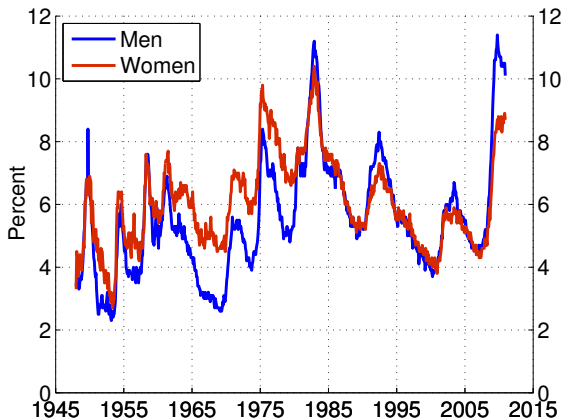


# The Gender Unemployment Gap

Stefania Albanesi, Columbia University, NBER and CEPR  
Aysegul Sahin, Federal Reserve Bank of New York

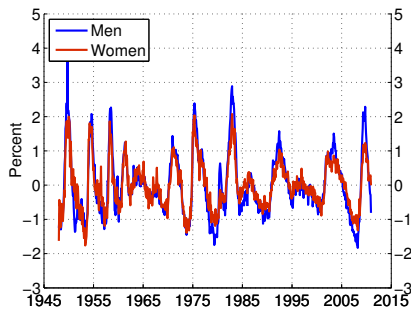
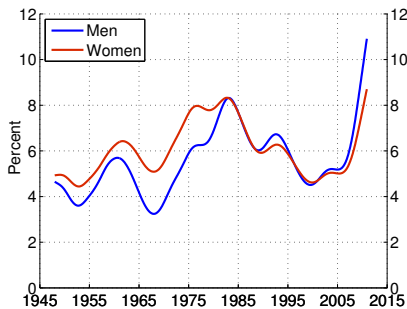
St. Louis Fed Seminar: October 11, 2011

# The Gender Unemployment Gap



- ▶ The gender unemployment gap was positive until 1980.
- ▶ After 1980, the gender unemployment gap virtually disappeared.

# Trend and Cyclical Components



- ▶ The gender gap in trend unemployment rates vanished by 1980.
- ▶ Instead, the cyclical properties of the gender gap in unemployment have been steady over the last 60 years.

# Hypothesis

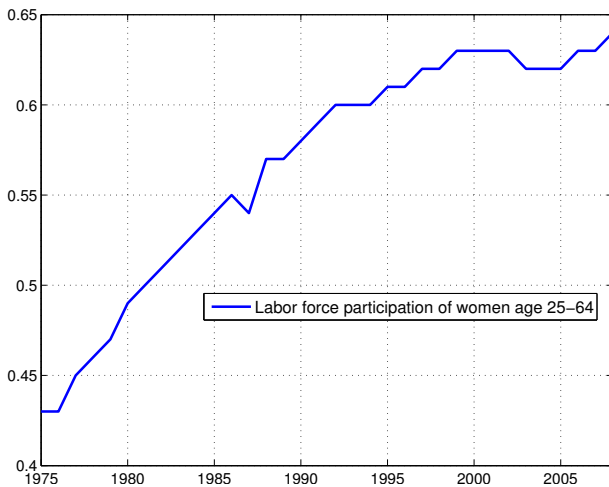
- ▶ Our hypothesis is that the positive gender unemployment gap was due to women's lower labor market attachment.
- ▶ Women experience more frequent spells of non-participation (Royalty, 1998), especially in childbearing years (Goldin, 1990).
  - ▶ With labor market frictions, more frequent non-participation spells increases average unemployment for women relative to men.

# Hypothesis

- ▶ Our hypothesis is that the positive gender unemployment gap was due to women's lower labor market attachment.
- ▶ Women experience more frequent spells of non-participation (Royalty, 1998), especially in childbearing years (Goldin, 1990).
  - ▶ With labor market frictions, more frequent non-participation spells increases average unemployment for women relative to men.
- ▶ The rise in in women's labor force attachment causes the gender unemployment gap to close.

