

# The Labor Demand and Labor Supply Channels of Monetary Policy

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# What we do

- ▶ Study response of labor market flows to identified monetary policy shocks
  - ▶ Look at flows across labor market states + job-to-job transitions
  - ▶ Proxy SVAR with HFI monetary policy shocks à la Gertler and Karadi (2015)
  - ▶ But apply methodology from Bauer and Swanson (2022) & use Chair speeches
- ▶ Focus on the role of supply-driven labor market flows:
  - ▶ Flows between unemployment and nonparticipation
  - ▶ Quits to non-employment
- ▶ Document heterogeneous response of labor market flows by ex-ante characteristics
- ▶ Finding: contractionary monetary policy shock increases labor supply
  - ▶ Labor supply response attenuates overall decline in employment
  - ▶ Consistent with income effect

## What we do, cont'd

- ▶ Contractionary monetary policy shock increases labor supply... but by how much?

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- ▶ Contractionary monetary policy shock increases labor supply... but by how much?
- ▶ Quantify contribution of supply flows to overall response of labor market stocks
  - ▶ à la Shimer (2013), Elsby, Hobijn, and Sahin (2015)
- ▶ Response of employment twice as large holding labor supply flows fixed
  - ▶ Even larger supply response for lower-skill workers
- ▶ Rationalize with simple model of labor market frictions and participation:
  - ▶ Substitution effect: drop in job-finding rate decreases search
  - ▶ Income effect: rise in marginal utility of consumption increases search

Income effect must be sufficiently strong to be consistent with estimates
- ▶ Consistent w/ stronger supply response of lower-skill workers

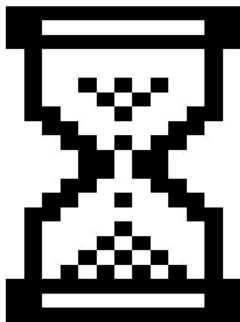
## Why we do it

- ▶ **Conventional wisdom:** monetary policy affects employment through **labor demand**
  - ▶ Little role (if any!) for **labor supply**

# Why we do it

- ▶ **Conventional wisdom:** monetary policy affects employment through **labor demand**
  - ▶ Little role (if any!) for **labor supply**
- ▶ NK models largely abstract from **labor supply** response to monetary policy
  - ▶ **Sticky wages** + **neoclassical** labor market clearing  $\Rightarrow$  **labor** is **demand-determined**
  - ▶ See, e.g., Broer, Hansen, Krusell, and Öberg (2020)
- ▶ This paper: **causal estimates** revealing important role of labor supply
- ▶ **Labor supply** margin appears **especially important** for **low-skill** workers
- ▶ Can rationalize findings with **labor frictions** + **income effect** on labor supply
- ▶ **Monetary** IRFs informative of economic response to **other driving forces**

## Related Literature



# Labor market flows



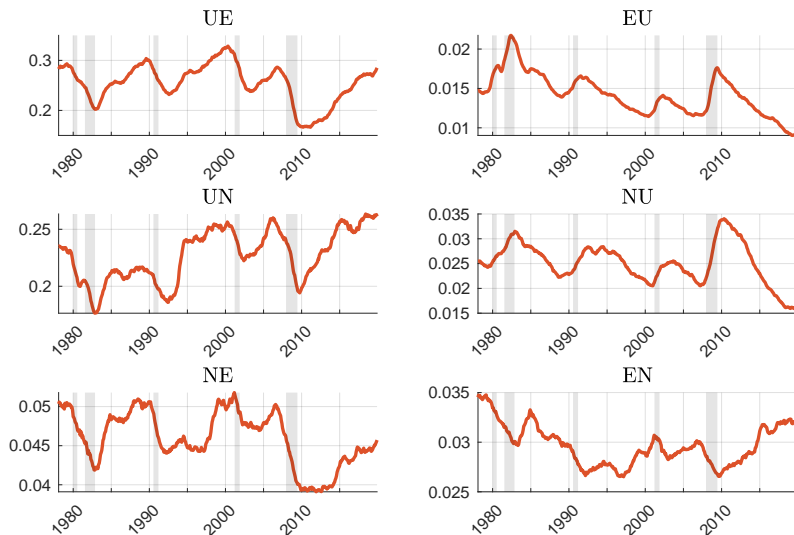
## Labor market flows

- ▶ Time series data on labor market flows from merged CPS monthly basics
- ▶ Three states: employment (**E**), unemployment (**U**), nonparticipation (**N**)
  - ▶ (Also consider job-to-job transitions, i.e., **E** to **E**)
- ▶ Interpret **dynamics** of **labor market stocks** through **flows**:

$$\begin{bmatrix} E \\ U \\ N \end{bmatrix}_{t+1} = \begin{bmatrix} 1 - p_{EU} - p_{EN} & p_{UE} & p_{NE} \\ p_{EU} & 1 - p_{UE} - p_{UN} & p_{NU} \\ p_{EN} & p_{UN} & 1 - p_{NE} - p_{NU} \end{bmatrix}_{t+1} \begin{bmatrix} E \\ U \\ N \end{bmatrix}_t.$$

- ▶ Useful for understanding how economic activity shapes dynamics of stocks
- ▶ Here: study response of **supply-driven** labor flows to monetary policy shock
  - ▶ **Decision to search** from non-employment, e.g. **UN** and **NU**
  - ▶ **Quits** to unemployment or nonparticipation (**how?**)

# Time Series of Labor Market Flows



Lots of work on studying unconditional variation in labor market flows— except EN!

# Understanding flows from employment to nonparticipation

- ▶ EU flows dominated by layoffs (see Elsby et al. 2009, Ahn, 2023)
- ▶ This paper: EN flows broadly accounted for by quits ▶ Decomposing EU and EN flows
- ▶ Regardless of destination (U or N),
  1. Quits are procyclical
  2. Layoffs are countercyclical
  3. The cyclicity of EU/EN flows determined by composition of quits/layoffs
- ▶ On average, quit rate to  $U+N \approx$  layoff rate to  $U+N$
- ▶ Implication: Quit rate from JOLTS  $\neq$  J2J rate

**Quits to non-employment are important!**

# Econometric Framework

# Estimating the Effects of Monetary Policy

- ▶ Begin with **reduced-form VAR**:

$$Y_t = \alpha + B(L)Y_{t-1} + u_t, \quad (1)$$

- ▶ Six monthly variables for baseline specification: two-year Treasury yield, unemployment rate, participation rate, log CPI, log IP, excess bond premium
- ▶ Assume **structural shocks**:

$$u_t = S\varepsilon_t, \quad (2)$$

where the first structural shock is a “**monetary policy shock**”,  $\varepsilon_t^{mp}$

- ▶ First column of  $S$ , denoted  $s_1$ , describes the impact effect of the structural monetary policy shock  $\varepsilon_t^{mp}$  on  $u_t$  and  $Y_t$ .
- ▶ Use an external instrument  $z_t$  to identify  $s_1$

