Labor Force Participation

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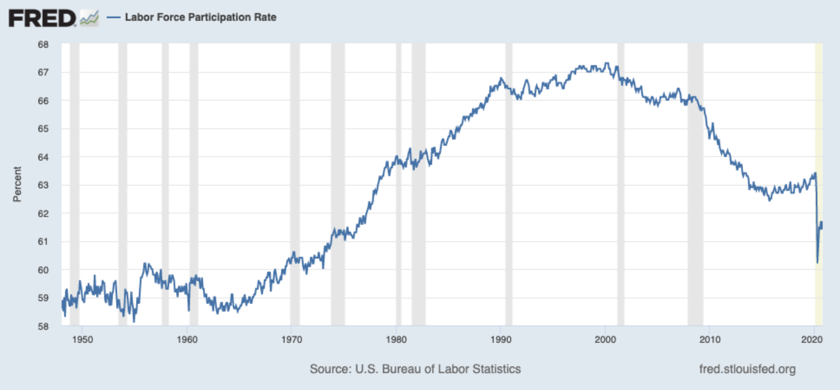
So far

- We have discussed movements between U and E
  - how firms and workers match $p(\theta)$
  - when workers stop searching, or how many times they search
  - can also think about job destruction δ, why matches end
- We have seen data on
  - unemployment u
  - vacancies v
  - job finding rate $p(\theta)$, job destruction rate δ
  - job filling rate $q(\theta)$

Now let's think about participation

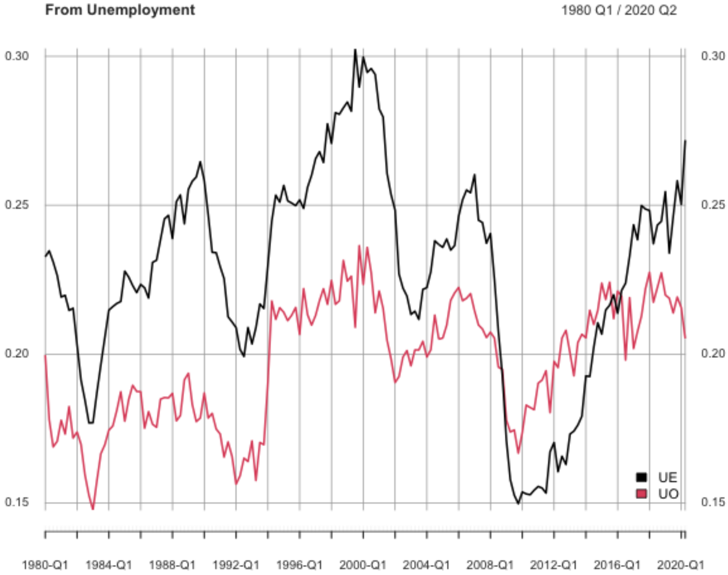
- What is labor force participation?
    - labor force = U + E
    - how has this changed over time, trend and cycle?
- How important is it for understanding trends and cyclical patterns in E, U, total hours, wages, output?
    - let's look at the flows
- What do people's decisions to participate depend on?
    - do labor market frictions matter?

Labor force participation rate

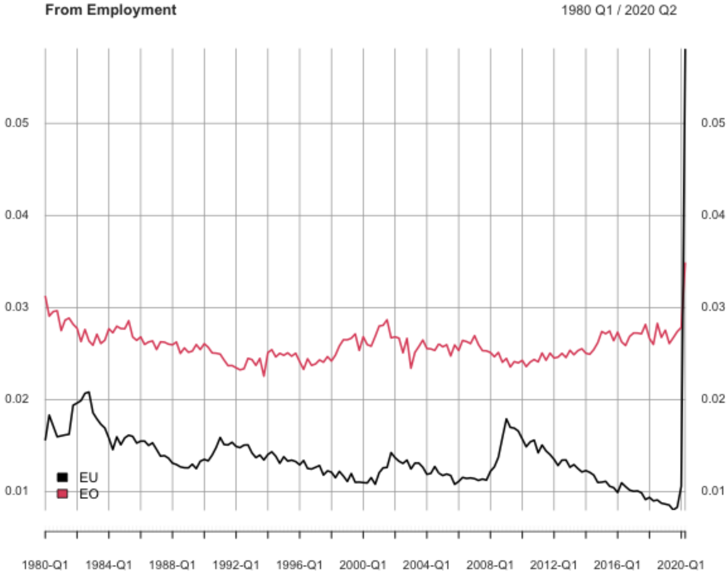


- large movements in trend
  - 1970's - 2000's women entered labor force
  - 2000's - current: aging population & young men not participating
- cyclical patterns: a-cyclical, pro-cyclical?

