The Gender Unemployment Gap: Trend and Cycle

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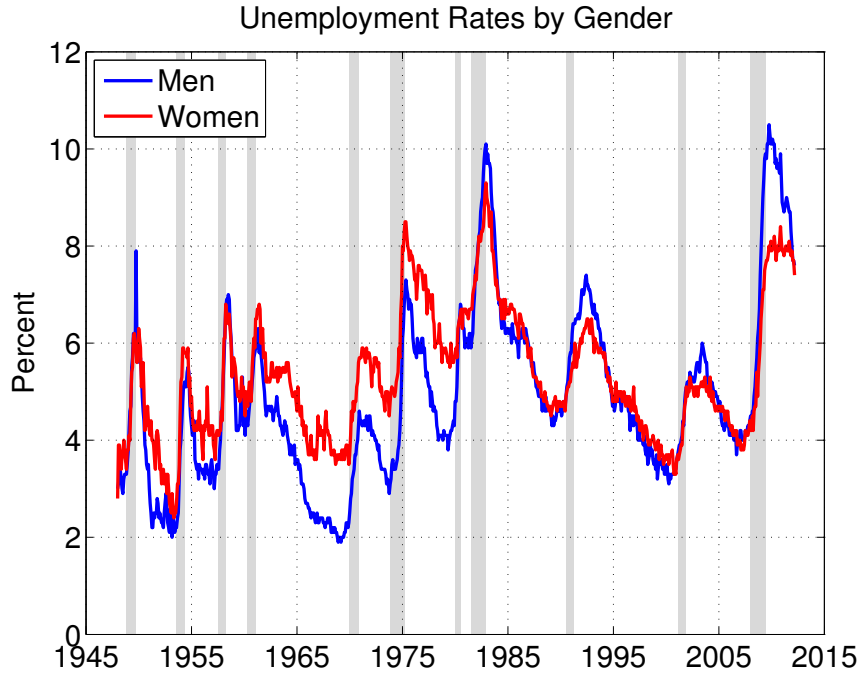
Family Inequality Workshop: November 15, 2012

The Gender Unemployment Gap



- The gender unemployment gap was positive until 1980.
- After 1980, the gender unemployment gap virtually disappeared, except for recessions, when men's unemployment rate exceeds women's.

Hypothesis and Findings

- Our hypothesis is that the decline in the gender unemployment gap was due to a convergence in labor market attachment by gender.

- We find that the convergence in labor force attachment by gender played an important role in the trend decline of the gender unemployment gap.
  - Convergence in the age and skill distribution by gender play a minimal role.
- Gender differences in unemployment over the business cycle have been stable:
  - Gender differences in industry composition can explain most gender differences in unemployment during recent recessions, but not during recoveries.

Outline

- Evidence
- Composition explanations
- Model
- Quantitative analysis
- International evidence
- Cyclical analysis

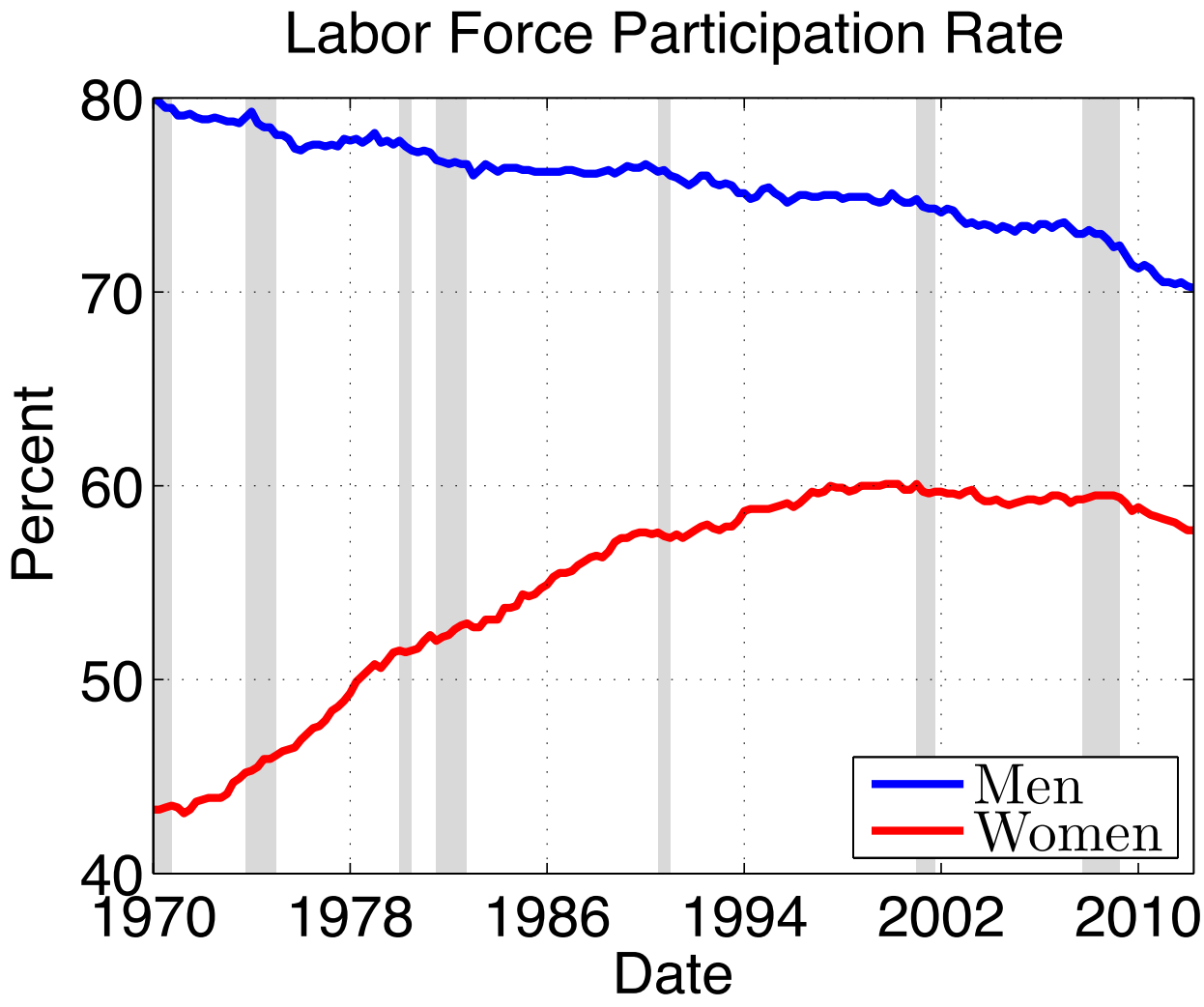
Evidence

Convergence in Labor Force Attachment

- Rise in female attachment:
  - Female LFP rose from 43% in 1970 to 60% in 2000.
  - Women historically experienced more frequent spells of non-participation (Royalty, 1998), especially in childbearing years (Goldin, 1990). They are now less likely to experience non-participation spells in conjunction with childbirth (Census Bureau 2008).
- Decline in male attachment:
  - LFP of men declined from 80% in 1970 to 75% in 2000.
  - Full time non-employment of prime age men declined (Juhn, Murphy and Topel, 2002 and Autor and Duggan, 2003).

