Trends In Labor Force Participation

June 2013

Daniel Sullivan
Federal Reserve Bank of Chicago
Labor Force Participation Rate, Trend vs. Actual

Ages 16+

CPS Data
LF Trend
BLS Data
Main Points

- **Participation is trending down for two reasons**
  - Demographics – we’re getting older
  - Long-running behavioral trends – participation for most narrow demographic groups has been dropping steadily over time

- **Nevertheless, 2012 participation is below its long-term trend by 1.2 percentage points**
  - Even accounting for the high unemployment rate it is 0.67 percentage points below trend

- **Groups especially far below trend**
  - The young
  - Those with low education
  - Older workers are bucking the trend
Participation By Age and Sex

2012 Labor Force Participation Rates and Change in Population Share, by Age (percent)

2012 Labor Force Participation Rates (left axis)
- Men
- Women

Change in Population Share (right axis)
- 1995-2000
- 2010-2015
Labor Force Participation, By Age/Gender

Ages 16-19 (percent)

Men
Women
Labor Force Participation, By Age/Gender

Men, 25-54
(percent)

25-29
30-34
35-39
40-44
45-49
50-54

Women, 25-54 (percent)
Labor Force Participation, By Age/Gender

Ages 65+
(percent)

- Men, 65-69
- Women, 65-69
- Men, 70+
- Women, 70+

2012 Male Participation Rates By Education

Men

Less than HS
HS
Some College
College
Post College
2012 Female Participation Rates By Education

Women

Less than HS
HS
Some College
College
Post College
Forecasting Demographic Group Behavior

- **Question:** In 2007, how to forecast participation rates of 50-54 year old women in 2015?

- **BLS Method:** Extrapolate the historical time series for participation of 50-54 year old women using last 13 years (mixing cohorts)

- **Cohort Method:**
  - Note that women who will be 50-54 in 2015 were born 1961-65
  - Compare the LFP of the 1961-65 birth cohorts to those of earlier cohorts at the same age
  - Assume cohort differences will persist at higher ages
Select Model Fit LFP Profile Projections

White Female HS Graduate, 25-54

<table>
<thead>
<tr>
<th>Year</th>
<th>Cohort</th>
</tr>
</thead>
<tbody>
<tr>
<td>1947</td>
<td>1947 Cohort</td>
</tr>
<tr>
<td>1952</td>
<td>1952 Cohort</td>
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<tr>
<td>1957</td>
<td>1957 Cohort</td>
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<tr>
<td>1962</td>
<td>1962 Cohort</td>
</tr>
<tr>
<td>1967</td>
<td>1967 Cohort</td>
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</tbody>
</table>

Log Odds
Select Model Fit LFP Profiles Through 2007

White Female HS Graduate, 25-54

Log Odds

1947 Cohort
1952 Cohort
1957 Cohort
1962 Cohort
1967 Cohort
Cohort-Based Projections

- Above projections based on extensions of Aaronson and Sullivan, Chicago Fed Economic Perspectives, 2001

- Somewhat similar results to Aaronson, Fallick, Figura, Pingle, and Wascher, Brookings, 2006

- Methodological differences
  - Estimates at individual level
    (Models estimated using CPS data 1987-2007)
  - Everything conditional on educational levels
  - Many details
A Basic Logistic Cohort Model

\[ p_{sbai} \quad \text{Prob individual } i \text{ of sex } s \text{ born in year } b \text{ is in LF at age } a \]

\[ \log \left( \frac{p_{sbai}}{1 - p_{sbai}} \right) = \beta_{sb} + \alpha_{sa} + x_{sbai} \gamma_s + z_{sba} \delta_s \]

- \( \beta_{sb} \): Birth year cohort dummies
- \( \alpha_{sa} \): Age dummies
- \( x_{sbai} \): Race group dummies
- \( z_{sba} \): Age-specific controls

Age-Specific Controls

- **Ages 16-24**
  - Real Minimum Wage
  - Hourly Wage Ratio of 16-19 year olds to 25-54 year olds

- **Ages 25-54**
  - Fraction of population married with a Child 5 Years or Younger
  - Fraction of population married with no Child 5 Years or Younger

- **Ages 55 and higher**
  - Gender specific life expectancies
Extension: Condition on Education

\[ p_{sebai} \]

Prob individual i of sex s and education e born in year b is in LF at age a

5 education categories: <HS, =HS, Some College, College, > College

\[
\log \left( \frac{p_{sebai}}{1 - p_{sebai}} \right) = \beta_{seb} + \alpha_{sea} + x_{sebai} \gamma_{se} + z_{seba} \delta_{se}
\]
Extension: Condition on Education

To forecast LFP, need educational attainment forecasts

\[ q_{sba}^e \]