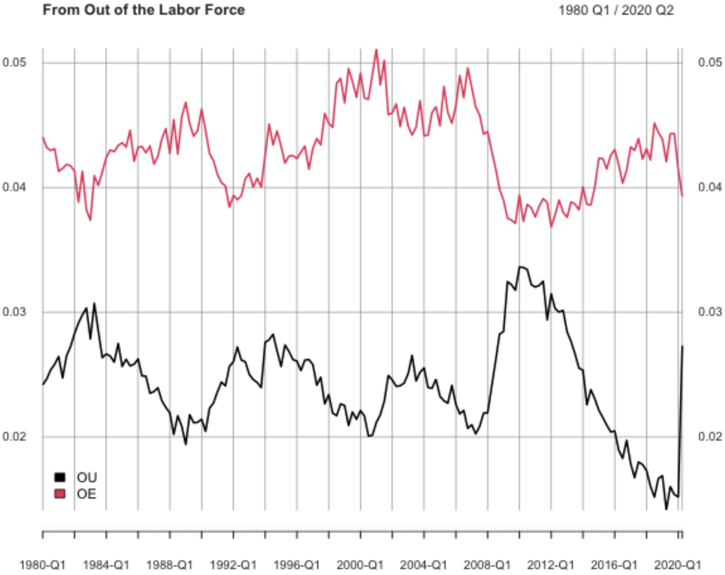
Flows between U, E, and O



Flows between U, E, and O



Flows between U, E, and O



Three facts from the flows

1) Unemployed people are equally likely to leave unemployment for employment or inactivity

2) Employed workers are more likely to leave employment for inactivity than unemployment

3) People who are out of the labor force are more likely to find a job than move to unemployment

How important is the participation margin?

Table 3
Three-state variance decomposition of changes in the unemployment rate by classification error adjustment.

Class. error adjustment	Start of sample	Share of variance						
		EU	*UE*	*NU*	*UN*	*EN*	*NE*	residual
Unadjusted	1967	24.9	34.9	9.5	23.9	−0.3	1.0	6.0
De*NU*nified	1967	–	–	–	–	–	–	–
Abowd–Zellner	1967	29.6	41.7	−0.7	26.7	−1.3	2.1	1.8
Unadjusted	1978	22.3	35.1	13.2	22.3	−0.7	1.5	6.3
De*NU*nified	1978	25.2	42.5	11.6	17.1	−0.8	1.1	3.3
Abowd–Zellner	1978	25.6	44.4	3.9	26.4	−1.7	2.3	−0.9

- Elsby, Hobijn, Sahin (2015): three state (E, U, N) variance decomposition of the unemployment rate.
    - $\sim$ 30% of the variation in the unemployment rate is attributed to movements between U and N
    - robust to measurement issue

Participation in the simple DMP model

- Consider the simple DMP model from last week
- Let's add a third state the worker can be in O
- If the worker is out of the labor force he gets b forever

$$rO = b$$

- Worker chooses to participate by comparing O and U

$$rU \geq rO \Rightarrow \text{ he participates}$$

Participation in the simple DMP model

- The value of unemployment

$$rU = \frac{r+\delta}{r+\delta+p(\theta)} b + \frac{p(\theta)}{r+\delta+p(\theta)} w$$

- As long as $w \geq b$ we have that $rU \geq rO$

- $w \geq b$ as long as productivity is high enough, regardless of the wage setting mechanism, i.e. $y \geq b$

Participation in the simple DMP model

- Changes in participation i.e. movements between U and O can only be driven by changes in y or b
  - frictions do not matter for labor supply, only employment
  - if $y > b$ without frictions we have full employment
  - if $y < b$ we have no employment
- Garibaldi and Wasmer (2005)
  - model linear utility, shocks to the value of non-participaiton
  - can not match large flows between U and O

When do frictions matter for labor supply?

$$\max_{\{c_t\},\{h_t\}} \sum_{t=0}^{\infty} \beta^t [\ln(c_t) + \alpha \ln(1 - h_t)] \quad , \quad h_t \in \{0, h\}$$

- Consider a simple indivisible labor model, Rogerson (1988) or Hansen (1985), workers are risk adverse and markets are incomplete
- models have interior solutions to labor supply, i.e. fraction of worker's life employed $\in (0, 1)$
- do not have frictions, no sense of unemployment
- α determines steady state employment
  - high $\alpha \rightarrow$ value leisure a lot $\rightarrow$ low emp.
  - low $\alpha \rightarrow$ do not value leisure $\rightarrow$ high emp.