## External Instrument

- ▶ External instrument  $z_t$  needs to satisfy:

$$\mathbb{E} \{ z_t \varepsilon_t^{mp} \} \neq 0 \quad (3)$$

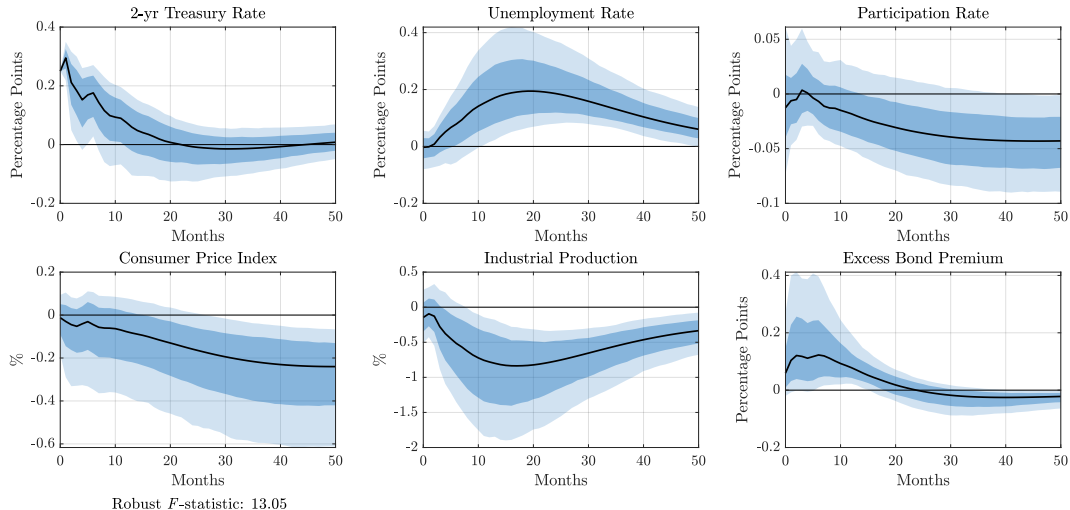
$$\mathbb{E} \{ z_t \varepsilon_t^{-mp} \} = 0 \quad (4)$$

- ▶ Use HFI changes in interest rate futures as external instrument in VAR
  - ▶ e.g., Kuttner (2001), Gertler & Karadi (2014)
- ▶ But specifics follow from Bauer & Swanson (2023):

High-frequency interest rate changes around FOMC announcements and Fed Chair speeches, orthogonalized with respect to recent macro/financial news
- ▶ Both speeches and orthogonalizing necessary for accurate estimates of flow IRFs

Estimates

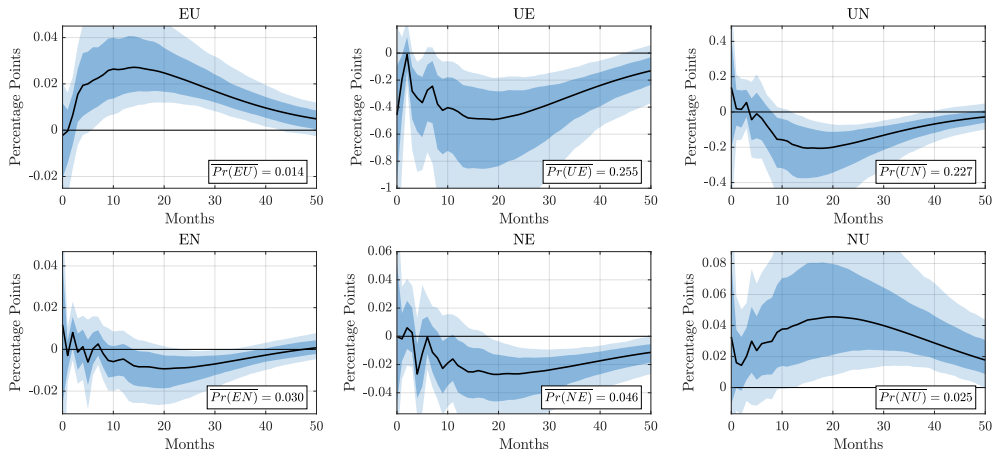
# IRFs from Baseline VAR



- ▶ Monthly data, 1978:M2–2019:M12
- ▶ Dark and light shaded regions report 68% and 90% confidence intervals



# Response of Labor Market Flows



►  $p_{EU} \uparrow$  &  $p_{UE} \downarrow \Rightarrow$  Consistent with decline in labor demand

►  $p_{NU} \uparrow$ ,  $p_{UN} \downarrow$ , &  $p_{EN} \downarrow \Rightarrow$  Increase in labor supply

Robustness and extensions:

► Quits vs. layoffs

► Intensive margins of search

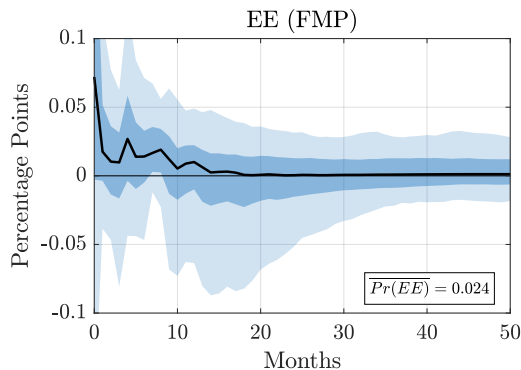
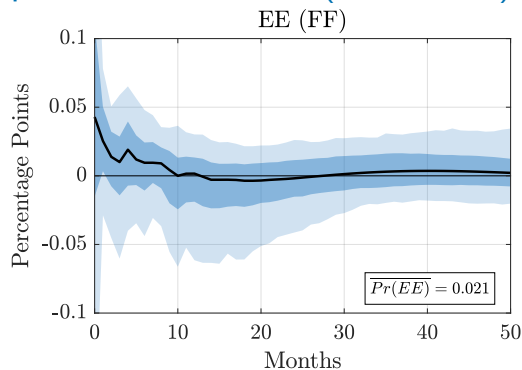
► Fixed-composition flows

► UN flows

► FOMC shocks only

► vs. unconditionals

# Response of J2J Flows (1995-2019)



- ▶ Use measures from Fujita, Moscarini, Postel-Vinay (2022)
- ▶ No response of EE rate to contractionary MPS
- ▶ Cyclicalities of EE series from CPS likely muted by workers who “jump ship”

# Flow-based accounting for dynamics of labor market stocks

# Flow-based accounting for dynamics of stocks

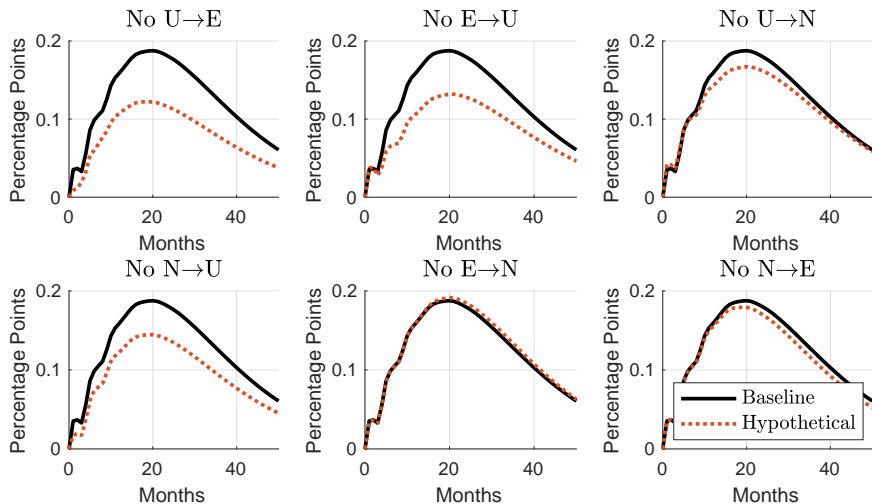
## General approach:

- ▶ Take IRF's as given, use **transition probabilities** to construct **hypothetical stocks**:
- ▶ **Law of motion** for **stocks** in terms of **transition probabilities** (i.e., flows):

$$\begin{bmatrix} E \\ U \\ N \end{bmatrix}_{t+1} = \begin{bmatrix} 1 - p_{EU} - p_{EN} & p_{UE} & p_{NE} \\ p_{EU} & 1 - p_{UE} - p_{UN} & p_{NU} \\ p_{EN} & p_{UN} & 1 - p_{NE} - p_{NU} \end{bmatrix}_{t+1} \begin{bmatrix} E \\ U \\ N \end{bmatrix}_t.$$

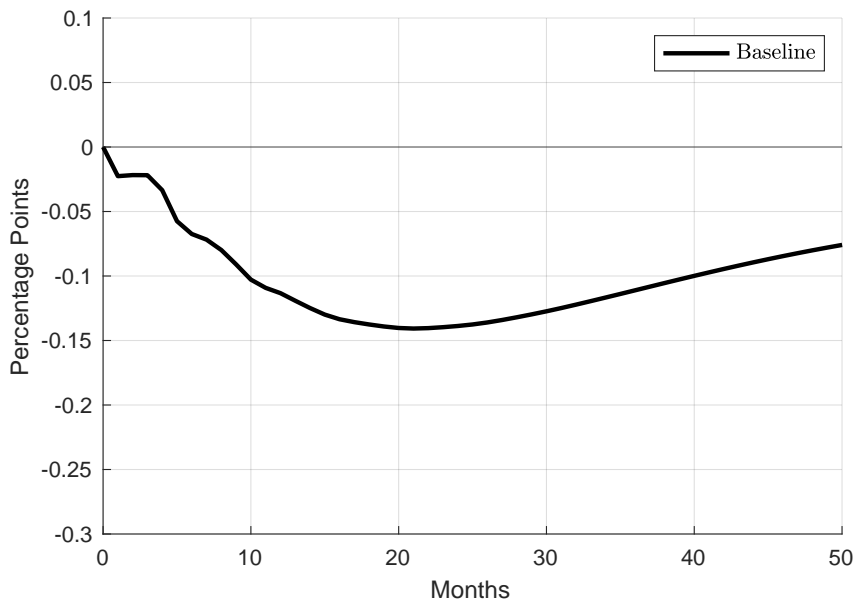
- ▶ Assess contribution of flow  $p_{XY}$  to stock  $Z$  by replacing  $\{p_{XY}\}_t$  with “steady-state” value,  $\tilde{p}_{XY}$
- ▶ Study behavior of resulting hypothetical stock  $\check{Z}$  to isolate role of flow  $p_{XY}$

# The Ins and Outs of Unemployment

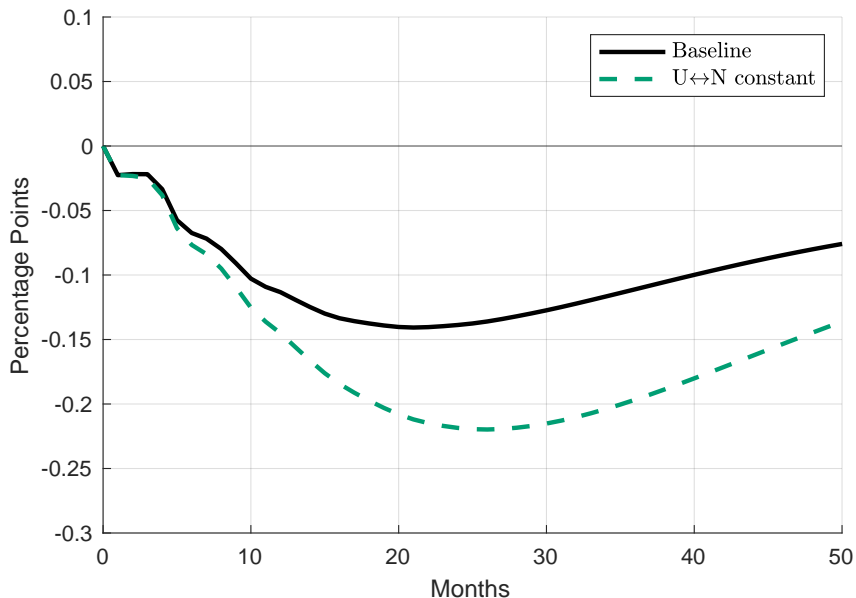


- $E \rightarrow U$  and  $U \rightarrow E$  roughly equally responsible for rise in unemployment

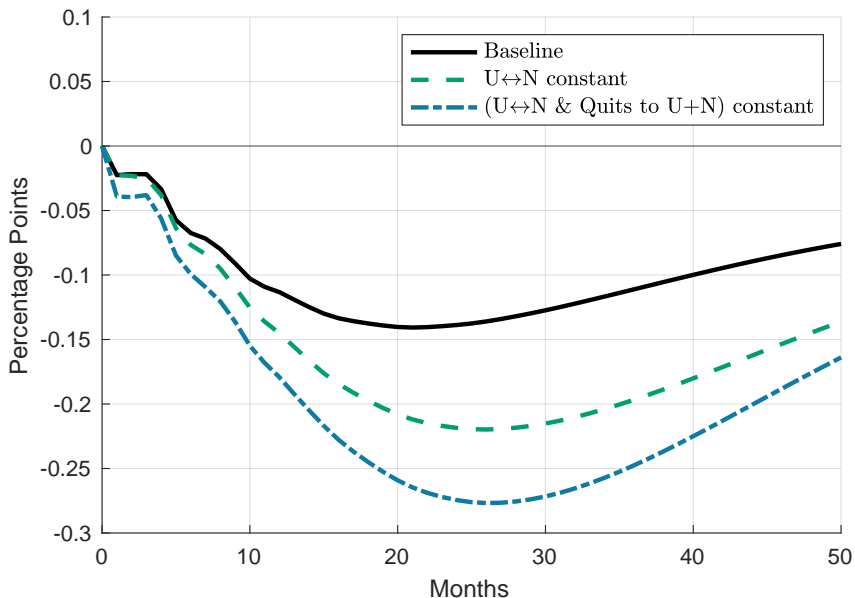
# Employment Response to a Monetary Policy Shock



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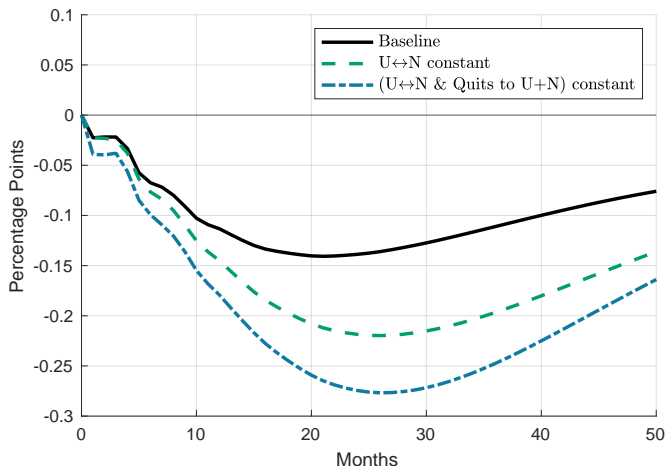


