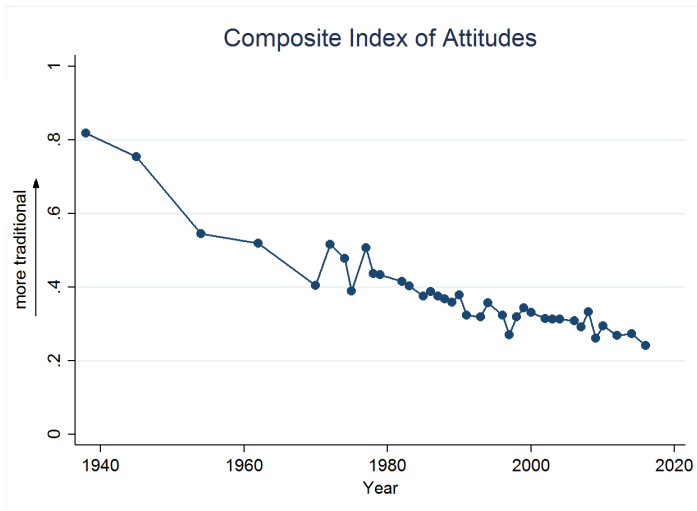
# Optimal public and private consumption

$$Q = \frac{w_m L_m + (1-\tau)w_f L_f + b_m(1-L_m) + b_f(1-L_f)}{2p}$$

$$C = pQ + \tau w_f L_f$$

return

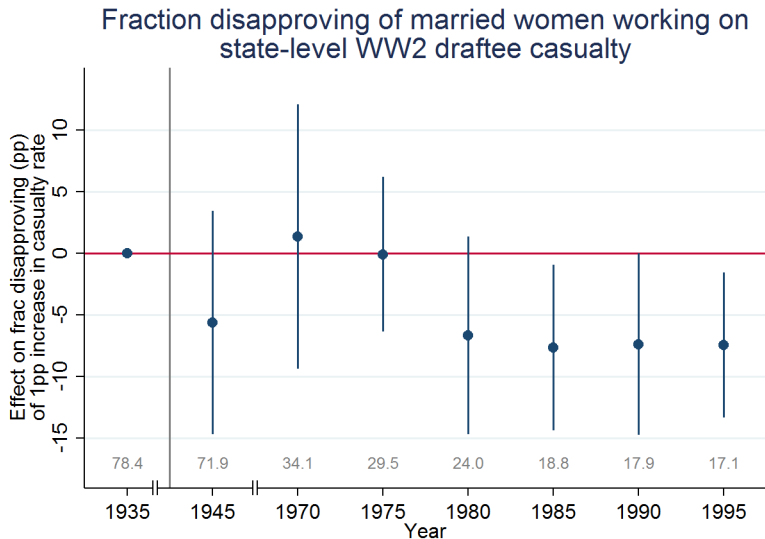
# Composite index of attitudes [All questions](#)



Source: Gallup Polls, Virginia Slims Survey, PEW Values Survey, General Social Survey

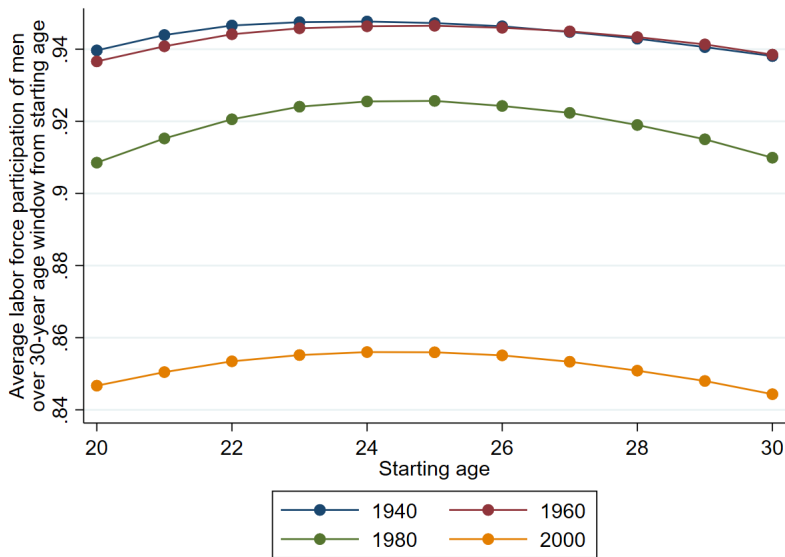
[return](#)

