The Dual U.S. Labor Market Uncovered

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October 28, 2022
Fall 2022 EFG Meeting
Chicago

This material is based upon work supported by the National Science Foundation under Grant No. SES-2048713. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation or of any of the institutions that they are affiliated with, including the Federal Reserve Board of Governors, the Federal Reserve Bank of Chicago, and the Federal Reserve System.
“A set of precise labor force concepts was developed in the late 1930s to classify people as working, looking for work, or not in the labor force. These concepts were adopted for a national survey of households, called the Monthly Report of Unemployment, which was initiated in 1940 by the Work Projects Administration. This survey was transferred to the Census Bureau in 1942 and later renamed the Current Population Survey. . . .” (BLS, History of the Current Population Survey)
Finer classification needed to understand many aspects of labor market dynamics

- Short- vs long-term employed
  
  Hall (1982); Hyatt and Spletzer (2016); Pries (2004); Morchio (2020); Pries and Rogerson (2021)

- Heterogeneity in types of unemployed
  
  van den Berg and van Ours (1996); Hornstein (2012); Kroft et al. (2016); Jarosch and Pilossoph (2019); Ahn and Hamilton (2020)

- Differences in labor supply elasticities and labor force attachment
  
  Elsby et al. (2015); Krusell et al. (2017); Kudlyak and Lange (2017); Heathcote et al. (2020)
Macro Heterogeneity within these categories topic of many studies

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**This paper:** shows that the rich macro heterogeneity can be captured with a dual labor market structure (DLM) augmented with a *predominantly* home production sector
U.S. labor market well approximated as the combination of three segments

Primary (Stability)  Secondary (Turbulence)  Tertiary (Low Attachment)
“The dual labor market is distinguished by the stability of jobs and very limited mobility between the two market segments.”

Doeringer and Piore (1970)
“The dual labor market is distinguished by the stability of jobs and very limited mobility between the two market segments.”

Doeringer and Piore (1970)

$L=$ Employed (E), Short and Long-term Unemployed (US, UL) and Nonparticipant (N)
“The dual labor market is distinguished by the stability of jobs and very limited mobility between the two market segments.”

Doeringer and Piore (1970)

Use detailed labor force histories of 10,178,593 respondents in the CPS in 1980 to 2021
Methodology

Hidden Markov Model with Inequality Restrictions
Hidden Markov Model (HMM): CPS Structure

**Hidden states:**
Refined labor force state

**Emissions:**
Observed labor force status

*Months in sample 1-4*

- $l_{i,t}$
- $l_{i,t+1}$
- $l_{i,t+2}$
- $l_{i,t+3}$

*Out of sample for 8 months*

- $l_{i,t+4}$

*Months in sample 5-8*

- $l_{i,t+11}$
- $l_{i,t+12}$
- $l_{i,t+13}$
- $l_{i,t+14}$
- $l_{i,t+15}$

*Emissions:*

- $X_{i,t}$
- $X_{i,t+1}$
- $X_{i,t+2}$
- $X_{i,t+3}$
- $X_{i,t+12}$
- $X_{i,t+13}$
- $X_{i,t+14}$
- $X_{i,t+15}$
Hidden Markov Model (HMM): CPS Structure

Identification of Macro Heterogeneity unsupervised machine learning problem

- Involves classifying individual, $i$ at each point in time into untagged hidden labor market states $l \in L$

Hall and Kudlyak (2019), Shibata (2019), Gregory et al. (2021), Braxton et al. (2021), Lentz et al. (2022)
Hidden Markov Model (HMM): CPS Structure

- **Transition model**: Dynamics of hidden states
- **Emissions model**: Likelihood of observations — the hidden states
Hidden Markov Model: Three objects

**Unconditional probabilities:**
Stocks of individuals in each hidden state

\[ \delta_{l,t} = P(\ell_{i,t} = l; t) \]

**Transition probabilities (horizontal arrows):**
Hidden states first-order Markov process

\[ q_{l,l',t} = P(l_{i,t} = l' \mid l_{i,t-1} = l; t) \]

