The Labor Demand and Labor Supply Channels of Monetary Policy

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3rd Sailing the Macro Workshop

Ortygia, Siracusa

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?

What we do, cont'd

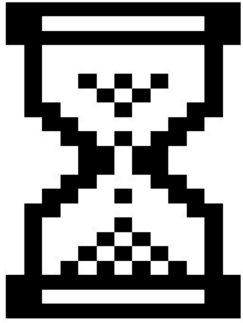
- Contractionary monetary policy shock increases labor supply... but by how much?
- Quantify contribution of supply flows to overall response of labor market stocks
  - à la Shimer (2013), Elsby, Hobijn, and Sahin (2015)
- Response of employment twice as large holding labor supply flows fixed
  - Even 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
- Sticky-wage NK models 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

Related Literature



Related Literature

- Cantore, Ferroni, Mumtaz, and Theophilopoulou (2023)
  - Increase in hours worked among lower-income workers from contractionary mps

Labor market flows

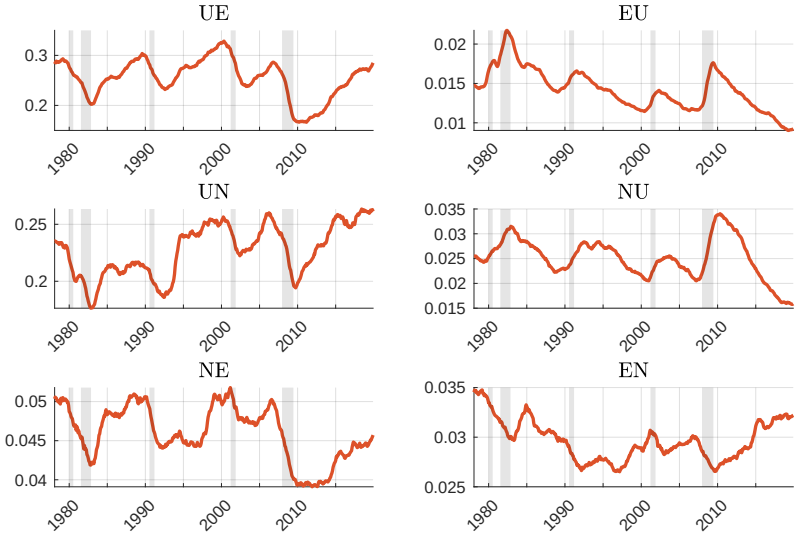
Labor market flows

- 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 cyclicality 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:

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

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

$$u_t = S\varepsilon_t, \tag{2}$$

  where the first structural shock is a "monetary policy shock", ε_t^{mp}
- First column of S, denoted s_1, describes the impact effect of the structural monetary policy shock ε_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:

$$\mathbb{E}\left\{z_t \varepsilon_t^{mp}\right\} \neq 0 \qquad \text{(relevance)}$$

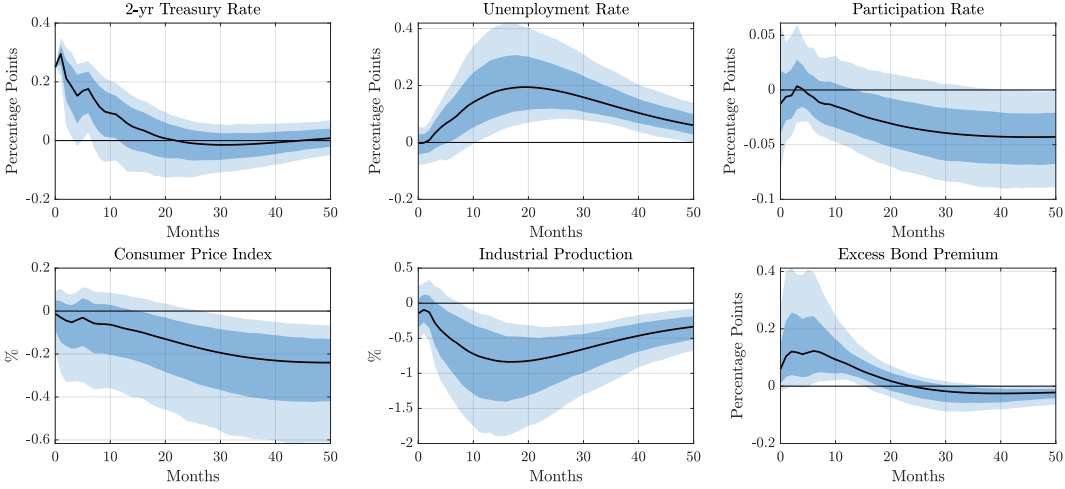
$$\mathbb{E}\left\{z_t \varepsilon_t^{-mp}\right\} = 0 \qquad \text{(exogeneity)}$$