# WW2 casualties gradually change attitudes



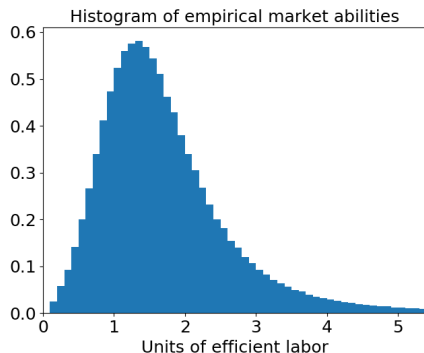
[return](#)

# Economically active age range



## $\theta$ : measure of dispersion of market & home abilities [return](#)

- MLE based on the distribution of real hourly wages, adjusting for selection into labor market



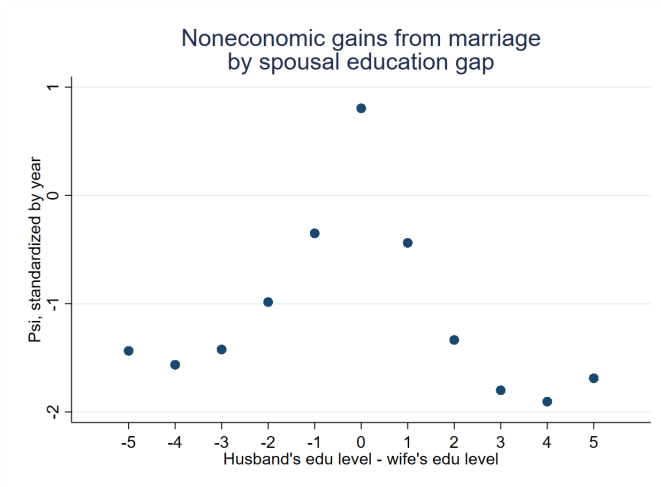
$\hat{\theta}$	1.837*** (18.31)
$N$	3570573

$t$  statistics based on standard errors  
clustered by sex in parentheses

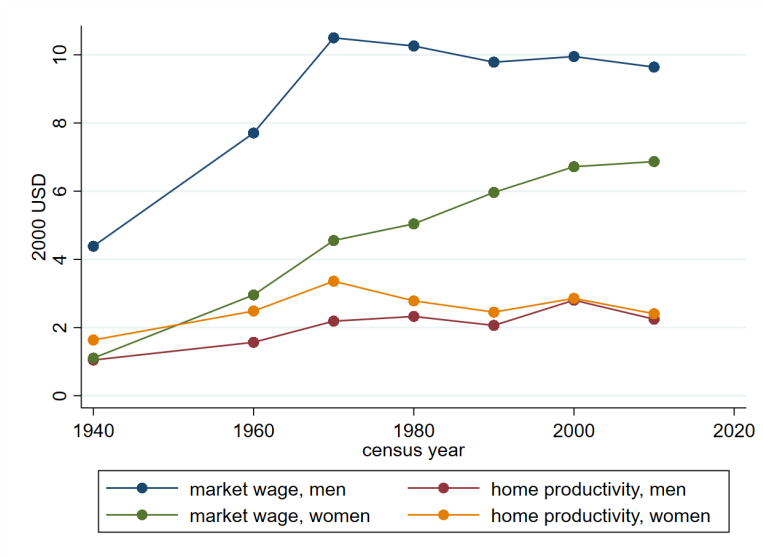
\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Similar to Hsieh et al (2018)'s estimate of 1.52 for the dispersion of abilities across occupations, and their choice to use 2 for conducting counterfactuals