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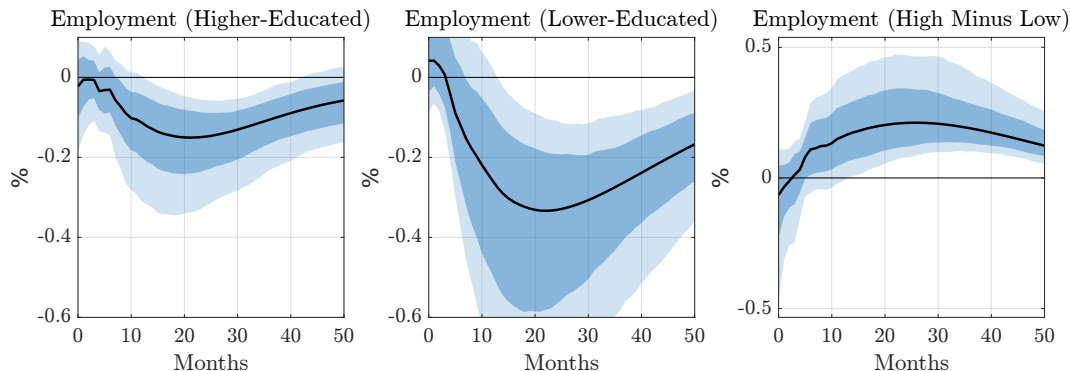
- ▶ Labor supply flows =  $U \leftrightarrow N$  flows + quits to non-employment
- ▶ Hold labor supply flows fixed  $\Rightarrow$  Employment falls twice as much

# Interpretation

- ▶ NK literature does not allow labor supply response to monetary policy
- ▶ Here: labor supply increases in response to contractionary monetary policy shock!
- ▶ Quantitatively important: reduces drop in employment by 50%
- ▶ Possible interpretation: income effect on labor supply
  - ▶ Monetary contraction  $\Rightarrow$  smaller budget set
  - ▶ Households “feel poorer,” take less leisure
- ▶ Next: look at low- versus high-educated workers
- ▶ Low-educated: greater reduction in labor demand, fewer assets
  - ▶ Bigger shocks, less wealth for consumption-smoothing
  - ▶ Should expect greater labor supply response

Heterogeneity

# Heterogeneity in Employment Responses



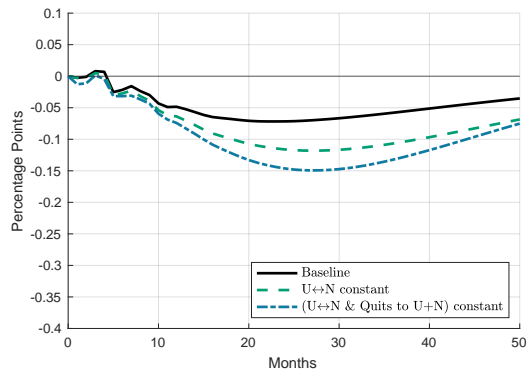
## ► Employment response to contractionary monetary policy shock:

- Larger employment decline of lower-educated workers
- Driven by larger increase in EU for low-educated. . .
- But moderated by larger decrease in EN for low-educated

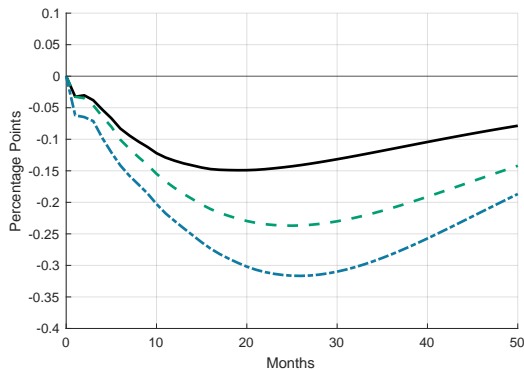
► Labor market flows, high-skill

► Labor market flows, low-skill

## Heterogeneity in Employment Responses, cont'd



(a) Higher-Educated



(b) Lower-Educated

- ▶ Labor supply response more important for lower-educated
- ▶ Consistent with income effect on labor supply
- ▶ Next: interpret through simple model

Model

# Model

Rationalize estimates within partial equilibrium model of labor supply

- ▶ Labor market frictions + endogenous participation
- ▶ Continuous time, infinite horizon
- ▶ Worker takes wage  $w$  and aggr. job-finding rate  $\lambda$  as given
- ▶ Perfect risk sharing within representative household
- ▶ Worker discounts future at constant rate  $r$
- ▶ Decreasing marginal utility of consumption  $\mu$
- ▶ Heterogeneous value of leisure  $b$
- ▶ Active search  $s \in \{0, 1\}$  is costly, but increases job-finding rate

Focus on decision to search for & accept a job

## Value of unemployment

$$rV_0(b) = \max_{s \in \{0,1\}} \left\{ \frac{b - \psi \cdot \mathbb{I}\{s = 1\}}{\mu} + (\alpha \cdot \mathbb{I}\{s = 1\} + (1 - \alpha)) \cdot \lambda \cdot [\max\{V_1(b), V_0(b)\} - V_0(b)] \right\}$$

- ▶ Let  $V_0(b)$  and  $V_1(b)$  be the consumption-equivalent values of non-employment and employment
- ▶  $V_0(b)$  incorporates
  - ▶ Decision to search (nonparticipation vs. unemployment)
  - ▶ “Wanting a job” from nonparticipation



## Search threshold

- ▶ Search threshold  $b^s$  equates cost of search with capital gains:

$$\underbrace{\left( \frac{\psi}{\mu} \right)}_{\text{Cost of search}} = \underbrace{\alpha \cdot \lambda \cdot \left( \frac{w - \frac{b^s - \psi}{\mu}}{r + \delta + \lambda} \right)}_{\text{Additional capital gains from search}}$$

with job-finding rate  $\lambda$  & marginal utility of consumption  $\mu$

- ▶ Contractionary monetary policy shock:  $\lambda \downarrow$  &  $\mu \uparrow$ 
  - ▶ Substitution effect:  $\lambda \downarrow \Rightarrow b^s \downarrow$  (decreased labor supply)
  - ▶ Income effect:  $\mu \uparrow \Rightarrow b^s \uparrow$  (increased labor supply)
- ▶ Income effect must dominate for the model to be consistent with the data

# Conclusion

# Conclusion

- ▶ Sizeable labor supply response to contractionary monetary policy shock
  - ▶ Decreases in quits to nonparticipation
  - ▶ Greater job-seeking from non-employment
- ▶ Both labor demand and supply channels more responsive for lower-educated
- ▶ Findings consistent with income effect on labor supply
- ▶ Labor supply response attenuates fall in employment by one-half

Extra slides

## Transition probabilities across labor market states

Table: Average transition properties across labor market states, 1978–2019

| <i>From</i> | <i>To</i> |       |       |
|-------------|-----------|-------|-------|
|             | E         | U     | N     |
| E           | 0.960     | 0.013 | 0.027 |
| U           | 0.257     | 0.550 | 0.193 |
| N           | 0.040     | 0.028 | 0.932 |

Data from merged monthly CPS.

Table: Cyclical properties of transition probabilities, 1978–2019

|           | $p_{EU}$ | $p_{EN}$ | $p_{UE}$ | $p_{UN}$ | $p_{NE}$ | $p_{NU}$ |
|-----------|----------|----------|----------|----------|----------|----------|
| std(x)    | 6.44     | 2.75     | 5.89     | 5.06     | 4.53     | 4.74     |
| corr(x,Y) | -0.775   | 0.373    | 0.749    | 0.424    | 0.258    | -0.574   |

All logged and HP-filtered (smoothing parameter = 1600). “std(x)” denotes standard deviation relative to GDP. “corr(x,Y)” denotes correlation w/ GDP.

