The Labor Demand and Labor Supply Channels of Monetary Policy

Sebastian Graves[1], Christopher Huckfeldt[2], and Eric Swanson[3]

[1]University of Cambridge
[2]Federal Reserve Board
[3]UC Irvine & NBER

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- Study response of labor market flows to identified monetary policy shocks
  - Estimate impulse responses from proxy SVAR with HFI monetary policy shocks à la Gertler and Karadi (2015)
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- Show response of employment twice as large holding supply-driven flows fixed

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- Estimate key model parameters to match response of labor market flows to contractionary monetary policy shock
  - Study by feeding in responses for layoff rate, job-finding rate, interest rate and wages
- Model achieves close fit for aggregate labor market flows
- While also consistent with micro evidence on MPCs and MPEs
- Model implies quantitatively important labor supply response:
  Fix labor supply policy functions at steady-state: employment falls $\approx$ 70% more

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- This paper: New evidence that decline in employment from a contractionary monetary policy shock significantly attenuated by increase in labor supply
- Potentially relevant for understanding post-Covid period: large fiscal transfers to households, quits $\uparrow$, labor force participation $\downarrow$, inflation $\uparrow$

Data & Methodology

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- Particular focus on response of supply-driven flows to monetary policy
  - Decision to search from non-employment, e.g. U-to-N and N-to-U
  - Quits to unemployment and nonparticipation

Time Series | Cyclical Properties

New Decomposition of Flows From Employment to Non-Employment

- Previous work: EU flows dominated by layoffs (Elsby et al. 2009, Ahn, 2023)

	Total	Quits	Layoffs	Other
mean(x)	0.014	0.002	0.008	0.004
std(x)/std(Y)	5.20	8.11	8.03	5.43
corr(x, Y)	−0.83	0.60	−0.83	−0.54

Note: x denotes the variable in each column, Y denotes HP-filtered log real GDP. Standard deviations/correlations computed for HP-filtered quarterly averages.

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- This paper: EN flows show larger role for quits

	Total	Quits	Layoffs	Other
mean(x)	0.030	0.012	0.003	0.015
std(x)/std(Y)	2.46	5.88	14.42	4.80
corr(x, Y)	0.49	0.53	−0.44	0.25

Note: x denotes the variable in each column, Y denotes HP-filtered log real GDP. Standard deviations/correlations computed for HP-filtered quarterly averages.

▸ Times Series of Decomposed EU and EN ▸ Economic Significance of Quits and Layoffs ▸ Robustness of EU and EN Decompositions

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- Estimate α, $B(L)$ using OLS over full sample, 1978–2019
- To estimate effects of monetary policy on labor market flow variables, extend baseline VAR with one flow variable at a time

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- First column of S, denoted s_1, describes the impact effect of ε_t^{mp} on u_t and Y_t
- IRF of ε_t^{mp} on Y_t then follows from $B(L)$

External Instrument

- Use an external instrument z_t to identify s_1
- External instrument z_t needs to satisfy:

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

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- These high-frequency interest rate changes are very plausibly both relevant and exogenous for ε_t^{mp}

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- Reduced-form residuals related to structural shocks:

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- Identify impact effect of ε_t^{mp} on u_t by regressing u_t on u_t^{2y} by 2SLS using z_t as an instrument (sample 1988:1–2019:12):

$$u_t = \gamma + s_1 u_t^{2y} + \eta_t$$

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- First-stage F-statistic for Y_t^{2y} on instrument z_t measures instrument strength

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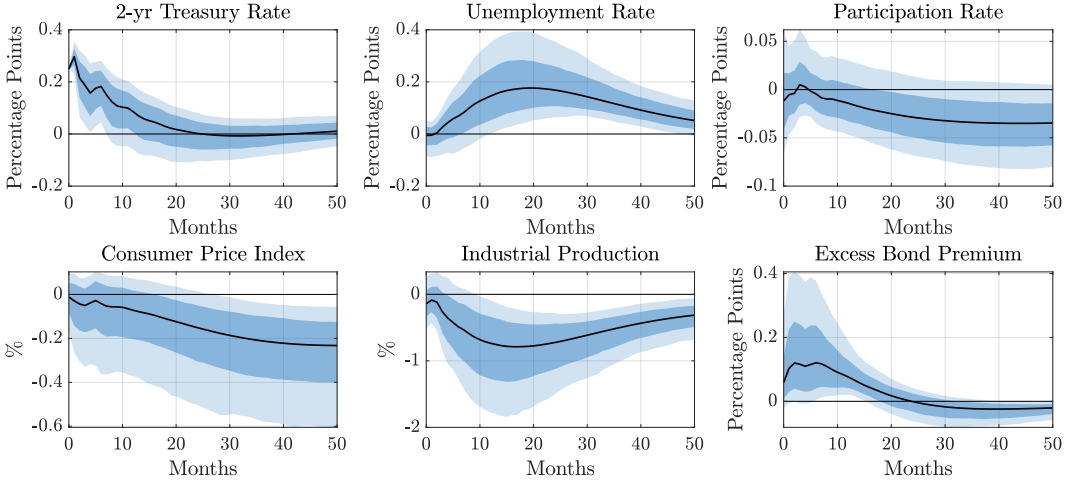
- Orthogonalizing improves exogeneity of instrument
- Both speeches and orthogonalizing **necessary** for accurate estimates of flow IRFs
  - Additional noise from labor market flows requires stronger, more valid instrument

