Gender and the business cycle: a stock and flows analysis of US and UK labour market states

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Outline

1. Context
2. The relationship between flows and stocks: *Why important?*
3. Literature
4. Data and Method
5. Reviewing labour market stocks by gender
6. Gender issue 1: is there a stock-flow fallacy?: *Key results*
7. Gender issue 2: is there an added worker effect?: *Key results*
“My fear is that we will look back on this time of the deepest recession since the war, and see it as a period when women’s lives took a step backwards, at home and at work.” (Polly Toynbee, 2012)

Romney’s argument that women have been disproportionately affected by the economic downturn is “ridiculous”: ... men, women and families alike have been hurt by the economy ... (Timothy Geithner, 2012)
Context

Percentage point gender employment rate gap, 16+, SA, 2007-2013

Source: own calculations from CPS (U.S.) & Labour Force Survey (U.K.)

Gender differentials and the economic cycle in the US and the UK - CASE Social Exclusion Seminar 11/02/15
Percentage point gender employment rate gap, 16+, SA, 1971-2013

Source: own calculations from CPS (U.S.) & Labour Force Survey (U.K.)
Share of women in employment, 16+, SA, 1948-2013

Source: own calculations from CPS (U.S.) & Labour Force Survey (U.K.)
Stocks and Flows

- Flows IN and OUT of three states drive aggregate dynamic in stocks
- Flows tell us something about the sources of net changes over a period of time
Research Questions

1. Are there significant gender differences in rates by which men and women transition between labour market states?
2. Does the stock-flow fallacy for the cyclical importance of participation margin apply to gender?
3. Is there an added worker effect at the aggregate level?
Surprisingly sparse economic evidence on gender differences in both stocks and flows during economic recession

Most analyses of cyclicality by gender focus on:

1. pay/wages (see Elsby et al 2013)
2. US (see Hoynes et al. 2012)
3. unemployment rate (see Albanesi and Sahin 2013, Peiro et al 2012)

Main conclusion:

1. Differential impact of recessions by age, gender, education
2. main factor is cyclicality of economic sectors people work in: jobs that predominantly hire men are more severely affected by economic recessions

extent to which gender responses to the cycle related to fluidity of labour market largely overlooked (see Elsby et al 2010, 2011, 2013)
Contribution

- Explicit focus on understanding possible gender differences
- Various methodological improvements: particularly important, we look at all labour market states (E, U and N)
- We find that gender differences in employment are not significant but they are in unemployment. No differences in inactivity but there might be a stock-flow fallacy.
- We link this to the growing literature on flow analysis to understand potential gender differences & better/explain the relationship between business cycles and labour market status
A simple gender output gap identity

- Start from Okun’s Law: output gap (e.g. determined by shock to economy) can be decomposed into factors.
- The most simple identity relating output and labour market outcomes:

\[ Y_t \equiv \frac{Y_t E_t}{E_t N_t} \quad (1) \]

- Cyclical components of male and female labour market rates, weights by their trend levels relative to total employment, relate to output gap:
- We can compute the extent to which changes in labour market variables cumulatively impact on output gap (see details in Annex).
Cumulative contribution of changes in labour market variables to output gap, 2007q4-2012q4

U.S. employment rates

U.K. employment rates
Cumulative contribution of changes in labour market variables to output gap, 2007q4-2012q4

U.S. unemployment and inactivity

U.K. unemployment and inactivity
Estimation

- Recursive VAR to obtain impulse response functions
- Each variable is in turn explained by its own past values and current and past values of other variables

\[ A_t = B(L)A_{t-1} + \varepsilon_t, \]  

(2)

- Impulse response functions trace out response of current and future values following a shock to the output gap.
- Estimated for full sample but also for restricted period to 2006 as sensitivity check. Results do not change when excluding Great Recession.
- Show results using one de-trending method.
US and UK weighted Employment rates - cumulative impulse response functions

Note: responses are from an orthogonal shock/impulse to the output gap which generates a max. cumulative increase of 1 log point; 90% confidence intervals from bootstrapping. GDP series filtered using HP 1600.
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US and UK weighted inactivity rates - cumulative impulse response functions

Note: responses are from an orthogonal shock/impulse to the output gap which generates a max. cumulative increase of 1 log point; 90% confidence intervals from bootstrapping

Gender differentials and the economic cycle in the US and the UK - CASE Social Exclusion Seminar 11/02/15
Stocks: Key messages

- Labour market response stronger in the US than UK
- Response of male employment rates stronger than female but overall not significantly
- Response of unemployment rates not gender neutral: response of male U more pronounced than female U
- No gender differences in the response of inactivity rates
They reveal potentially dissimilar experiences of men and women.

