

The Dual U.S. Labor Market Uncovered

Hie Joo Ahn^a, Bart Hobijn^b, and Ayşegül Şahin^c

^aFederal Reserve Board

^bFRB of Chicago

^cUniversity of Texas at Austin, NBER

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.

Coarse classification of employed, unemployed, and non-participant



“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)

Macro Heterogeneity within these categories topic of many studies

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

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)

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

The gist of this paper in a (*coco-*) Nutshell

U.S. labor market well approximated as the combination of three segments

Primary (Stability)

Secondary (Turbulence)

Tertiary (Low Attachment)

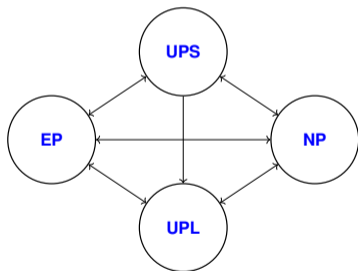


Three Segregated Segments

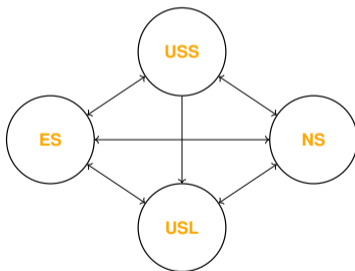
“The dual labor market is distinguished by the stability of jobs and very limited mobility between the two market segments.”

Doeringer and Piore (1970)

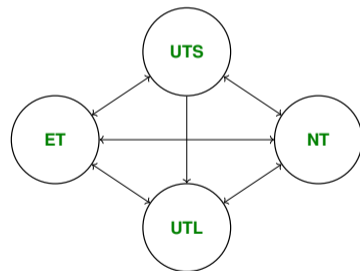
Primary



Secondary



Tertiary

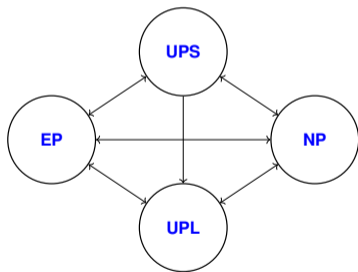


Three Segregated Segments

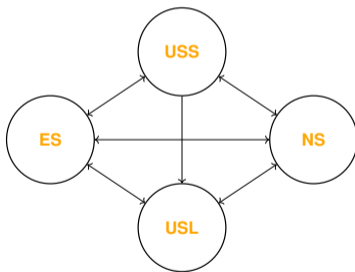
“The dual labor market is distinguished by the stability of jobs and very limited mobility between the two market segments.”

Doeringer and Piore (1970)

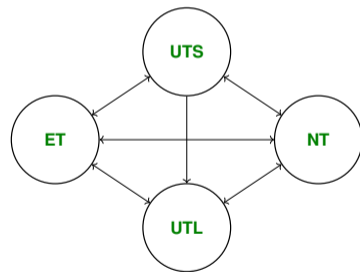
Primary



Secondary



Tertiary



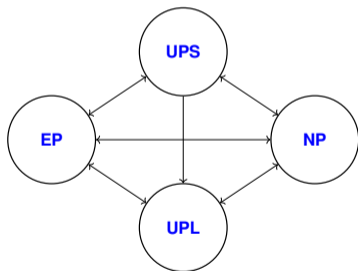
L=Employed (E), Short and Long-term Unemployed (US, UL) and Nonparticipant (N)

Three Segregated Segments

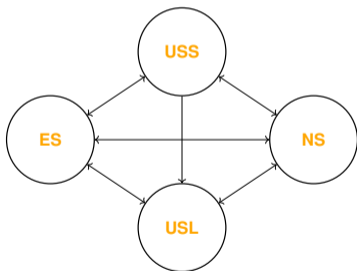
“The dual labor market is distinguished by the stability of jobs and very limited mobility between the two market segments.”

Doeringer and Piore (1970)

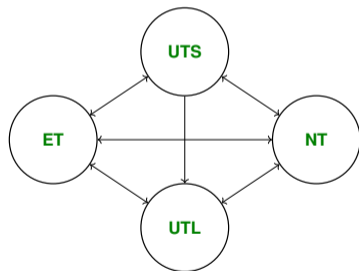
Primary



Secondary



Tertiary

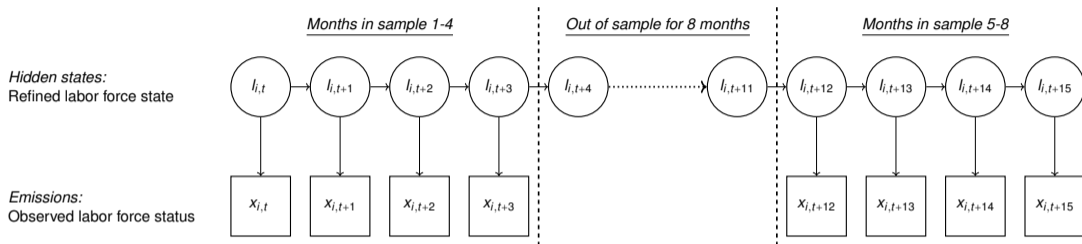


Use detailed labor force histories of 10,178,593 respondents in the CPS in 1980 to 2021