Convergence in Labor Force Attachment

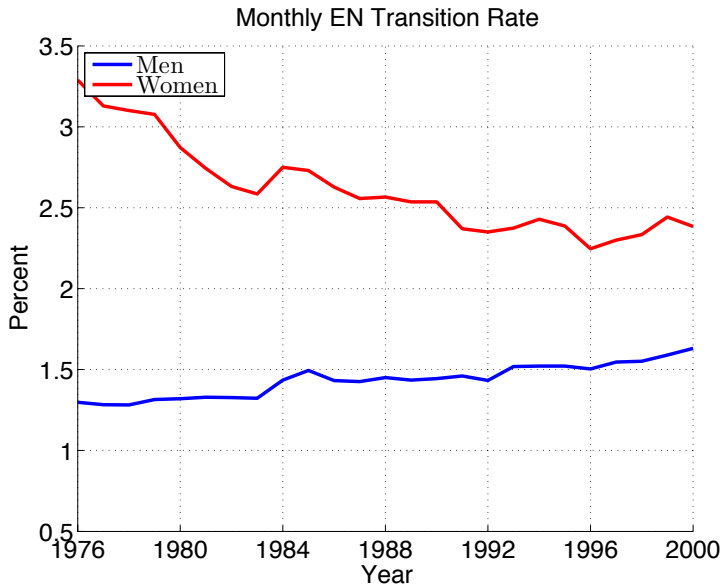
Labor Force Participation By Gender

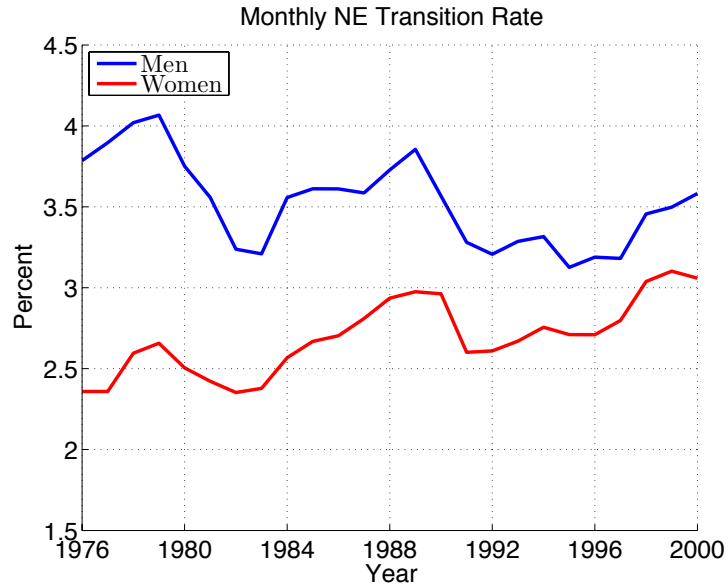


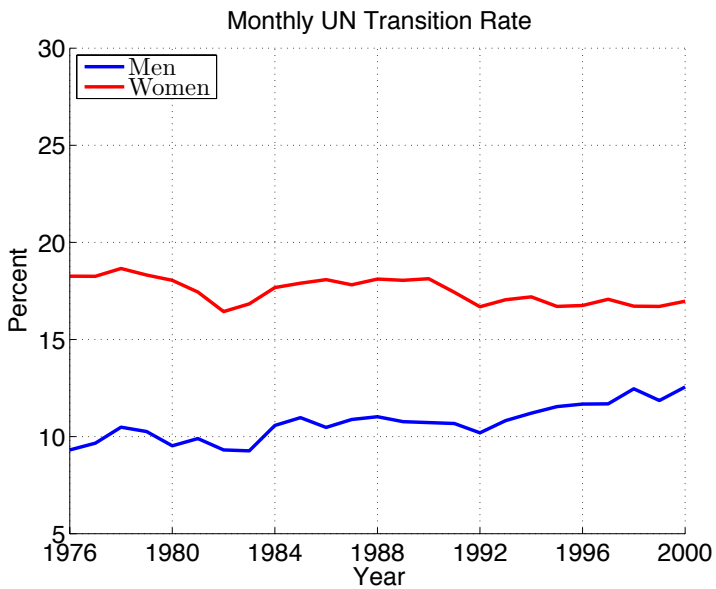
Convergence in Labor Force Attachment

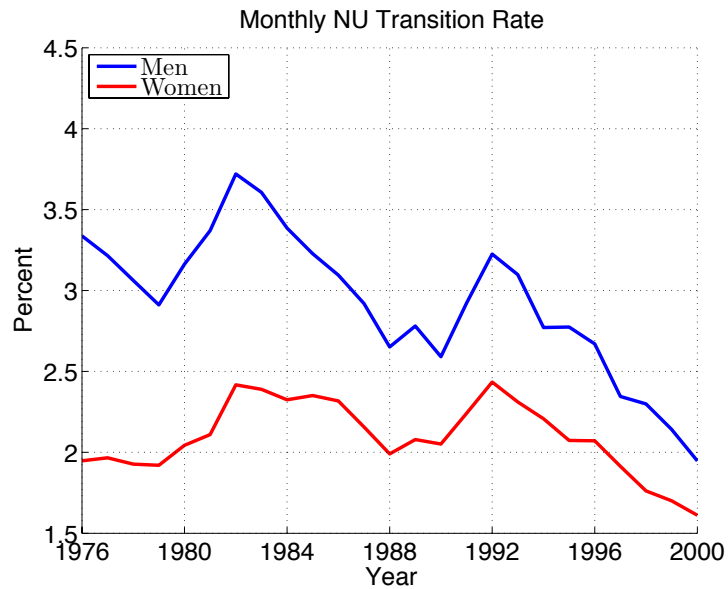
- Flow rates involving the participation decision for men and women have steadily converged (Abraham and Shimer, 2002).
  - NE $\uparrow$ and EN $\downarrow$ for women relative to men $\Longrightarrow$ E $\uparrow$ for women relative to men.
  - NU $\downarrow$ and UN $\uparrow$ for men relative to women $\Longrightarrow$ U $\uparrow$ for women relative to men.
- There has been no systematic convergence in flow rates between employment and unemployment.

Convergence in Flow Rates









Age adjusted flow rates. Source: Abraham and Shimer (2002)

Convergence in Labor Force Attachment

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  - NE $\uparrow$ and EN $\downarrow$ for women relative to men $\Longrightarrow$ E $\uparrow$ for women relative to men.
  - NU $\downarrow$ and UN $\uparrow$ for men relative to women $\Longrightarrow$ U $\uparrow$ for women relative to men.
- There has been no systematic convergence in flow rates between employment and unemployment.
- The gender unemployment gap declines because the effect on E prevails, and E/U rises:

$$u = \frac{U}{E+U} = \frac{1}{\frac{E}{U}+1}$$

Other Contributing Factors: Composition of the Labor Force

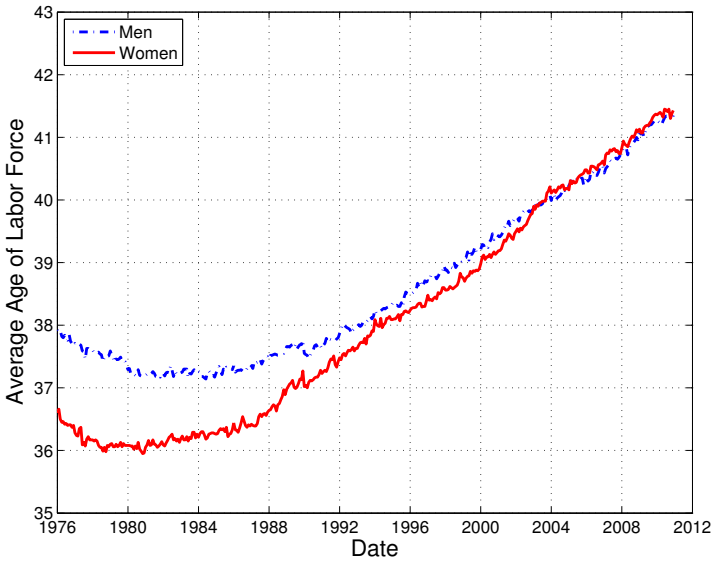
- Well-documented patterns for unemployment:
  - Skill: Low-skilled workers tend to have higher unemployment rates.
  - Age: Younger workers tend to have higher unemployment rates

  [Mincer (1991), Shimer (1998)]

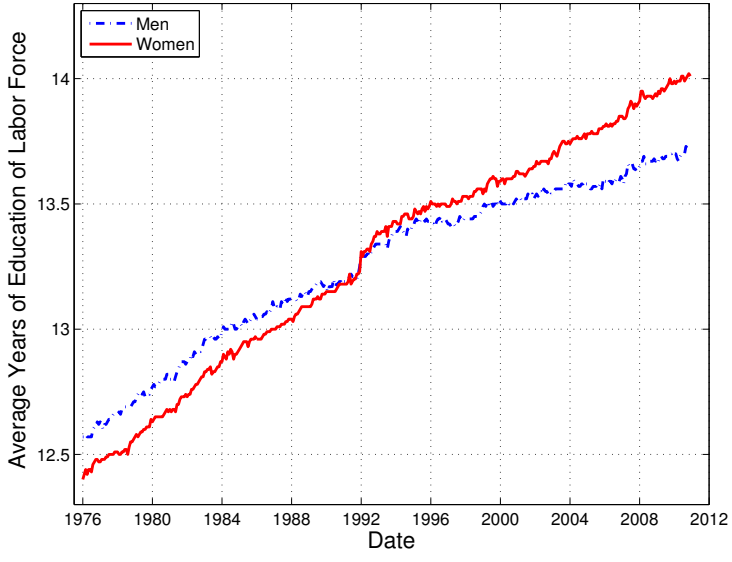
- Female workers were relatively younger and less educated earlier

  $\Longrightarrow$ higher female unemployment rate

Average Age and Education by Gender



Age



Skill

- Female workers were younger and relatively less educated earlier.

Can Age and Skill Composition Explain the Evolution of the Gap?

- Unemployment rate at month t for women is:

$$u_{f,t} = \sum_s u^s_{f,t} \frac{L^s_{f,t}}{L_{f,t}}$$

  where $u^s_{f,t}$ is the unemployment rate for group s and $L^s_{f,t}/L_{f,t}$ is labor force share of group s for women at month t.

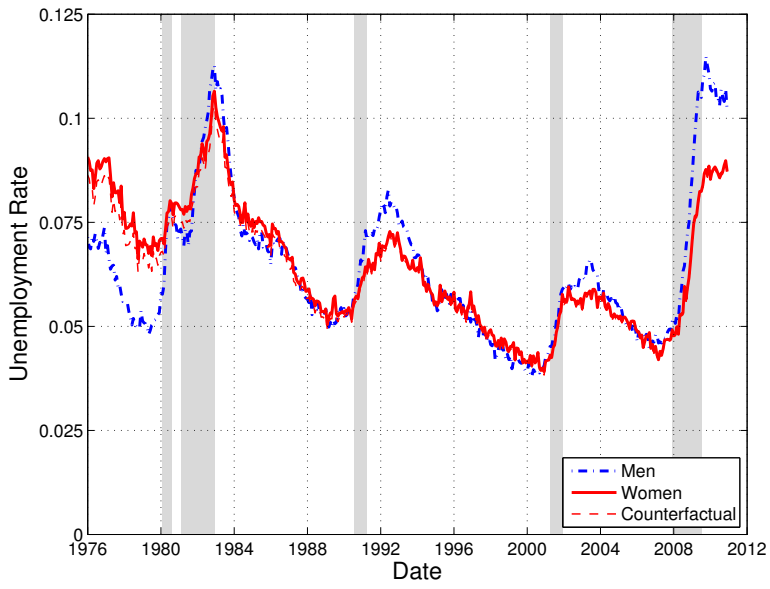
- To isolate the effect of composition, we calculate a *counterfactual* unemployment rate for women:

$$u^C_{f,t} = \sum_s u^s_{f,t} \frac{L^s_{m,t}}{L_{m,t}}$$

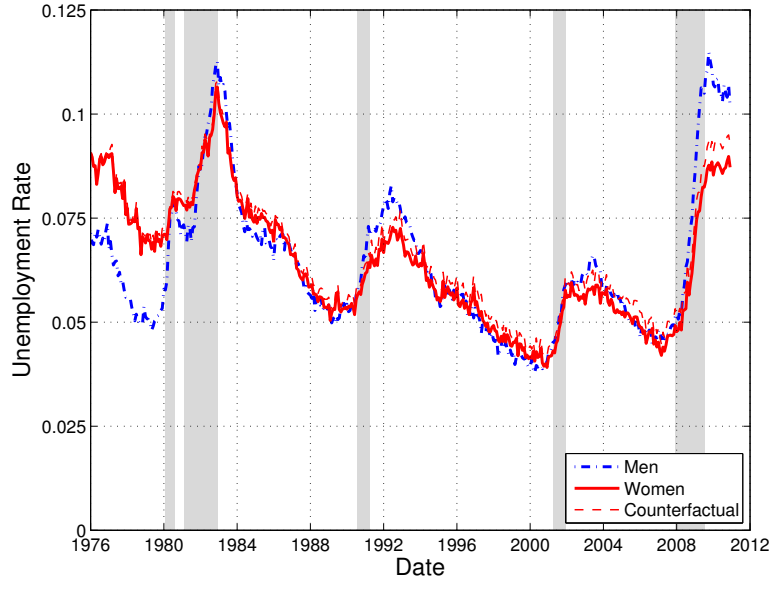
  where $L^s_{m,t}/L_{m,t}$ is the share of group s for men.

