The Gender Unemployment Gap

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ESSIM Tarragona: May 30, 2014

The views expressed here are those of the authors and do not necessarily reflect the views of the Federal Reserve Bank of New York or the Federal Reserve System.
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.
Questions
The Gender Unemployment Gap

▶ What are the determinants on gender differences in unemployment?

▶ Are there any common international patterns? What can we learn for other countries from the US experience?

▶ How has changing women’s labor supply affected aggregate labor market conditions?
Findings: Trends

- Convergence in labor force attachment by gender, and in particular the rise in female labor force participation, played an important role in the trend decline of the gender unemployment gap in the US.
  - Most advanced OECD economies display similar patterns to the US.
Findings: Business Cycles

- Gender differences in employment behavior over the business cycle in the US have evolved over time:
  - Gender differences in the growth of participation play an important role in early cycles.
  - Gender differences in industry composition can explain most gender differences in employment for recent recessions.

- Rising female labor force participation reduced the depth of recessions, and generated strong recoveries in early US cycles.
  - Flat women’s participation since the early 1990s contributed to the recent jobless recoveries.
Outline

- Trends
  - The US experience
    - Composition explanations
    - Quantitative analysis
  - International evidence
- Business cycles in the US
Trends: The US Experience
Female LFP rose in the post-war period to a peak of 60% in 1995, and *stabilized thereafter*. Male LFP slowly declined throughout.

Convergence in Labor Force Attachment
Women’s Non-Participation Spells

- Women’s historically high incidence of non-participation spells in relation to childbirth (Goldin 1990, Royalty 1998) has substantially declined.

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

Convergence in Labor Force Attachment
Flow Rates by Gender

- Flow rates involving the participation decision for men and women have steadily converged (Abraham and Shimer, 2002).
  - NE ↑ and EN ↓ for women relative to men ⇒ E ↑ for women relative to men.
  - NU ↓ and UN ↑ for men relative to women ⇒ U ↑ for women relative to men.
  - Unemployment duration has increased for women relative to men.
Convergence in Flow Rates

The empirical evidence suggests strong convergence in labor force attachment for men and women. However, at first glance, it is not obvious that all these patterns are consistent with a closing unemployment gender gap. Most importantly, we have discussed that women's duration of unemployment increased relative to men's starting in 1990s. An increase in the duration of unemployment clearly causes an increase in the unemployment rate and seem inconsistent with our hypothesis. It is true that if attachment only affected the duration of unemployment for women, everything else being equal, female unemployment rate would have risen. However, this is not the only dimension that a rise in attachment affects labor market outcomes. As female attachment rose, women became less likely to leave employment for non-participation and return to the labor force after non-participation spells. These changes both caused a drastic increase in employment, counteracting the rise in the unemployment duration.

To summarize, the evidence we surveyed suggests that the evolution of the gender gap in unemployment cannot be accounted for in isolation from the drastic change in women's labor force participation and the relatively smaller but still evident decline in men's participation. Therefore, in the next section, we examine a search model of unemployment with a participation margin.
Convergence in Unemployment Duration

Figure 14:

As the figure shows, men on average experienced substantially longer duration of unemployment spells relative to women until the 90s. Starting in the 90s, women's average duration increased to values similar to men's.

Figure 15:

Relatedly, the convergence in labor force attachment of men and women has also affected the labor market flow rates that involve the participation decision. According to Abraham and Shimer (2002), women have become less likely to leave employment for non-participation—a sign of increased labor force attachment—while men have become more likely to leave the labor force from unemployment and less likely to re-enter the labor force once they leave it—a sign of decreased...

Median months. Source: BLS
Flow rates involving the participation decision for men and women have steadily converged (Abraham and Shimer, 2002).

There has been no systematic convergence in flow rates between employment and unemployment.
Convergence in Labor Force Attachment
Flow Rates by Gender

- Flow rates involving the participation decision for men and women have steadily converged (Abraham and Shimer, 2002).
- 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
  \(\implies\) higher female unemployment rate
Average Age and Education by Gender

- 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:

$$u_{f,t} = \sum_s u_{f,t}^s \frac{L_{s,f,t}}{L_{f,t}}$$

where $u_{f,t}^s$ 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 $t$.