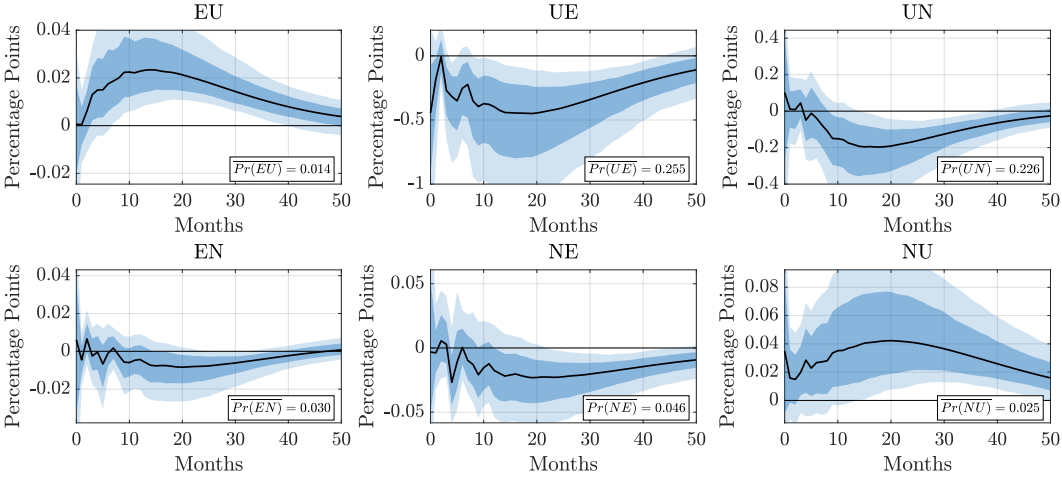
Estimates

Baseline VAR



- Monthly data, 1978:M1–2019:M12
- Dark and light shaded regions report **68%** and **90%** confidence intervals