# Hypothesis

Rise in women's labor force attachment



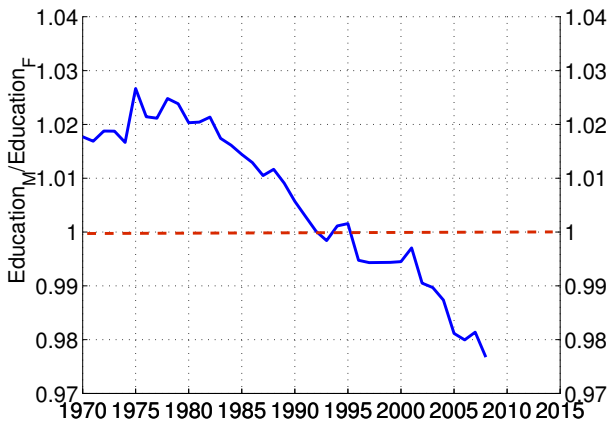
# Outline

- ▶ Alternative hypotheses
- ▶ Model
- ▶ Quantitative analysis
- ▶ Remarks on recent recession

# 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  
[Clark and Summers (1981), Gomme, Rogerson, Rupert, and Wright (2004), Kydland (1984), Mincer (1991), Shimer (1998)]
- ▶ Female workers were relatively younger and less educated pre-1980  $\implies$  higher female unemployment rate

## Gender Education Ratio



- ▶ Female workers were relatively less educated pre-1990.

## Can the Evolution of Skill Composition Explain the Evolution of the Gap?

- ▶ Unemployment rate for women at month  $t$  is:

$$u_{w,t} = \sum_s u_{w,t}^s \frac{l_{w,t}^s}{l_{w,t}}$$

where  $u_{w,t}^s$  is the unemployment rate for skill group  $s$  and  $l_{w,t}^s/l_{w,t}$  is the share of skill group  $s$  for women at month  $t$ .

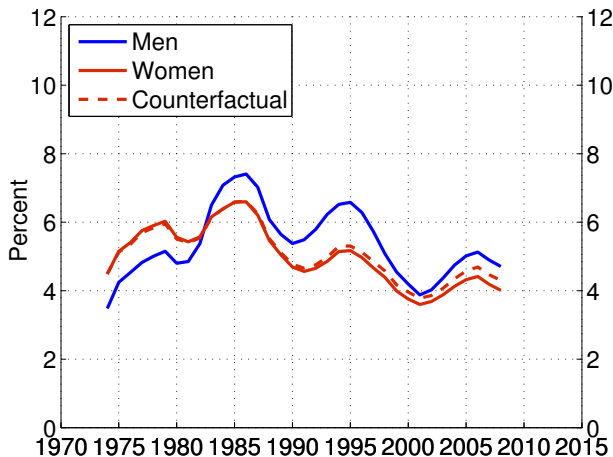
- ▶ To isolate the effect of skill composition, we calculate a *counterfactual* unemployment rate

$$u_{w,t}^C = \sum_s u_{w,t}^s \frac{l_{m,t}^s}{l_{m,t}}$$

where  $l_{m,t}^s/l_{m,t}$  is the share of skill group  $s$  for men.

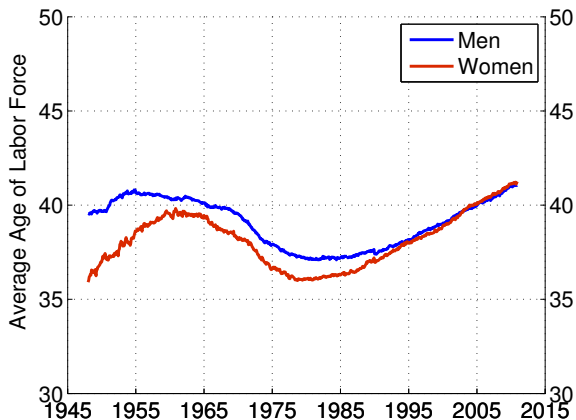
- ▶ Skill Groups: <HS, HS, Some college, College+ for age 25+

## Actual and Counterfactual Unemployment Rates



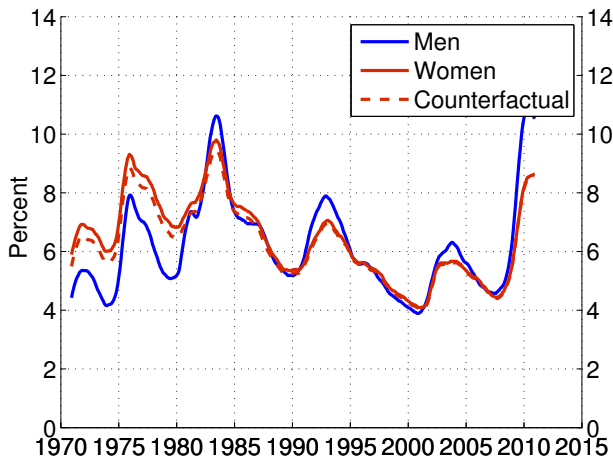
- ▶ Small quantitative effect of gender differences in skill composition

## Average Age of the Labor Force by Gender



- ▶ Female workers were relatively younger pre-1990.