- 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

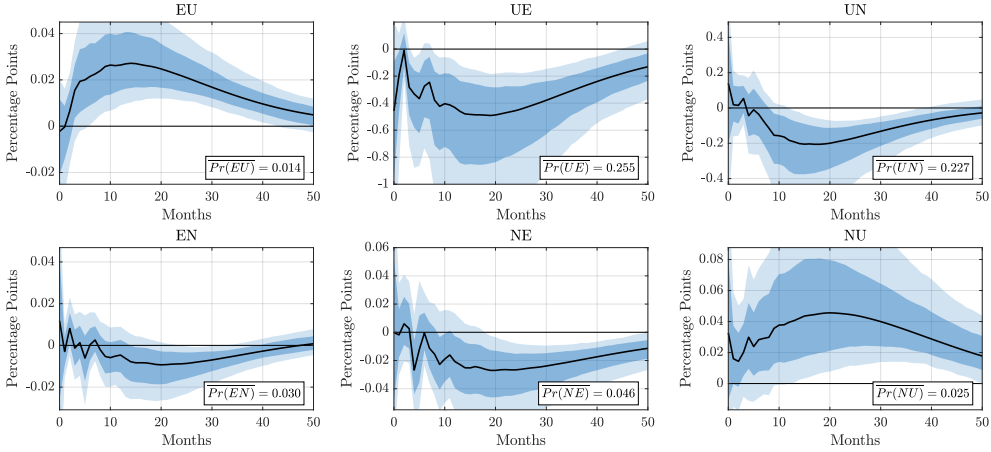
Estimates

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

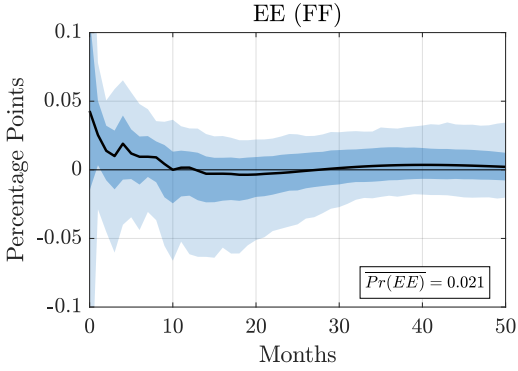


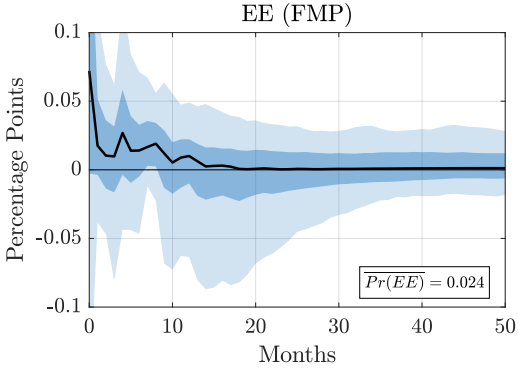
- pEU ↑ & pUE ↓ ⇒ Consistent with decline in labor demand
- pNU ↑, pUN ↓, & pEN ↓ ⇒ Increase in labor supply

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
- Cyclicality of EE series from CPS likely muted by workers who "jump ship"

▸ Flows with same sample

Flow-based accounting for dynamics of labor market stocks

Flow-based accounting for dynamics of stocks

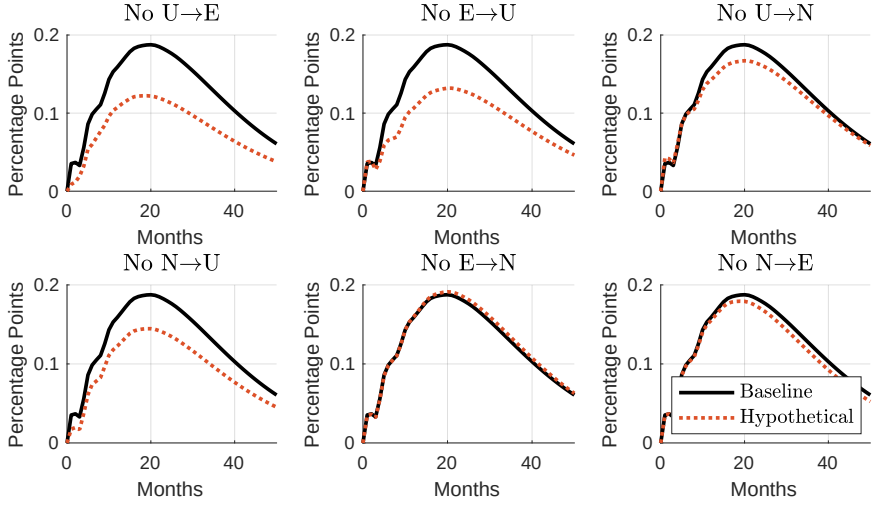
General approach:

- 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):

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

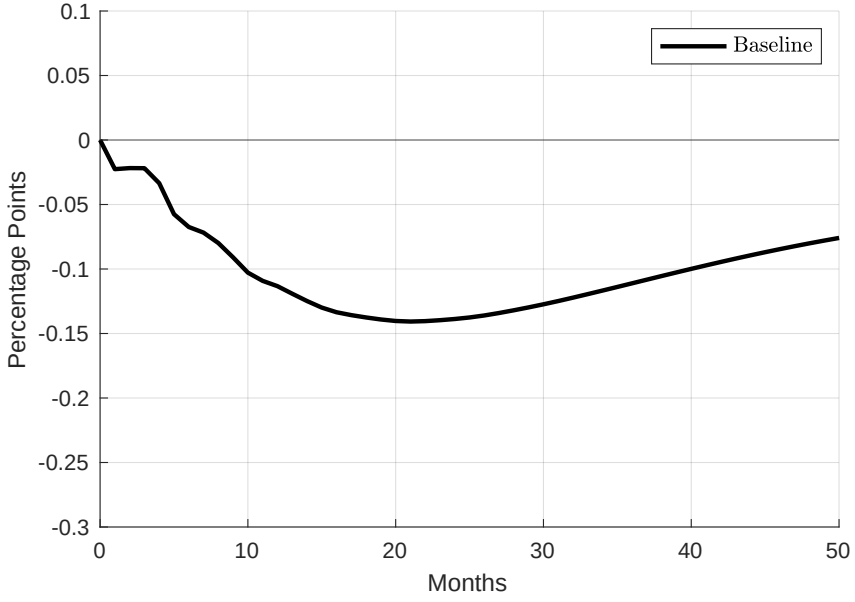
- Assess contribution of flow p_{XY} to stock Z by replacing $\{p_{XY}\}_t$ with "steady-state" value, $\tilde{p}_{XY}$
- Study behavior of resulting hypothetical stock $\check{Z}$ to isolate role of flow p_{XY}