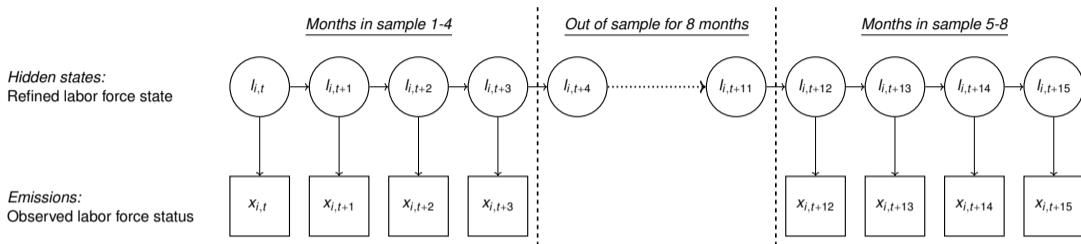
Methodology

Hidden Markov Model with Inequality Restrictions

Hidden Markov Model (HMM): CPS Structure



Hidden Markov Model (HMM): CPS Structure

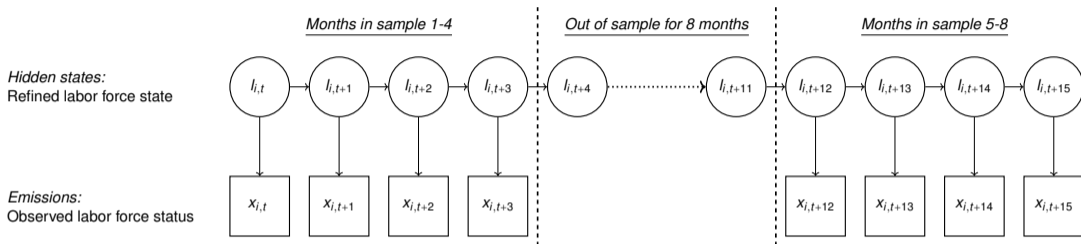


Identification of Macro Heterogeneity unsupervised machine learning problem

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

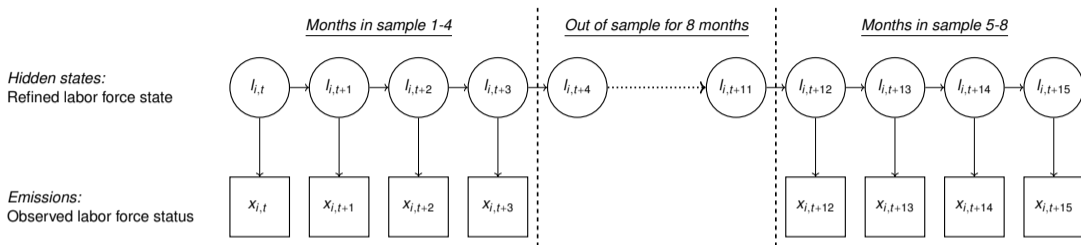
Hall and Kudlyak (2019), Shibata (2019), Gregory *et al.* (2021), Braxton *et al.* (2021), Lentz *et al.* (2022)

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

$$\delta_{l,t} = P(l_{i,t} = l; t)$$

Transition probabilities (horizontal arrows):

Hidden states first-order Markov process

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

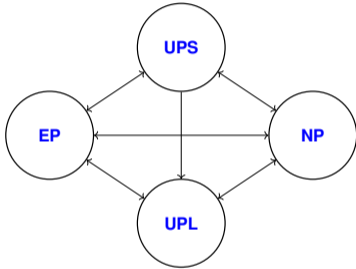
Emission probabilities (vertical arrows):

Observations only conditionally dependent on current hidden state

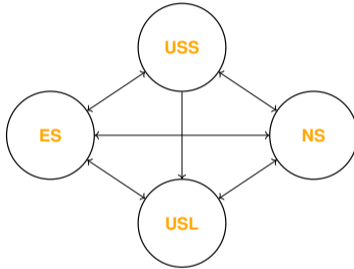
$$\omega_{x,l,t} = P(x_{i,t} = x \mid l_{i,t} = l; t)$$