## Decomposing EU and EN Flows, cont'd

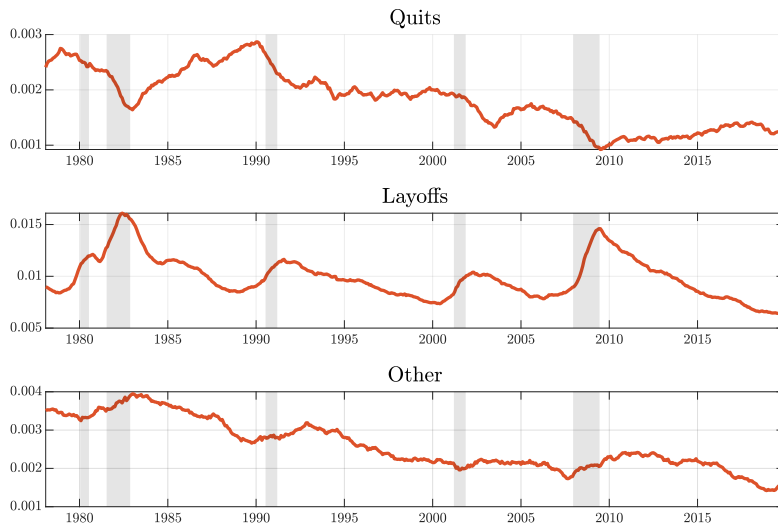
Table: Decomposition of EU Flows

|                               | Total | Quits | Layoffs | Other |
|-------------------------------|-------|-------|---------|-------|
| mean                          | 0.014 | 0.002 | 0.010   | 0.003 |
| $\text{std}(x)/\text{std}(Y)$ | 5.16  | 8.16  | 7.88    | 6.26  |
| $\text{corr}(x, Y)$           | -0.82 | 0.61  | -0.83   | -0.11 |

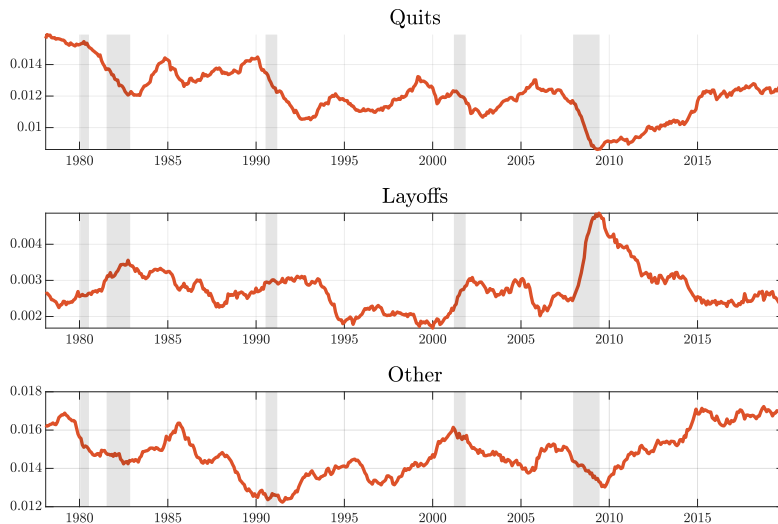
Table: Decomposition of EN Flows

|                               | Total | Quits | Layoffs | Other |
|-------------------------------|-------|-------|---------|-------|
| mean                          | 0.030 | 0.012 | 0.003   | 0.015 |
| $\text{std}(x)/\text{std}(Y)$ | 2.47  | 5.89  | 14.46   | 4.61  |
| $\text{corr}(x, Y)$           | 0.49  | 0.53  | -0.44   | 0.28  |

# Decomposition of EU Flows

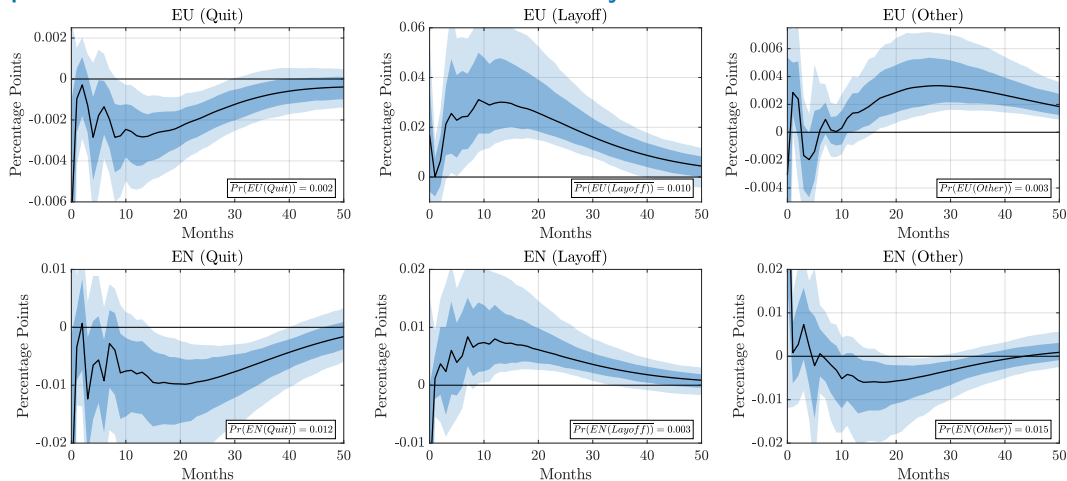


# Decomposition of EN Flows





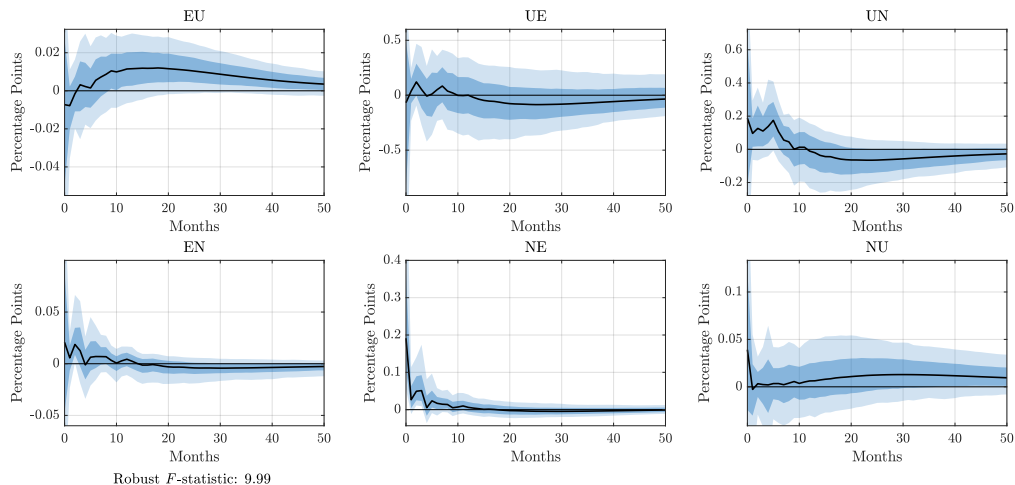
# Response of EU & EN Flows: Quits vs Layoffs