The Ins and Outs of Unemployment



- E→U and U→E roughly equally responsible for rise in unemployment

Employment Response to a Monetary Policy Shock



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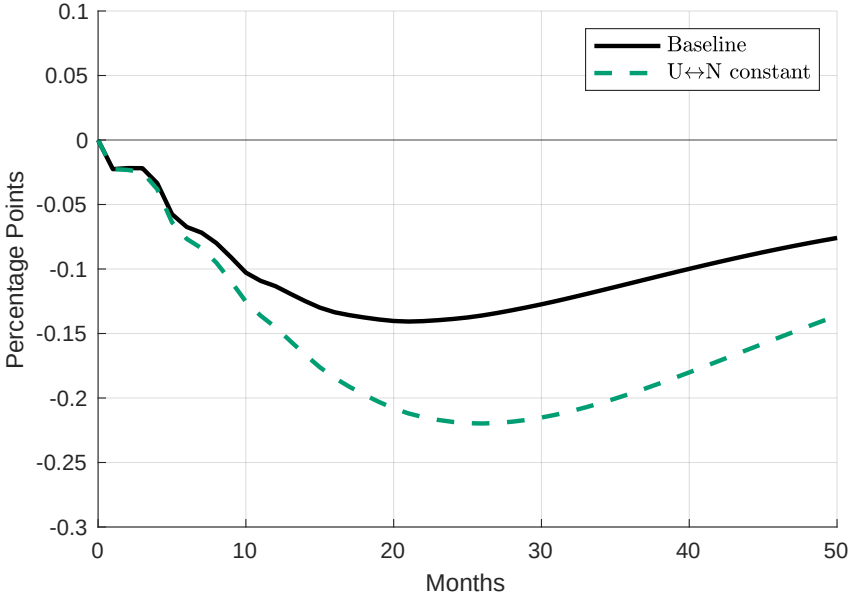
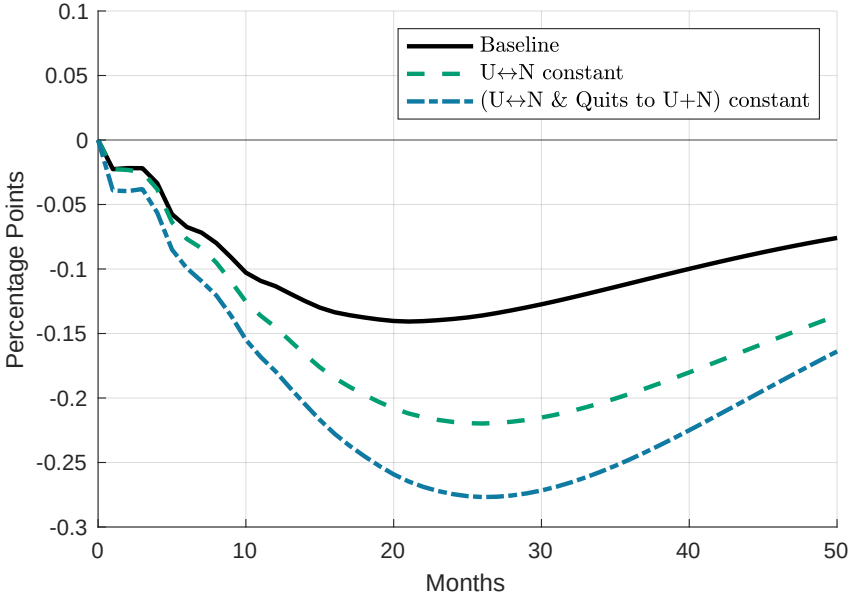
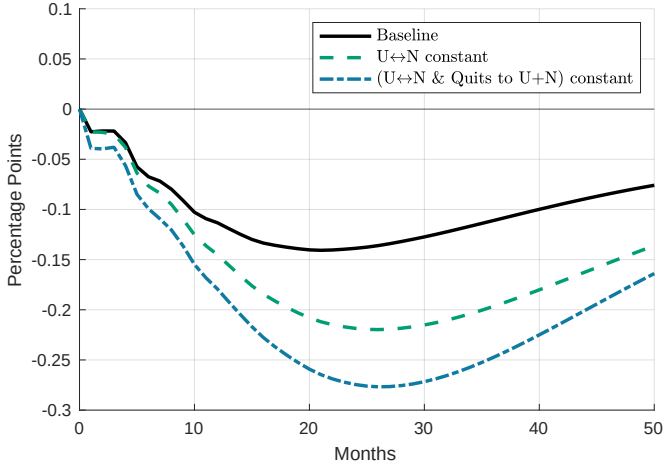


Employment Response to a Monetary Policy Shock



Employment Response to a Monetary Policy Shock



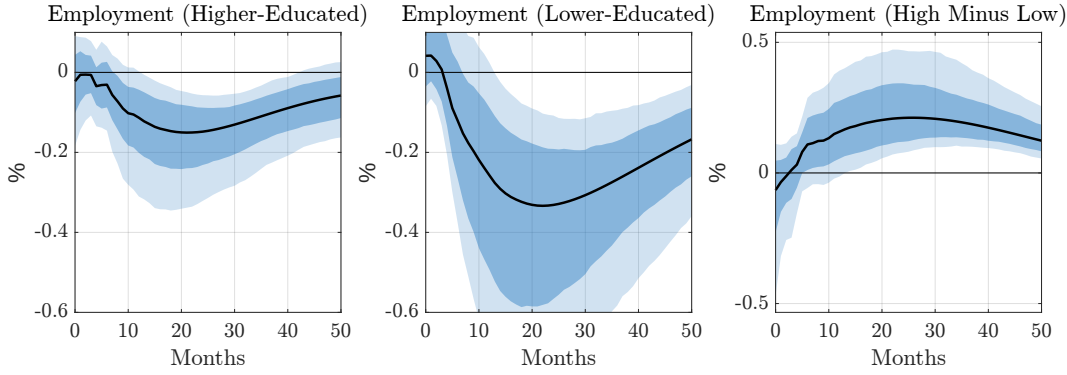
- Labor supply flows = U↔N flows + quits to non-employment
- Hold labor supply flows fixed ⇒ Employment falls twice as much