- Age groups: $\{16-24, 25-54, 55+\}$
- Skill Groups: <HS, HS, Some college, College+ for age 25+

Can Age and Skill Composition Explain the Evolution of the Gap?



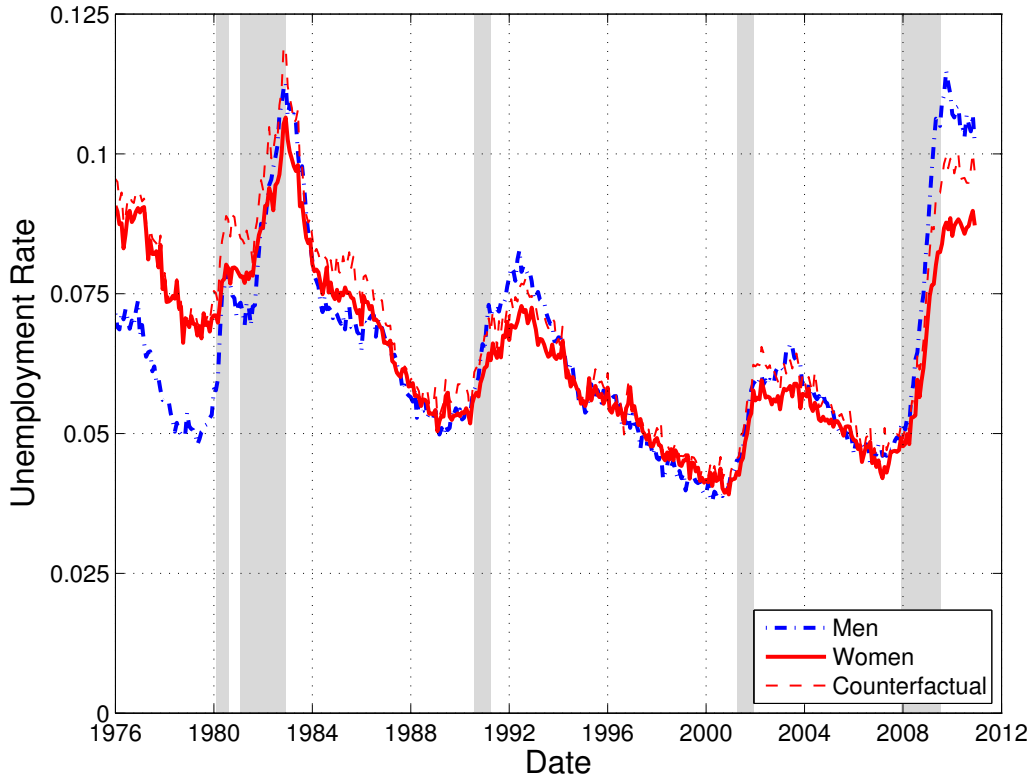
Age



Skill

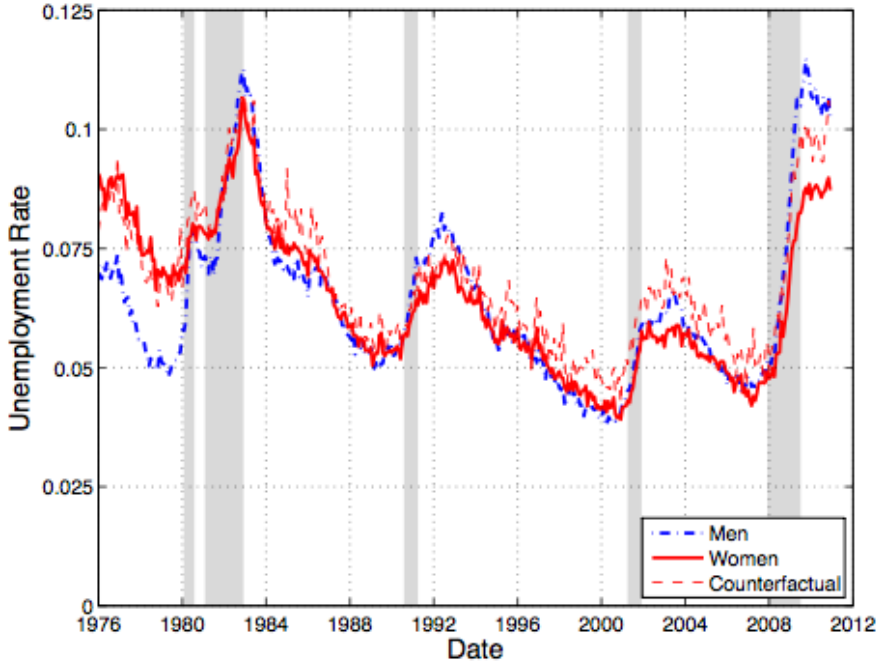
- Small quantitative effect of gender differences in age and skill composition

Can the Industry Composition Explain the Evolution of the Gap?



- Higher share of men in goods producing sector.
- Industry composition explains approximately half of the gender gap in unemployment during recessions.

Can the Occupational Distribution Explain the Evolution of the Gap?



- Higher share of men in production occupations, and of women in sales and office occupations.
- Relatively high unemployment rates for women in production occupations.

Model

Model

- 3-state search model of the labor market:
  - Male and female individuals
  - Skill heterogeneity: skilled (college graduate), unskilled (less than college)
  - Opportunity cost of work, x, stochastic, differs by gender to reflect differences in home production opportunities
    - x distribution is Pareto, $F_j(x)$ for $j = f, m$, iid

Agents

- The flow values depend on agents' realized value of opportunity cost of work (x) and their labor market status.
  - Worker:
$$v_{ij}^{W}(x) = w + (1 - e)x$$
  - Unemployed:
$$v_{ij}^{S}(x) = (1 - s)x$$
  - Non-participant:
$$v_{ij}^{H}(x) = x$$

  for $i = s, u$ and $j = f, m$
  where
  w is the wage,
  $e \in (0, 1]$ is the fraction of time devoted to market work if E,
  $s \in [0, 1]$ is the fraction of time devoted to job search if U.

Timing

- Employed agents may experience an exogenous separation shock δ_{ij}.
- Unemployed agents may receive a job offer with probability p_{ij}.
- Each individual draws a new value of opportunity cost of work in each period with probability λ_{ij}.
- The opportunity cost of work, separation and job finding shocks are all realized at the same time *before* the agents make any decisions.

Agents' Decisions

- Value functions:
  - Employed: $W_{ij}(x)$
  - Unemployed: $S_{ij}(x)$
  - Out of the labor force: $H_{ij}(x)$
- Employed:

$$
\begin{aligned}
W_{ij}(x) = {} & v_{ij}^{W}(x) \\
& + (1-\lambda_{ij})\beta\left[(1-\delta_{ij})W_{ij}(x) + \delta_{ij} max\left\{S_{ij}(x), H_{ij}(x)\right\}\right] \\
& + \lambda_{ij}\beta\int_{\underline{x}_j}^{\overline{x}_j}\left[(1-\delta_{ij})max\left\{W_{ij}(x'), S_{ij}(x'), H_{ij}(x')\right\} + \delta_{ij} max\left\{S_{ij}(x'), H_{ij}(x')\right\}\right] dF_j(x')
\end{aligned}
$$

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\end{aligned}
$$

Agents' Decisions

- Unemployed:

$$
\begin{aligned}
&S_{ij}(x) = v_{ij}^{S}(x) \\
&+(1-\lambda_{ij})\beta\left[p_{ij} * max\left\{W_{ij}(x), S_{ij}(x)\right\} + (1-p_{ij})S_{ij}(x)\right] \\
&+\lambda_{ij}\beta\int_{\underline{x}_j}^{\overline{x}_j}\left[p_{ij} * max\left\{W_{ij}(x'), S_{ij}(x'), H_{ij}(x')\right\} + (1-p_{ij})max\left\{S_{ij}(x'), H_{ij}(x')\right\}\right] dF_j(x')
\end{aligned}
$$

- Out of the labor force:

$$
\begin{aligned}
H_{ij}(x) = v_{ij}^{H}(x) &+ (1-\lambda_{ij})\beta H_{ij}(x) \\
&+ \lambda_{ij}\beta\int_{\underline{x}_j}^{\overline{x}_j} max\left\{S_{ij}(x'), H_{ij}(x')\right\} dF_j(x')
\end{aligned}
$$

Agents' Decisions

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\begin{aligned}
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&+(1-\lambda_{ij})\beta\left[p_{ij} * max\left\{W_{ij}(x), S_{ij}(x)\right\} + (1-p_{ij})S_{ij}(x)\right] \\
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&+ \lambda_{ij}\beta\int_{\underline{x}_j}^{\overline{x}_j} max\left\{S_{ij}(x'), H_{ij}(x')\right\} dF_j(x')
\end{aligned}
$$

Firms

- Firms post vacancies to hire workers. There is free entry.
  - Unemployed workers meet firms according to a matching function, $M(u; v)$.
  - If a firm is matched with a worker, the worker produces in that period.
  - Next period, the worker may quit or the job may be exogenously destroyed.

Wage Determination Mechanism

- Labor markets are segmented by skill.
- Individual opportunity cost of work, x, private information. Distribution of x by gender publicly known.
- *Male wages* are set by standard surplus splitting scheme within each skill group.
- We consider several alternatives for *female wages*:
  - Benchmark: Female wages set to render firms *indifferent* between hiring workers of a given skill level $\Longrightarrow$ $p_{if} = p_{im}$.
  - Alternatives: Labor markets segmented by skill and gender.
    - Surplus splitting by skill and gender, with same bargaining power.
    - Exogenous gender wage gap.
    - Different bargaining power, set to match the gender wage gap.