Krusell, Mukoyama, Rogerson, Sahin (2008)

- Environment
  - Risk averse workers: $U(c_t, h_t) = log(c_t) - d(h_t)$
  - Incomplete markets
    - can save assets at rate r
  - To start, no frictions, choose $h_t \in \{0, 1\}$
- When do frictions matter for the labor supply decision?

Value Functions

- No borrowing, $a' > 0$
- Budget constraint
  - working: $c + a' = (1+r)a + w$
  - not working: $c + a' = (1+r)a$
- Value of working

$$W(a) = \max_{a'} log[(1+r)a + w - a'] - d(1) + \beta V(a')$$

- Value of not working

$$N(a) = \max_{a'} log[(1+r)a - a'] - d(0) + \beta V(a')$$

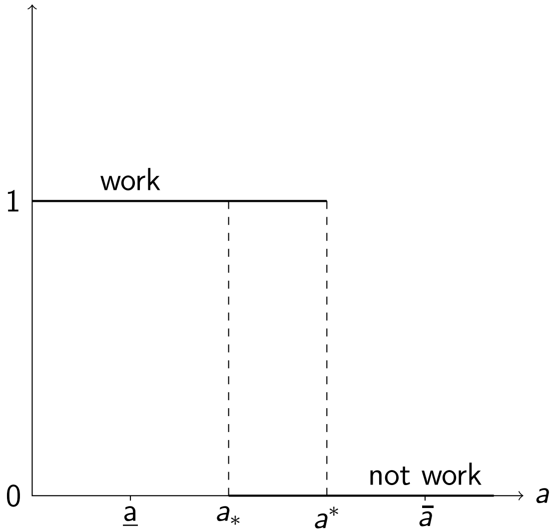
- Total Value function

$$V(a) = \max\{W(a), N(a)\}$$

Steady State Solution

- Work region: $a \leq \underline{a}$
  - c_t and a_t constant over time, always work
  - absorbing state
- Leisure region: $a \geq \bar{a}$
  - c_t and a_t constant over time, never work
  - absorbing state
- Indifference region: $a \in [a_*, a^*]$
  - indifferent between working and not working
  - c_t is constant over time
  - a_t is decreasing if not working
  - a_t is increasing if working

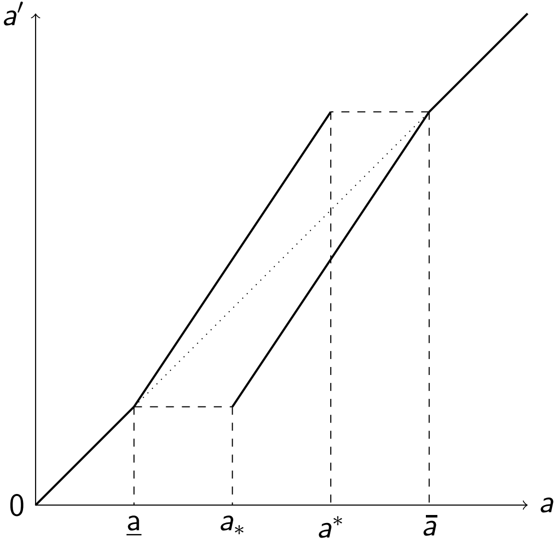
Work Policy Function



Steady State Solution

- Buffer regions: $a \in [\underline{a}, a_*]$ or $a \in [a^*, \bar{a}]$
  - c_t is constant over time, equal to indifference region
  - $a \in [\underline{a}, a_*]$: always working and a_t is increasing
    - moving towards indifference region from below
  - $a \in [a^*, \bar{a}]$: always not working and a_t is decreasing
    - moving towards indifference region from above
- Buffer + Indifference region, $a \in [\underline{a}, \bar{a}]$ is absorbing

Asset Policy Function



When do frictions matter for labor supply?