Restrictions and Assumptions for Identification and Interpretability

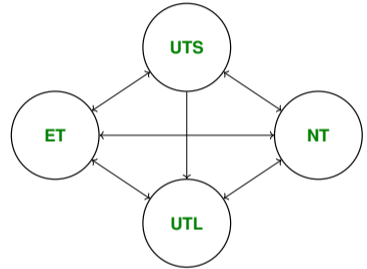
Primary



Secondary

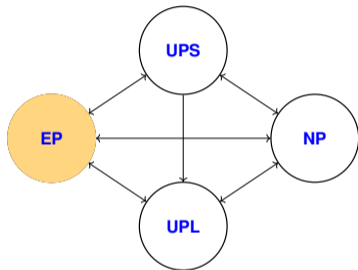


Tertiary

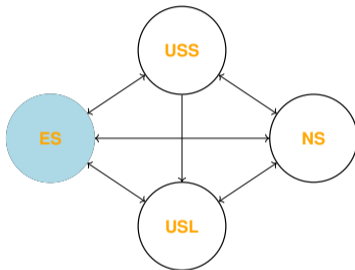


Restrictions and Assumptions for Identification and Interpretability

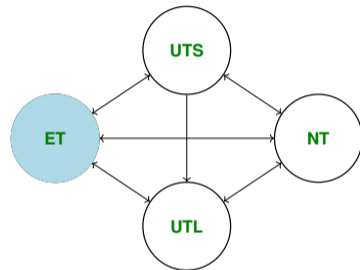
Primary



Secondary



Tertiary

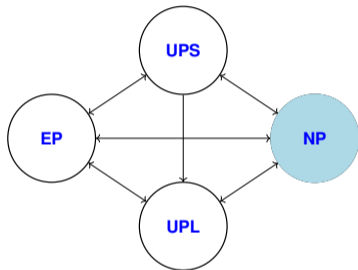


Employment in primary sector more persistent

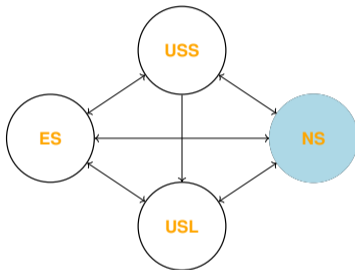
Distinguishes primary sector from secondary (and tertiary)

Restrictions and Assumptions for Identification and Interpretability

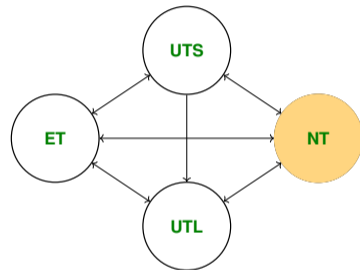
Primary



Secondary



Tertiary

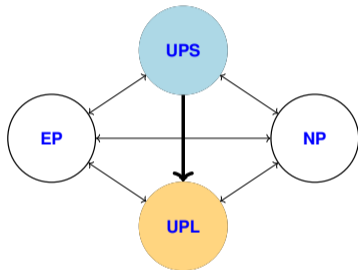


Persistence of non-participation higher in the tertiary sector

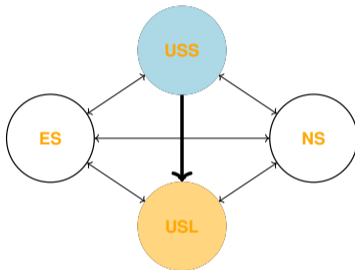
Pins down tertiary segment as “home production” sector

Restrictions and Assumptions for Identification and Interpretability

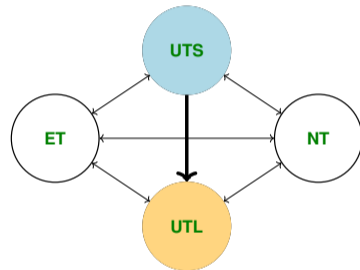
Primary



Secondary



Tertiary

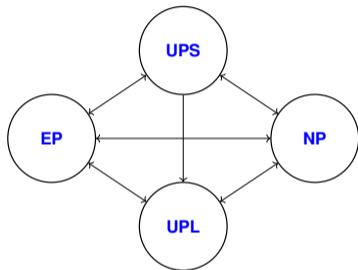


Long-term unemployment (UL) more persistent than short-term U (US)
Can only go from short- to long-term unemployment

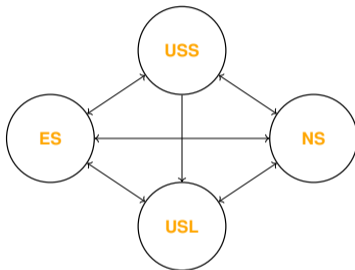
Separates short- and long-term employed types

Restrictions and Assumptions for Identification and Interpretability

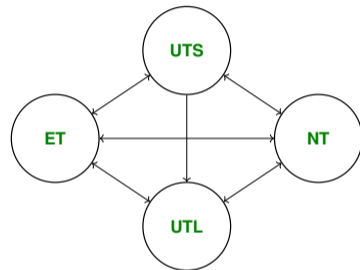
Primary



Secondary



Tertiary



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.

Use extensive answers about labor force status as emissions

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

Use extensive answers about labor force status as emissions

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

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

Algorithm from Andersen *et al.* (2011)

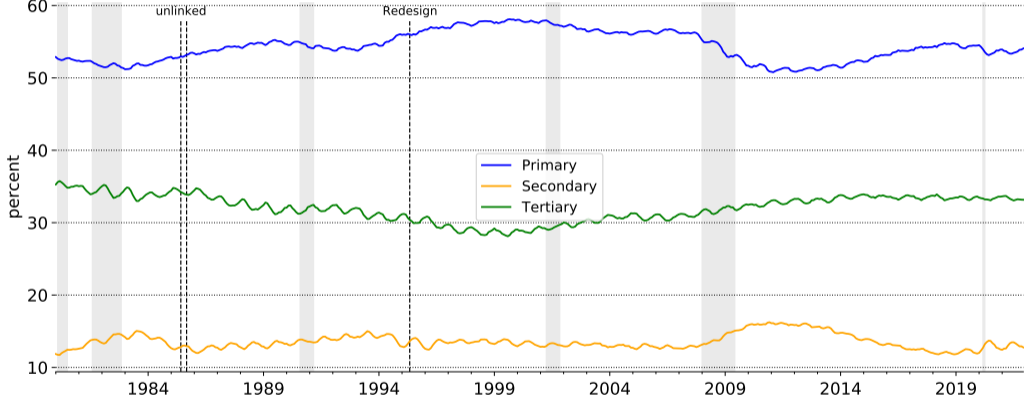
Examples

Three Labor Market Segments

Secondary market is small

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

	Primary	Secondary	Tertiary	Total
Share of population	54.46	13.75	31.79	100.00
Unemployment rate	2.07	26.45	19.92	6.62
Labor-force participation rate	97.16	72.92	8.84	65.77
Employment-to-population ratio	95.15	53.55	7.05	61.42