## Can the Age Composition Explain the Evolution of the Gap?



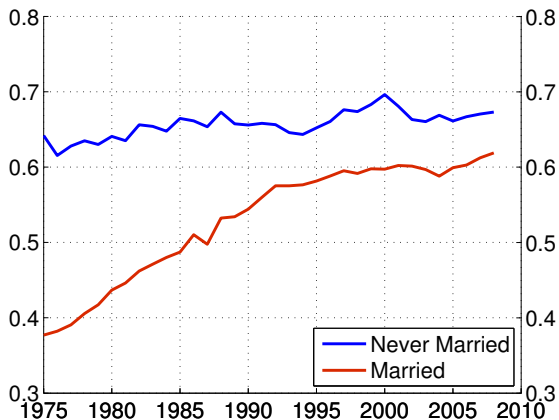
- ▶ Small quantitative effect of gender differences in age composition.

# Our Hypothesis: Increase in Women's Labor Force Attachment

- ▶ Drastic increase in female labor force participation, especially for married women
  - ▶ The evolution of the gender unemployment gap is mostly due to the labor market outcomes of married women

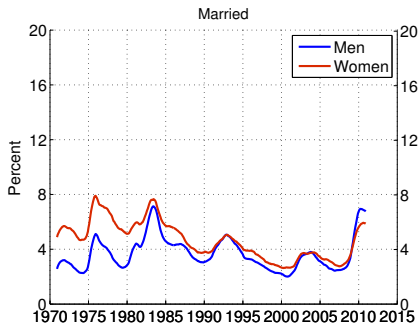
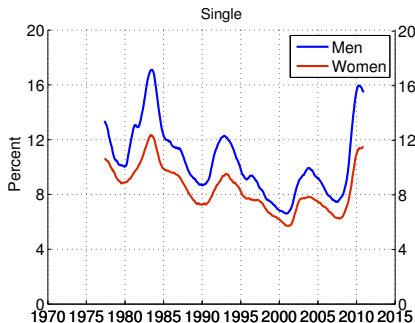
# Female Labor Force Participation

By Marital Status



# Evolution of the Unemployment Gender Gap

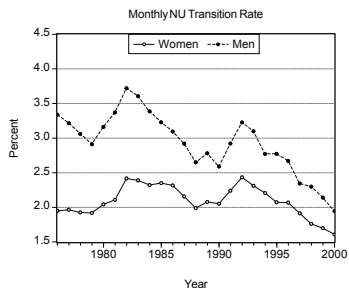
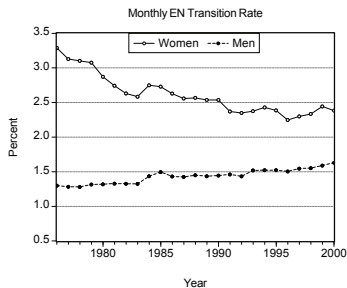
By Marital Status



# Our Hypothesis: Increase in Women's Labor Force Attachment

- ▶ Drastic increase in female labor force participation, especially for married women
  - ▶ The evolution of the gender unemployment gap is mostly due to the labor market outcomes of married women
- ▶ Flow rates involving the participation decision have steadily converged for men and women (Abraham and Shimer, 2002)
  - ▶ Women are now less likely to exit the labor force
  - ▶ There is no evidence of convergence in flow rates between employment and unemployment

# Convergence in E-to-N and N-to-U Flow Rates



▶ In 1978  $EN_W/EN_M = 2.38$

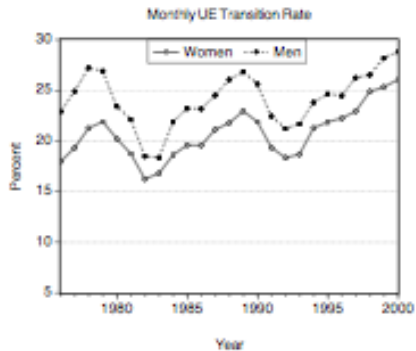
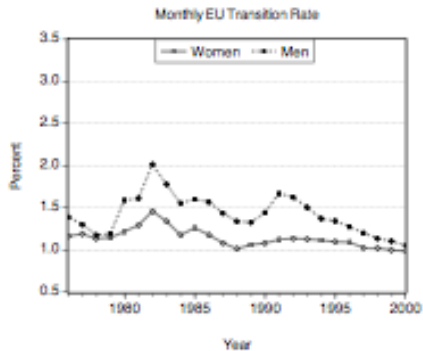
▶ In 1996  $EN_W/EN_M = 1.50$