- Frictions $\rightarrow$ it takes time to find a job
- When indifference region is large
  - worker can go many periods being indifferent between working and not working
  - the length of time it takes to find a job is not so important
  - small changes in frictions have little impact on labor supply
- When the indifference region is small
  - worker goes fewer period being indifferent between working and not working
  - the length of time it takes to find a job is important
  - small changes in frictions can have large impact on labor supply

Taking the model to the data

- Krusell et al. have many variations of the model and different calibrations, see 2008, 2010, 2011, 2017
- Krusell et al. (2017)
  - idiosyncratic productivity shocks
  - shocks to the disutility of searching
  - shocks to unemployment benefits, b
- Need large shocks to disutility of searching to match UO flows

An Alternative View of Labor Force Attachment

- Look's at participation from the data side
- The standard definition of unemployment: one active search effort in past 4 weeks and available to work
  - "in or out" approach
  - all "in" people are considered the same

Question Is the "in or out" approach a good measure of labor underutilization?

An Alternative View of Labor Force Attachment

Question Is the "in or out" approach a good measure of labor underutilization?

Status in previous month	Not seasonally adjusted			
	Status in current month			
	Employed	Unemployed	Not in labor force	Other outflows(1)
Total, 16 years and over				
Employed	152,964	1,296	4,193	25
Unemployed	1,402	2,686	1,375	2
Not in labor force	4,604	1,523	89,365	202
Other inflows(2)	96	5	336	-

- Two observations

  (1) Large oscillations between U and O

  (2) Large flows $O \rightarrow E$

Answer: no.

Two Main Problems

1. Measurement Issues: misclassification between LM states
   - Solutions: (misses on Problem # 2)
     (1) estimate misclassification probabilities and move people around Abowd & Zellner (1985), Poterba & Summers (1986), Feng & Hu (2013), Elsby, Hobijn & Sahin (2015), Krueger, Mas & Niu (2017), Shibata (2019WP), Ahn & Hamilton (2019WP)
     (2) BLS broader measures of unemployment

2. No Heterogeneity: changes in the unemployment rate driven by compositional changes of the pool of unemployed
   - Solution: (misses on Problem # 1)
     (1) adjust using labor force shift share Perry (1970), Gordon (1982), Summers (1986), Shimer (1998), Barnichon & Mesters (2018), Crump, Giannoni, Eusepi, & Sahin (2019)

Proposed solution

- Think about labor force attachment as a continuous variable
- Each person has a degree of labor force attachment, or alternatively an unemployment intensity
  - degree of attachment $\in [0, 1]$
  - 1: most attached, fully unemployed
  - 0: least attached, fully out of the labor force
- Note: we often use an intensive margin for employment
  - full/part time and full time equivalents
  - total hours

Continuous Definition of Labor Force Attachment

Discrete LF attachment	**Continuous LF attachment**
$U_t = \sum_{i \in N_t} \mathbb{1}(_{\text{search \& avail.}}) wgt_i$	$\tilde{U}_t = \sum_{i \in N_t} P_{it} wgt_i$

- N_t = not employed
- wgt_i = sampling weight
- P_{it} = estimated search effort
  - $P_{it} \in (0, 1)$

    $\Rightarrow$ addresses Problem # 1
  - estimated using demographic characteristics

    $\Rightarrow$ addresses Problem # 2
  - positively correlated with emp. prob. & hours worked

Empirical Strategy

- **Data Sources**
  (1) American time use survey (ATUS) 2003-2018
    - contains job search information for everyone
  (2) Current Population Survey 1980 onward
    - used to calculate all aggregate labor market stats
- **Empirical Strategy**
  (1) Machine Learning to best predict job search in ATUS
  (2) Predict job search in CPS from 1980 onward
  (3) Construct continuous labor market statistics

Data

- American Time Use Survey 2003-2018
  - Interviews CPS respondents 2-5 months after CPS
  - Asks about labor force status again
    - categorizes identically to CPS
  - Asks people what, where, with whom, and how long they did activities throughout the day
    - job search activities

Who is Searching?

Search Effort by Labor Force Status

	Age 16+		
	Daily Probability	Monthly Probability	Minutes Per Day
Employed	0.6	16.8	113.4
Unemployed	17.1	99.6	145.8
Out of the Labor Force	0.4	11.9	132.9
N	189,314	189,314	2,122

	Age 25-55		
	Daily Probability	Monthly Probability	Minutes Per Day
Employed	0.6	15.5	123.2
Unemployed	23.0	99.9	155.2
Out of the Labor Force	1.0	25.4	136.3
N	108,505	108,505	1,506

What are they doing?