## $\psi$ : Noneconomics gains to marriage match [return](#)



Matches the well-documented assortative matching by education





## Strong corr between attitude index & time allocation

	1(Wife works) (1)	Wife's weekly market hours (2)	Husband's share of housework (3)
Attitude	-0.217*** (-2.92)	-18.44**** (-5.08)	-0.144*** (-2.97)
N	4158	4108	1573

*t* statistics in parentheses; \*\*\*  $p < 0.01$ , \*\*\*\*  $p < 0.001$

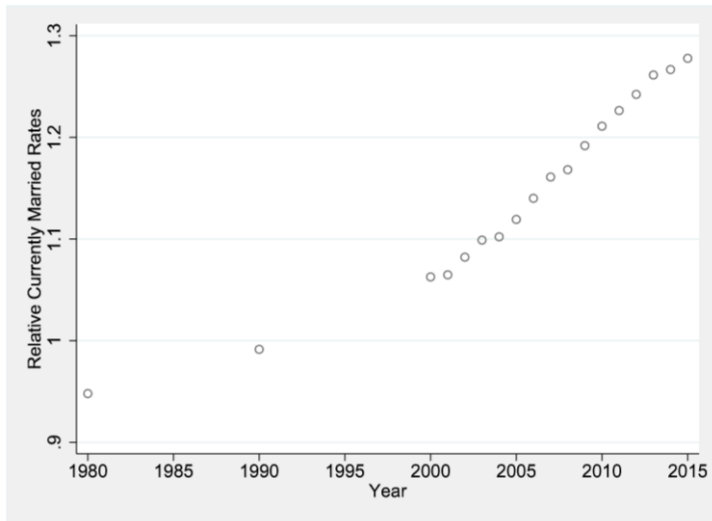
Attitude  $\in [0, 1]$ , with higher value indicating more traditional gender role attitudes

Includes individual FE, state FE, year FE. SE clustered at the individual level

Results robust to controlling for age, age<sup>2</sup>, youngest child's age,  
number of children, household size

Data: Work and Family Life Study, 1980-2000 [return](#)

## Relative marriage rate of educated women increasing

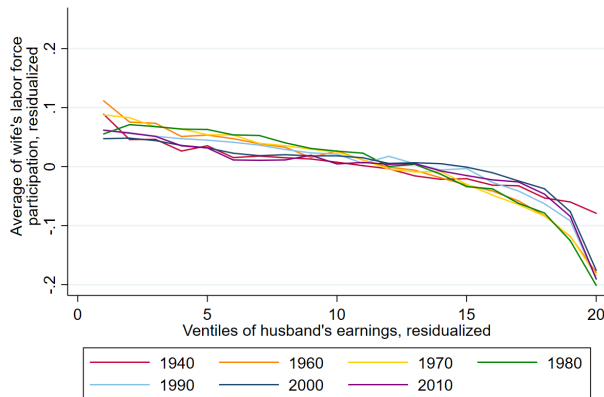


Source: Bar et al (2018)

[return](#)

# Cross-elasticity between spouses' LFPs likely stable over time

- ▶ Elasticity of  $L_f$  w.r.t. husband's earnings quite stable over time



Residualized for own and spousal years of schooling, number of children under 18, number of children under 5, family size, age, race, U.S. county dummies

[return](#)

# Alternative channels of long-term effects of WW2 casualties

return

- ▶ Gender ratio fell, increasing husbands' bargaining power
  - ▶ But men have more traditional views
- ▶ Increased the stigma of remaining single
  - ▶ But this would predict a decrease in married women's labor force participation, because it affects the marginal *man's* marriage choice more
- ▶ Female wage increased
  - ▶ But female wage did not increase. Could it be that observed female wage did not increase because higher female wage induced lower ability women to start working? It is unlikely that indirect effect dominates the direct effect.
- ▶ Increased marketization of home production, which induces higher ability women to get married more (Bar et al, 2018)
  - ▶ But the number of children fell
- ▶ Birth control pill enabled family planning
  - ▶ But availability of birth control pill should not be correlated with casualties