- Stark differences in unemployment rates
- High employment rate in primary

LFPR

EPOP

Different markets contribute to different labor market aggregates

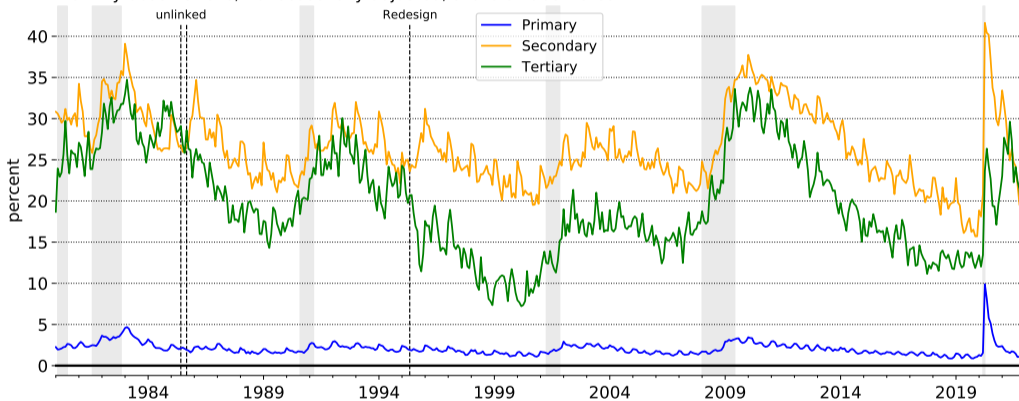
	Primary	Secondary	Tertiary	Total
Share of population	54.46	13.75	31.79	100.00
Share of unemployment	25.0	61.8	13.2	6.62
Share of labor force	80.4	15.3	4.3	65.77
Share of employment	84.4	12.0	3.6	61.42

- 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

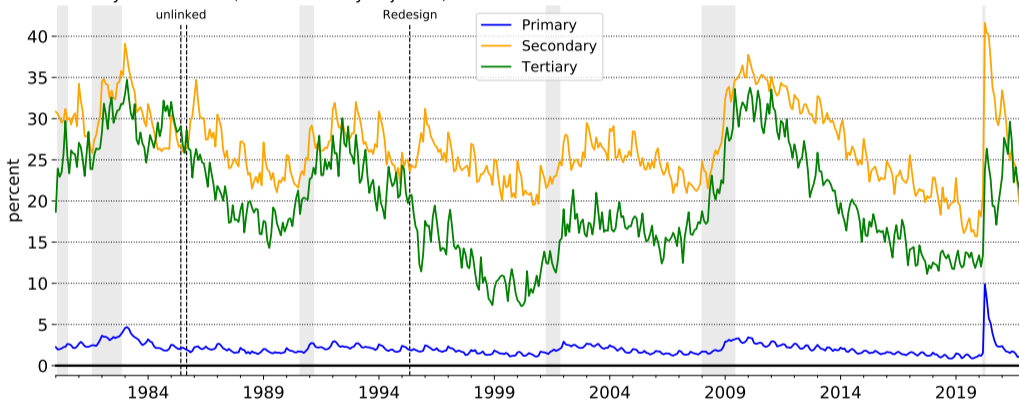


Source: CPS and authors' calculations

Unemployment fluctuations in each segment

Unemployment rates in labor market segments

Monthly observations, not seasonally adjusted, share of labor force



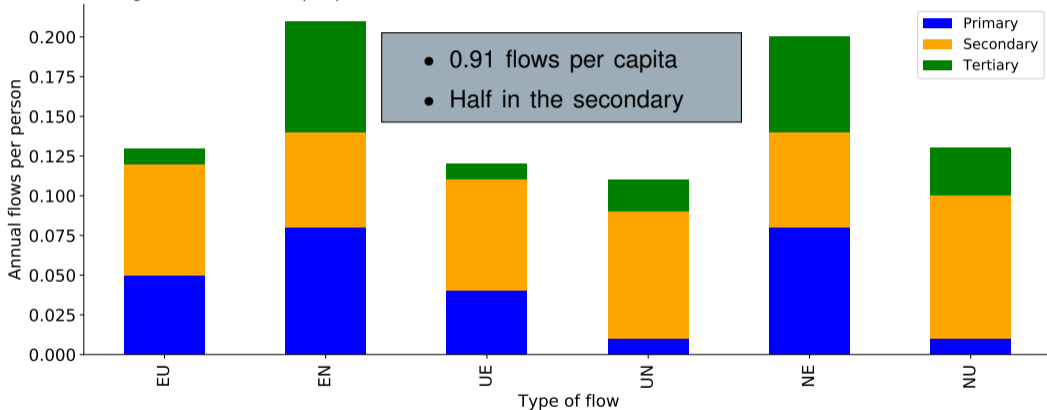
Source: CPS and authors' calculations

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

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



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**

Doeringer and Piore (1970), Dickens and Lang (1985)

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

- **Unionization**

Berger *et al.* (1980), Reich *et al.* (1973)

- Small effects and not consistent with stable secondary share
-

Most support in data for ...