Percent of Time by Activity

	Age 16+			Age 25-55		
	E	U	O	E	U	O
Active Job Search	81.8	91.1	85.8	82.2	92.8	89.7
Interviewing	14.9	6.8	9.7	14.2	5.1	5.4
Other	3.2	2.1	4.5	3.6	2.1	4.9
N	579	1,344	199	421	959	126

Predicting Search Probability

- Logistic function for prob. job search ($y_i = 1$)

$$P(y_i = 1|x_i) = \frac{\exp(\beta_0 + x_i^T\beta)}{1 - \exp(\beta_0 + x_i^T\beta)}$$

- Net-elastic regularization

$$\min_{\beta_0,\beta} - \left[\frac{1}{N}\sum_{i=1}^{N} y_i(\beta_0 + x_i^T\beta) - \ln[1 - \exp(\beta_0 + x_i\beta)]\right] + \lambda\left[(1-\alpha)\sum_{k\in K}\beta_k^2 + \alpha\sum_{k\in K}|\beta_k|\right]$$

α $= 0.95 \Rightarrow$ close to LASSO

λ chosen by cross validation of 10 folds to maximize the area under receiver operating characteristic curve

K is the set of predictors with penalty

- Estimated on each labor market state separately

Predicted Probabilities

- Data: CPS 1980 onward
- Contains all the same demographic variables
- Predicted search probabilities
  - Daily probability

$$\hat{p}_d \text{ for Monday -Sunday}$$

  - Weekly probability

$$\hat{p}_i^w = 1 - \prod_{d=1}^{7}(1 - \hat{p}_d)$$

  - Monthly probability

$$\hat{P}_i = 1 - (1 - \hat{p}_i^w)^{4.17}$$

Labor Force Attachment

- If P_{it} is a measurement for attachment
  - higher effort should imply more hours
  - more likely to work full time
  - higher job finding probability
- Subset all transition from non-employment to employment

$$y_{it} = \beta \hat{P}_{i,t-1} + \delta_t + \varepsilon_{it}$$

	Job Finding Prob.		Hours Worked		Change in Hours	
Search Probability	0.174	0.176	7.397	7.554	18.542	18.502
	(0.000)	(0.000)	(0.065)	(0.065)	(0.230)	(0.229)
Mean	0.037	0.037	30.33	30.33	0.33	0.33
Month $\times$ Year FE		✓		✓		✓
Observations	17608693	17608693	345967	345967	188130	188130
Sample	Full	Full	Nonemp. Job Finders	Nonemp. Job Finder	Emp. Job Switchers	Emp. Job Switchers

Total Number of Searchers

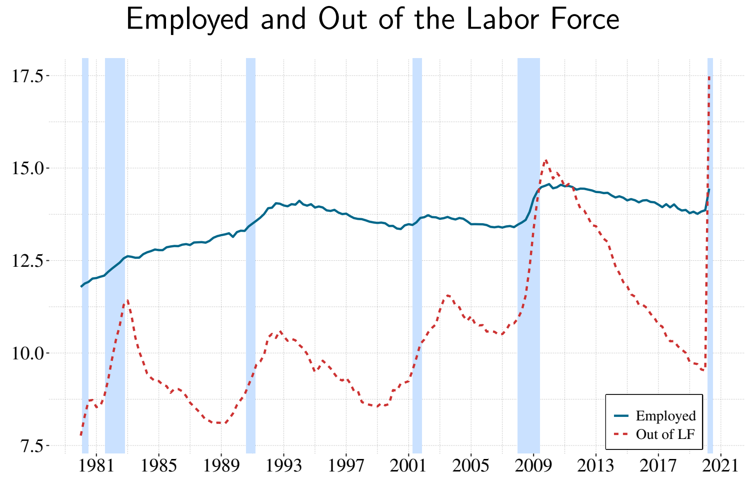
- Total number of searchers per BLS defined group