Stock-based results might not account for offsetting forces of worker flows, so promoted to conclude there are no relevant gender differences in the role of participation over the cycle.

Assessment of labour market fluidity sheds light on possible added-worker effect at aggregate level.
Gender Flows: Data

- **UK**: LFS 2 quarter LS, working age, 1997 to 2013
  - *sample split into 5 waves, one wave leaving sample and one wave entering every quarter*

- **US**: CPS monthly gross flows, working age, 1990 onwards
  - *sample split into 8 groups in a given month, six being interviewed in the next month*

**Data challenges:**

1. *response error*: respondents systematically classified in wrong labour market status. Solution for US, not UK data
2. *time aggregation bias*: arises from discrete nature of observations we have in data so that one NE transition might be the result of two transitions: NU and UE. Solution to both US and UK data computing continuous/time adjusted hazard rates
Gender Flows - Data

Gross labour market flows, UK 2013 quarter 1-2. Stocks are for the first quarter. In brackets are gender differences in gross flows expressed as (male/female -1)

- Transition probabilities: probability of changing state between beginning and end of longitudinal periods. For instance for EU, transition probability is \( \frac{E_{U_t}}{E_{t-1}} \)
- Hazard rate: continuous time equivalent (accounting for time aggregation bias & used to estimate steady state values).
Gender Flows - Key Facts

US and UK hazard rates, Employment outflows
(solid line: male, dashed: female)

US - EU

UK - EU

Source own calculations from CPS and LFS; time aggregation bias correction using eigen decomposition as per Shimer (2012) & Elsby et al (2013); 3 month moving average and 4 quarter moving average
US and UK hazard rates, Employment outflows
(solid line: male, dashed: female)

Source own calculations from CPS and LFS; time aggregation bias correction using eigen decomposition as per Shimer (2012) & Elsby et al (2013); 3 month moving average and 4 quarter moving average
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US and UK hazard rates, Inactivity Outflows
(solid line: male, dashed: female)

Source own calculations from CPS and LFS; time aggregation bias correction using eigen decomposition as per Shimer (2012) & Elsby et al (2013); 3 month moving average and 4 quarters moving average
Gender Flows

- EU and NU counter-cyclical while UE and UN pro-cyclical in both countries
- NU transition appears U-shaped in UK, low point towards mid-2000
- EU rates always greater for men than women in both countries over entire period
- Response of EU rate more pronounced for men than for women in both countries
- Narrower gender differences in UE rates in both countries
- Pronounced and consistent gender differences in the transition between unemployment and inactivity: women more likely to move from U to N than men while opposite for N to U
Simple time series cannot tell us the extent to which variations in unemployment during recessions can be attributed to each of the flow.

What is the contribution of changes in flows (hazard rates) to changes in stock (e.g. unemployment rate)?

Variance Decomposition: proportion of overall variance in employment and unemployment rates explained by each of the transition rates

Approaches:
- Two state ss: does not take into account inactivity flows; Fujita & Ramey (2009), Elsby et al (2009)
- Three state ss: consider all three status; Elsby et al (2010), Shimer (2012)
Decomposition

- Variance of changes in stocks as composed of past and present changes in all hazard rates, and initial values and "demography" changes and approximation error

Two issues:

- Gender stock-flow fallacy: are gender differences in importance of participation over the cycle more relevant than those suggested by analysis of stocks?

- Added worker effect: are women relatively more likely to move between inactivity and activity during economic recessions?
### Stock-Flow fallacy by gender?