**Emission probabilities (vertical arrows):**
Observations only conditionally dependent on current hidden state

\[ \omega_{x,l,t} = P(x_{i,t} = x \mid l_{i,t} = l; t) \]
Restrictions and Assumptions for Identification and Interpretability

**Primary**

- EP
- UPS
- NP
- UPL

**Secondary**

- ES
- USS
- NS
- USL

**Tertiary**

- ET
- UTS
- NT
- UTL
Restrictions and Assumptions for Identification and Interpretability

Employment in primary sector more persistent

Distinguishes primary sector from secondary (and tertiary)
Persistence of non-participation higher in the tertiary sector

Pins down tertiary segment as “home production” sector
Restrictions and Assumptions for Identification and Interpretability

**Primary**
- UPS
- EP
- NP
- UPL

**Secondary**
- USS
- ES
- NS
- USL

**Tertiary**
- UTS
- ET
- NT
- UTL

Long-term unemployment (UL) more persistent than short-term U (US)
Can only go from short- to long-term unemployment
Separates short- and long-term employed types
Restrictions and Assumptions for Identification and Interpretability

No mobility between sectors, no misclassification error and random missing observations

4-8-4 structure of CPS limits estimation of cross-segment mobility. Make sure that estimated stocks and flows match those published by BLS.
1. **Employed** (3): Part-time for economic reasons, absent from work for other reasons, and the rest

2. **Unemployed** (16): 4 reasons for unemployment \( \otimes \) 4 categories of unemployment duration
   - Reason: Temporary layoffs, temporary job ended, job losers, and the rest
   - Duration: less than 5 weeks, 5-14 weeks, 15-26 weeks, longer than 26 weeks

3. **Nonparticipation** (10)
   - Discouraged, Marginally attached, Temporary job ended, Previous job search, Available for work or not, Want a job
1. **Employed** (3): Part-time for economic reasons, absent from work for other reasons, and the rest

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3. **Nonparticipation** (10)
   - Discouraged, Marginally attached, Temporary job ended, Previous job search, Available for work or not, Want a job

**Solution method:** Expectation Maximization with inequality constraints to estimate 90,216 parameters

Algorithm from Andersen *et al.* (2011)
Three Labor Market Segments
Secondary market is small

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Shares of population in labor market segments
Monthly observations, not seasonally adjusted

Source: CPS and authors’ calculations
Total is very different from each of its three parts

<table>
<thead>
<tr>
<th></th>
<th>Primary</th>
<th>Secondary</th>
<th>Tertiary</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share of population</td>
<td>54.46</td>
<td>13.75</td>
<td>31.79</td>
<td>100.00</td>
</tr>
<tr>
<td>Unemployment rate</td>
<td>2.07</td>
<td>26.45</td>
<td>19.92</td>
<td>6.62</td>
</tr>
<tr>
<td>Labor-force participation rate</td>
<td>97.16</td>
<td>72.92</td>
<td>8.84</td>
<td>65.77</td>
</tr>
<tr>
<td>Employment-to-population ratio</td>
<td>95.15</td>
<td>53.55</td>
<td>7.05</td>
<td>61.42</td>
</tr>
</tbody>
</table>

- Stark differences in unemployment rates
- High employment rate in primary
Different markets contribute to different labor market aggregates

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<td>13.75</td>
<td>31.79</td>
<td>100.00</td>
</tr>
<tr>
<td>Share of unemployment</td>
<td>25.0</td>
<td>61.8</td>
<td>13.2</td>
<td>6.62</td>
</tr>
<tr>
<td>Share of labor force</td>
<td>80.4</td>
<td>15.3</td>
<td>4.3</td>
<td>65.77</td>
</tr>
<tr>
<td>Share of employment</td>
<td>84.4</td>
<td>12.0</td>
<td>3.6</td>
<td>61.42</td>
</tr>
</tbody>
</table>

- Primary sector account for 84% of employment but accounts for only 25% of unemployment
- Secondary sector constitutes less than 14% of the population but accounts for
  - almost two thirds of unemployment
Unemployment fluctuations in each segment

Unemployment rates in labor market segments

Monthly observations, not seasonally adjusted, share of labor force

- **Primary**: Generally stable across years.
- **Secondary**: Strongly countercyclical, with more than 40% of the fluctuations in unemployment.
- **Tertiary**: Less volatile than Primary and Secondary.