Prob individual i of sex s born in year b has attainment of at least e at age a given attainment of at least e - 1

\[
\log \left( \frac{q_{sba}^e}{1 - q_{sba}^e} \right) = \beta_{sb}^e + \alpha_{sa}^e + x_{sba}^e \gamma_s^e + z_{sba}^e \gamma_s^e
\]
Prob individual i of sex s and education e born in year b is in LF at age a

\[
\log \left( \frac{p_{sebai}}{1 - p_{sebai}} \right) = \beta_{seb} + \alpha_{sea} + w_{sea} \lambda_{se} + x_{sebai} \gamma_{se} + z_{seba} \delta_{se}
\]

Annual unemployment gap (actual – CBO NAIRU)
A Decomposition

Let

\( p_t = \text{Overall trend LFP at time } t \)
\( p_{dt} = \text{Trend LFP for demographic group } d \text{ at time } t \)
\( f_{dt} = \text{Share of population in group } d \text{ at time } t \)

Then

\[
p_t = \sum_d f_{dt} p_{dt}
\]

And

\[
\Delta p_t = \sum_d (p_{dt-1} - p_{t-1}) \Delta f_{dt} + \sum_d f_{dt} \Delta p_{dt}
\]

Demographics \hspace{1cm} Behavior
Decomposition of LFP Change

(Percentage points per year)

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Total Change</td>
<td>0.14</td>
<td>-0.02</td>
<td>-0.16</td>
<td>-0.19</td>
</tr>
<tr>
<td>Demographic</td>
<td>0.05</td>
<td>-0.06</td>
<td>-0.08</td>
<td>-0.10</td>
</tr>
<tr>
<td>Behavioral</td>
<td>0.09</td>
<td>0.04</td>
<td>-0.07</td>
<td>-0.09</td>
</tr>
</tbody>
</table>
## Decomposition of Demographic Contribution

(Percentage points per year)

<table>
<thead>
<tr>
<th></th>
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<td>Total</td>
<td>0.05</td>
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</tr>
<tr>
<td>Age 16-19</td>
<td>0.01</td>
<td>0.00</td>
<td>0.01</td>
<td>0.03</td>
</tr>
<tr>
<td>Age 20-24</td>
<td>-0.02</td>
<td>0.01</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Age 25-54</td>
<td>0.05</td>
<td>-0.04</td>
<td>-0.04</td>
<td>-0.05</td>
</tr>
<tr>
<td>Age 55-70</td>
<td>0.04</td>
<td>-0.06</td>
<td>-0.07</td>
<td>-0.05</td>
</tr>
<tr>
<td>Age 71-79</td>
<td>-0.03</td>
<td>0.03</td>
<td>0.02</td>
<td>-0.03</td>
</tr>
</tbody>
</table>
Labor Force Participation Rate, Trend vs. Actual

16-19 year olds

20-24 year olds
Labor Force Participation Rate, Trend vs. Actual

Male, 25-54

Female, 25-54

BLS Data
CPS Data
LF Trend
Labor Force Participation Rate, Trend vs. Actual

Male, 55-70

Female, 55-70

BLS Data
CPS Data
LF Trend
Labor Force Participation Rate, Trend vs. Actual

Male, >70

Female, >70

CPS Data
LF Trend
Demographically-Adjusted LFP

16+ CPS
Adjusted 16+ LFP
## Decomposition of Behavioral Contribution

(Percentage points per year)

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<td>-0.09</td>
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<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
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</tbody>
</table>
LFP By Education

Less than HS

HS Degree

Some College
LFP Gap By Education

(Actual LF – Predicted LF)
Contribution to LFP Gap By Education

(LFP Gap * Population Share)
Possible Interpretation of Low Education Results

- Housing boom may have temporarily stopped the slide of real wages for low education workers …
  - Possible interpretation of Charles, Hurst, and Notowidigdo (2012)

- Temporarily holding up LFP
  - And our trend estimates

- After housing collapse, wages and LFP declined

- Another story: Downward nominal wage rigidity bites harder for low education workers
  - Productivity gains take longer to bring realignment
  - Probably more a story for unemployment
LFP Gap By Age

(Actual LF – Predicted LF)
Contribution to LFP Gap By Age

(LFP Gap * Population Share)
Possible Interpretation of Age Results

- **Young workers most affected by down turn**
  - Consistent with past research that entrants face disproportionate difficulties in poor labor markets

- **Young workers may also be returning to school**
  - Understandable given low opportunity costs

- **Older workers may be working more to compensate for negative shock to wealth**
### Contribution to 2012 LFP Gap, by sex/age/education