- *Counterfactual* unemployment rate for women is:

$$u_{f,t}^C = \sum_s u_{f,t}^s \frac{L_{s,m,t}}{L_{m,t}}$$

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: $<\text{HS}, \text{HS}, \text{Some college}, \text{College+ for age 25+} \}$
Can Age and Skill Composition Explain the Evolution of the Gap?

\[
t_{\text{us}} = X_{\text{A}} s_{\text{t}}(i)u_{\text{st}}(i). \quad (1)
\]

where \( s_{\text{2}} \{ \text{m, f} \} \). We then calculate a counterfactual unemployment rate, \( \tilde{u}_{\text{f}}\text{t} \) for women by assuming that the age composition of the female labor force were the same as men's, i.e.

\[
l_{\text{f}}\text{t}(i) = l_{\text{m}}\text{t}(i). \quad (2)
\]

Figure 4 shows both the actual and counterfactual female unemployment rates against the male unemployment rate. Since the female labor force before 1990 was younger than the male labor force, the counterfactual female unemployment rate lies below the actual female unemployment rate. However, this effect is clearly not big enough to explain the gender gap in unemployment rates. After 1990, since the age difference disappears, there is no difference between the actual and counterfactual unemployment rates.

Unemployment Rate

Date


0 0.025 0.05 0.075 0.1 0.125

Men Women Counterfactual

Figure 4: Actual and Counterfactual Unemployment Rates (Age). Source: Bureau of Labor Statistics.

2.2 Education Composition

Another compositional issue is the difference between the skill levels of men and women. Figure 5 shows the male-female ratio of average years of schooling for workers 25 years of age and older. To compute this ratio, we divide the labor force into four education groups, \( A_{e} = \{ \text{less than a high} \} \). We impose this age restriction since we are interested in completed educational attainment. Consequently, the unemployment rates in Figure 5 are different from the overall unemployment rates.

Unemployment Rate

Date


0 0.025 0.05 0.075 0.1 0.125

Men Women Counterfactual

Figure 6: Actual and Counterfactual Unemployment Rates (Education). Source: Bureau of Labor Statistics.

2.3 Industry Composition

There have always been considerable differences between the distribution of female and male workers across different industries. Figure 7 shows the fraction of male and female workers employed in the goods-producing, service-providing, and government sectors. In general, goods-producing industries, like construction and manufacturing, employ mostly male workers while most female workers work in the service-providing and government sectors.

Unemployment Rate

Date


0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1

Male Labor Force Share

Date

Goods Services Government Missing


0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1

Female Labor Force Share

Date

Goods Services Government Missing


0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1

Figure 7: The unemployment share of men (left panel) and women (right panel). Source: Bureau of Labor Statistics.

- Small quantitative effect of gender differences in age and skill composition
Can the Industry Composition Explain the Evolution of the Gap?

We calculate a counterfactual unemployment rate for women by assigning the male industry composition to the female labor force to isolate the role of industry distributions. Figure 8 shows both the actual and counterfactual female unemployment rates against the male unemployment rate. The industry composition does not affect the evolution of trend unemployment rates. However, its impact is important during recessions. If women had men's industry distribution, their unemployment rate would have gone up more during the recessions. If we focus on the three most recent downturns, which occurred after male and female unemployment rates converged, industry composition explains more than half of the gender gap during the recessions. As for the 1981-82 recession, the counterfactual predicts that the female unemployment rate would have been higher if women's employment patterns were similar to men's.

We conclude that gender differences in age, skill, and industry composition cannot account for the evolution of the gender unemployment gap. However, we find that industry distribution plays an important role in explaining cyclical patterns.

Our Hypothesis: Increase in Women's Labor Force Attachment

Our hypothesis is that the evolution of the gender unemployment gap was due to the rise in women's labor market attachment. Women were less attached to the labor force in the 70s. This low attachment manifested itself in two different dimensions. First, among working age women a higher fraction was not in the labor force (Goldin, 1990). Second, those who ever participated in the labor force experienced more frequent spells of nonparticipation, as documented by Royalty (1998). We calculate a counterfactual unemployment rate for women by assigning the male industry composition to the female labor force to isolate the role of industry distributions.