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

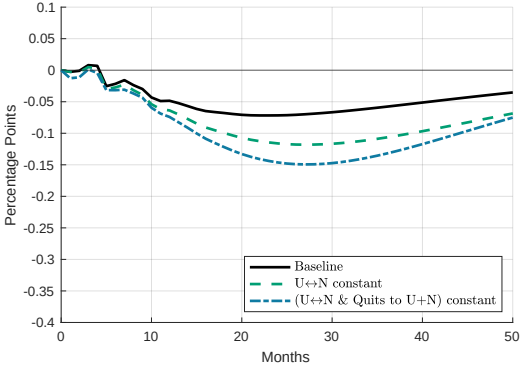
Heterogeneity in Employment Responses



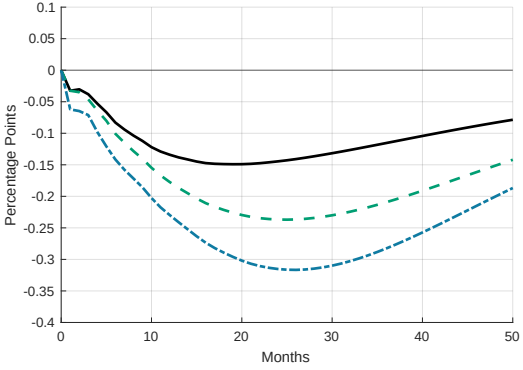
- Employment response to contractionary monetary policy shock:
  - Larger employment decline of lower-educated workers
  - Driven by larger increase in EU for low-educated...
  - But moderated by larger decrease in EN for low-educated

▸ 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 λ as given
- Perfect risk sharing within representative household
- Worker discounts future at constant rate r
- Decreasing marginal utility of consumption μ
- 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

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

- 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 λ & marginal utility of consumption μ

- 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

▸ Value Functions

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

	To		
From	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.

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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
std(x)/std(Y)	5.16	8.16	7.88	6.26
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
std(x)/std(Y)	2.47	5.89	14.46	4.61
corr(x, Y)	0.49	0.53	−0.44	0.28

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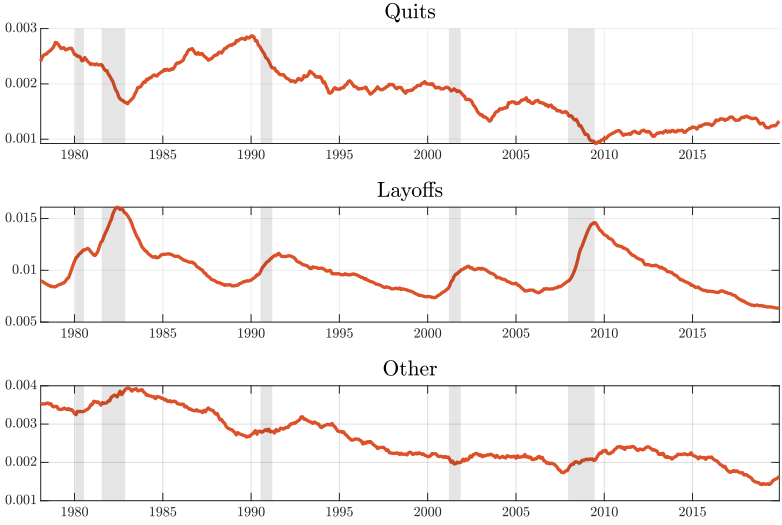
Decomposition of EU Flows



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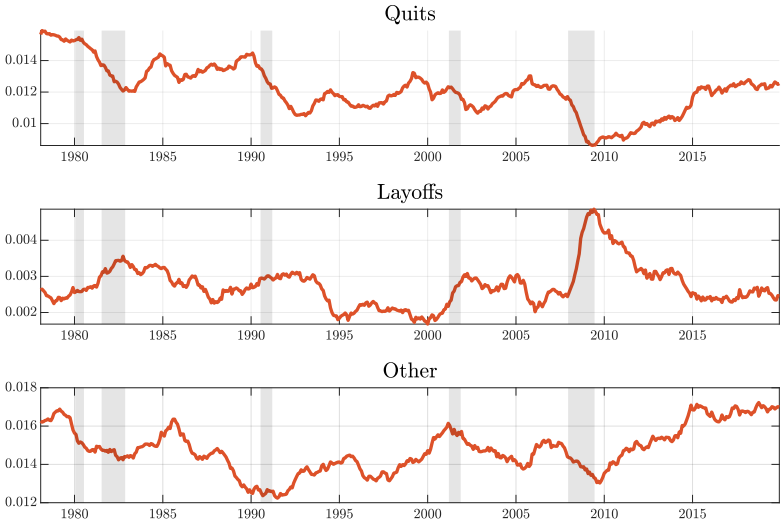
Decomposition of EN Flows