Source: CPS and authors' calculations
Unemployment fluctuations in each segment

Unemployment rates in labor market segments

Monthly observations, not seasonally adjusted, share of labor force

- Secondary and tertiary: Strongly countercyclical.
- Secondary: more than 40 percent of the fluctuations in unemployment

Source: CPS and authors' calculations
U.S. labor market owes its dynamism to 14 percent of population

Composition of flows per person in the population

Average annualized flows per person

- 0.91 flows per capita
- Half in the secondary

Source: BLS and authors' calculations
Potential Reasons for Segmentation
Many causes emphasized by studies on the Dual Labor Markets

Some, but limited, evidence for ...

- **Discrimination**
  - Women, Black and Hispanic workers, foreign-born underrepresented in primary
  - Explanatory power small and declining over time

- **Unionization**
  - Small effects and not consistent with stable secondary share

Most support in data for ...

- **Life-cycle career choices**
- **Efficiency wage theory**
- **Differential labor demand fluctuations**
Life Cycle
Primary market share peaks for prime-age workers

Segment share by cohort: Primary
Fraction of persons in primary segment, by age and cohort

Source: BLS and authors' calculations
Secondary share high for teenagers. Levels off during prime-age.
Secondary share high for teenagers. Levels off during prime-age.

**Segment share by cohort: Secondary**

Fraction of persons in secondary segment, by age and cohort

<table>
<thead>
<tr>
<th>Share</th>
<th>High-school</th>
<th>56.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Some college</td>
<td>23.4</td>
<td></td>
</tr>
<tr>
<td>College</td>
<td>19.9</td>
<td></td>
</tr>
</tbody>
</table>

Source: BLS and authors' calculations
Efficiency Wages and Demand Fluctuations
Primary sector jobs more stable and better paid

<table>
<thead>
<tr>
<th></th>
<th>Primary</th>
<th>Secondary</th>
<th>Tertiary</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2J rate</td>
<td>2.1</td>
<td>4.5</td>
<td>3.3</td>
<td>2.4</td>
</tr>
<tr>
<td>Tenure</td>
<td>5.0</td>
<td>1.8</td>
<td>2.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Weekly hours</td>
<td>40</td>
<td>32</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>Hourly earnings</td>
<td>6.2</td>
<td>-23.1</td>
<td>-23.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Weekly earnings</td>
<td>8.3</td>
<td>-45.5</td>
<td>-44.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

- Return to education and experience both higher in primary
Also consistent with differential frequency and magnitude of demand fluctuations
“Response to flux and uncertainty...”

Source: BLS and authors’ calculations

Piore (1970)
The labor market is the sum of three very different parts

**Primary (Stability)**  
**Secondary (Turbulence)**  
**Tertiary (Low Attachment)**

Provides a new perspective on many empirical puzzles in macro-labor and food for thought for future theories and policy design.


DOERINGER, P.B., AND PIOR, M.J. 1970. *Internal labor markets and manpower analysis*. Manpower Administration (Department of Labor).

ELSBY, MICHAEL W.L., HOBIJN, BART, AND ŞAHIN, AYŞEGÜL. 2015. On the importance of the participation margin for labor market fluctuations. *Journal of monetary economics, 72*(C), 64–82.


References II


FOM matches the one-month persistence of employment...