- **Life-cycle career choices**

Pries (2004), Morchio (2020)

- **Efficiency wage theory**

Bulow and Summers (1986), Albrecht and Vroman (1992), Saint-Paul (1997)

- **Differential labor demand fluctuations**

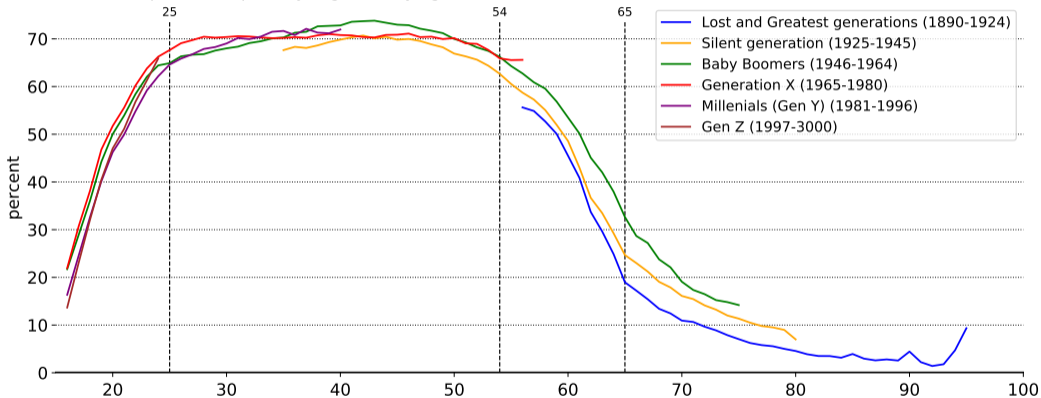
Berger *et al.* (1980), Saint-Paul (1997)