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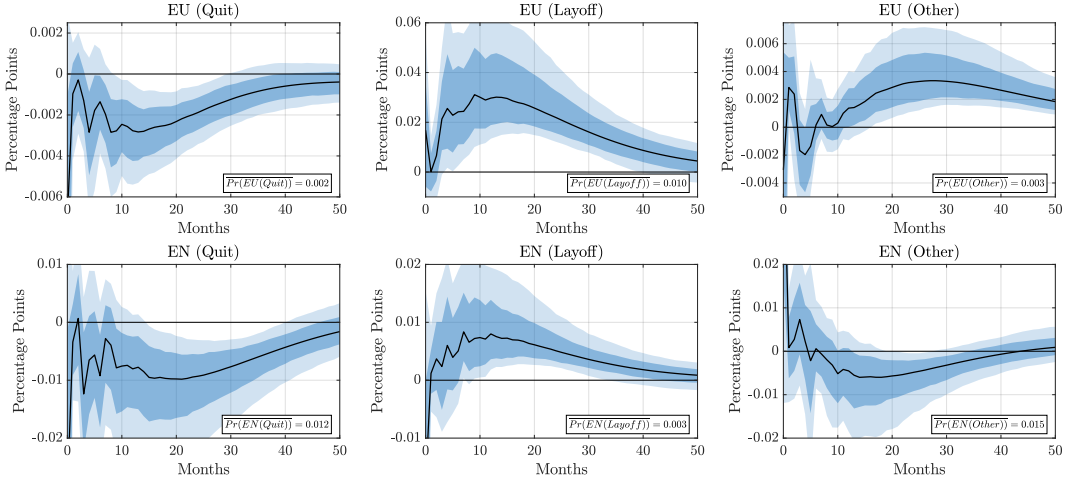
Response of EU & EN Flows: Quits vs Layoffs



Following a contractionary monetary policy shock

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

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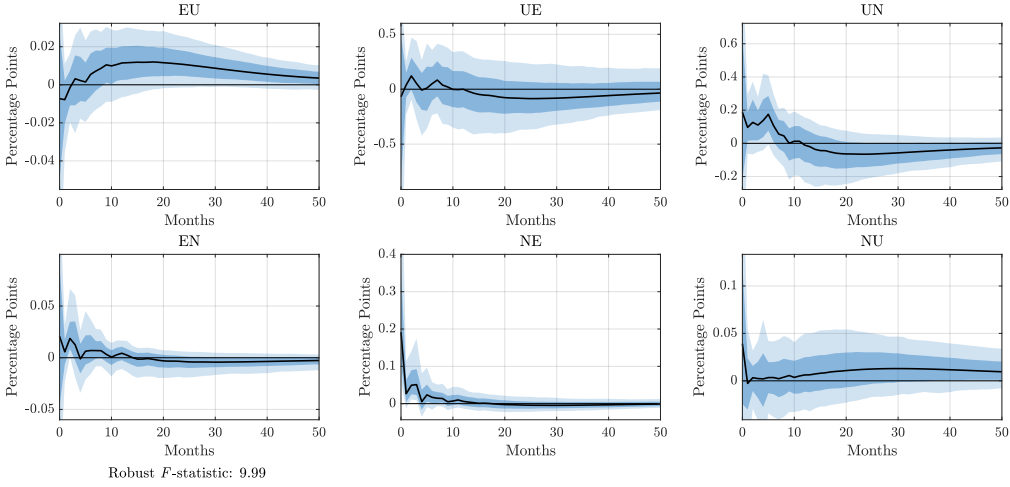
Labor Market Flows: No Speeches



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

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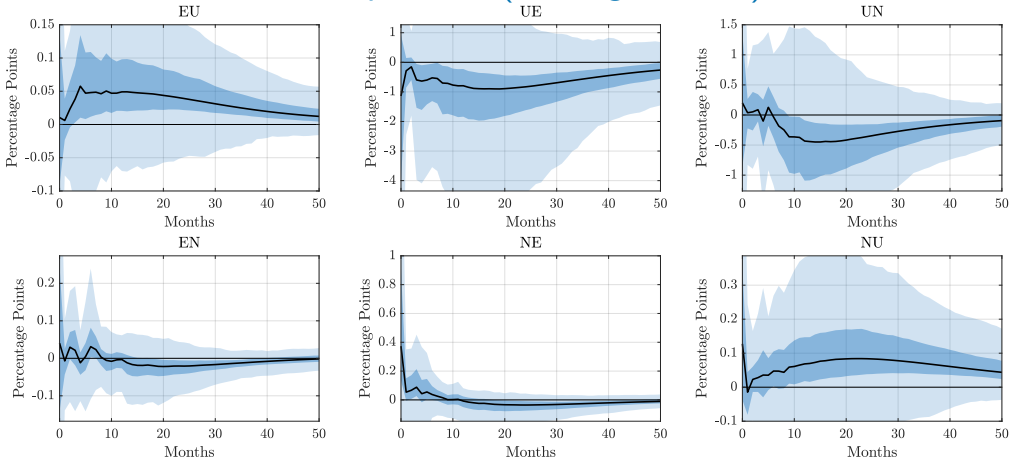
Labor Market Flows: No Speeches (Orthogonalized)



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

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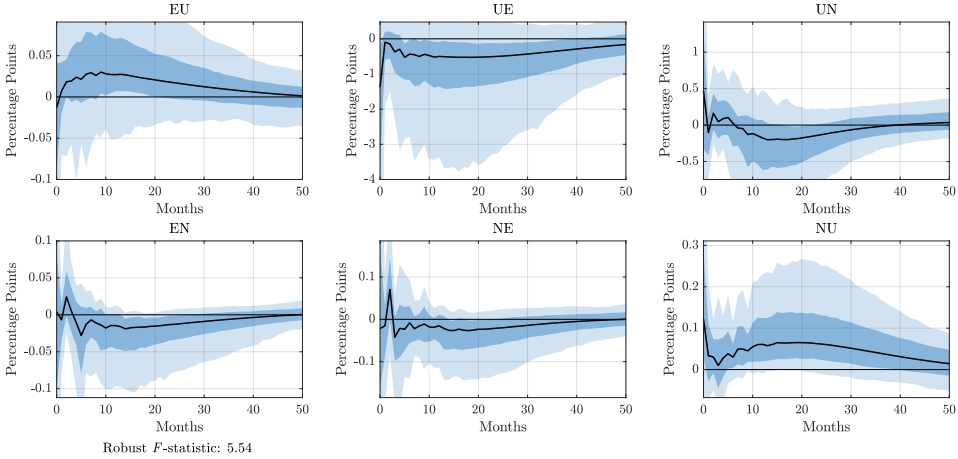
Labor Market Flows: Short Sample (1995-2019)