Following a **contractionary monetary policy shock**

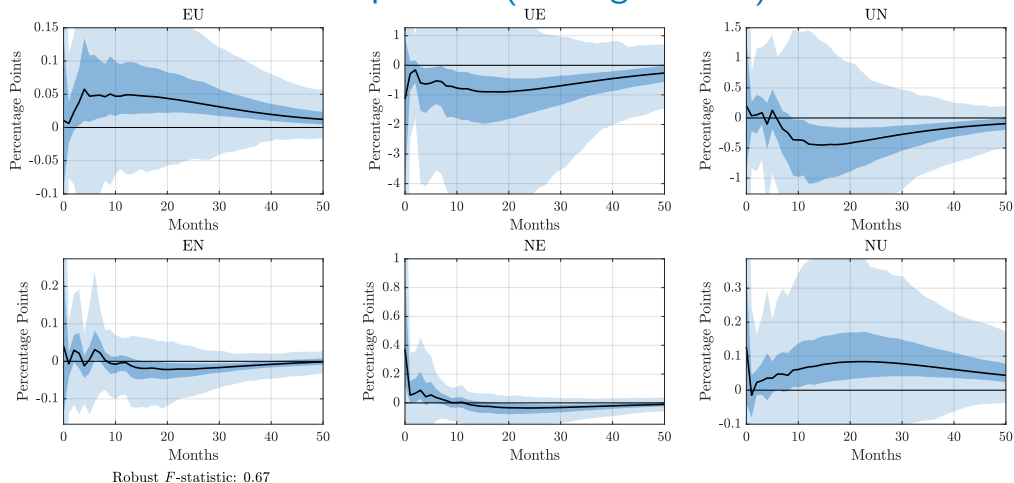
- ▶ **Heightened layoffs** drive increase in **EU** flows
- ▶ **Lower quits** drive fall in **EN** flows

# Labor Market Flows: No Speeches



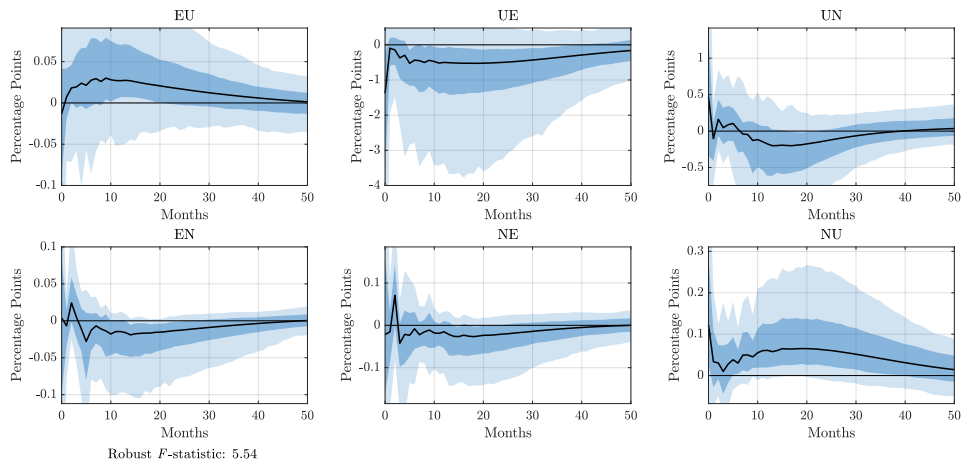
- High-frequency shocks from announcements only (e.g. Gertler & Karadi (2015))

# Labor Market Flows: No Speeches (Orthogonalized)



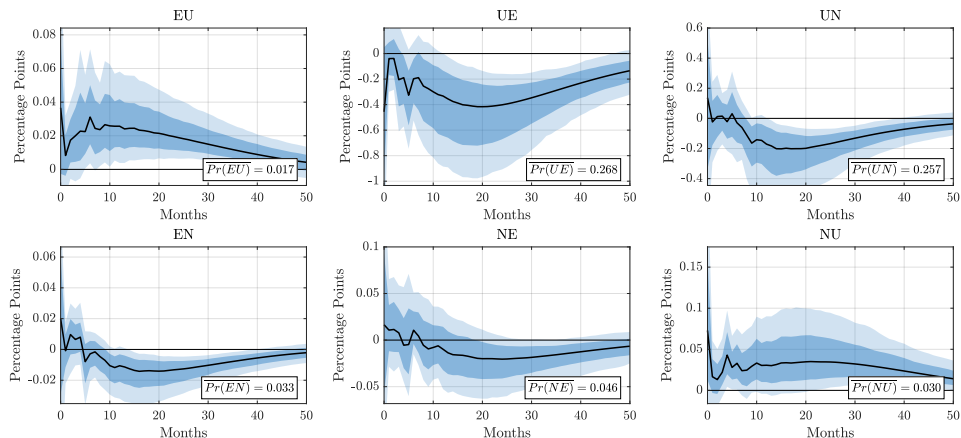
- From announcements only, orthogonalized as in Bauer & Swanson (2022)
- Very low first-stage F-stats/weak instrument → large confidence intervals

# Labor Market Flows: Short Sample (1995-2019)



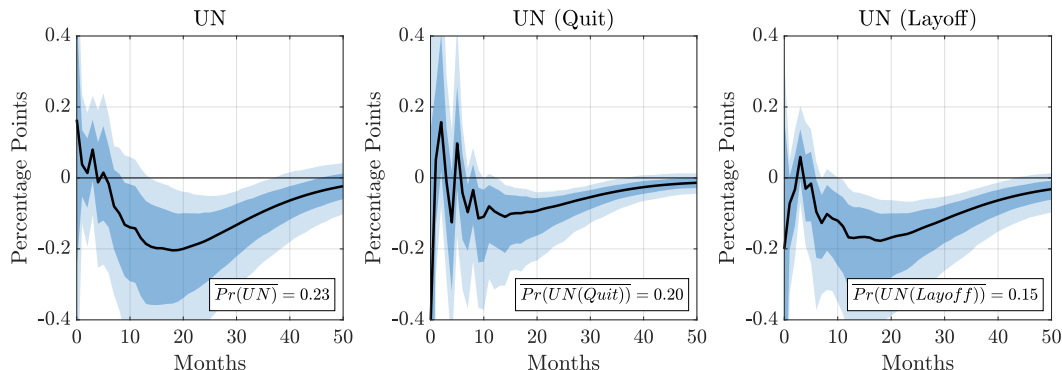
- ▶ Similar point estimates to full sample (but larger confidence intervals)
- ▶ Larger confidence intervals due to sample uncertainty, not weak instrument

# Labor Market Flows: Fixed-composition



- Composition-adjusted flows by ex-ante characteristics, à la Elsby et al. (2015)
- Fix shares using bins for age  $\times$  gender  $\times$  education

# UN Flows: Quits vs Layoffs



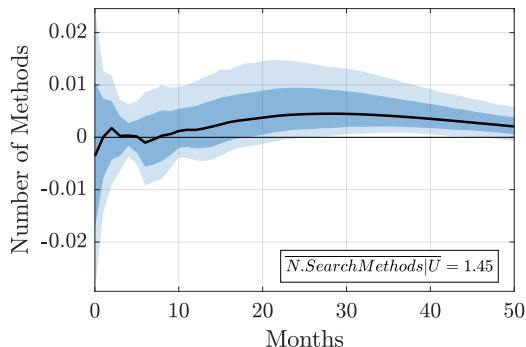
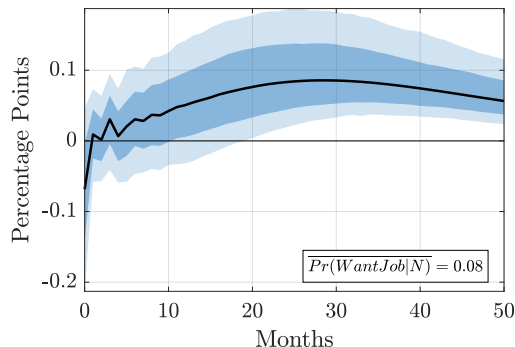
**Q:** Is decline in UN flows driven by a shift in the composition of U towards layoffs?