- Higher share of men in goods producing sector.
- Industry composition explains approximately half of the gender gap in unemployment during recessions.
Quantitative Analysis
To explore the link between convergence in attachment and the gender unemployment gap, we develop a 3-state search model of the labor market that captures gender differences in labor market attachment.

- Male and female individuals
- Skill heterogeneity by sex: skilled (college graduate), unskilled (less than college)
- Opportunity cost of work, $x \geq 0$, stochastic, differs by sex to reflect differences in home production opportunities
Model

Gender Differences in Attachment

- Opportunity cost of work, \( x \geq 0 \), stochastic, differs by sex to reflect differences in home production opportunities
  - \( x \) distribution, \( F_j(x) \) for \( j = f, m \), iid
  - \( x \) higher on average, with fatter right tail for women
- New value of \( x \) drawn in each period with probability \( \lambda_{ij} \) for \( j = f, m \) and \( i = s, u \)
- Examples of \( x \) shocks:
  - Poor health/disability (own or for family members)
  - Pregnancy and childbirth
  - Change in income of household members
- Gender differences in \( x \) capture relative barriers to women’s labor force participation and differences in attachment by sex
Model
Agents

- The flow values depend on agents’ realized value of opportunity cost of work \((x)\) and their labor market status.
  
  - Non-participant:
    \[
    v_{ij}^N(x) = x
    \]
  
  - Unemployed:
    \[
    v_{ij}^U(x) = (1 - s)x
    \]
  
  - Employed:
    \[
    v_{ij}^E(x) = w + (1 - e)x
    \]

  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.
Model

Timing

- Employed agents may experience an exogenous separation shock $\delta_i$.

- 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 $\lambda_{ij}$.

- The opportunity cost of work, separation and job finding shocks are all realized at the same time before the agents make any decisions.
Model
Agents’ Decisions

- Value functions:
  - Employed: $V_{ij}^E(x)$
  - Unemployed: $V_{ij}^U(x)$
  - Out of the labor force: $V_{ij}^N(x)$
Model
Agents’ Decisions

▲ Value functions:
   ▼ Employed: \( V_{ij}^E(x) \)
   ▼ Unemployed: \( V_{ij}^U(x) \)
   ▼ Out of the labor force: \( V_{ij}^N(x) \)

▲ Employed:

\[
V_{ij}^E(x) = v_{ij}^E(x) + (1 - \lambda_{ij}) \beta \left[ (1 - \delta_i) V_{ij}^E(x) + \delta_i \max \left\{ V_{ij}^U(x), V_{ij}^N(x) \right\} \right] \\
+ \lambda_{ij} \beta \int_{x_j}^{\bar{x}j} \left[ (1 - \delta_i) \max \left\{ V_{ij}^E(x'), V_{ij}^U(x'), V_{ij}^N(x') \right\} \right] dF_j(x')
\]
Model
Agents’ Decisions

▶ Unemployed:

\[
V_{ij}^U(x) = v_{ij}^U(x) + (1 - \lambda_{ij})\beta \left[ p_{ij} * \max \{ V_{ij}^E(x), V_{ij}^U(x) \} + (1 - p_{ij})V_{ij}^U(x) \right] \\
+ \lambda_{ij}\beta \int_{x_j}^{x_j} \left[ p_{ij} * \max \{ V_{ij}^E(x'), V_{ij}^U(x'), V_{ij}^N(x') \} + (1 - p_{ij})\max \{ V_{ij}^U(x'), V_{ij}^N(x') \} \right] dF_j(x')
\]

▶ Out of the labor force:

\[
V_{ij}^N(x) = v_{ij}^N(x) + (1 - \lambda_{ij})\beta V_{ij}^N(x) \\
+ \lambda_{ij}\beta \int_{x_j}^{x_j} \max \{ V_{ij}^U(x'), V_{ij}^N(x') \} dF_j(x')
\]
Model

Shocks and Decisions: Flows Between Employment States

- All shocks are all realized at the same time before the agents make any decisions.
Model

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.
Model

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.