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

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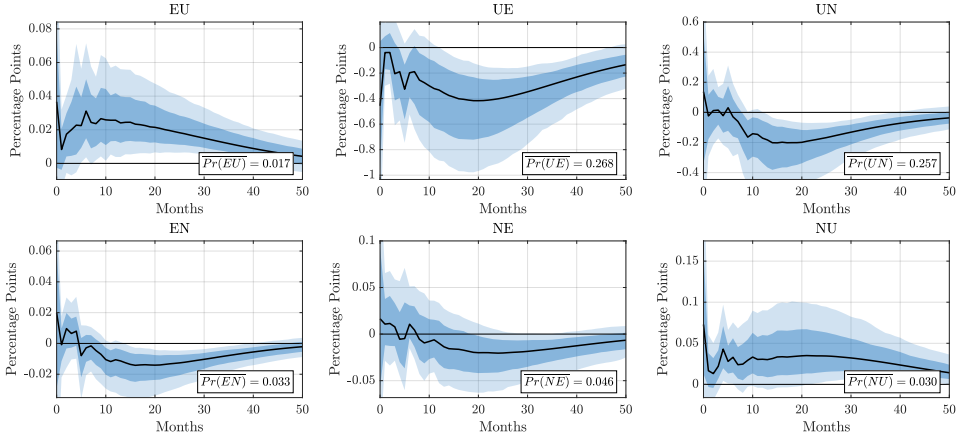
Labor Market Flows: Fixed-composition



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

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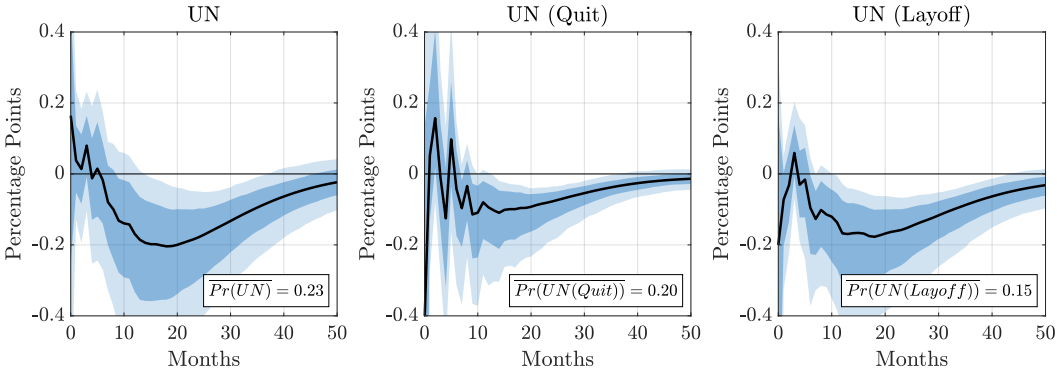
UN Flows: Quits vs Layoffs



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

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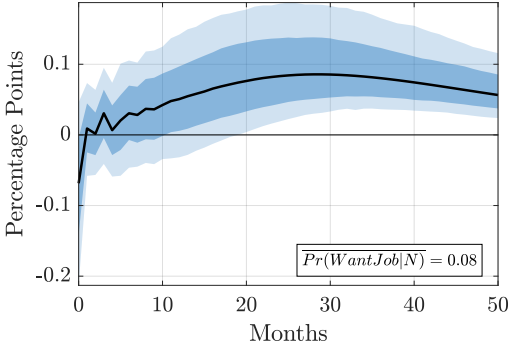
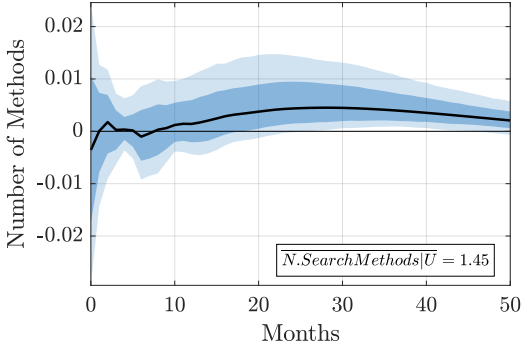
Intensive Margins of Labor Supply

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

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





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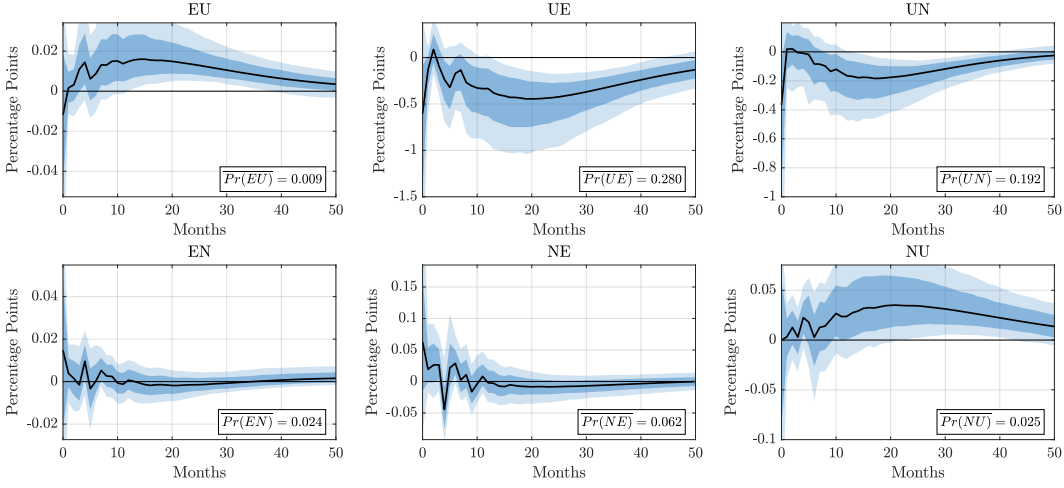
Labor market flows: Higher-educated