#### US and UK flows decomposition of changes in the unemployment rate

<table>
<thead>
<tr>
<th></th>
<th>UE</th>
<th>EU</th>
<th>EN</th>
<th>UN</th>
<th>NE</th>
<th>NU</th>
<th>Init. val.</th>
<th>d</th>
<th>approx. err.</th>
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<tbody>
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<td>0.31</td>
<td>0.23</td>
<td>-0.02</td>
<td><strong>0.24</strong></td>
<td>0.02</td>
<td><strong>0.19</strong></td>
<td>0.00</td>
<td>0.00</td>
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<tr>
<td></td>
<td>Male</td>
<td>0.28</td>
<td>0.28</td>
<td>-0.01</td>
<td>0.23</td>
<td>0.01</td>
<td>0.20</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>0.29</td>
<td>0.21</td>
<td>-0.01</td>
<td>0.25</td>
<td>0.02</td>
<td>0.23</td>
<td>0.00</td>
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</tr>
<tr>
<td></td>
<td>all</td>
<td>0.37</td>
<td>0.30</td>
<td>-0.02</td>
<td>0.15</td>
<td>0.04</td>
<td>0.05</td>
<td>0.06</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>0.39</td>
<td><strong>0.35</strong></td>
<td>-0.02</td>
<td>0.13</td>
<td>0.04</td>
<td><strong>0.02</strong></td>
<td>0.06</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>0.32</td>
<td><strong>0.19</strong></td>
<td>-0.01</td>
<td>0.18</td>
<td>0.03</td>
<td><strong>0.14</strong></td>
<td>0.05</td>
<td>0.04</td>
</tr>
</tbody>
</table>

* $\beta_{UE}^{UE} = \frac{\text{cov}(\Delta U_{t,k}, C_{t,k}^{UE,U})}{\text{var}(\Delta U_{t})}$, where $C_{t}^{UE,U}$ is the component of the decomposition accounting for current and past changes in the UE transition probability.

Rows may not sum to one due to rounding errors. April1990 - March2014 for the US and q11998 to q12013 for the UK.
US and UK cumulative percentage point contributions from changes in hazard rates to the unemployment rate change, 2008-2012

Gender differentials and the economic cycle in the US and the UK - CASE Social Exclusion Seminar 11/02/15
US and UK cumulative percentage point contributions from changes in hazard rates to the unemployment rate change, 2008-2012

US Male - EN & NE

US Female - EN & NE

UK Male - EN & NE

UK Female - EN & NE
Cumulative contribution to change in U.S. unemployment rate, 2007-2012;

Source: own calculations from CPS; 3 month moving average change in unemployment rates
Cumulative contribution to change in U.K. unemployment rate, 2007-2012;

Source: own calculations from LFS; 4 quarter moving average change in unemployment rates
Consider heterogeneity in NU transition rates, averaged over two periods: 1997 to 2007 and 2008 to 2012.

Individuals aged 20-54: by age, age of youngest child, number of dependent children, inactivity status (others in paper)

1. Pre-recession period - inactive men are closer to the labour market than inactive women in both countries: across all groups, male flow probability greater than female.
2. Male flow probability decreases with age of youngest child, slightly increases for female in UK.
3. Across two time periods - in US, across all groups not marked gender differences: some by Inactivity (looking after family) and age of youngest child.
4. In UK, more marked gender differences: younger and prime aged worker men much less likely to rejoin labour market via Unemployment than women.
5. More relevant to added worker effect: IU flow for those looking after family or home is twice for women, for those with young children is more than six times higher for women.
## Average US transition probabilities from inactivity to unemployment, $p_{NU}$, age 20-54