Firms

- Value of a filled job:

$$J_{ij} = y_i - w_{ij} + \beta \left\{ \int_{\underline{x}_j}^{min\left\{x_{ij}^q, x_{ij}^a\right\}} \left[(1-\delta_{ij}) J'_{ij} + \delta_{ij} V_i \right] dF_j(x') + \int_{min\left\{x_{ij}^q, x_{ij}^a\right\}}^{\overline{x}_j} V_i \, dF_j(x') \right\}$$

- Male wages solve a surplus splitting problem:

$$w_{im} = argmax_w \left[\int_{\underline{x}_m}^{\overline{x}_m} \left(W_{im}(x; w) - max\left\{ H_{im}(x), S_{im}(x) \right\} \right) dF_m(x) \right]^{\gamma} \left[J_{im} - V_i \right]^{1-\gamma}$$

  - Wages do not depend on x, which is privately observed.

- Condition to determine female wages for benchmark case:

$$J_{if} = J_{im}$$

Qualitative Implications of the Model

- Gender differences in the distribution of the opportunity cost of market work determine the gender gaps in labor force participation and unemployment in equilibrium.
- For the benchmark female wage determination mechanism, the gender wage gap is also endogenous:
  - Since women have greater opportunity cost of work they have higher quit rates
    $\Longrightarrow$ lower surplus for the firm $\Longrightarrow$ lower wages.
- For the other mechanisms the gender wage gap by skill is exogenous, or counterfactual for surplus splitting by skill and gender.

Quantitative Analysis

Calibration

- Monthly model, calibrated to 25+ old workers
- We choose 1978 as a base year
  - first available midpoint between unemployment trough and peak
- Parameters set based on empirical evidence:
  - Educational composition of the labor force by skill and gender
  - Other variables: time devoted to work and job search
  - Matching function parameters
- Workers' bargaining power set equal to the elasticity of the matching function with respect to unemployment
- Remaining parameters calibrated to match:
  - participation and unemployment rates by gender, skill premium
  - EE by gender and EU rates by skill

Calibration

Parameters calibrated to match data moments

e	s	β	α	γ	μ	c	$\underline{x}_f$	$\underline{x}_m$
0.625	0.15	0.996	0.72	0.72	0.15	8.7	0	0

		Pop. share	δ	λ	$\bar{x}$	κ	y_s/y_u
Women	Unskilled	0.465	0.0042	0.0096	9.73	50	1.46
	Skilled	0.067	0.0048	0.0123			
Men	Unskilled	0.375	0.0084	0.0120	7.13	5	1.46
	Skilled	0.093	0.0042	0.0100			

Calibration

Data targets and model outcomes

	Data		Model	
	Women	Men	Women	Men
Unemployment	0.052	0.034	0.052	0.034
LFP	0.468	0.788	0.468	0.788
EU Rate	0.010	0.009	0.010	0.009
EE Rate	0.95	0.98	0.96	0.98
Skill premium	1.49		1.49	
	Data		Model	
	Skilled	Unskilled	Skilled	Unskilled
EU Rate	0.005	0.010	0.006	0.010
EE Rate	0.98	0.96	0.98	0.97

Flows

- 3-state models typically have difficulty matching U-to-N flows.

  Garibaldi and Wasmer (2006), Krusell, Mukoyama, Rogerson, and Şahin (2010, 2011)

- Some part of these flows is likely to be due to misclassification error, more so for women.

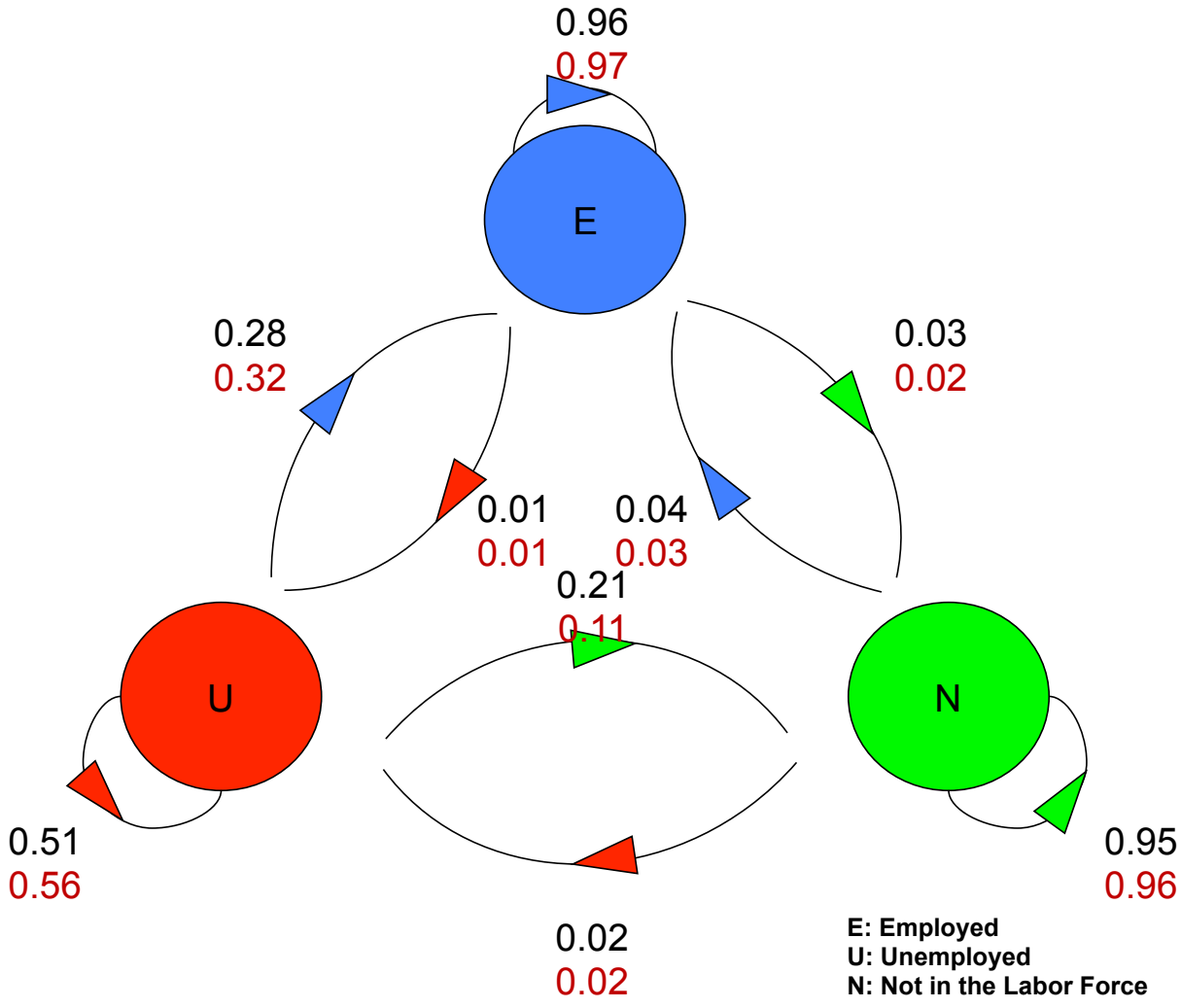
  (Abowd and Zellner 1985, Poterba and Summers 1986)

True status	Recorded status	True status	Recorded status
Males	N	Females	N
U	7.8%	U	11.5%
E	0.7%	E	1.5%

Source: Abowd and Zellner (1985)

- We introduce misclassification error to the outcomes of our model, following Abowd and Zellner (1985).

Aggregate Flow Rates: Data and Model



Experiment: Rise in Labor Force Attachment

- We make the following changes in our calibration to match 1996 data:
  - Composition of the population by skill and gender.
  - Productivity differences between the high skill and low skill workers to match the skill premium.
  - *EU* transition rate (same for both genders).
- We then change $\overline{x}_f$ and $\overline{x}_m$ to match participation rates by gender in 1996, *without* targeting unemployment.
- By matching attachment, we can fully account for the decline in the gender unemployment gap.

Experiment: Labor Force Attachment

	1978		1996	
Labor Force Participation Rate	Data	Model	Data	Model
Women	46.8%	46.8%	58.8%	58.8%
Men	78.8%	78.8%	76.3%	76.3%
Gap (ppts)	32	32	17.5	17.5
Percentage Gap	51.8%	51.8%	26.1%	26.1%

Experiment: Labor Force Attachment

The Gender Unemployment Gap

	1978		1996	
Unemployment Rate	Data	Model	Data	Model
Women	5.2%	5.2%	4.5%	4.9%
Men	3.4%	3.4%	4.2%	4.5%
Gap (ppts)	1.8	1.8	0.3	0.4
Percentage Gap	41%	41%	7.0%	8.5%

Labor Force Attachment and the Unemployment Rate

- Both E and U rise with attachment, but, as in the data, E/U rises $\Longrightarrow$ $u = \frac{1}{1+E/U}$ falls with attachment.