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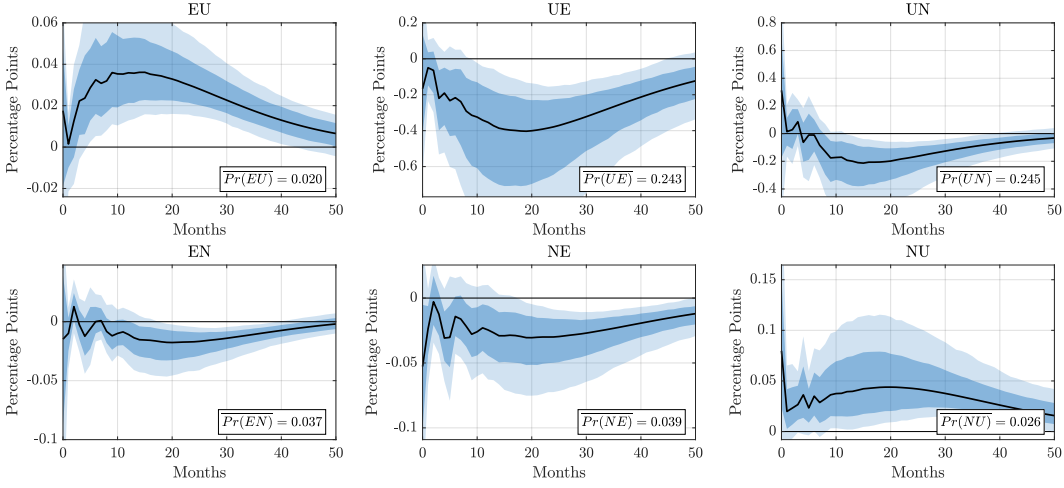
Labor market flows: Lower-educated



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Unconditional versus conditional responses

Conditional cyclicality 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

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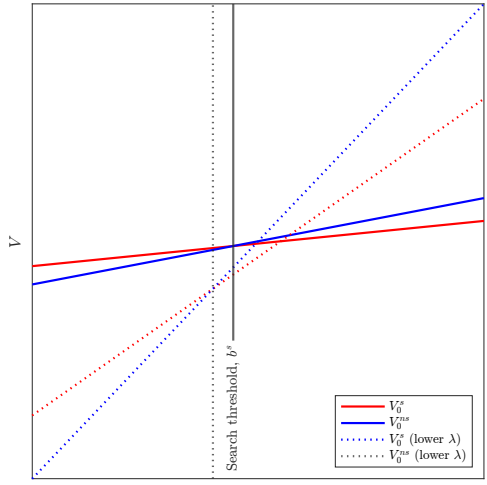
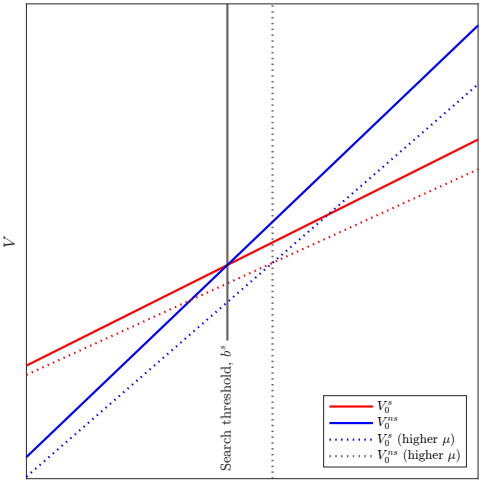
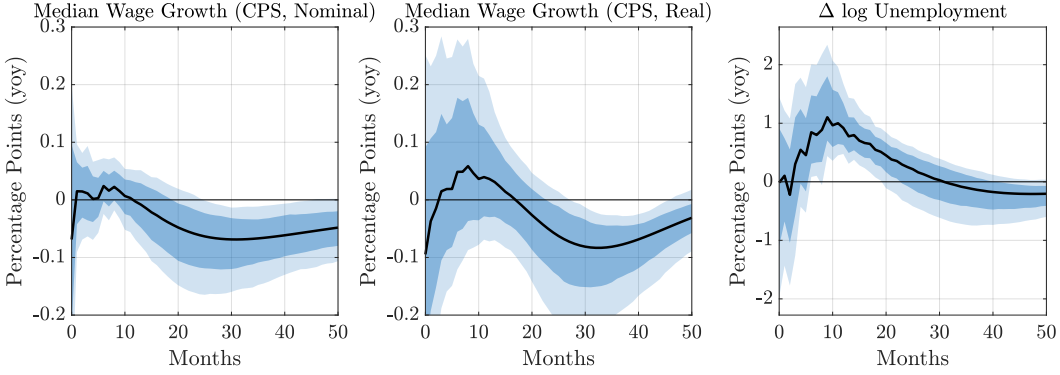
Model: Comparative Statics