- Value of a filled job:

$$J_{ij} = y_i - w_{ij} + \beta \left\{ \int_{x_j}^{x_{ij}^q} (1 - \delta_i) J_{ij}^t + \delta_i V_i \right\} dF_j(x') + \int_{x_j}^{x_{ij}^q} V_i dF_j(x')$$
Model
Wage Determination

- Labor markets are segmented by skill.
- Male wages: Set by standard surplus splitting scheme within each skill group.
- Female wages: Women have higher opportunity cost of work and higher quit rates for given wage $\Rightarrow$ surplus of a firm with a female employee is lower for given wage and skill.
  - Baseline: Female wages set to render firms indifferent between hiring workers of a given skill level $\Rightarrow p_{if} = p_{im}$ and $w_{if} < w_{im}$, no segmentation by gender.
- Alternatives:
  - Surplus splitting by skill and gender, with same bargaining power.
  - Exogenous gender wage gap.
  - Different bargaining power, set to match the gender wage gap.
Model
Wage Determination

- Individual opportunity cost of work, $x$, **private information**. Distribution of $x$ by gender publicly known.
- Low $x$ workers earn informational rents, which reduce the surplus of the firm.
- Firm trade-off:
  - Lower offered wage shrinks the pool of workers that will accept, and makes workers more likely to quit, conditional on accepting.
  - Lower offered wage increases current profits for the firm.
For candidate equilibrium wage $w_{im}$, firms choose $\hat{w}_{ij}$ to solve the following:

$$w_{im} = \arg\max_{\hat{w}} \left[ \min_{x_m} \{ x_{im}^a(w_m), x_{im}^q(w_{im}) \} \right]^\gamma S_{im}(x; \hat{w}) dF_m(x)$$

$$\times [J_{im}(\hat{w}) Q_{im}(\hat{w}, w_{im}) - V_i]^{1-\gamma},$$

where

- $S_{im}(x; \hat{w}) = \max \{0, (W_{im}(x; \hat{w}) - \max \{H_{im}(x; \hat{w}), S_{im}(x; \hat{w})\})\}$ = worker surplus
- $Q(\hat{w}_{ij}, w_{ij})$ = fraction of workers of type $ij$ in the labor force given $w_{ij}$, who would accept a job at wage $\hat{w}_{ij}$

- Equilibrium wage: $w_{im}^* = \hat{w}_{im}(w_{im}^*)$.
- In the baseline case, female wages satisfy: $J_{if} = J_{im}$. 
Model

Qualitative Implications

- Gender differences in the distribution of the opportunity cost of market work determine the gender gaps in labor force participation and unemployment in equilibrium:
  - Women’s greater opportunity cost of work implies that they have lower participation and more frequent spells of unemployment.
- For the **baseline** female wage determination mechanism, the gender wage gap is also endogenous:
  - Women’s higher quit rates imply lower female wages and the labor market is not segmented by gender.
- For the other wage schemes the gender wage gap by skill is exogenous or counterfactual.
Convergence in Attachment and Unemployment
Exercise: Convergence in Labor Force Attachment

- 1978 chosen as a base year
  - Model calibrated to match:
    - Educational composition of the labor force by skill and gender
    - Skill premium, and EU rates by skill
    - Participation and unemployment rates by gender

1996 chosen as year by which convergence in attachment has mostly occurred
- Model calibrated to match:
  - Educational composition of the labor force by skill and gender
  - Skill premium, and EU rates by skill
  - Participation rates by gender

Question: Can the model account for the convergence in unemployment rates between 1978 and 1996?
Exercise: Convergence in Labor Force Attachment

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- Question: Can the model account for the convergence in unemployment rates between 1978 and 1996?
Exercise: Convergence in Labor Force Attachment
1978 Calibration

- Monthly model, age range 25+
- $F_j(x)$ is Pareto, with parameters $\kappa_j$ and $\bar{x}_j$
- 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
Exercise: Convergence in Labor Force Attachment
1978 Calibration