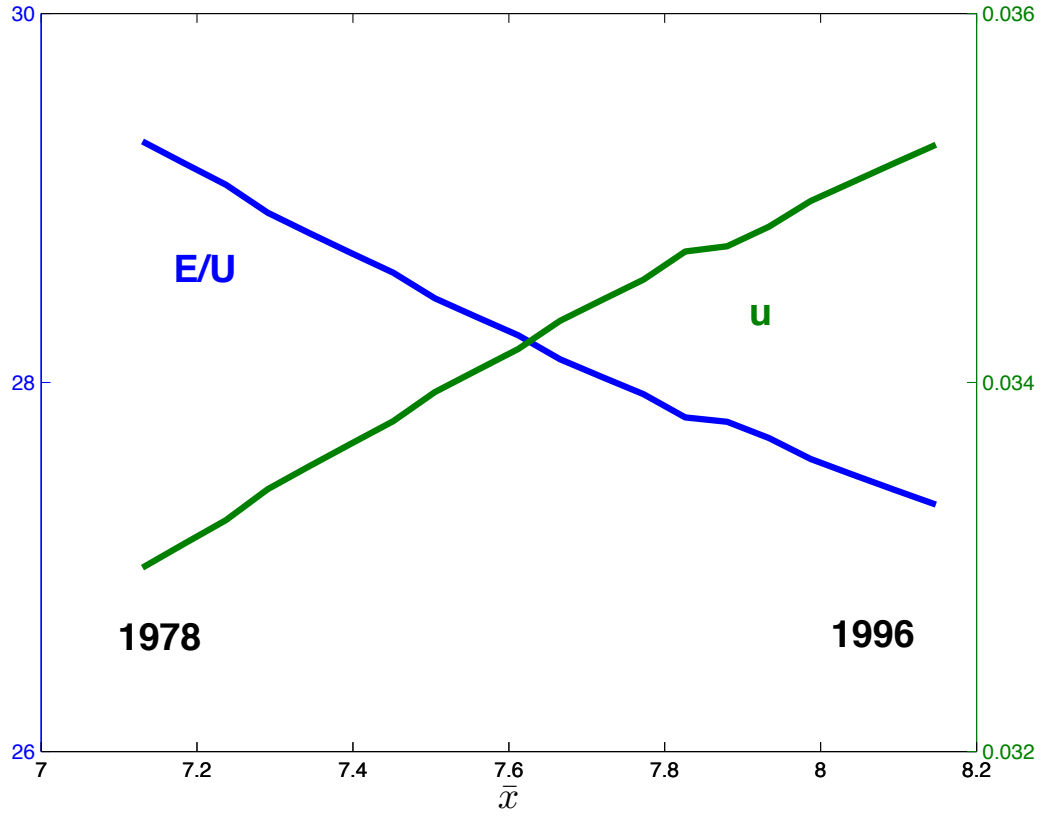


Figure: Sensitivity to $\overline{x}$ for men in the calibrated model

Experiment: Other Contributing Factors

	LFPR		Unemployment Rate	
	Gender Gap (ppts)	Gender Gap (fraction of *lfpr*)	Gender Gap (ppts)	Gender Gap (fraction of *u*)
1996 Data	17.5	26.1%	0.3	7.0%
Benchmark	17.5	26.1%	0.4	8.5%
EU	29.2	45.3%	1.0	20.4%
Skill comp.	31.8	50.3%	1.6	40.0%
Skill premium	32.4	50.2%	1.7	41.5%

Alternative Wage Setting Mechanisms

The Gender Unemployment Gap

- We calibrate the model to 1978 with the alternative wage determination mechanisms, and replicate the same exercise.

	Unemployment Rate		Gender Gap	
	Men	Women	ppts	as a fraction of u
1996 Data	4.2%	4.5%	0.3	7.0%
Benchmark	4.5%	4.9%	0.4	8.5%
Surplus splitting by gender	4.6%	4.8%	0.2	4.5%
Exogenous gender wage gap	4.6%	4.7%	0.1	2.8%
Different bargaining power	4.6%	4.7%	0.1	2.0%

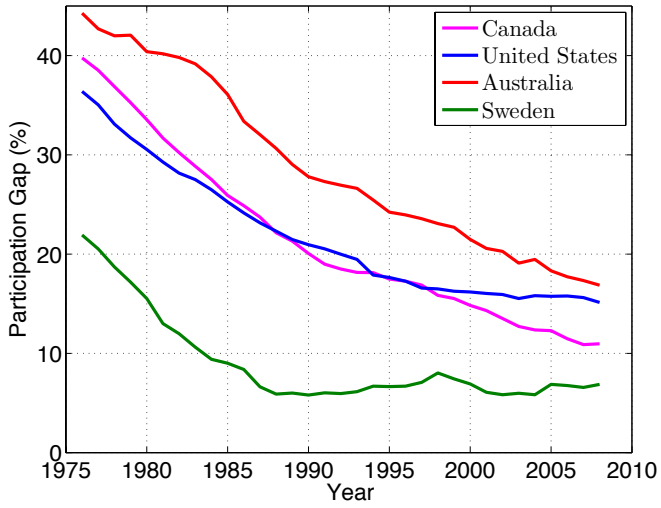
Alternative Wage Setting Mechanisms

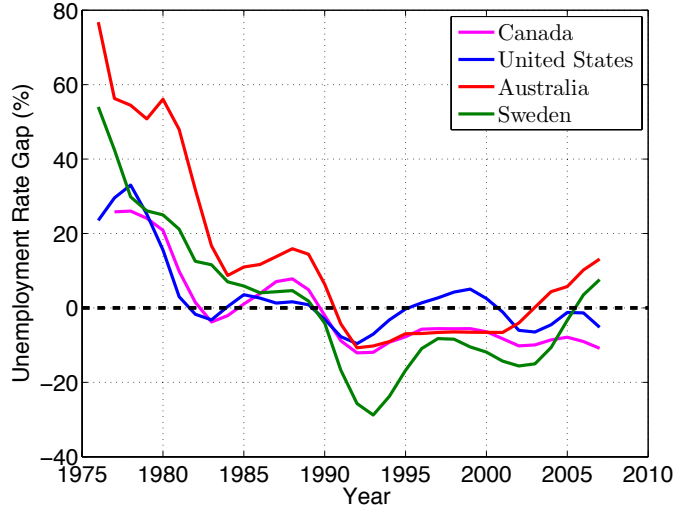
The Gender Wage Gap

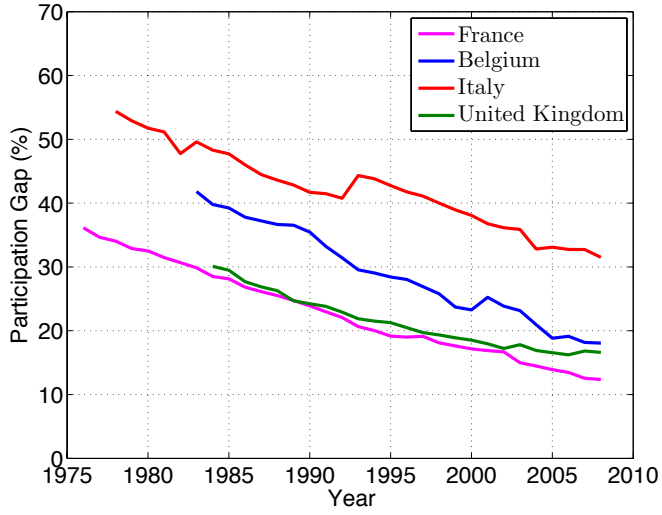
- *Benchmark*:
  - Captures only a small fraction of the gender wage gap in 1978. No gender differences in wages in 1996.
- *Surplus splitting by gender*:
  - Women's surplus conditional on the wage is smaller than men's $\Longrightarrow$ Counterfactual gender wage gap, conditional on skill.
- *Exogenous female wages:*
  - Set to match empirical gender wage gap in each year.
- *Different bargaining power by gender:*
  - Set to match empirical gender wage gap in 1978 $\Longrightarrow$ $\gamma^f = 0.26$, $\gamma^m = 0.72$.

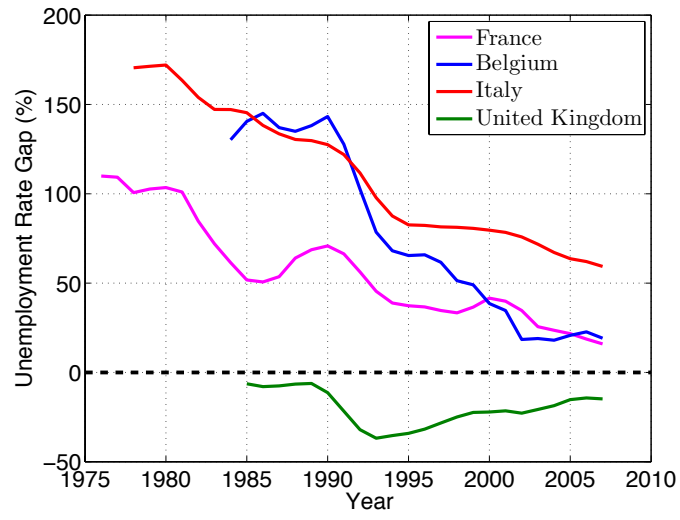
International Evidence

International Evidence









Source: OECD. *Participation Gap* $= \frac{L_m - L_f}{L_m}$, *Unemployment Gap* $= \frac{u_f - u_m}{u_m}$.

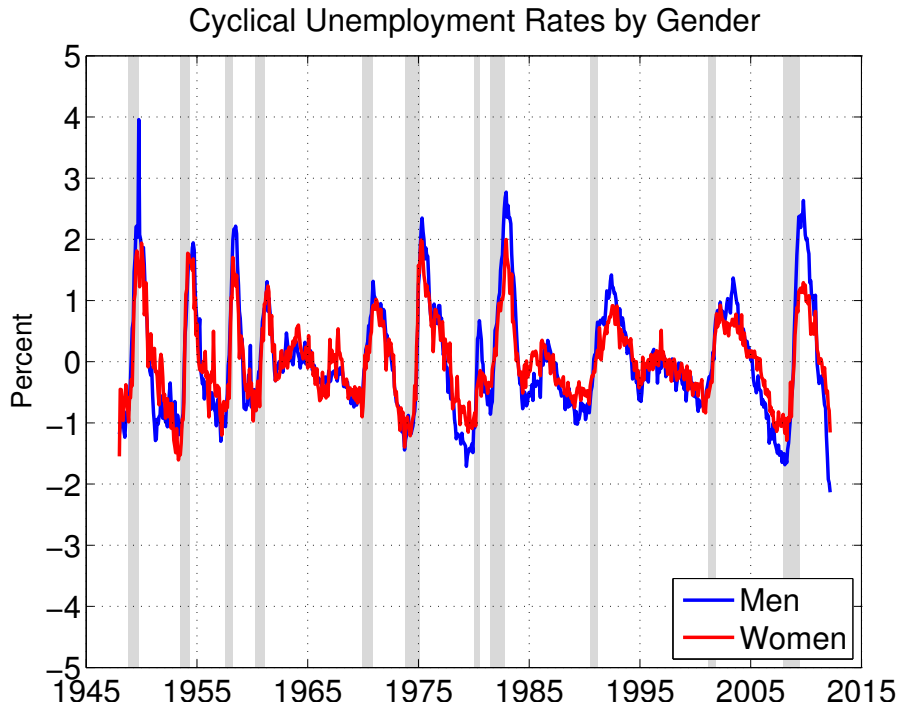
International Evidence

- A decline in the gender participation gap is associated with a decline in the gender unemployment gap.
- The gender unemployment gap disappears in countries that have achieved a substantial convergence in participation by gender.
- Countries in which the current participation gap is still substantial display large gender unemployment gaps.