▶ Source: Abraham and Shimer, 2002

In 1978  $NU_W/NU_M = 0.61$

In 1996  $NU_W/NU_M = 0.77$

# E-to-U and U-to-E Flow Rates

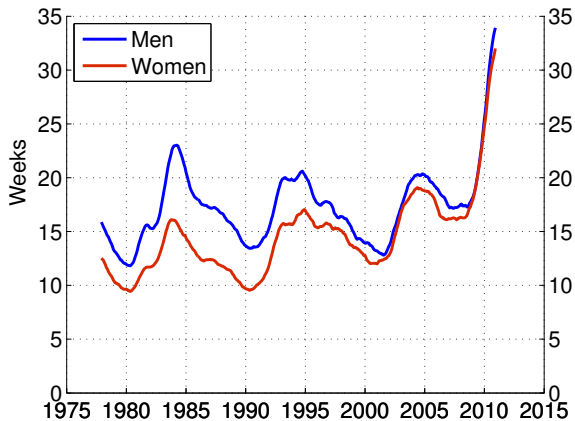


Source: Abraham and Shimer, 2002

# Our Hypothesis: Increase in Women's Labor Force Attachment

- ▶ Drastic increase in female labor force participation, especially for married women
  - ▶ The evolution of the gender unemployment gap is mostly due to the labor market outcomes of married women
- ▶ Flow rates, which involve the participation decision have steadily converged for men and women, (Abraham and Shimer, 2002)
  - ▶ Women are now less likely to exit the labor force.
  - ▶ There is no evidence of convergence in flow rates between employment and unemployment
- ▶ Women's unemployment duration is now very similar to men's

## Convergence in unemployment duration



# 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 (differs by gender, stochastic):
    - ▶ Low frequency component: to reflect differences in home production opportunities.
    - ▶ High frequency component: to reflect transitory factors like pregnancy, sickness etc.

# Agents

- ▶ The flow values depend on agents' realized value of opportunity cost of work ( $x$ ) and their labor market status.

- ▶ Worker:

$$v^W(x) = w + (1 - e)x,$$

- ▶ Unemployed:

$$v^S(x) = b + (1 - s)x,$$

- ▶ Non-participant:

$$v^H(x) = x,$$

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,

$b$  are unemployment benefits.

# Timing

- ▶ Each individual draws a new value of opportunity cost of work in each period with probability  $\lambda$ .
- ▶ Employed agents may experience an exogenous separation shock  $\delta$ .
- ▶ Unemployed agents may receive a job offer with probability  $p$ .
- ▶ The opportunity cost of work, separation and job finding shocks are all realized *before* the agents make any decisions.

# Agents' Decisions

- ▶ Value functions:
  - ▶ Employed:  $W(x)$
  - ▶ Unemployed:  $S(x)$
  - ▶ Out of the labor force:  $H(x)$

# Agents' Decisions

- ▶ Value functions:
  - ▶ Employed:  $W(x)$
  - ▶ Unemployed:  $S(x)$
  - ▶ Out of the labor force:  $H(x)$
  
- ▶ Employed:

$$\begin{aligned} W(x) = & v^W(x) \\ & + \lambda \beta \int_{\underline{x}}^{\bar{x}} [(1 - \delta) \max \{W(x'), S(x'), H(x')\} + \delta \max \{S(x'), H(x')\}] dF(x') \\ & + (1 - \lambda) \beta [(1 - \delta) W(x) + \delta \max \{S(x), H(x)\}] \end{aligned}$$

# Agents' Decisions

► Unemployed:

$$\begin{aligned} S(x) &= v^S(x) \\ &+ \lambda \beta \int_{\underline{x}}^{\bar{x}} \left[ p * \max \{ W(x'), S(x'), H(x') \} + (1 - p) \max \{ S(x'), H(x') \} \right] dF(x') \\ &+ (1 - \lambda) \beta [p \max \{ W(x), S(x) \} + (1 - p) S(x)] \end{aligned}$$

► Out of the labor force:

$$\begin{aligned} H(x) &= v^H(x) \\ &+ \lambda \beta \int_{\underline{x}}^{\bar{x}} \max \{ S'(x'), H'(x') \} dF(x') + (1 - \lambda) \beta H(x) \end{aligned}$$

# Firms

- ▶ Firms post vacancies to hire workers. There is free entry.
- ▶ 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.

## Firms

- ▶ Firms post vacancies to hire workers. There is free entry.
- ▶ 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.
  
- ▶ There are separate labor markets for each skill group. Unemployed workers meet firms according to a matching function,  $M_i(u; v)$  for  $i = h; l$ .
- ▶ *Male wages* are determined by Nash bargaining within each skill group. *Female wages* are obtained by imposing that firms are *indifferent* between hiring workers of a given skill level.