<table>
<thead>
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<th>Parameters based on independent evidence</th>
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<tbody>
<tr>
<td>$e$</td>
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</tr>
<tr>
<td>0.625</td>
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<table>
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<th>Parameters calibrated to match data moments</th>
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<td></td>
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<tr>
<td>Women</td>
</tr>
<tr>
<td>Unskilled</td>
</tr>
<tr>
<td>Skilled</td>
</tr>
<tr>
<td>Men</td>
</tr>
<tr>
<td>Unskilled</td>
</tr>
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<td>Skilled</td>
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Exercise: Convergence in Labor Force Attachment
1978 Calibration: Data Targets and Model Outcomes

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<tr>
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<td>Women</td>
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<tr>
<td><strong>Unemployment</strong></td>
<td>0.052</td>
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</tr>
<tr>
<td><strong>LFP</strong></td>
<td>0.468</td>
<td>0.788</td>
</tr>
<tr>
<td><strong>EU Rate</strong></td>
<td>0.010</td>
<td>0.009</td>
</tr>
<tr>
<td><strong>EE Rate</strong></td>
<td>0.95</td>
<td>0.98</td>
</tr>
<tr>
<td><strong>Skill premium</strong></td>
<td>1.49</td>
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<tbody>
<tr>
<td></td>
<td>Skilled</td>
<td>Unskilled</td>
</tr>
<tr>
<td><strong>EU Rate</strong></td>
<td>0.005</td>
<td>0.010</td>
</tr>
<tr>
<td><strong>EE Rate</strong></td>
<td>0.98</td>
<td>0.96</td>
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</tbody>
</table>
Exercise: Convergence in Labor Force Attachment

1978 Calibration: 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)
Exercise: Convergence in Labor Force Attachment
1978 Calibration: Flows

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

- 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)

<table>
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<th>Recorded status</th>
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<td>True status</td>
<td>Recorded status</td>
<td>True status</td>
<td>Recorded status</td>
</tr>
<tr>
<td>Males</td>
<td>N</td>
<td>Females</td>
<td>N</td>
</tr>
<tr>
<td>U</td>
<td>7.8%</td>
<td>U</td>
<td>11.5%</td>
</tr>
<tr>
<td>E</td>
<td>0.7%</td>
<td>E</td>
<td>1.5%</td>
</tr>
</tbody>
</table>

Source: Abowd and Zellner (1985)

- We introduce misclassification error to the outcomes of our model, following Abowd and Zellner (1985).
Exercise: Convergence in Labor Force Attachment

1978 Aggregate Flow Rates: Data and Model

E: Employed
U: Unemployed
N: Not in the Labor Force
Exercise: Convergence in Labor Force Attachment

1996 Economy

- 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 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 $\bar{x}_f$ and $\bar{x}_m$ 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.
Parameters of the distribution on $x$ by gender set to match the convergence in participation between 1978 and 1996.

<table>
<thead>
<tr>
<th>Labor Force Participation Rate</th>
<th>1978</th>
<th>1996</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Data</td>
<td>Model</td>
</tr>
<tr>
<td>Women</td>
<td>46.8%</td>
<td>46.8%</td>
</tr>
<tr>
<td>Men</td>
<td>78.8%</td>
<td>78.8%</td>
</tr>
<tr>
<td>Gap (ppts)</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>Percentage Gap</td>
<td>51.8%</td>
<td>51.8%</td>
</tr>
</tbody>
</table>
Exercise: Convergence in Labor Force Attachment

The Gender Unemployment Gap

- Unemployment rates in 1978 matched in calibration.
- In 1996, by matching convergence in participation rates, the model can account for most of the convergence in unemployment rates.

<table>
<thead>
<tr>
<th></th>
<th>1978</th>
<th>1996</th>
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<tbody>
<tr>
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<td>Data</td>
<td>Model</td>
</tr>
<tr>
<td>Unemployment Rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>5.2%</td>
<td>5.2%</td>
</tr>
<tr>
<td>Men</td>
<td>3.4%</td>
<td>3.4%</td>
</tr>
<tr>
<td>Gap (ppts)</td>
<td>1.8</td>
<td>1.8</td>
</tr>
<tr>
<td>Percentage Gap</td>
<td>41%</td>
<td>41%</td>
</tr>
</tbody>
</table>
Exercise: Convergence in Labor Force Attachment

Convergence in Flows

- The model captures the convergence in labor market flows involving the participation decision.

