Using the American Community Survey to Construct a Labor Composition Measure

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Project Overview

- Labor composition used in:
  - BLS multifactor productivity (MFP) by industry
  - BEA-BLS industry-level production accounts (ILPA)

- Improved and shared methodology
  - Combines information from both the ACS and CPS
  - Small area estimation to handle thin cells
The Model*

1. Define industry cohorts: age by education by sex by class
2. Calculate growth in hours worked
   a) Unweighted
   b) Weighted by share of labor cost
3. Labor composition = Weighted Growth – Unweighted Growth

*D.W. Jorgenson, F.M. Gollop, and B. Fraumeni, Productivity and U.S. Economic Growth
A unique combination of the following:

- 63 industries
- 8 age groups
- 6 education groups
- 2 sex groups
- 2 class of worker groups

### Age Definition

<table>
<thead>
<tr>
<th>Age</th>
<th>Definition</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>&lt; 16</td>
</tr>
<tr>
<td>2</td>
<td>16-17</td>
</tr>
<tr>
<td>3</td>
<td>18-24</td>
</tr>
<tr>
<td>4</td>
<td>25-34</td>
</tr>
<tr>
<td>5</td>
<td>35-44</td>
</tr>
<tr>
<td>6</td>
<td>45-54</td>
</tr>
<tr>
<td>7</td>
<td>55-64</td>
</tr>
<tr>
<td>8</td>
<td>65+</td>
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</table>

### Education Definition

<table>
<thead>
<tr>
<th>Education</th>
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<tbody>
<tr>
<td>1</td>
<td>Grades 0-8</td>
</tr>
<tr>
<td>2</td>
<td>Grades 9-12</td>
</tr>
<tr>
<td>3</td>
<td>HS Diploma</td>
</tr>
<tr>
<td>4</td>
<td>Some college</td>
</tr>
<tr>
<td>5</td>
<td>Bachelor’s</td>
</tr>
<tr>
<td>6</td>
<td>More than a bachelor’s</td>
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### Sex Definition

<table>
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<tbody>
<tr>
<td>1</td>
<td>Male</td>
</tr>
<tr>
<td>2</td>
<td>Female</td>
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</table>

### Class Definition

<table>
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<th>Definition</th>
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<tbody>
<tr>
<td>1</td>
<td>Payroll</td>
</tr>
<tr>
<td>2</td>
<td>Self-employed</td>
</tr>
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</table>
Published Methodology – Data Source

- **BLS**
  - Basic Monthly Current Population Survey (CPS)

- **ILPA**
  - Decennial Census
  - CPS Annual March Supplement (CPS ASEC)
  - Iterative proportional fitting (RAS)
    - Maintains cohort proportions from Census
    - Adjusts levels to match marginal totals in ASEC
Current Issues

- Missing wage data
- Cohorts that drop in and out of the time-series
- **Thin cells** – cohorts with low number of observations
- Changes to Decennial Census starting in 2010
  - Income, education, and employment information moved to annual American Community Survey (ACS)
ACS vs. CPS - Similarities

- Household surveys
- Data collected monthly
- Data released annually (CPS ASEC)
- Industry, age, sex, education, class of worker available
- Hours and wages available
# ACS vs. CPS - Differences

<table>
<thead>
<tr>
<th>Topic</th>
<th>ACS</th>
<th>CPS</th>
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</thead>
<tbody>
<tr>
<td>Main purpose</td>
<td>Population demographics</td>
<td>Unemployment rate</td>
</tr>
<tr>
<td>Reference period</td>
<td>Previous 12 months</td>
<td>Last week</td>
</tr>
<tr>
<td>Multiple job holders</td>
<td>No data</td>
<td>Second job data</td>
</tr>
<tr>
<td>Time-series</td>
<td>Starts in 2003</td>
<td>Starts in 1960s</td>
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</tbody>
</table>
ACS vs. CPS – Sample Size

- Current Population Survey (CPS)
  - March Supplement (ASEC) – 98,000 households per year

- American Community Survey (ACS)
  - 3.5 million housing units per year
ACS vs. CPS

Percent of U.S. Workforce with at least a Bachelor’s degree
ACS vs. CPS

Percent of Females in U.S. Workforce

ACS vs. CPS - Takeaway

- CPS – labor force focused
  - Employment, hours and wages more aligned
- ACS – general population focused
  - Demographic composition
- Which one should we use?
Shared Methodology - RAS

- Use estimates from the ACS
- Scale ACS estimates to CPS-ASEC using RAS
  - Age by education by sex totals
  - For employment, hours, and wages
- Similar to ILPA approach with Decennial Census
Small Area Estimation (SAE)

- Fay-Herriot model
  - Mixed effects model, includes random and fixed effects
- Requires standard errors for each cohort
  - Replicate weights from ACS
- Weighted sum of the ACS and model estimate
- Borrow strength from other available information
Small Area Estimation – Auxiliary Data

- **CPS**
  - Independent estimate
  - Consistent with the aggregate

- **ACS 5-year (ex. 2015-2019)**
  - Larger sample size (60 vs. 12 months)
  - Point estimate for a 5-year time period
  - Data for areas with small populations
  - More reliable but not as timely
Impact of Adjustments

Warehousing and Storage

Labor Composition (2012=100)
Labor Composition Index

Total Economy
Labor Composition Index

Computer & Electronics Manufacturing (NAICS 334)
Labor Composition Index

Wholesale Trade (NAICS 42)
Labor Composition Index

Management of Companies (NAICS 55)
Conclusion

- Improved methodology for labor composition
  - Combines strengths of ACS and CPS
  - Small area estimation to address thin cells
- Shared methodology for both BEA and BLS
  - Will be introduced in near future
- Research into more industry detail underway
Contact Information

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