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

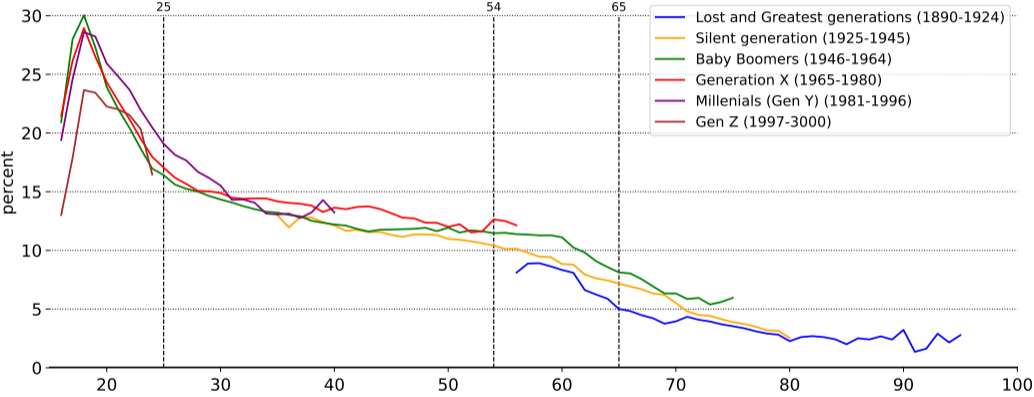


Source: BLS and authors' calculations

Secondary share high for teenagers. Levels off during prime-age

Segment share by cohort: Secondary

Fraction of persons in secondary segment, by age and cohort

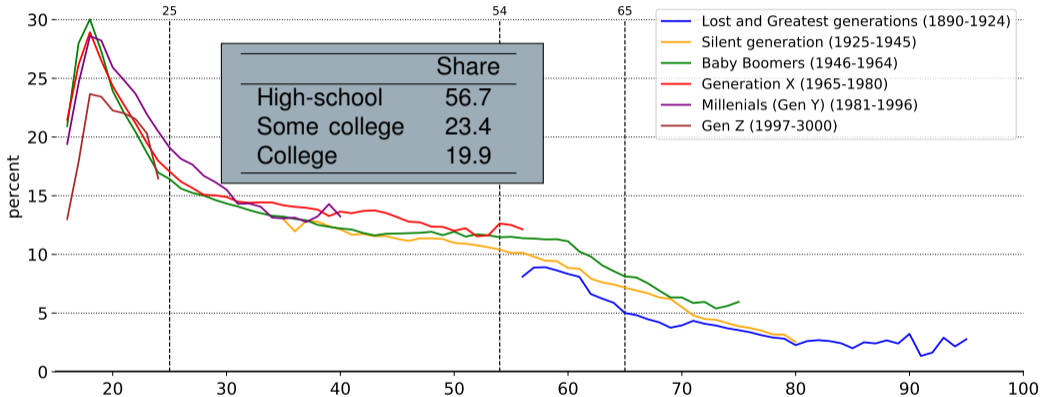


Source: BLS and authors' calculations

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



Source: BLS and authors' calculations

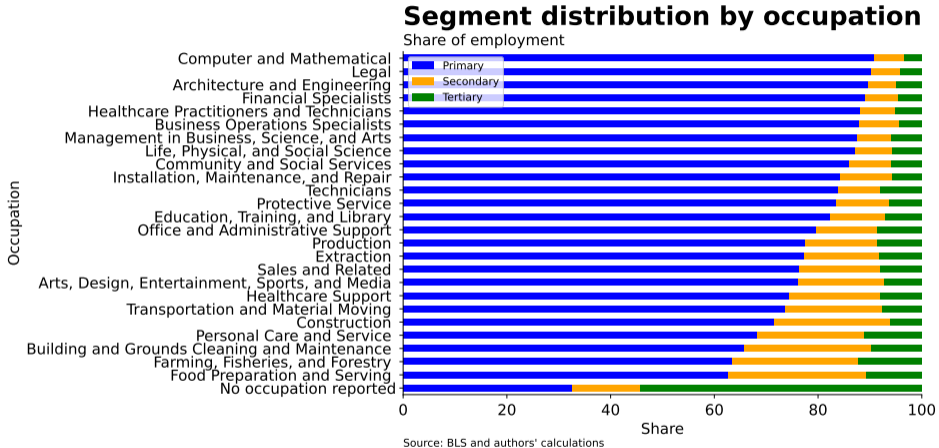
Efficiency Wages and Demand Fluctuations

Primary sector jobs more stable and better paid

	Primary	Secondary	Tertiary	Total
J2J rate	2.1	4.5	3.3	2.4
Tenure	5.0	1.8	2.0	4.0
Weekly hours	40	32	30	40
Hourly earnings	6.2	-23.1	-23.1	0.0
Weekly earnings	8.3	-45.5	-44.0	0.0
Return to education	7.1%	5.7%	6.0%	—
Return to experience	3.4%	2.1%	2.0%	—

- Return to education and experience both higher in primary

Distribution of segments within occupation



Also consistent with differential frequency and magnitude of demand fluctuations
“Response to flux and uncertainty...”

Piore (1970) Industries

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

References I

- AHN, HIE JOO, AND HAMILTON, JAMES D. 2020. Heterogeneity and unemployment dynamics. *Journal of business and economic statistics*, **38**(3), 554–569.
- ALBRECHT, JAMES W., AND VROMAN, SUSAN B. 1992. Dual labor markets, efficiency wages, and search. *Journal of labor economics*, **10**(4), 438–461.
- ANDERSEN, MARTIN, DAHL, JOACHIM, LIU, ZHANG, AND VANDENBERGHE, LIEVEN. 2011. Interior-point methods for large-scale cone programming. *Optimization for machine learning*, **5583**.
- BERGER, S., BERGER, P.P.S.S., PIORE, M.J., SUZANNE, B., AND PRESS, CAMBRIDGE UNIVERSITY. 1980. *Dualism and discontinuity in industrial societies*. Cambridge University Press.
- BRAXTON, J. CARTER, HERKENHOFF, KYLE, ROTHBAUM, JONATHAN, AND SCHMIDT, LAWRENCE. 2021. *Changing income risk across the us skill distribution: Evidence from a generalized kalman filter*. Tech. rept.
- BULOW, JEREMY I, AND SUMMERS, LAWRENCE. 1986. A theory of dual labor markets with application to industrial policy, discrimination, and keynesian unemployment. *Journal of labor economics*, **4**(3), 376–414.
- DICKENS, WILLIAM T., AND LANG, KEVIN. 1985. A test of dual labor market theory. *The american economic review*, **75**(4), 792–805.
- DOERINGER, P.B., AND PIORE, 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.
- GREGORY, VICTORIA, MENZIO, GUIDO, AND WICZER, DAVID G. 2021 (Apr.). *The Alpha Beta Gamma of the Labor Market*. NBER Working Papers 28663. National Bureau of Economic Research, Inc.
- HALL, ROBERT E. 1982. The importance of lifetime jobs in the u.s. economy. *The american economic review*, **72**(4), 716–724.
- HALL, ROBERT E., AND KUDLYAK, MARIANNA. 2019 (Feb.). *Job-Finding and Job-Losing: A Comprehensive Model of Heterogeneous Individual Labor-Market Dynamics*. NBER Working Papers 25625. National Bureau of Economic Research, Inc.
- HEATHCOTE, JONATHAN, PERRI, FABRIZIO, AND VIOLANTE, GIOVANNI L. 2020. The rise of us earnings inequality: Does the cycle drive the trend? *Review of economic dynamics*, **37**, S181–S204. The twenty-fifth anniversary of “Frontiers of Business Cycle Research”.
- HORNSTEIN, ANDREAS. 2012 (11). *Accounting for unemployment: the long and short of it*. Working Paper 12-07. Federal Reserve Bank of Richmond.
- HYATT, HENRY, AND SPLETZER, JAMES. 2016. The shifting job tenure distribution. *Labour economics*, **41**(C), 363–377.