# Firms

- ▶ Value of a filled job:

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

# Firms

- ▶ Value of a filled job:

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

- ▶ Male wages determined via Nash bargaining:

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

# Firms

- ▶ Value of a filled job:

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

- ▶ Male wages determined via Nash bargaining:

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

- ▶ Condition to determine female wages:

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

## 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, unemployment, and wages in equilibrium.
  - ▶ Since agents with greater opportunity cost of work have higher quit rates, they generate lower surplus for the firm, and consequently will receive lower wages.
  - ▶ This mechanism endogenously generates gender wage gaps, within each skill group.

→ The model allows us to study the *joint* evolution of gender gaps in participation, unemployment, and wages.

# Alternative Wage Setting Paradigms

- ▶ Gender and skill specific labor markets, Nash bargaining:
  - ▶ Women's surplus conditional on the wage is smaller than men's, due to their greater opportunity cost of working  $\implies$  Female wages  $>$  Male wages, conditional on skill
- ▶ Take it or leave it offers by firms  $\implies$  Female wages  $>$  Male wages, conditional on skill
- ▶ Exogenous wages
  - ▶ Can match empirical gender wage gap  $\implies$  additional force reducing women's attachment to labor force

## Calibration

- ▶ We choose 1996 as a base point because there are no gender differences in unemployment and virtually no gender differences in skills.
- ▶ Monthly model, calibrated to 25+ old workers

## Calibration

- ▶ We choose 1996 as a base point because there are no gender differences in unemployment and virtually no gender differences in skills.
- ▶ Monthly model, calibrated to 25+ old workers
- ▶ Parameters set based on empirical evidence:
  - ▶ Educational composition of the labor force by skill and gender
  - ▶ Job separation rate by skill and gender (note that this is not enough to match the unemployment rates)
  - ▶ Other variables: productivity differences by skill, time devoted to work and job search
- ▶ Exogenously set parameters: workers' bargaining power, unemployment insurance

## Calibration

- ▶ We choose 1996 as a base point because there are no gender differences in unemployment and virtually no gender differences in skills.
- ▶ Monthly model, calibrated to 25+ old workers
- ▶ Parameters set based on empirical evidence:
  - ▶ Educational composition of the labor force by skill and gender
  - ▶ Job separation rate by skill and gender (note that this is not enough to match the unemployment rates)
  - ▶ Other variables: productivity differences by skill, time devoted to work and job search
- ▶ Exogenously set parameters: workers' bargaining power, unemployment insurance
- ▶ We assume  $x$  follows a Pareto distribution and calibrate the tail index and threshold parameters by gender to match:
  - ▶ aggregate stocks (E,N,U)
  - ▶ gender specific unemployment rates

## Calibration Targets

	Aggregates			Gender specific $u$	
	$E/P$	$lfpr$	$u$	$M$	$W$
Data	64.3%	67.1%	4.2%	4.1%	4.3%
Model	64.2%	67.0%	4.2%	4.1%	4.3%

# Flows

- ▶ The model captures the behavior of labor market flows pretty well, with the exception of U-to-N flows (and consequently U-to-E) flows.
- ▶ 3-state models typically have difficulty matching U-to-N flows.

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

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

(Poterba and Summers 1986, Abowd and Zellner, 1985)

## Flows

- ▶ The model captures the behavior of labor market flows pretty well, with the exception of U-to-N flows (and consequently U-to-E) flows.
- ▶ 3-state models typically have difficulty matching U-to-N flows.

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

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

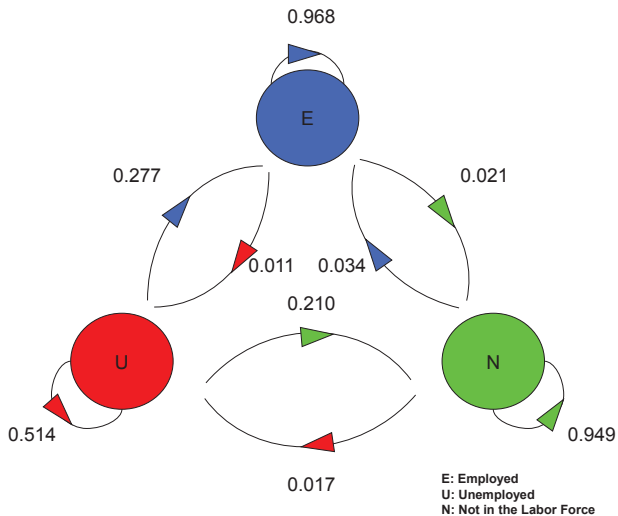
(Poterba and Summers 1986, Abowd and Zellner, 1985)