Cyclical Properties

Cyclical Properties

- Men experience greater job losses in recessions, causing a reverse gender unemployment gap at the unemployment peak.

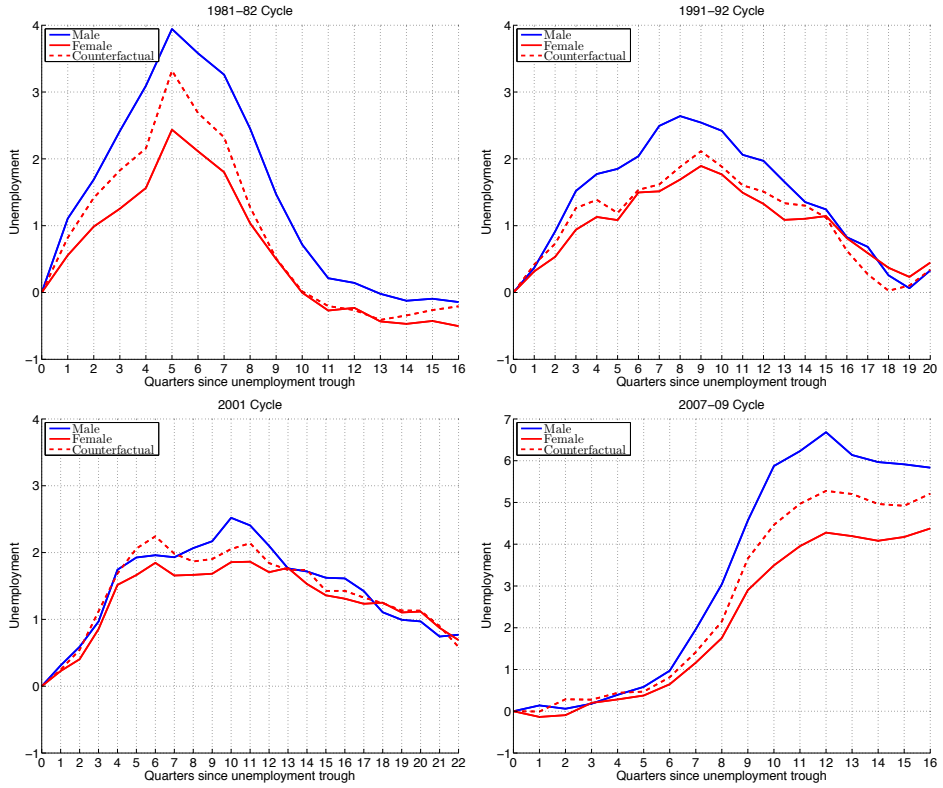


- This pattern has been stable over time and is driven by greater inflows into unemployment for men.

Cyclical Properties

Industry Composition: Household Data

- Industry composition can account for approximately half of the gender gap in unemployment during recessions. (See also Shin 2000.)



Cyclical Properties

Industry Composition: Payroll Data

Actual and counterfactual employment changes during recessions:

Recessions	Men Actual	Women Actual	Women Counterfactual
12/1969-12/1970	-1.35%	+0.69%	-0.65%
10/1973-5/1975	-3.26%	+2.16%	-0.31%
5/1979-7/1980	-2.04%	+3.11%	-1.86%
7/1981-11/1982	-4.97%	-0.52%	-2.28%
7/1990-6/1992	-2.74%	0.81%	-1.70%
12/2000-6/2003	-3.16%	-0.72%	-4.72%
8/2007-10/2009	-8.34%	-3.28%	-7.47%

- Industry composition can explain virtually all the gender difference in employment change in the last three recessions, it is less important for earlier recessions.

Cyclical Properties

Industry Composition: Payroll Data

Actual and counterfactual employment changes during recoveries:

Recoveries	Men Actual	Women Actual	Women Counterfactual
12/1970-12/1973	+8.06%	+14.12%	+16.22%
5/1975-5/1978	+9.31%	+18.72%	+20.83%
7/1980-7/1983	-2.84%	+5.52%	+4.11%
11/1982-11/1985	+8.13%	+14.42%	+14.59%
6/1992-6/1995	+7.92%	+7.81%	+7.04%
6/2003-6/2006	+5.98%	+3.38%	+3.24%
10/2009-4/2012	+5.17%	+2.25%	+0.77%

- Industry composition does not explain the gender difference in employment change in recoveries.

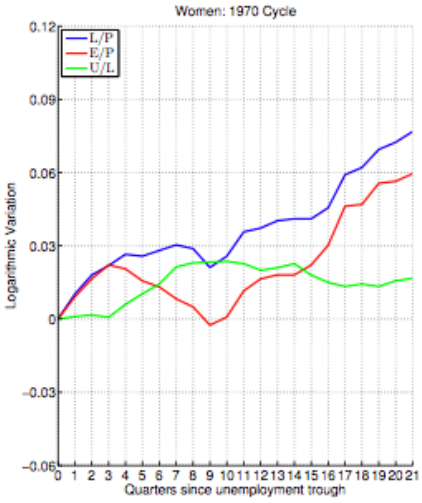
Cyclical Properties

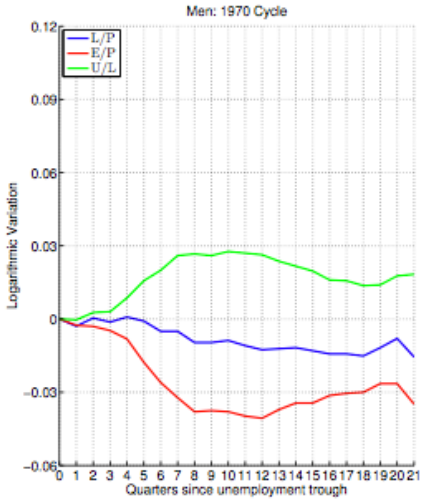
Participation, Employment and Unemployment

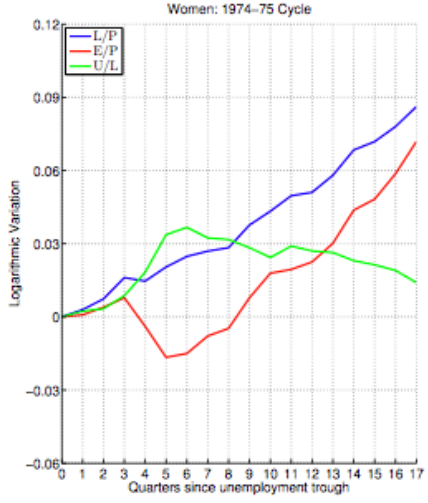
- Gender differences in employment growth during recessions and recoveries are associated with changes over time in trends in participation by gender.
- In early cycles, female employment was strongly rising in recessions and recoveries, following the trend in participation.
- In later cycles, female participation stopped rising, and affecting the cyclical behavior of female employment.
- Male participation and employment behavior is similar in early and recent cycles.

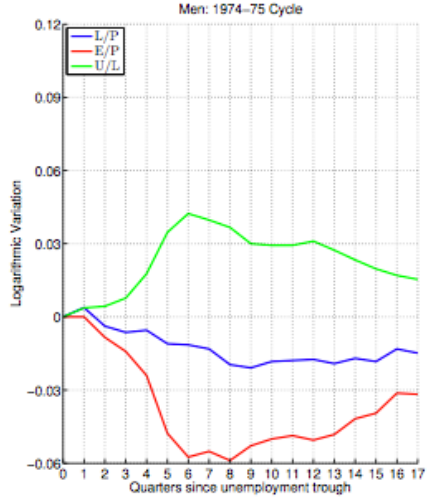
Cyclical Properties

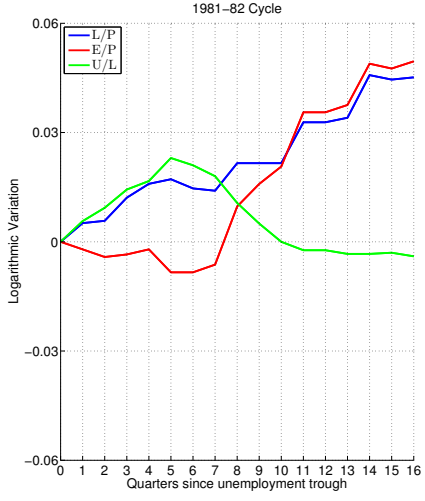
Participation, Employment and Unemployment: Early Cycles