1-month transition probabilities between labor market states

Monthly observations; not seasonally adjusted

Source: BLS and authors' calculations
... But fails to fit 12-month persistence

12-month transition probabilities between labor market states

Monthly observations; not seasonally adjusted

Source: BLS and authors' calculations
Employment-to-population ratio in each segment

Employment-population ratio in labor market segments

Monthly observations, not seasonally adjusted, share of population

- Primary and tertiary: flat EPOP ratios; stark difference in levels
- Secondary: cyclically sensitive

Source: CPS and authors' calculations

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Labor force participation rates in each segment

- Secondary market: LFPR rose during the Great Recession.
- Tertiary market: slow downtrend + seasonality

Source: CPS and authors' calculations
Observables explain little of variation in segment membership

<table>
<thead>
<tr>
<th></th>
<th>primary</th>
<th>secondary</th>
<th>tertiary</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-squared</td>
<td>0.1891</td>
<td>0.0490</td>
<td>0.2305</td>
</tr>
<tr>
<td>Female</td>
<td>-0.1189</td>
<td>-0.0053</td>
<td>0.1241</td>
</tr>
<tr>
<td></td>
<td>(-466.82)</td>
<td>(-31.095)</td>
<td>(524.19)</td>
</tr>
<tr>
<td>16-24</td>
<td>-0.1157</td>
<td>0.0618</td>
<td>0.0538</td>
</tr>
<tr>
<td></td>
<td>(-270.32)</td>
<td>(217.65)</td>
<td>(135.34)</td>
</tr>
<tr>
<td>55 and over</td>
<td>-0.3628</td>
<td>-0.0652</td>
<td>0.4280</td>
</tr>
<tr>
<td></td>
<td>(-1164.7)</td>
<td>(-315.35)</td>
<td>(1477.6)</td>
</tr>
<tr>
<td>Less than high school</td>
<td>-0.2279</td>
<td>0.0545</td>
<td>0.1734</td>
</tr>
<tr>
<td></td>
<td>(-533.61)</td>
<td>(192.34)</td>
<td>(436.53)</td>
</tr>
<tr>
<td>High school diploma</td>
<td>-0.1235</td>
<td>0.0378</td>
<td>0.0857</td>
</tr>
<tr>
<td></td>
<td>(-302.55)</td>
<td>(139.50)</td>
<td>(225.77)</td>
</tr>
<tr>
<td>Some college</td>
<td>-0.0704</td>
<td>0.0275</td>
<td>0.0429</td>
</tr>
<tr>
<td></td>
<td>(-172.78)</td>
<td>(101.53)</td>
<td>(113.33)</td>
</tr>
<tr>
<td>Black</td>
<td>-0.0700</td>
<td>0.0616</td>
<td>0.0084</td>
</tr>
<tr>
<td></td>
<td>(-182.25)</td>
<td>(241.52)</td>
<td>(23.591)</td>
</tr>
<tr>
<td>Other</td>
<td>-0.0579</td>
<td>0.0175</td>
<td>0.0404</td>
</tr>
<tr>
<td></td>
<td>(-109.71)</td>
<td>(49.964)</td>
<td>(82.314)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>-0.0291</td>
<td>0.0391</td>
<td>-0.0100</td>
</tr>
<tr>
<td></td>
<td>(-72.960)</td>
<td>(147.74)</td>
<td>(-26.990)</td>
</tr>
</tbody>
</table>

Effects

<table>
<thead>
<tr>
<th></th>
<th>Time</th>
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Distribution of segments within industries

Segment distribution by industry

- Finance and insurance
- Government
- Information
- Wholesale trade
- Durable goods manufacturing
- Health care and social assistance
- Transportation warehousing and utilities
- Educational services
- Real estate and rental and leasing
- Mining and logging
- Nondurable goods manufacturing
- Professional and business services
- Construction
- Retail trade
- Arts entertainment and recreation
- Other services
- Accommodation and food services
- Not Applicable/Not available

Source: BLS and authors' calculations
### E-step example: Respondent who is employed