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

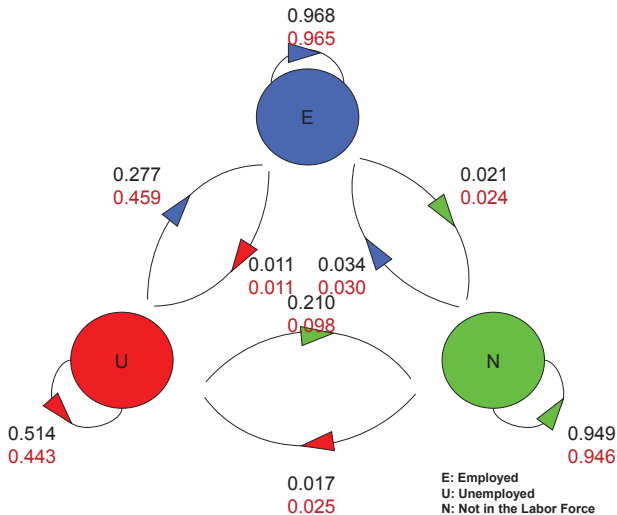
Source: Abowd and Zellner (1985)

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

# Aggregate Flows: Data

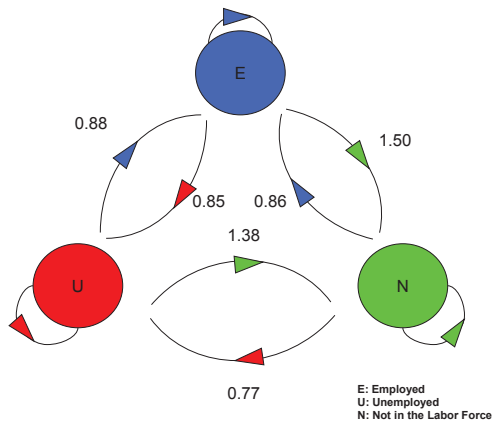


# Aggregate Flows: Data and Model



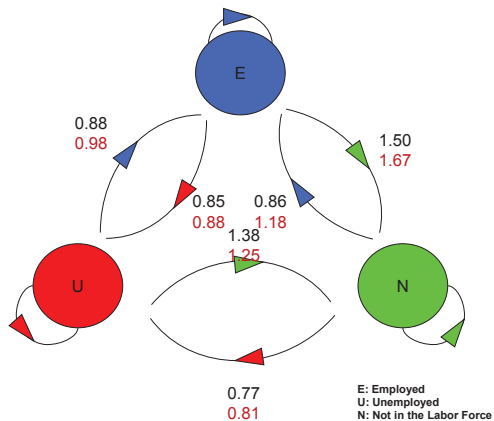
## Flows by Gender: Data

The ratio of women's flow rates to men's flow rates



# Flows by Gender: Data and Model

The ratio of women's flow rates to men's flow rates



# Experiment

- ▶ Now we turn to 1978 and make the following exogenous changes in our calibration:
  - ▶ Productivity differences between the high skill and low skill workers to match the skill premium
  - ▶ Composition of the population by skill and gender
  - ▶ E-to-U transition rate (the same for both genders)
- ▶ These changes alone are not enough to capture the behavior of labor market stocks and gender unemployment gap in 1978.

## Experiment: Labor Force Attachment

- ▶ We vary women's labor force attachment by allowing the opportunity cost of work to be higher and making the high-frequency shock more frequent.
- ▶ We target the aggregate stocks (E,N,U) in 1978.

	Aggregates		
	$E/P$	$lfpr$	$u$
Data	59.3%	61.8%	4.1%
Model	59.3%	61.8%	4.1%

# The Gender Unemployment Gap

	1978		1996	
	Data	Model	Data	Model
Women	5.2%	5.6%	4.3%	4.3%
Men	3.3%	3.1%	4.1%	4.1%

# The Gender Unemployment Gap

	1978		1996	
	Data	Model	Data	Model
Women	5.2%	5.6%	4.3%	4.3%
Men	3.3%	3.1%	4.1%	4.1%

# The Gender Unemployment Gap

	1978		1996	
	Data	Model	Data	Model
Women	5.2%	5.6%	4.3%	4.3%
Men	3.3%	3.1%	4.1%	4.1%

## The Gender Participation Gap

	1978		1996	
	Data	Model	Data	Model
Women	46.8%	48.6%	58.8%	61.9%
Men	78.8%	76.9%	76.3%	72.5%

## The Gender Participation Gap

	1978		1996	
	Data	Model	Data	Model
Women	46.8%	48.6%	58.8%	61.9%
Men	78.8%	76.9%	76.3%	72.5%