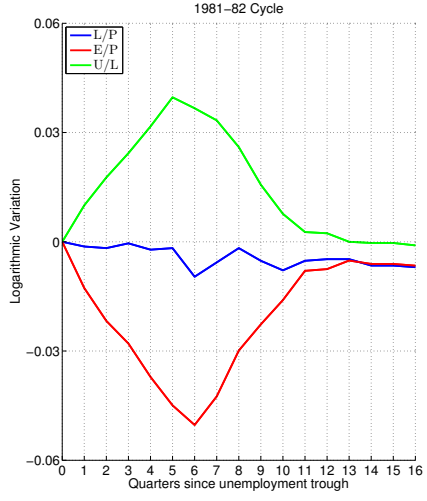






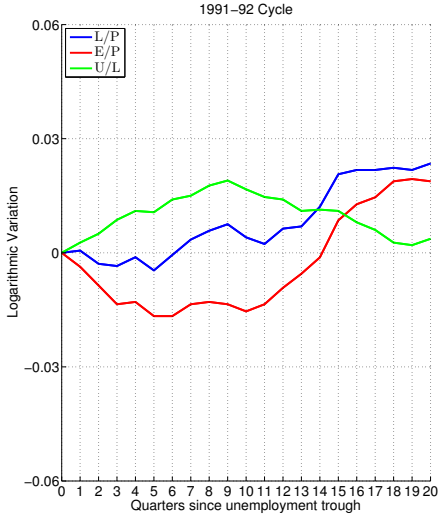


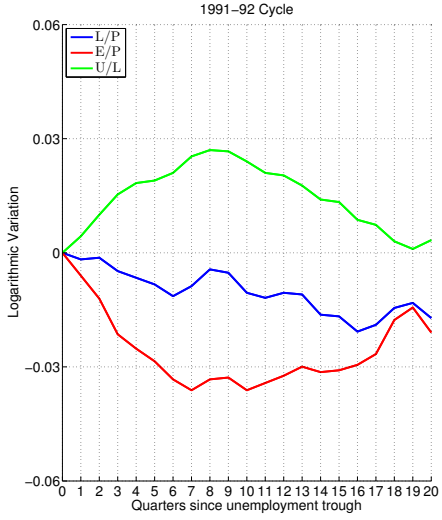


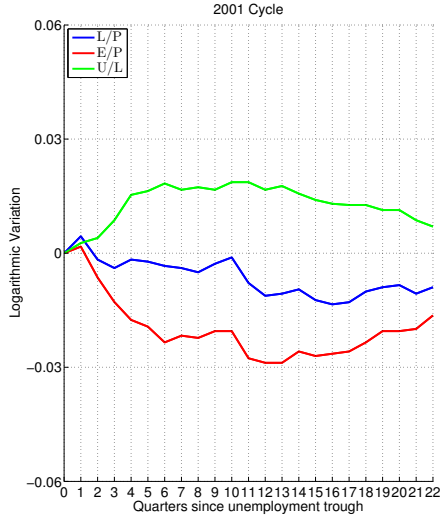


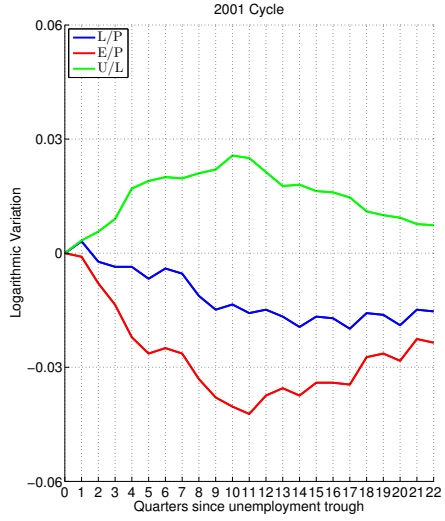
Cyclical Properties

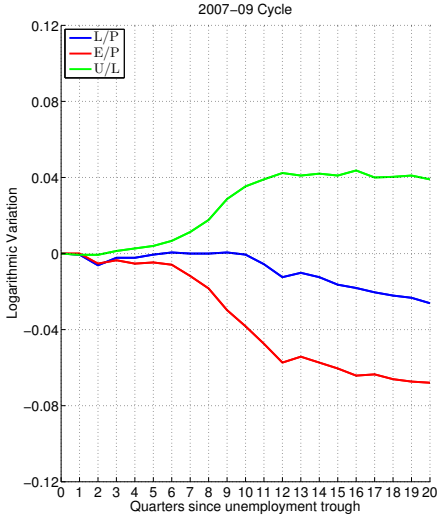
Participation, Employment and Unemployment: Recent Cycles

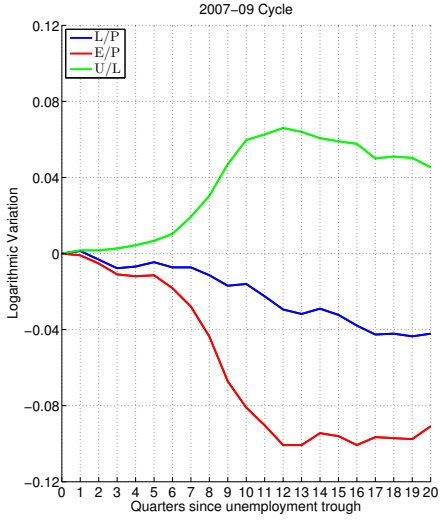








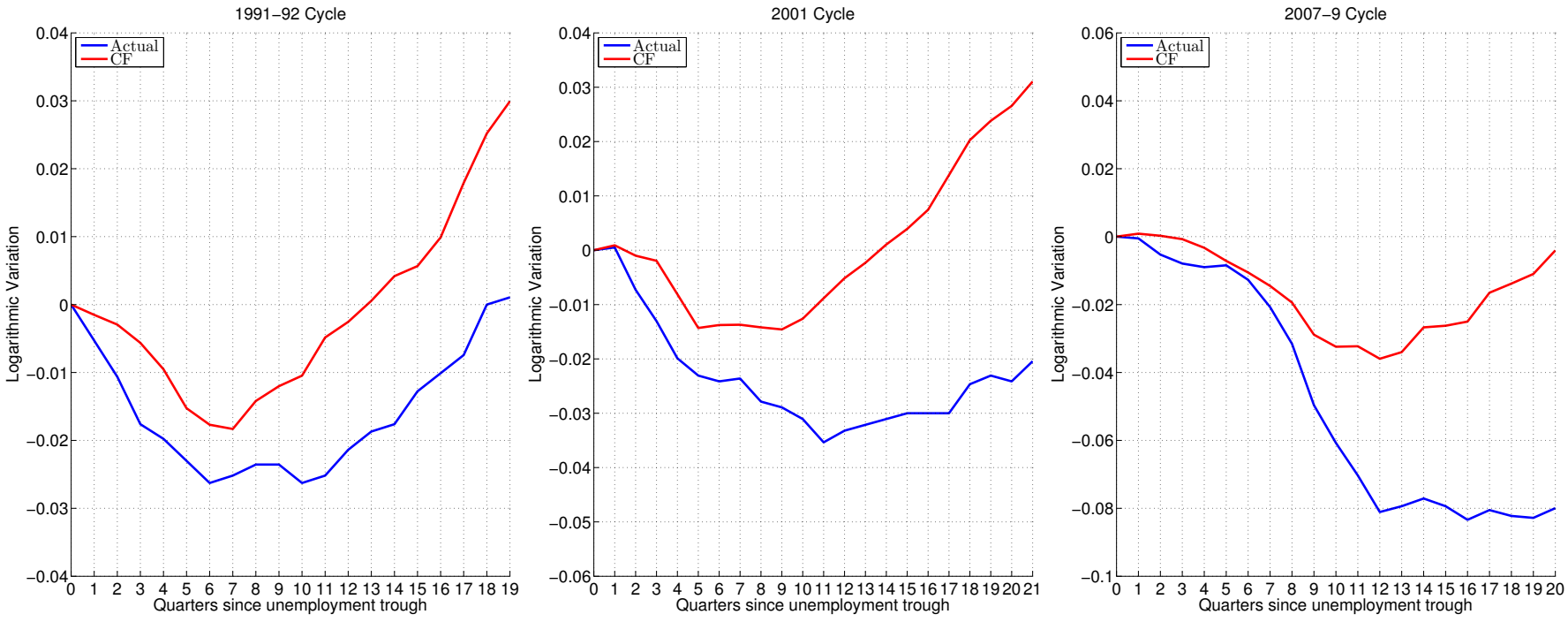




Cyclical Properties

Aggregate Employment: Jobless Recoveries

- The flattening of female labor force participation since the early 1990s can account for the recent jobless recoveries.



E/P counterfactual: Female E/P replaced with average for early recessions.

Conclusions

- Our 3-state model captures the joint evolution of gender participation and unemployment gaps in the US quite well.
- The convergence in labor force attachment by gender seems to be the main factor explaining the decline in the gender unemployment gap.
- The link between convergence in attachment and decline in the gender unemployment gap is supported by evidence from OECD countries.
- At the cyclical frequency, gender differences in industry distribution account for a large fraction of the gender unemployment gap in recent recessions for the US.
- The flattening of female participation since the early 1990s can account for the joblessness of recoveries in recent cycles.