<table>
<thead>
<tr>
<th>Date</th>
<th>Emission</th>
<th>P(P)</th>
<th>P(S)</th>
<th>P(T)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005-01</td>
<td>Employed-not PTER+no other absence</td>
<td>89.2</td>
<td>7.3</td>
<td>3.5</td>
</tr>
<tr>
<td>2005-02</td>
<td>Employed-not PTER+no other absence</td>
<td>92.5</td>
<td>4.9</td>
<td>2.6</td>
</tr>
<tr>
<td>2005-03</td>
<td>Employed-not PTER+no other absence</td>
<td>94.8</td>
<td>3.2</td>
<td>2</td>
</tr>
<tr>
<td>2005-04</td>
<td>Employed-not PTER+no other absence</td>
<td>96.4</td>
<td>2.2</td>
<td>1.5</td>
</tr>
<tr>
<td>2006-01</td>
<td>Employed-not PTER+no other absence</td>
<td>98.9</td>
<td>0.9</td>
<td>0.2</td>
</tr>
<tr>
<td>2006-02</td>
<td>Employed-not PTER+no other absence</td>
<td>99.3</td>
<td>0.6</td>
<td>0.1</td>
</tr>
<tr>
<td>2006-03</td>
<td>Employed-not PTER+no other absence</td>
<td>99.5</td>
<td>0.4</td>
<td>0.1</td>
</tr>
<tr>
<td>2006-04</td>
<td>Employed-not PTER+no other absence</td>
<td>99.7</td>
<td>0.3</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Someone who reports to be employed, is not absent from work, and does not work part-time for economic reasons
### E-step example: Part-time employed for economic reasons

<table>
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<tr>
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<td>89.2</td>
<td>7.3</td>
<td>3.5</td>
</tr>
<tr>
<td>2005-02</td>
<td>Employed-PTER</td>
<td>31.5</td>
<td>66.2</td>
<td>2.2</td>
</tr>
<tr>
<td>2005-03</td>
<td>Employed-PTER</td>
<td>1.7</td>
<td>98.2</td>
<td>0.1</td>
</tr>
<tr>
<td>2005-04</td>
<td>Employed-PTER</td>
<td>0.1</td>
<td>99.9</td>
<td>0</td>
</tr>
<tr>
<td>2006-01</td>
<td>Employed-PTER</td>
<td>0</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>2006-02</td>
<td>Employed-PTER</td>
<td>0</td>
<td>100</td>
<td>0</td>
</tr>
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<td>2006-03</td>
<td>Employed-PTER</td>
<td>0</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>2006-04</td>
<td>Employed-not PTER+no other absence</td>
<td>0</td>
<td>100</td>
<td>0</td>
</tr>
</tbody>
</table>

Because people who are PTER tend to have less persistent employment spells, worker classified in secondary market.
## E-step example: Information in type of non-participation

<table>
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<tr>
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<th>P(S)</th>
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<tbody>
<tr>
<td>2005-01</td>
<td>Employed-not PTER+no other absence</td>
<td>89.2</td>
<td>7.3</td>
<td>3.5</td>
</tr>
<tr>
<td>2005-02</td>
<td>U-Temporary job ended-less than 5 weeks</td>
<td>63.3</td>
<td>36.7</td>
<td>0</td>
</tr>
<tr>
<td>2005-03</td>
<td>Nonparticipants who do not want a job</td>
<td>46.6</td>
<td>53.3</td>
<td>0.1</td>
</tr>
<tr>
<td>2005-04</td>
<td>Nonparticipants who do not want a job</td>
<td>46.6</td>
<td>53.1</td>
<td>0.3</td>
</tr>
<tr>
<td>2006-01</td>
<td>Nonparticipants who do not want a job</td>
<td>10.2</td>
<td>87.7</td>
<td>2.1</td>
</tr>
<tr>
<td>2006-02</td>
<td>Nonparticipants who do not want a job</td>
<td>10.5</td>
<td>84.7</td>
<td>4.8</td>
</tr>
<tr>
<td>2006-03</td>
<td>Nonparticipants who do not want a job</td>
<td>10.6</td>
<td>78.8</td>
<td>10.5</td>
</tr>
<tr>
<td>2006-04</td>
<td>Nonparticipants who do not want a job</td>
<td>9.1</td>
<td>70.5</td>
<td>20.4</td>
</tr>
</tbody>
</table>

Whether you are marginally attached or don’t want a job affects imputed probabilities.