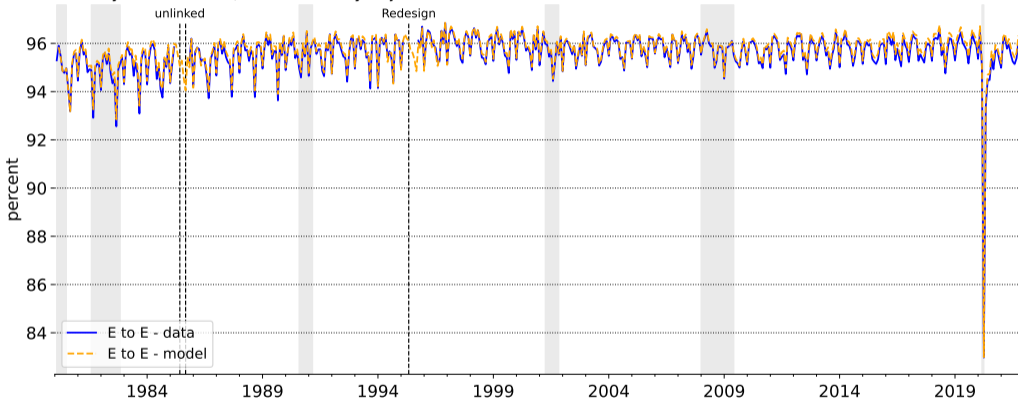
References II

- JAROSCH, GREGOR, AND PILOSSOPH, LAURA. 2019. Statistical discrimination and duration dependence in the job finding rate. *The review of economic studies*, **86**(4), 1631–1665.
- KROFT, KORY, LANGE, FABIAN, NOTOWIDIGDO, MATTHEW J., AND KATZ, LAWRENCE F. 2016. Long-term unemployment and the great recession: The role of composition, duration dependence, and nonparticipation. *Journal of labor economics*, **34**(S1), S7–S54.
- KRUSELL, PER, MUKOYAMA, TOSHIHIKO, AND ŞAHIN, AYŞEGÜL. 2010. Labour-Market Matching with Precautionary Savings and Aggregate Fluctuations. *The review of economic studies*, **77**(4), 1477–1507.
- KRUSELL, PER, MUKOYAMA, TOSHIHIKO, ROGERSON, RICHARD, AND ŞAHIN, AYŞEGÜL. 2017. Gross Worker Flows over the Business Cycle. *American economic review*, **107**(11), 3447–3476.
- KUDLYAK, MARIANNA, AND LANGE, FABIAN. 2017 (Sept.). *Measuring Heterogeneity in Job Finding Rates among the Non-Employed Using Labor Force Status Histories*. Working Paper Series 2017-20. Federal Reserve Bank of San Francisco.
- LENTZ, RASMUS, PIYAPROMDEE, SUPHANIT, AND ROBIN, JEAN-MARC. 2022. *The Anatomy of Sorting – Evidence from Danish Data*. Working paper series.
- MORCHIO, IACOPO. 2020. Work histories and lifetime unemployment. *International economic review*, **61**(1), 321–350.
- PIORE, MICHAEL J. 1970. The dual labor market: Theory and implications. *Pages 55–59 of: BEER, SAMUEL H., AND BARRINGER, RICHARD E. (eds), The state and the poor*.
- PRIES, MICHAEL J. 2004. Persistence of Employment Fluctuations: A Model of Recurring Job Loss. *Review of economic studies*, **71**(1), 193–215.
- PRIES, MICHAEL J, AND ROGERSON, RICHARD. 2021. Declining worker turnover: The role of short duration employment spells. *American economic journal: Macroeconomics*.
- REICH, MICHAEL, GORDON, DAVID M., AND EDWARDS, RICHARD C. 1973. A theory of labor market segmentation. *The american economic review*, **63**(2), 359–365.
- SAINT-PAUL, GILLES. 1997. *Dual Labor Markets: A Macroeconomic Perspective*. MIT Press Books, vol. 1, no. 0262193760. The MIT Press.
- SHIBATA, IPPEI. 2019 (Dec.). *Labor Market Dynamics: A Hidden Markov Approach*. IMF Working Papers 2019/282. International Monetary Fund.
- VAN DEN BERG, GERARD J., AND VAN OURS, JAN C. 1996. Unemployment dynamics and duration dependence. *Journal of labor economics*, **14**(1), 100–125.