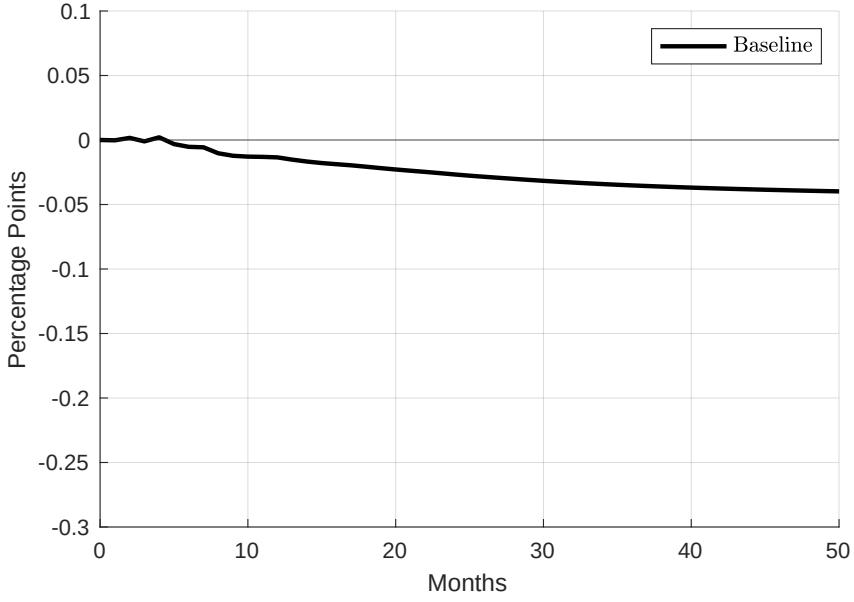


Back

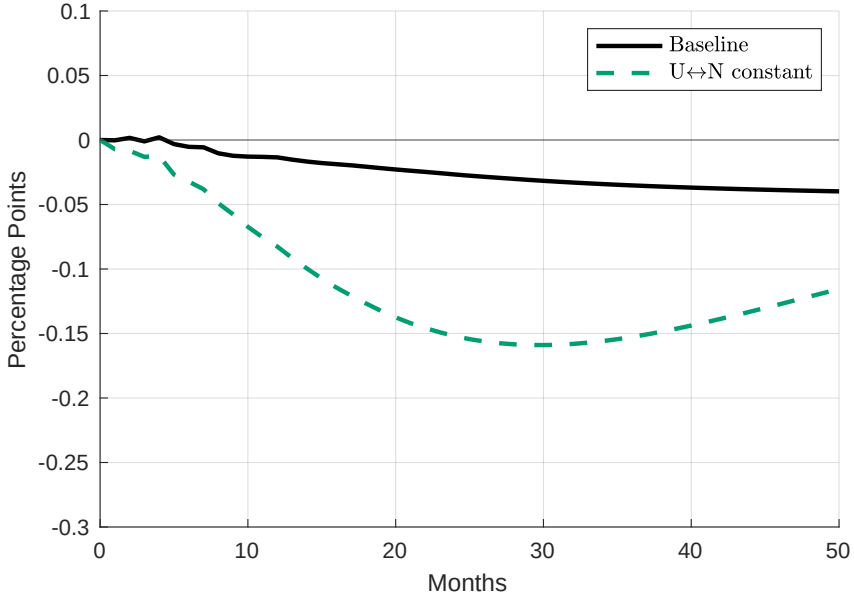
Response of Wages and Unemployment



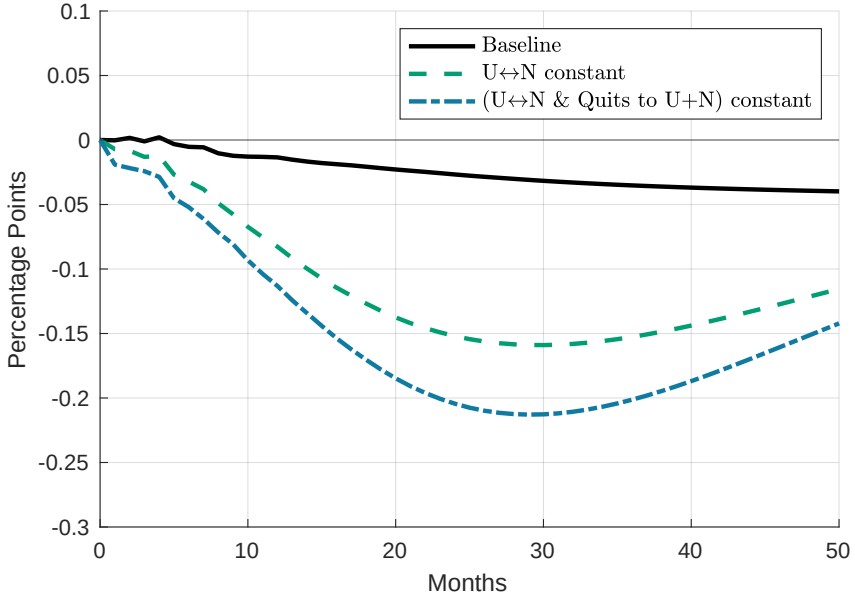
Participation Response to a Monetary Policy Shock



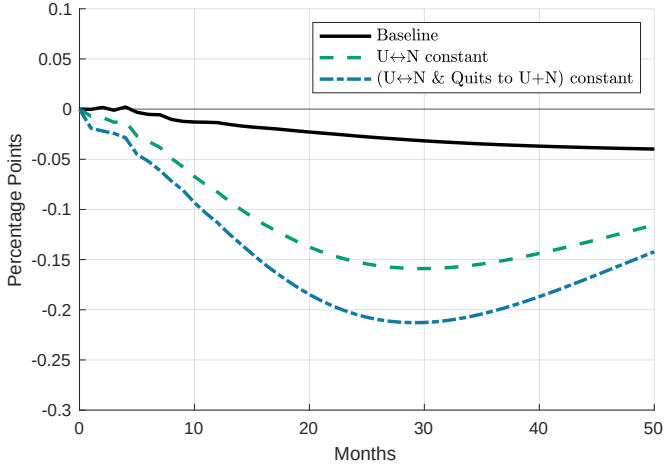
Participation Response to a Monetary Policy Shock



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