## The Gender Participation Gap

	1978		1996	
	Data	Model	Data	Model
Women	46.8%	48.6%	58.8%	61.9%
Men	78.8%	76.9%	76.3%	72.5%

# The Gender Wage Gap

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

	1978		1996	
	Data	Model	Data	Model
Unskilled	1.65	1.14	1.40	1.00
Skilled	1.72	1.67	1.49	1.02

# The Gender Wage Gap

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

	1978		1996	
	Data	Model	Data	Model
Unskilled	1.65	1.14	1.40	1.00
Skilled	1.72	1.67	1.49	1.02

# The Gender Wage Gap

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

	1978		1996	
	Data	Model	Data	Model
Unskilled	1.65	1.14	1.40	1.00
Skilled	1.72	1.67	1.49	1.02

# The Convergence of Flows

Ratio of women's flow rates to men's flow rates:

	1978		1996	
	Data	Model	Data	Model
<i>EN</i>	2.38	2.41	1.50	1.67
<i>NU</i>	0.61	0.70	0.77	0.81
<i>NE</i>	0.68	0.66	0.86	1.18
<i>UN</i>	1.80	1.46	1.38	1.25

The model captures the convergence of flows that involve the non-participation state well.

# The Convergence of Flows

Ratio of women's flow rates to men's flow rates:

	1978		1996	
	Data	Model	Data	Model
<i>EN</i>	2.38	2.41	1.50	1.67
<i>NU</i>	0.61	0.70	0.77	0.81
<i>NE</i>	0.68	0.66	0.86	1.18
<i>UN</i>	1.80	1.46	1.38	1.25

The model captures the convergence of flows that involve the non-participation state well.

# The Convergence of Flows

Ratio of women's flow rates to men's flow rates:

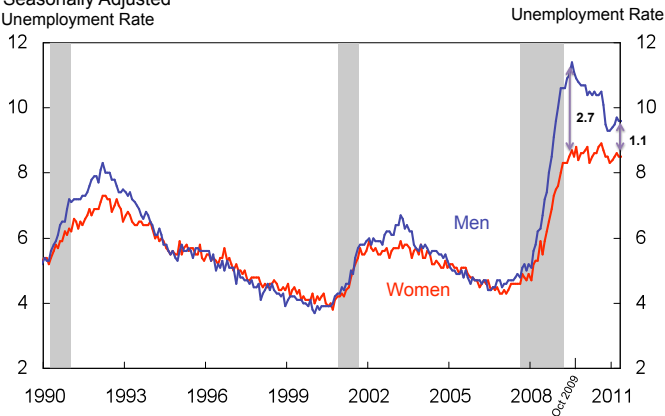
	1978		1996	
	Data	Model	Data	Model
<i>EN</i>	2.38	2.41	1.50	1.67
<i>NU</i>	0.61	0.70	0.77	0.81
<i>NE</i>	0.68	0.66	0.86	1.18
<i>UN</i>	1.80	1.46	1.38	1.25

The model captures the convergence of flows that involve the non-participation state well.

# The Recent Recession

## Unemployment Rate by Gender

Seasonally Adjusted  
Unemployment Rate



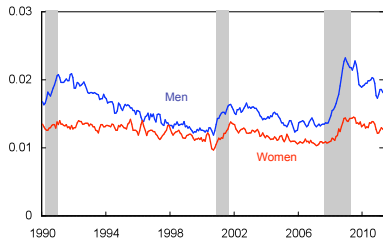
Source: Bureau of Labor Statistics

- ▶ The gender unemployment gap was at its highest for the post-war period during the last recession.

# The Recent Recession

Employment to Unemployment by Gender

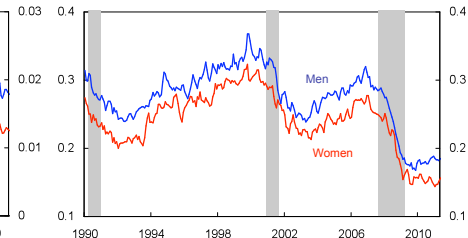
Seasonally Adjusted  
Percent



Source: Bureau of Labor Statistics

Unemployment to Employment by Gender

Seasonally Adjusted  
Percent



Source: Bureau of Labor Statistics

- ▶ Men experience larger job losses during the recession and more sizable employment gains during the recovery.