**A:** No. Decline in UN flows even conditioning on Quit/Layoff

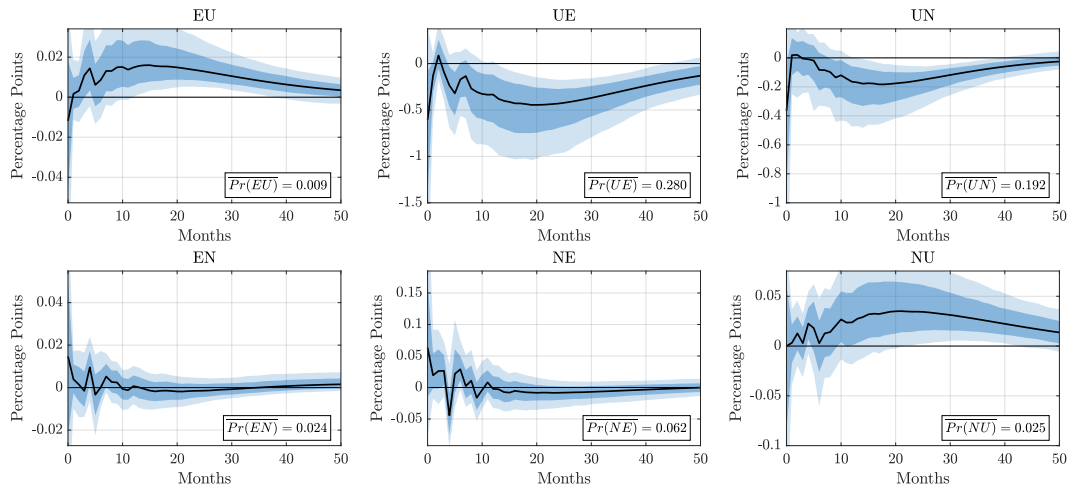
# Intensive Margins of Labor Supply

Intensive margins of search consistent with behavior of  $NU/UN$  flows:

- ▶ For  $N$ : share that want a job
- ▶ For  $U$ : number of search methods

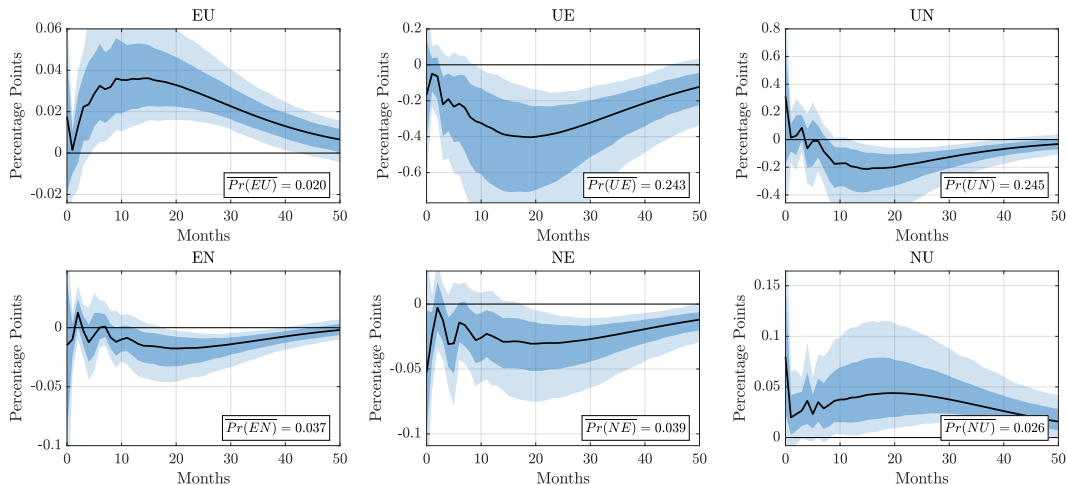


# Labor market flows: Higher-educated





# Labor market flows: Lower-educated



# Unconditional versus conditional responses

Conditional cyclical<sup>y</sup> of flows resembles unconditional, but ...

## 1. Conditional response of EU more persistent

- ▶ Short-lived increase in layoffs at start of recession
- ▶ MPS: more important role for EU in shaping response of unemployment

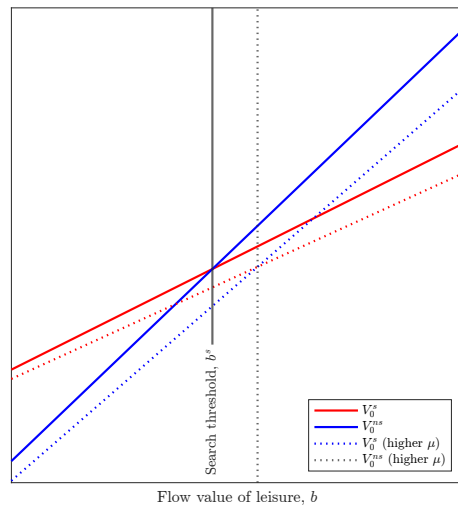
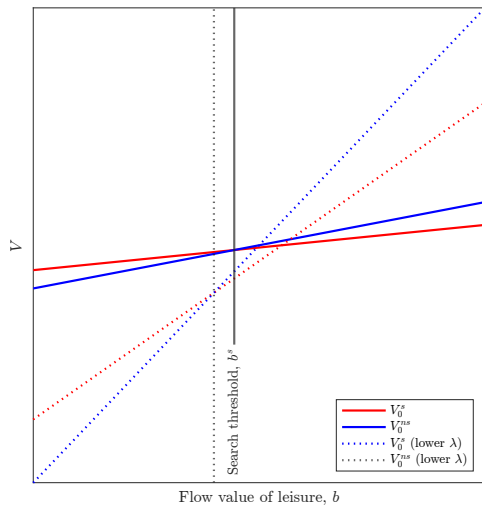
## 2. No response of J2J flows to monetary contraction

- ▶ J2J negatively correlated with unemployment, positively correlated with wage growth
- ▶ MPS: no evidence of offer-matching in driving inflation through J2J transitions

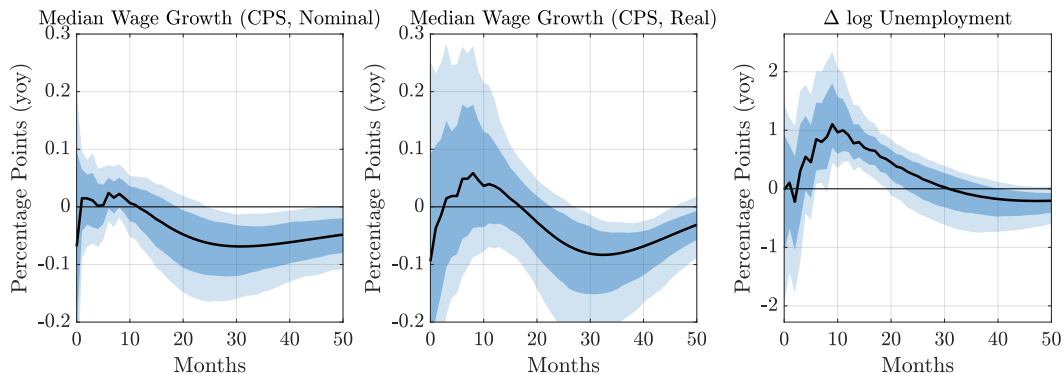
## 3. Conditional responses not driven by cyclical composition