Response of Labor Market Flows



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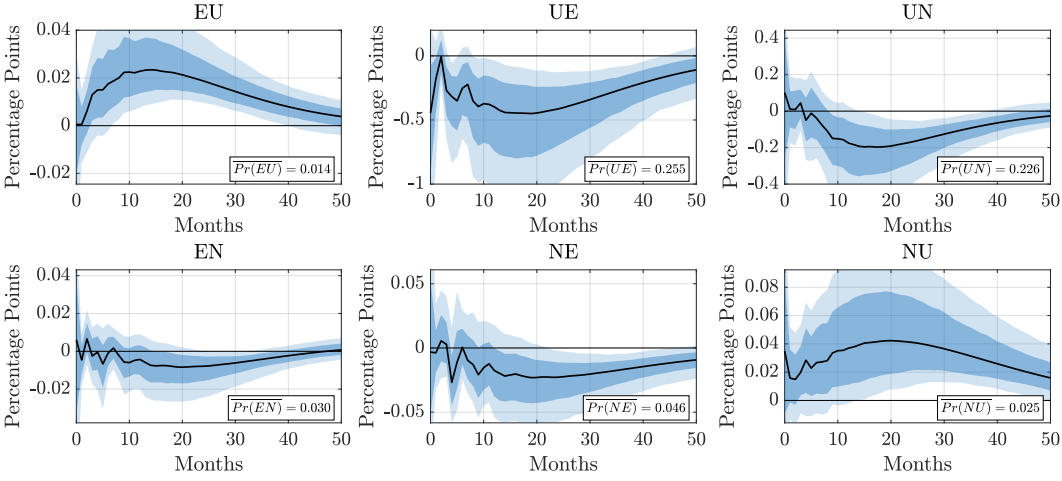
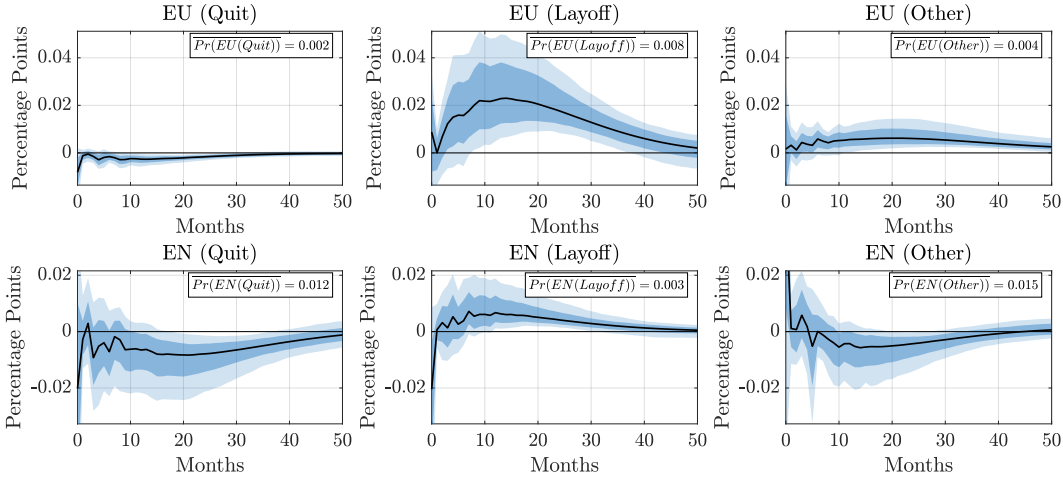


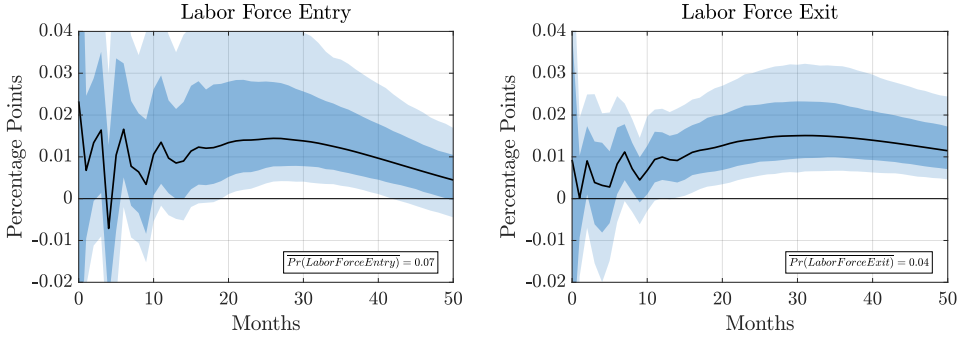
- pEU ↑ & pUE ↓ ⇒ Consistent with narrative of decline in labor demand
- pNU ↑, pUN ↓, & pEN ↓ ⇒ Consistent with increase in labor supply

Response of EU & EN Flows: Quits vs Layoffs



- Increase in layoffs explains rise in EU rate
- Decline in quits explains fall in EN rate

Participation: Response of Labor Force Entry and Exit



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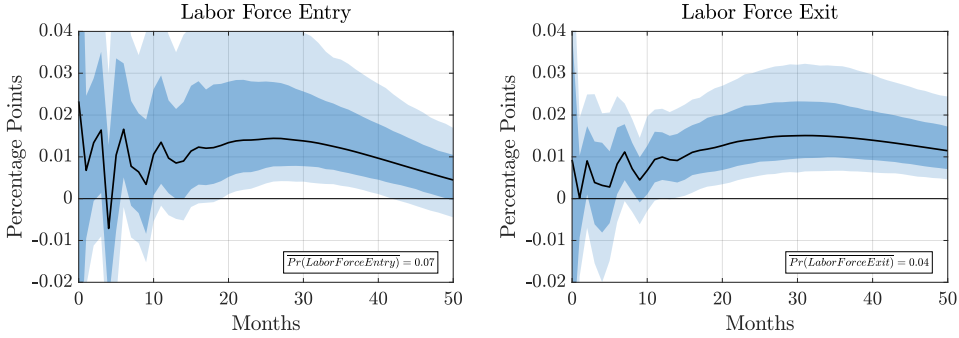