# The Recent Recession

## Sectoral composition: Recession

**Table 1: Sectoral Composition of Job Creation, December 2007 - December 2009 (percent)**

	Change in Payroll Employment since December 2007	Change in Women's Employment	Change in Men's Employment	Share of Male Workers at start of recession
Total	-6	-4	-8	51
Goods	-19	-18	-20	77
Manufacturing	-17	-17	-16	71
Construction	-25	-20	-25	88
Natural Resources and Mining	-11	-1	-12	87
Services	-4	-3	-5	46
Trade and Transportation	-8	-8	-8	59
Information	-9	-12	-7	58
Financial Activities	-7	-7	-6	41
Professional and Business Services	-9	-8	-9	55
Education and Health Services	4	4	4	23
Leisure and Hospitality	-4	-5	-4	48
Other Services	-4	-2	-5	48
Government	0	1	0	43

\*Data from Dec 2007 - Dec 2009

- ▶ Men over-represented in more cyclical sectors

# The Recent Recession

## Sectoral composition: Recovery

**Table 2: Sectoral Composition of Job Creation, January 2010 - July 2011 (percent)**

	Change in Payroll			Share of Male Workers in Jan 2010
	Employment since Jan 2010	Change in Women's Employment	Change in Men's Employment	
Total	1	0	3	50
Goods	2	-1	3	77
Manufacturing	2	-1	4	71
Construction	-1	-4	0	87
Natural Resources and Mining	20	11	22	86
Services	1	0	2	46
Trade and Transportation	2	0	3	59
Information	-2	-3	-1	59
Financial Activities	-1	-2	1	41
Professional and Business Services	4	3	5	55
Education and Health Services	3	2	6	23
Leisure and Hospitality	2	2	3	48
Other Services	2	2	2	47
Government	-2	-2	-2	43

\*Data from Jan 2010 - July 2011

- ▶ Women experience smaller job creation during the recovery

# The Recent Experience

## Counterfactuals for job destruction and job creation

Job destruction by gender December 2007-December 2009		
Actual, percent		Counterfactual, percent
Female	Male	Female
-3.958	-8.845	-6.392
Job creation by gender January 2010-July 2011, percent		
Actual, percent		Counterfactual, percent
Female	Male	Female
0.342	2.610	0.087

- ▶ Sectoral composition accounts for majority of gender difference in job losses during the recession.
- ▶ Sectoral composition cannot explain the gender differences in job creation during the recovery.

# Conclusions

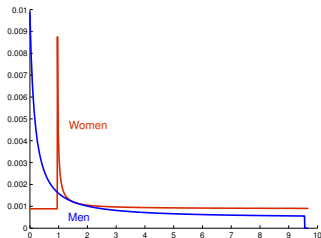
- ▶ Our 3-state model captures the joint evolution of gender participation, unemployment, and wage gaps pretty well.
- ▶ The increase in women's labor force attachment seems to be the main factor explaining the convergence of gender-specific unemployment rates.
- ▶ Changes in skill and age composition were quantitatively much less important.

# Future Work

- ▶ Cyclical sensitivities of gender-specific unemployment rates:
  - ▶ For the last three recessions, sectoral composition of job losses explains majority of the differences in male and female unemployment rate, not true for earlier recessions.
  - ▶ Interesting evolution of within sector gender differences in job loss and employment recovery.

## Opportunity Cost of Work ( $x$ )

- ▶ We assume that  $x$  follows a Pareto distribution and allow the tail index and threshold parameters to vary by gender.

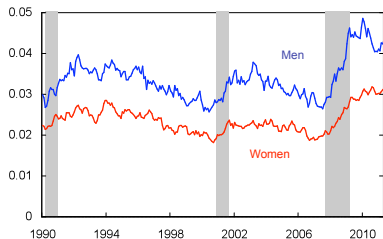


- ▶ At every period  $x$  changes with probability  $\lambda$ . The average duration of a particular  $x$  is 8.4 years for men and 4.2 years for women.
- ▶ In addition, agents can receive a shock that temporarily moves them to the highest  $x$ . This shock, which can be interpreted as pregnancy or disability, is less persistent than the  $\lambda$  shock and varies by gender.

# The Recent Experience

Nonparticipation to Unemployment by Gender

Seasonally Adjusted  
Percent



Source: Bureau of Labor Statistics

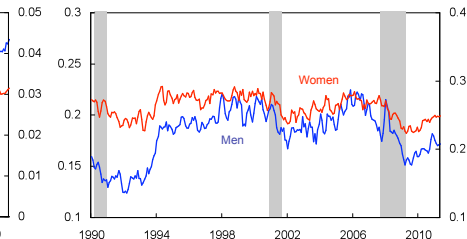
Unemployment to Non-Participation by Gender

Seasonally Adjusted

Percent

Percent Women

Percent Men



Source: Bureau of Labor Statistics

- ▶ Flow from non-participation to unemployment were higher for men during the recession.
- ▶ Flows to non-participation were higher for women during the recession and the recovery.