- ▶ Elsby et al (2015):  $UN \downarrow$  &  $NU \uparrow$  during recession reflects change in composition
- ▶ MPS: IRFs robust to controls for composition  $\Rightarrow$  interpretable as behavioral response

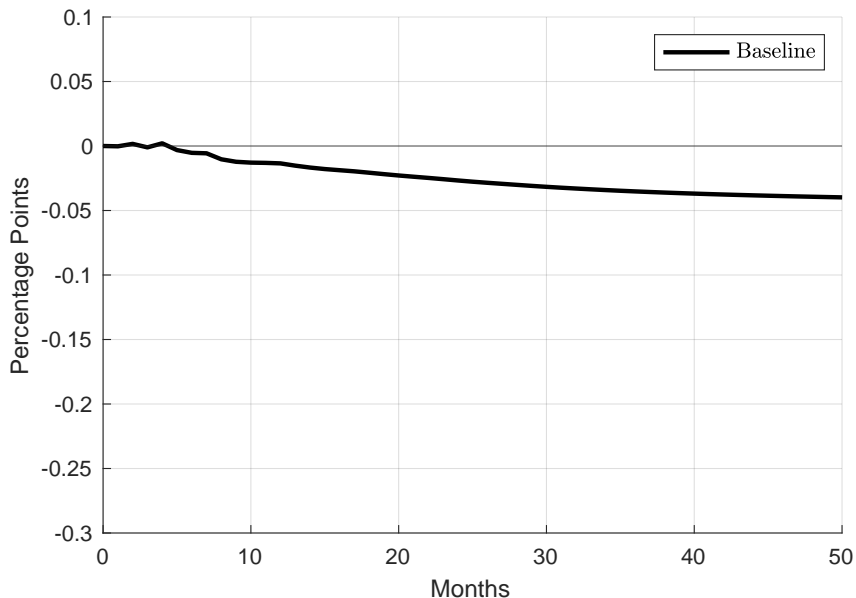
# Model: Comparative Statics



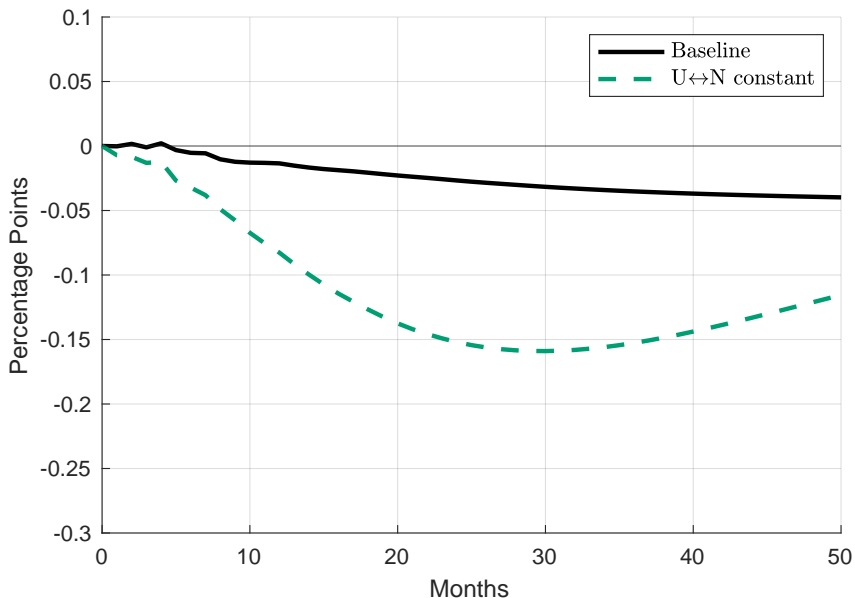
# Response of Wages and Unemployment



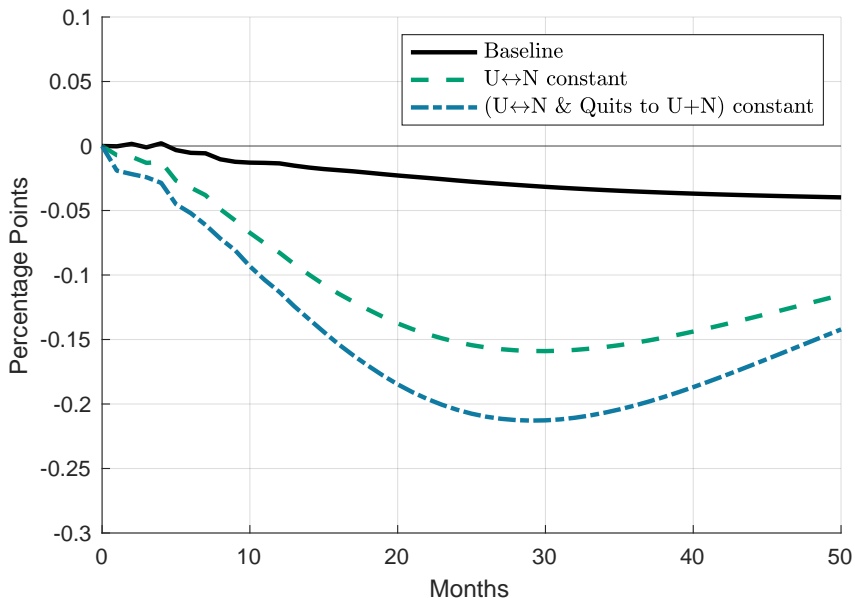
## Participation Response to a Monetary Policy Shock



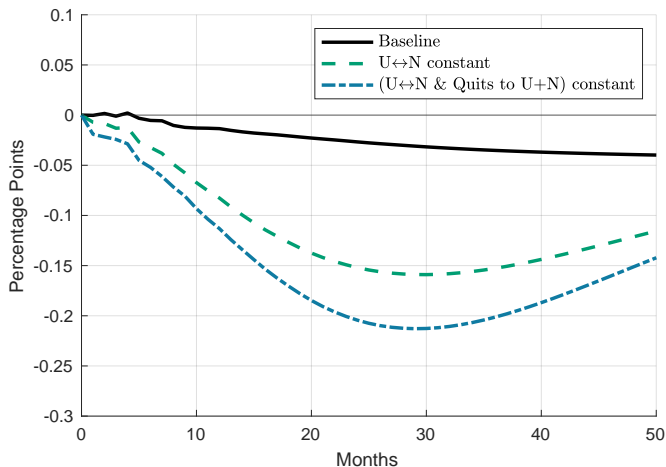
# Participation Response to a Monetary Policy Shock



# Participation Response to a Monetary Policy Shock



# Participation Response to a Monetary Policy Shock



- ▶ Labor supply flows =  $U \longleftrightarrow N$  flows + quits to non-employment
- ▶ Hold labor supply flows fixed  $\Rightarrow$  Participation far more procyclical