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

1-month transition probabilities between labor market states

Monthly observations; not seasonally adjusted

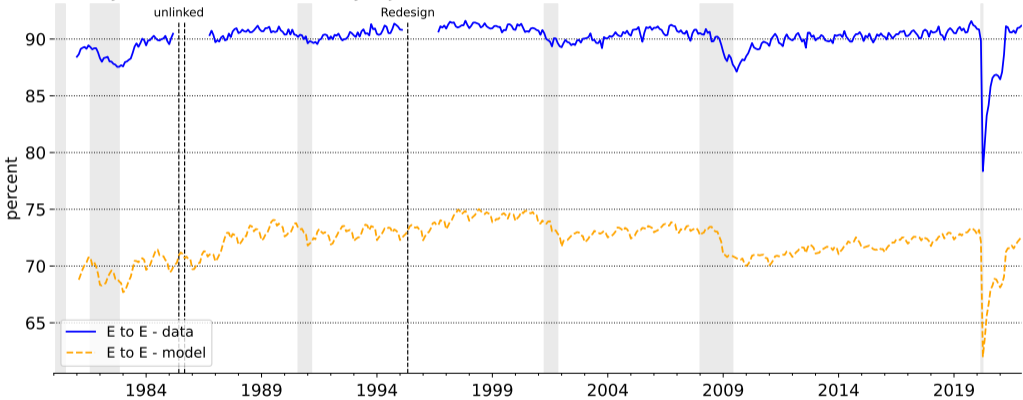


Source: BLS and authors' calculations

... But fails to fit 12-month persistence

12-month transition probabilities between labor market states

Monthly observations; not seasonally adjusted



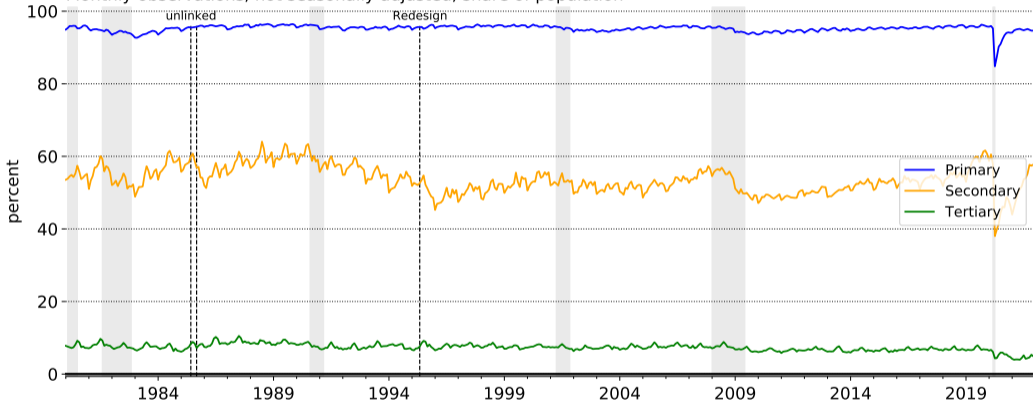
Source: BLS and authors' calculations

[Back](#)

Employment-to-population ratio in each segment

Employment-population ratio in labor market segments

Monthly observations, not seasonally adjusted, share of population



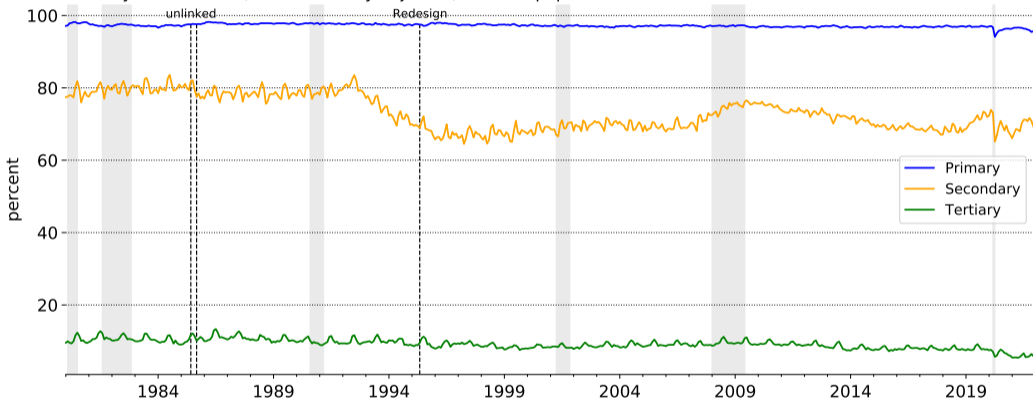
Source: CPS and authors' calculations

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

Labor force participation rates in each segment

Labor force participation rate in labor market segments

Monthly observations, not seasonally adjusted, share of population



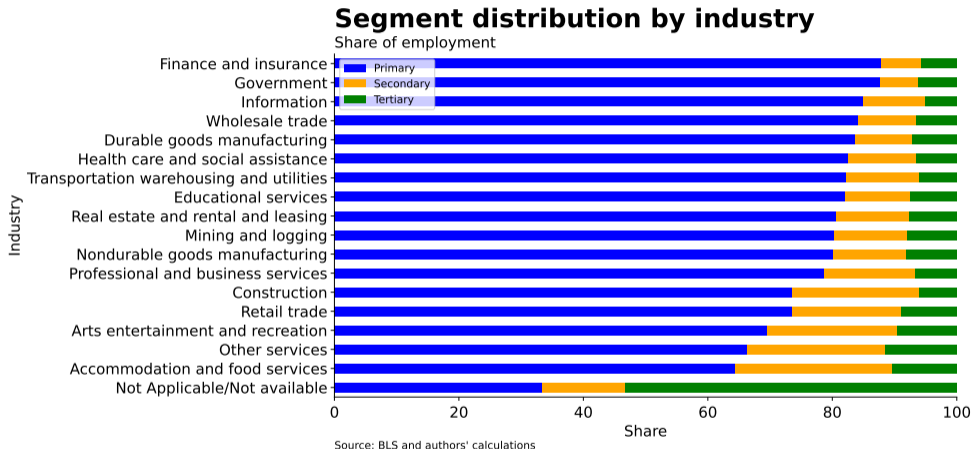
Source: CPS and authors' calculations

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

Observables explain little of variation in segment membership

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

Distribution of segments within industries



E-step example: Respondent who is employed

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

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

Date	Emission	P(P)	P(S)	P(T)
2005-01	Employed-not PTER+no other absence	89.2	7.3	3.5
2005-02	Employed-PTER	31.5	66.2	2.2
2005-03	Employed-PTER	1.7	98.2	0.1
2005-04	Employed-PTER	0.1	99.9	0
2006-01	Employed-PTER	0	100	0
2006-02	Employed-PTER	0	100	0
2006-03	Employed-PTER	0	100	0
2006-04	Employed-not PTER+no other absence	0	100	0

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

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

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

[Back](#)