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<tr>
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</thead>
<tbody>
<tr>
<td>EN</td>
<td>3.38</td>
<td>2.55</td>
<td>1.80</td>
<td>2.08</td>
</tr>
<tr>
<td>EU</td>
<td>1.11</td>
<td>1.11</td>
<td>0.92</td>
<td>0.92</td>
</tr>
<tr>
<td>NU</td>
<td>0.82</td>
<td>0.61</td>
<td>0.84</td>
<td>0.74</td>
</tr>
<tr>
<td>NE</td>
<td>0.82</td>
<td>0.45</td>
<td>0.87</td>
<td>0.85</td>
</tr>
<tr>
<td>UN</td>
<td>2.10</td>
<td>1.61</td>
<td>1.58</td>
<td>1.45</td>
</tr>
<tr>
<td>UE</td>
<td>0.80</td>
<td>0.89</td>
<td>0.93</td>
<td>0.95</td>
</tr>
</tbody>
</table>

Table: Ratio of female flow transition rates to male transition rates in the data and the model.
Exercise: Convergence in Labor Force Attachment
Other Contributing Factors

- Other factors cannot account for the convergence in participation or unemployment rates by sex.

<table>
<thead>
<tr>
<th></th>
<th>LFPR</th>
<th>Unemployment Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gender Gap (ppts)</td>
<td>Gender Gap (fraction of (lfpr))</td>
</tr>
<tr>
<td>1996 Data</td>
<td>17.5</td>
<td>26.1%</td>
</tr>
<tr>
<td>Benchmark</td>
<td>17.5</td>
<td>26.1%</td>
</tr>
<tr>
<td>(EU)</td>
<td>29.2</td>
<td>45.3%</td>
</tr>
<tr>
<td>Skill comp.</td>
<td>31.8</td>
<td>50.3%</td>
</tr>
<tr>
<td>Skill premium</td>
<td>32.4</td>
<td>50.2%</td>
</tr>
</tbody>
</table>
Exercise: Convergence in Labor Force Attachment

Role of $\lambda$

- Female participation increases with $x$ duration, but changes in $\lambda_{if}$ are not sufficient to generate convergence in participation. Similar result for changes in the shape parameter $\kappa_j$. 
Exercise: Convergence in Labor Force Attachment
Alternative Wage Setting Mechanisms

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

<table>
<thead>
<tr>
<th></th>
<th>Unemployment Rate</th>
<th>Gender Gap</th>
<th>as a fraction of $u$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
<td>ppts</td>
</tr>
<tr>
<td>1996 Data</td>
<td>4.2%</td>
<td>4.5%</td>
<td>0.3</td>
</tr>
<tr>
<td>Baseline</td>
<td>4.5%</td>
<td>4.9%</td>
<td>0.4</td>
</tr>
<tr>
<td>Surplus splitting by gender</td>
<td>4.6%</td>
<td>4.8%</td>
<td>0.2</td>
</tr>
<tr>
<td>Exogenous gender wage gap</td>
<td>4.6%</td>
<td>4.7%</td>
<td>0.1</td>
</tr>
<tr>
<td>Different bargaining power</td>
<td>4.6%</td>
<td>4.7%</td>
<td>0.1</td>
</tr>
</tbody>
</table>
Exercise: Convergence in Labor Force Attachment
The Gender Wage Gap

Ratio of men’s wages to women’s wage for baseline case:

<table>
<thead>
<tr>
<th></th>
<th>1978</th>
<th>1996</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Data</td>
<td>Model</td>
</tr>
<tr>
<td>Unskilled</td>
<td>1.65</td>
<td>1.10</td>
</tr>
<tr>
<td>Skilled</td>
<td>1.72</td>
<td>1.12</td>
</tr>
</tbody>
</table>