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th></th>
<th></th>
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<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-29</td>
<td>0.08</td>
<td>0.10</td>
<td>0.05</td>
<td>0.06</td>
</tr>
<tr>
<td>30-39</td>
<td>0.06</td>
<td>0.10</td>
<td>0.03</td>
<td>0.04</td>
</tr>
<tr>
<td>40-54</td>
<td>0.04</td>
<td>0.06</td>
<td>0.02</td>
<td>0.04</td>
</tr>
<tr>
<td>Inactivity reason</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Retired</td>
<td>0.02</td>
<td>0.02</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Disabled</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Family/home</td>
<td>0.13</td>
<td>0.18</td>
<td>0.03</td>
<td>0.05</td>
</tr>
<tr>
<td>Student</td>
<td>0.06</td>
<td>0.08</td>
<td>0.05</td>
<td>0.06</td>
</tr>
<tr>
<td>Other*</td>
<td>0.19</td>
<td>0.25</td>
<td>0.11</td>
<td>0.16</td>
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<tr>
<td>Age of youngest child</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>0-2</td>
<td>0.08</td>
<td>0.12</td>
<td>0.03</td>
<td>0.04</td>
</tr>
<tr>
<td>3-5</td>
<td>0.07</td>
<td>0.12</td>
<td>0.03</td>
<td>0.05</td>
</tr>
<tr>
<td>6-13</td>
<td>0.06</td>
<td>0.10</td>
<td>0.03</td>
<td>0.04</td>
</tr>
<tr>
<td>Number of dep. children</td>
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<td></td>
</tr>
<tr>
<td>&lt; 18</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>0</td>
<td>0.06</td>
<td>0.08</td>
<td>0.03</td>
<td>0.05</td>
</tr>
<tr>
<td>1</td>
<td>0.06</td>
<td>0.10</td>
<td>0.03</td>
<td>0.05</td>
</tr>
<tr>
<td>2</td>
<td>0.06</td>
<td>0.11</td>
<td>0.03</td>
<td>0.04</td>
</tr>
<tr>
<td>3</td>
<td>0.07</td>
<td>0.11</td>
<td>0.03</td>
<td>0.04</td>
</tr>
<tr>
<td>≥ 4</td>
<td>0.08</td>
<td>0.11</td>
<td>0.03</td>
<td>0.04</td>
</tr>
</tbody>
</table>

* Includes those who are temporarily ill
<table>
<thead>
<tr>
<th>Age</th>
<th>Male</th>
<th>Female</th>
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</thead>
<tbody>
<tr>
<td>20-29</td>
<td>0.09</td>
<td>0.10</td>
</tr>
<tr>
<td>30-39</td>
<td>0.07</td>
<td>0.07</td>
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<tr>
<td>40-54</td>
<td>0.04</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>Retired</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Disabled</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>Family/home</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td>Student</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>Other*</td>
<td>0.17</td>
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<td>2-4</td>
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<td>0.07</td>
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<td>0.10</td>
</tr>
<tr>
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<td>0.07</td>
<td>0.09</td>
</tr>
<tr>
<td>3</td>
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<td>0.06</td>
</tr>
<tr>
<td>≥4</td>
<td>0.07</td>
<td>0.05</td>
</tr>
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</table>

* Includes those who are temporarily ill
** All children aged 15 and under and those aged 16-18 in full-time education
### Percent change in $p_{NU}$ from 1997-2007 to 2008-2012

<table>
<thead>
<tr>
<th>Age</th>
<th>US Male</th>
<th>US Female</th>
<th>UK Male</th>
<th>UK Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-29</td>
<td>20.8</td>
<td>28.1</td>
<td>11.0</td>
<td>33.2</td>
</tr>
<tr>
<td>30-39</td>
<td>52.7</td>
<td>38.1</td>
<td>4.9</td>
<td>28.8</td>
</tr>
<tr>
<td>40-54</td>
<td>52.1</td>
<td>44.6</td>
<td>28.3</td>
<td>26.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inactivity reason</th>
<th>US Male</th>
<th>US Female</th>
<th>UK Male</th>
<th>UK Female</th>
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</thead>
<tbody>
<tr>
<td>Retired</td>
<td>-14.4</td>
<td>1.3</td>
<td>33.1</td>
<td>21.3</td>
</tr>
<tr>
<td>Disabled</td>
<td>23.6</td>
<td>23.9</td>
<td>22.3</td>
<td>41.5</td>
</tr>
<tr>
<td>Looking after family/home</td>
<td>36.9</td>
<td>43.5</td>
<td><strong>20.1</strong></td>
<td><strong>39.2</strong></td>
</tr>
<tr>
<td>Student</td>
<td>28.6</td>
<td>25.3</td>
<td>9.2</td>
<td>25.9</td>
</tr>
<tr>
<td>Other</td>
<td>33.6</td>
<td>43.3</td>
<td>11.6</td>
<td>19.4</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Age of youngest child</th>
<th>US</th>
<th>UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2 / 0-1</td>
<td>43.8</td>
<td>6.6</td>
</tr>
<tr>
<td>3-5 / 2-4</td>
<td>62.0</td>
<td>17.8</td>
</tr>
<tr>
<td>6-13 / 5-9</td>
<td>74.6</td>
<td>18.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of dep. children &lt; 19</th>
<th>US</th>
<th>UK</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>39.2</td>
<td>15.3</td>
</tr>
<tr>
<td>1</td>
<td>55.2</td>
<td>38.9</td>
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<tr>
<td>2</td>
<td>71.9</td>
<td>29.2</td>
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<td>3</td>
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<td>&gt;= 4</td>
<td>43.0</td>
<td>-29.2</td>
</tr>
<tr>
<td></td>
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<td>33.0</td>
</tr>
</tbody>
</table>
US and UK differences