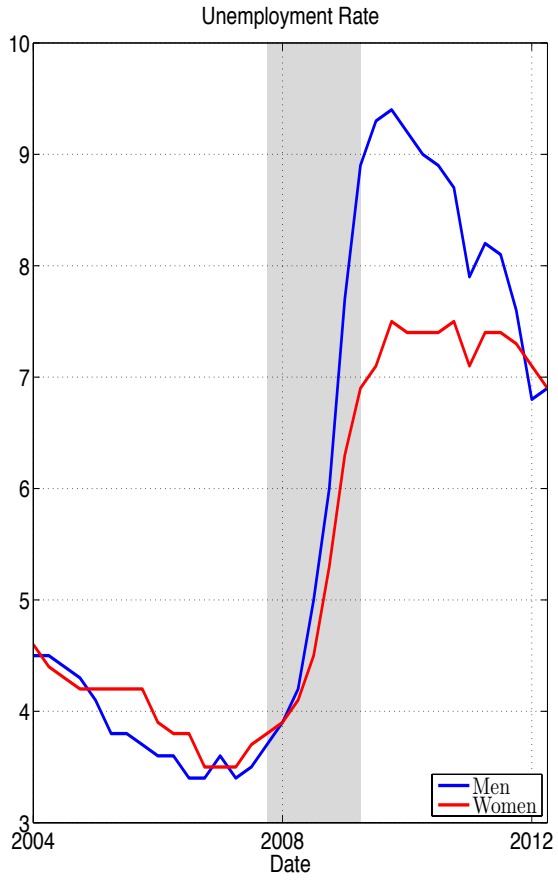
The 2007-2009 Cycle

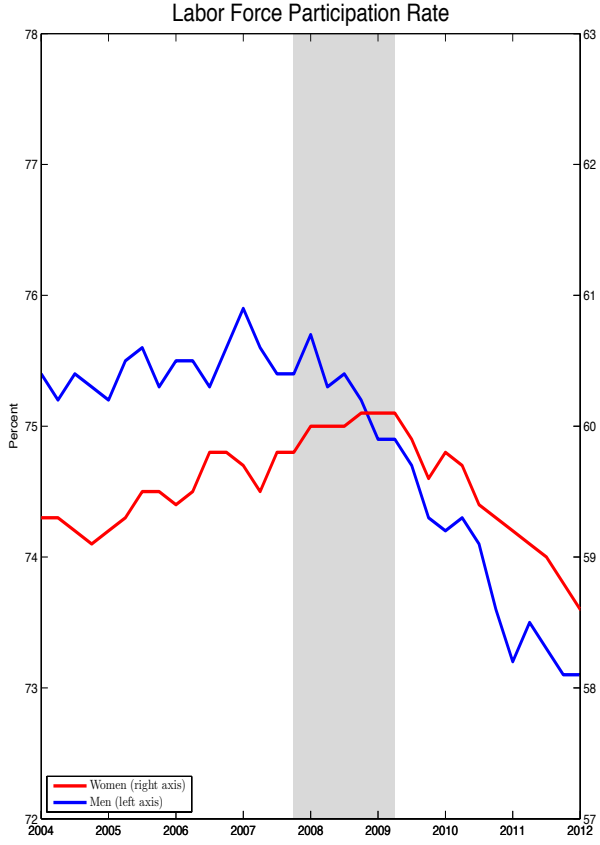
- The male-female difference in unemployment rates reached 2.7 ppts in the 2007-2009 recession.
- Men experienced larger job losses during the recession, while women experience smaller job creation during the recovery.
- Sectoral composition accounts for majority of gender difference in job losses during the recession, but it cannot explain the gender differences in job creation during the recovery.

The 2007-2009 Cycle

The Link Between Participation and Unemployment

- The 2007-2009 cycle is characterized by a particularly slow recovery of the unemployment rate, and at the same time a sizable decline in participation, for both men and women.





The 2007-2009 Cycle

The Link Between Participation and Unemployment

- Our model suggests that the decline in participation may be in part responsible for the slow recovery of unemployment, as the decline in attachment puts upward pressure on the unemployment rate.
- To assess the strength of this mechanism, we run run the following experiment:
  - We change parameters to match the skill composition, the skill premium, UE and EU flows to 2011 data.
  - We then reduce attachment by adjusting the distribution of x to match the labor force participation rate by gender in 2011.

The 2007-2009 Cycle

The Link Between Participation and Unemployment

- The model predicts that the decline in attachment causes a rise in unemployment.
- Changes in labor market conditions alone do not give rise to a decline in participation in the model.

	LFPR		Unemployment Rate	
	Men	Women	Men	Women
2001 Data	0.73	0.59	0.079	0.073
Benchmark	0.73	0.59	0.109	0.100
EU	0.78	0.65	0.056	0.051
EU and *UE*	0.79	0.64	0.087	0.083

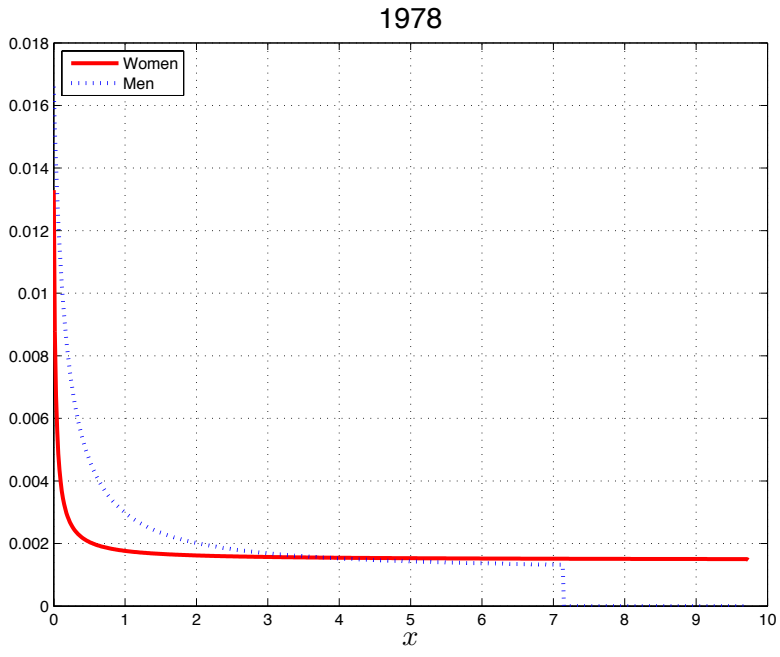
The 2007-2009 Cycle

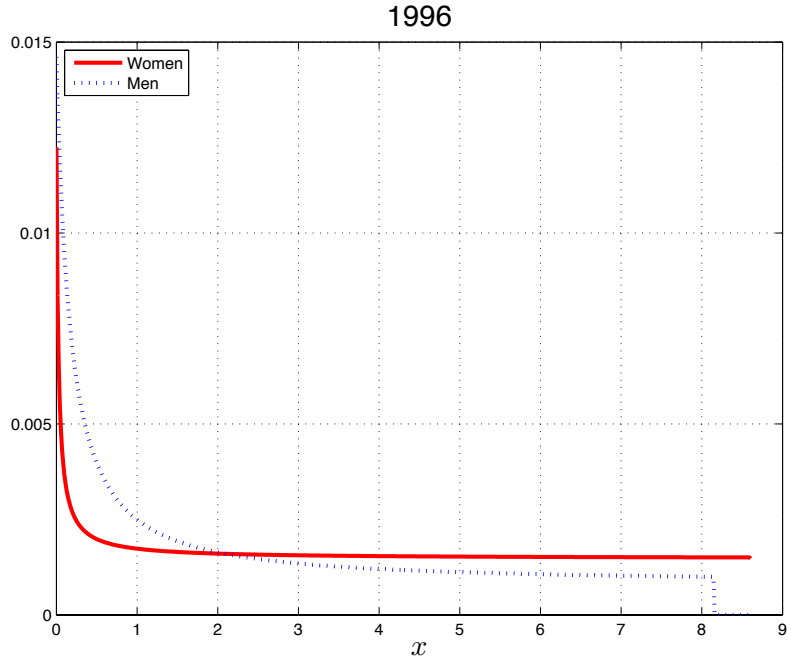
The Link Between Participation and Unemployment

- The model also matches the empirical rise in the *NU* rate.

	2011		Flows		
	Data	Model	Data	2011	1996
Unemployment					
Women	0.073	0.100	*EU* Rate	0.014	0.012
Men	0.079	0.109	*UE* Rate	0.162	0.272
LFPR					
Women	0.59	0.59	*UN* Rate	0.187	0.211
Men	0.73	0.73	*NU* Rate	0.026	0.018

Distribution of x by gender

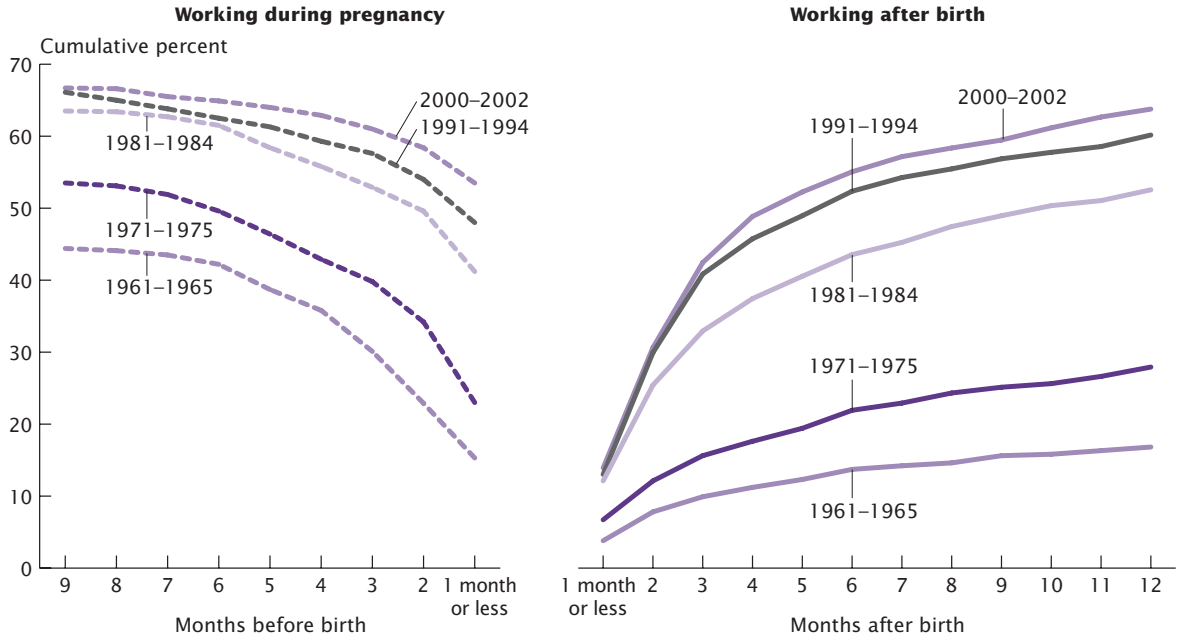




Women's Non-Participation Spells

Figure 4.

Percent of Women Working During Pregnancy and Percent Working After Their First Birth by Month Before or After Birth: Selected Years, 1961–1965 to 2000–2002



Source: 1961–1965 to 1981–1984: Bureau of the Census, Current Population Reports, Series P-23, No. 165 (*Work and Family Patterns of American Women*), Table B-5; 1991–1994: P70-79 (*Maternity Leave and Employment Patterns: 1961–1995*), Figure 7; and 2000–2002: Survey of Income and Program Participation, 2004 Panel, Wave 2.

Source: 2008 Current Population Report on "Maternity leave and Employment Patterns of First Time Mothers: 1961-2003."

Experiment: Labor Force Attachment

The Gender Wage Gap

Ratio of men's wages to women's wage:

	1978		1996	
	Data	Model	Data	Model
Unskilled	1.65	1.10	1.40	1.02
Skilled	1.72	1.12	1.49	1.01