- The baseline wage determination mechanism captures only a small fraction of the gender wage gap in 1978. No gender differences in wages in 1996.
- What is the contribution of rising female wages to the change in the gender unemployment gap?
Exercise: Convergence in Labor Force Attachment
Contribution of the Closing Gender Wage Gap

Model with exogenous female wages:

<table>
<thead>
<tr>
<th></th>
<th>LFPR</th>
<th>Unemployment Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gender Gap</td>
<td>Gender Gap</td>
</tr>
<tr>
<td></td>
<td>(pPTS)</td>
<td>(fraction of LFPR)</td>
</tr>
<tr>
<td>1996 Data</td>
<td>17.5</td>
<td>26.1%</td>
</tr>
<tr>
<td>GWG only</td>
<td>26.9</td>
<td>42.1%</td>
</tr>
<tr>
<td>EU, Skill c.,</td>
<td>25.9</td>
<td>38.4%</td>
</tr>
<tr>
<td>Skill p., GWG</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- The closing of the gender wage gap accounts for only a small fraction of the convergence in attachment and unemployment rates.
Attachment and the Unemployment Rate
Implications for the Great Recession

Figure: Participation by sex during the recent cycle
Attachment and the Unemployment Rate
Implications for the Great Recession

- Participation rates have been declining for both men and women during the recovery from the Great Recession.
  - Our model suggests that the decline in participation would determine a rise in the unemployment rate, other things equal.
  - This factor could have contributed to the slow decline in the unemployment rate.

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ifpr</td>
<td>u</td>
<td>Ifpr</td>
</tr>
<tr>
<td>2009</td>
<td>67%</td>
<td>7.6%</td>
<td>75%</td>
</tr>
<tr>
<td>3 ppts decline</td>
<td>64%</td>
<td>7.7%</td>
<td>72%</td>
</tr>
<tr>
<td>5 ppts decline</td>
<td>62%</td>
<td>7.8%</td>
<td>70%</td>
</tr>
</tbody>
</table>

Table: Predicted effect of declining labor force participation on unemployment rates in 2009.
International Evidence
International Evidence
Participation and Unemployment Gaps

- 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.
International Evidence
Participation and Unemployment Gaps

Source: OECD.
Countries with currently large gender unemployment gaps also display very high *aggregate unemployment rates*.

![Graph showing the relationship between aggregate unemployment rate and unemployment rate gap for various countries from 1996 to 2005. The graph includes data points for countries such as Australia (AUS), Austria (AUT), Belgium (BEL), Canada (CAN), Denmark (DNK), Finland (FIN), France (FRA), Germany (GER), Greece (GRC), Ireland (IRL), Italy (ITA), Luxembourg (LUX), the Netherlands (NLD), New Zealand (NZL), Norway (NOR), Portugal (PRT), Spain (ESP), Sweden (SWE), Switzerland (SUI), and the United States (USA). The correlation coefficient, r = 0.4, is indicated on the graph. The source of the data is OECD.]
Countries with currently large gender unemployment gaps also display very high *aggregate unemployment rates*. Thus, these countries could achieve substantial reductions in the aggregate unemployment rate by reducing those gaps.

Since large gender unemployment gaps are associated with low female labor force participation, countries with currently large gender unemployment gaps could reduce aggregate unemployment by *increasing female labor force participation*. 
Cyclical Properties
Cyclical Properties
The US Experience

- Men experience greater job losses in recessions, causing a reverse gender unemployment gap at the unemployment peak.
  - Industry composition plays a large role for this difference in recent cycles.
  - Differences by sex in participation trends play a large role in explaining gender differences in employment growth in early cycles.
- The convergence in participation trends by sex can explain the sluggish employment growth in recent jobless recoveries.
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:

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

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:

<table>
<thead>
<tr>
<th>Recoveries</th>
<th>Men Actual</th>
<th>Women Actual</th>
<th>Women Counterfactual</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/1970-12/1973</td>
<td>+8.06%</td>
<td>+14.12%</td>
<td>+16.22%</td>
</tr>
<tr>
<td>7/1980-7/1983</td>
<td>-2.84%</td>
<td>+5.52%</td>
<td>+4.11%</td>
</tr>
<tr>
<td>6/1992-6/1995</td>
<td>+7.92%</td>
<td>+7.81%</td>
<td>+7.04%</td>
</tr>
<tr>
<td>6/2003-6/2006</td>
<td>+5.98%</td>
<td>+3.38%</td>
<td>+3.24%</td>
</tr>
<tr>
<td>10/2009-4/2012</td>
<td>+5.17%</td>
<td>+2.25%</td>
<td>+0.77%</td>
</tr>
</tbody>
</table>

Industry composition does not explain the gender difference in employment change in recoveries.
Gender differences in employment growth during recessions and recoveries are associated with changes over time in the trend in female participation.

In early cycles, female employment was stable in recessions and strongly rising in recoveries, following the positive trend in participation.
Participation and Employment: Early Cycles
The 1981-1982 Cycle


Source: Current Population Survey
Gender differences in employment growth during recessions and recoveries are associated with changes over time in the trend in female participation.

In early cycles, female employment was stable in recessions and strongly rising in recoveries, following the positive trend in participation.

Male participation and employment behavior are similar in early and recent cycles.

In recent cycles, female participation stopped rising, making the cyclical behavior of female employment similar to men’s.
Participation and Employment: Recent Cycles
The 1991-92 Cycle

- Female participation stopped rising in 1995, reducing the gender differences in the cyclical behavior of employment.

Source: Current Population Survey
Participation and Employment: Recent Cycles

The 2001 Cycle

Source: Current Population Survey
Participation and Employment: Recent Cycles
The 2007-09 Cycle

Source: Current Population Survey
Participation, Employment and Unemployment
Implications for Aggregate Employment

- The strong growth in female participation until the early 1990s contributed to shallow recessions and very strong recoveries for aggregate employment in early cycles.

  ⇒ The flattening of female labor force participation since the early 1990s has made recoveries in recent cycles appear jobless.
Implications for Aggregate Employment

Jobless Recoveries in Recent Cycles

- Imposing that female employment growth is the same as the average in early cycles, recent cycles exhibit much stronger employment growth in the recovery.

Counterfactual E/P: Female E/P replaced with average for early cycles.
Conclusions

▶ Trends:
▶ The convergence in labor force attachment by gender is the main factor explaining the decline in the gender unemployment gap in the US.
▶ This link is supported by evidence from OECD countries.

▶ Cycles:
▶ Gender differences in industry distribution account for a large fraction of the gender unemployment gap in recent recessions for the US.
▶ The growth in women’s attachment until the early 1990s in the US contributed to dampen recessions and boost recoveries in early cycles, making recent recoveries seem sluggish.
More International Evidence

Participation and Unemployment Gaps

![Graphs showing participation and unemployment gaps for various countries over time.](image)

Source: OECD. Participation Gap = \( \frac{L_m - L_f}{L_m} \), Unemployment Gap = \( \frac{u_f - u_m}{u_m} \).
More International Evidence
Participation and Unemployment Gaps

- Countries with relatively large participation gap in the 1970s display a rising unemployment gap in early years.
  - Initial temporary rise in the gender unemployment gap is associated with an acceleration in female participation.
Female Labor Force Participation, *Unemployment Gap* = \( \frac{u_f - u_m}{u_m} \).

Source: BLS and OECD.
More International Evidence
Participation and Unemployment Gaps

- Countries with relatively large participation gap in the 1970s display a rising unemployment gap in early years.
  - The initial temporary rise in the gender unemployment gap is associated with an acceleration in female participation.
- This phenomenon also occurred in countries with currently low participation and unemployment gaps (US, Nordic countries).
- The rise in fraction of *married* women in the female labor force accounts for this initial rise.
  - Married women are initially more subject to non-participation spells than never married women, but they become more attached over time.
Countries with currently large gender unemployment gaps also display very high *aggregate unemployment rates*.

→ These countries could achieve substantial reductions in the *aggregate unemployment rate* by reducing those gaps.
Unemployment Gender Gaps and Aggregate Unemployment

- Counterfactual aggregate unemployment rate assumes that the gender unemployment gap is reduced by 50% in all years.

Source: OECD.