<table>
<thead>
<tr>
<th>Group</th>
<th>2012 LFP Gap</th>
<th>Contribution to Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Gap:</td>
<td>-1.14%</td>
<td></td>
</tr>
<tr>
<td>Female, 25-54, HS Grads</td>
<td>-2.14%</td>
<td>-0.14%</td>
</tr>
<tr>
<td>Male, 25-54, HS dropouts</td>
<td>-3.03%</td>
<td>-0.10%</td>
</tr>
<tr>
<td>Female, 25-54, Some college</td>
<td>-1.03%</td>
<td>-0.08%</td>
</tr>
<tr>
<td>Female, 25-54, HS dropouts</td>
<td>-2.74%</td>
<td>-0.07%</td>
</tr>
<tr>
<td>Male, 20-24, HS graduates</td>
<td>-4.07%</td>
<td>-0.06%</td>
</tr>
<tr>
<td>Female, 71-79, HS Grads</td>
<td>-2.34%</td>
<td>-0.06%</td>
</tr>
<tr>
<td>Male, 25-54, HS Grads</td>
<td>-0.71%</td>
<td>-0.06%</td>
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<tr>
<td>Male, 25-54, Some College</td>
<td>-0.81%</td>
<td>-0.05%</td>
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<tr>
<td>Female, 20-24, Some College</td>
<td>-1.88%</td>
<td>-0.04%</td>
</tr>
<tr>
<td>Female, 16-19, Some college</td>
<td>-8.67%</td>
<td>-0.04%</td>
</tr>
<tr>
<td>Male, 16-19, HS dropouts</td>
<td>-1.59%</td>
<td>-0.04%</td>
</tr>
<tr>
<td>Residual:</td>
<td>-0.40%</td>
<td></td>
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</tbody>
</table>

(Difference of above gaps to total)
Caveats on LFP Modeling

- **Modeling of business cycle could be improved**
  - E.g., some evidence that LFP responds to unemployment with very long lags

- **Could incorporate more effects of policy changes**
  - E.g., on SS, taxes, tuition, etc.

- **More generally, need better economics**
  - Labor supply responds to wages and other general equilibrium factors
Payroll Employment

Ratio of Payroll to Household Employment (percent)

<table>
<thead>
<tr>
<th>Year</th>
<th>Trend</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>90</td>
<td>98</td>
</tr>
<tr>
<td>1992</td>
<td>92</td>
<td>96</td>
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<td>1997</td>
<td>94</td>
<td>96</td>
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<td>2002</td>
<td>98</td>
<td>94</td>
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<tr>
<td>2007</td>
<td></td>
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<tr>
<td>2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td></td>
<td></td>
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</tbody>
</table>

Payroll Employment-to-Population Ratio (fraction)

<table>
<thead>
<tr>
<th>Year</th>
<th>Trend</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>0.50</td>
<td>0.65</td>
</tr>
<tr>
<td>1992</td>
<td>0.55</td>
<td></td>
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<tr>
<td>1997</td>
<td>0.60</td>
<td></td>
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<tr>
<td>2002</td>
<td>0.65</td>
<td></td>
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<tr>
<td>2007</td>
<td>0.60</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>0.55</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>0.50</td>
<td></td>
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</table>
Payroll Employment

Payroll Employment Gap
(thousands of jobs)

Avg. monthly gains of 195k close the gap by the end of 2016
Payroll Employment

Trend Payroll Employment Growth
(jobs/month)
Extra Slides
-- May eventually be deleted
Participation By Age and Sex

2012 Labor Force Participation Rates, by Age (percent)

Change in Population Share, by Age (percentage points)
Participation By Age and Sex

2012 Labor Force Participation Rates
(percent)
Change in Population Share, By Age

(percentage points)
Age-Specific Control Variables
Teen and 20-24 models

Real Minimum Wage (Demeaned)
Age-Specific Control Variables
Teen and 20-24 models

Hourly Wage Ratio of 16-19 year olds to 25-54 year olds (Demeaned)
Age-Specific Control Variables
Prime age models

Married with a Child 5 Years or Younger
(percent of 25-54 year olds)
Age-Specific Control Variables
Prime age models

Married with no Child 5 Years or Younger
(percent of 25-54 year olds)
Age-Specific Control Variables
Older age models

Life Expectancies by Sex
(expected years lived past 50)
LF Participation Rate, with Business Cycles

Ages 16+


CPS Data
LF Trend
Demographically-Adj. LFP, w/Business Cycle Effect
<table>
<thead>
<tr>
<th>Education Level</th>
<th>Gap (%)</th>
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</thead>
<tbody>
<tr>
<td>Less than HS</td>
<td>-2.50%</td>
</tr>
<tr>
<td>HS</td>
<td>-2.00%</td>
</tr>
<tr>
<td>Some College</td>
<td>-1.50%</td>
</tr>
<tr>
<td>College</td>
<td>-1.00%</td>
</tr>
<tr>
<td>Post College</td>
<td>-0.50%</td>
</tr>
</tbody>
</table>

LFP Gap By Education, with Business Cycle Effect

(Actual LF – Predicted LF)

Graph showing the LFP gap by education level from 1987 to 2012 with different lines representing each educational level.
Contribution to LFP Gap By Education

(LFP Gap * Population Share)
LFP Gap By Age, with Business Cycle Effect

(Actual LF – Predicted LF)
Contribution to LFP Gap By Age

(LFP Gap * Population Share)
Labor Force Participation Rate, Trend vs. Actual

Estimated with data through 2012, Ages 16-79

CPS Data
LF Trend