Possible explanations

- Labour market institutions: role of unemployment insurance? Assortative mating might results in increased correlation between labour market shocks of husbands and wives.

- Non labour market institutions: social and institutional changes might results in differences in which families enforce risk-sharing.

- Differences in labour market attachment of men in two countries rather than differences between the UK and US female inactive populations!
US and UK cumulative percentage point contributions from changes in hazard rates to the unemployment rate change, 2008-2012

US Male - UN & NU

US Female - UN & NU

UK Male - UN & NU

UK Female - UN & NU

Gender differentials and the economic cycle in the US and the UK - CASE Social Exclusion Seminar 11/02/15
In both countries, the response of male labour market outcomes is generally stronger than female

1. male employment rates stronger but not significant
2. male unemployment rate stronger and significant
3. not substantial gender differences in response of inactivity rates

However, when looking at flows we find that:

1. Especially for the UK, more prevalent gender differences than those implied by stock analysis
2. Flows between U and E explain around 75 percent of variation in male U rates and 50 percent for female rate
3. Flows from N to U explains 14 percent of variation in female U rate and only 2 percent for men
4. Assessment of heterogeneity corroborates possible presence of added worker effect in the UK
Technical Appendix
Motivate approach using the most simple identity relating output and labour market outcomes (See Gordon (1993) for a discussion of output identities of this type and their implicit role in Okun)

\[ Y_t \equiv \frac{Y_t E_t}{E_t N_t} \quad (3) \]

Using first order log approximation around some trend or potential levels (denoted by \( X_{t}^{\tau} \))

\[ y_{t}^{c} = \frac{E_{t}^{\tau,m}}{E_{t}^{\tau}} [e_{t}^{c,m} - n_{t}^{c,m}] + \frac{E_{t}^{\tau,f}}{E_{t}^{\tau}} [e_{t}^{c,f} - n_{t}^{c,f}] + \nu_{t} \quad (4) \]

or

\[ y_{t}^{c} = -\frac{U_{t}^{\tau,m}}{E_{t}^{\tau}} [u_{t}^{c,m} - n_{t}^{c,m}] - \frac{U_{t}^{\tau,f}}{E_{t}^{\tau}} [u_{t}^{c,f} - n_{t}^{c,f}] \]

\[ -\frac{I_{t}^{\tau,m}}{E_{t}^{\tau}} [i_{t}^{c,m} - n_{t}^{c,m}] - \frac{I_{t}^{\tau,f}}{E_{t}^{\tau}} [i_{t}^{c,f} - n_{t}^{c,f}] + \zeta_{t} \quad (5) \]
General approach to estimate stocks relationship

- Recursive VAR:

\[ A_t = B(L)A_{t-1} + \varepsilon_t, \quad (6) \]

- \( X_{t|\tau}^{c,f}, \frac{\tau_{\tau}}{E_t}[x_t^{c,f} - n_t^{c,f}] = x_t^{*,c,f} \)

- \( A_t = \begin{bmatrix} y_t^{c}, & x_t^{*,c,f}, & x_t^{*,c,m} \end{bmatrix}' \)

- \( B(L) \) is 3x3; each \( i,j \) th element is the lag polynomial \( b_{ij}(L) = (\beta_{i,j,0}L^0 + \beta_{i,j,1}L^1 + \cdots + \beta_{i,j,p}L^p) \).

- Identification: Cholesky ordering as listed above.

- Also estimate 5 variable VAR including inactivity rates alongside unemployment.