$$E_t^s = \sum_{i \in E_t} weight_{it} \times \hat{P}_{it}$$

$$U_t^s = \sum_{i \in U_t} weight_{it} \times \hat{P}_{it}$$

$$O_t^s = \sum_{i \in O_t} weight_{it} \times \hat{P}_{it}$$

Fraction of Searchers



- Fraction of unemployed searching is on average 96

Unemployment and Participation

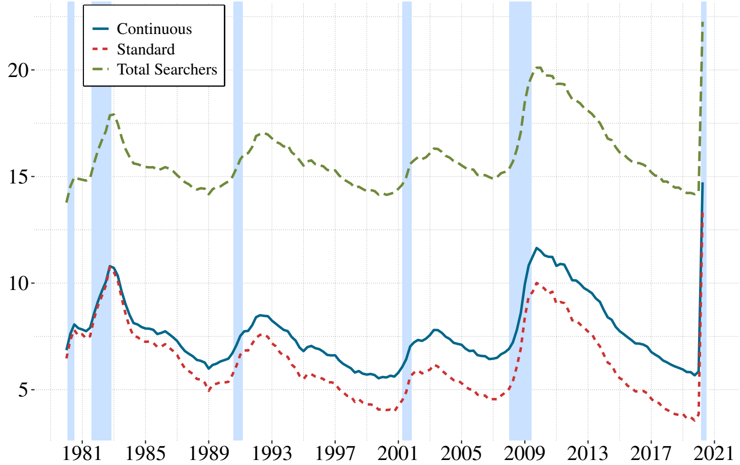
- Standard Rates

$$u = \frac{U}{U+E} \qquad p = \frac{U+E}{U+O+E}$$

- Continuous Rates

$$\tilde{u} = \frac{U^s + O^s}{U+O+E} \qquad \tilde{p} = \frac{U^s + O^s + E}{U+O+E} \qquad \tilde{s} = \frac{U^s + O^s + E^s}{U+O+E}$$

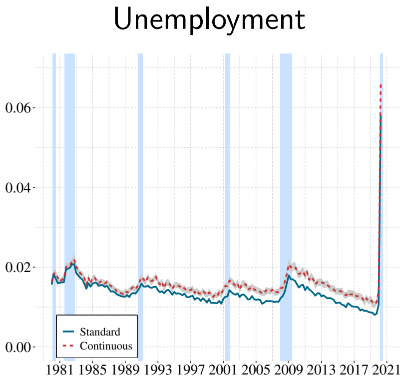
Unemployment and Total Searcher Rate



- Continuous unemployment rate is on average 2.1pp higher

Labor Market Flows

Employment to

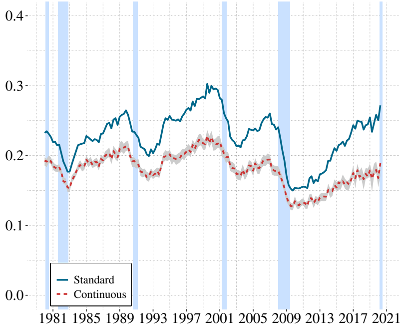


Back

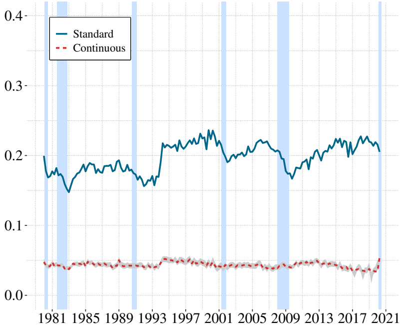
Labor Market Flows

Unemployment

Employment



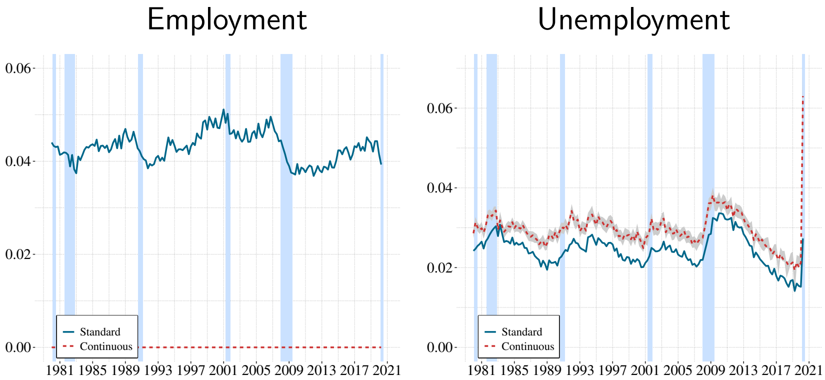
Out of the Labor Force



Labor Market Flows

Out of the Labor Force

Employment / Unemployment



Summing Up

- Introduce continuous approach to participation
  - changes low and high frequency properties of urate
  - makes unemployment more persistent
- **Other Points in the Paper**
  - Educational attainment is the main driver of the increase in OLF search
  - Application: no flattening of the Phillips Curve post 2008 recession
- **Next Lecture:** Competitive/Directed Search