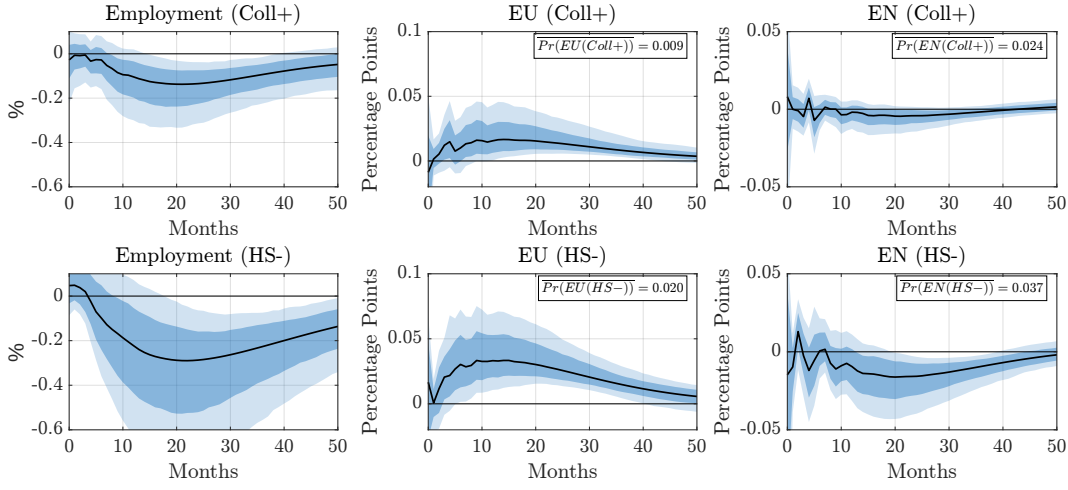
- Participation falls due to higher exit rate, offset by rise in entry
- Increase in exits driven by u_t, attenuated by EN_t and UN_t

$$\left(\text{Labor Force Entry Rate}\right)_t = NU_t + NE_t$$

$$\left(\text{Labor Force Exit Rate}\right)_t = u_{t-1} \cdot UN_t + (1 - u_{t-1}) \cdot EN_t$$

where u_{t-1} denotes the unemployment rate (and $\overline{UN} \gg \overline{EN}$)

Heterogeneity in Labor Market Responses: Education



- Decline in E-to-N concentrated among less educated

▸ Flows: Coll+ ▸ Flows: HS+

Additional Results

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Chair speeches and orthogonalized shocks necessary for our estimates:

- Resolves known issues from HFI estimation of monetary policy shocks:
  - Biased estimates from non-orthogonalized shocks
  - Imprecise estimates from orthogonalized shocks w/o Chair speeches
- More valid instrument needed given additional noise from labor market flows

Using Flows to Account 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)

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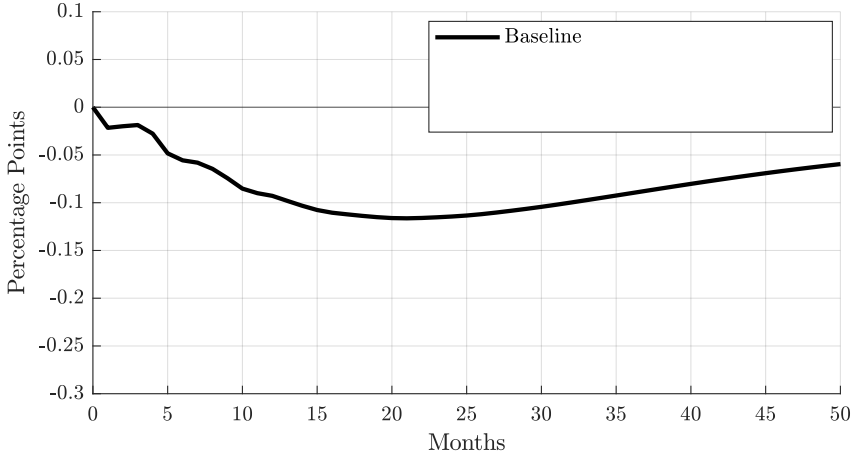
- Assess contribution of flow p_{XY} to stock Z by replacing $\{p_{XY}\}_t$ with steady-state value, $\bar{p}_{XY}$
- Study behavior of resulting hypothetical stock $\tilde{Z}$ to isolate role of flow p_{XY}
- Can also study hypothetical stock from "shutting down" multiple flows

▸ Ins and Outs of Employment ▸ Ins and Outs of Unemployment ▸ Ins and Outs of Participation

Decomposing Employment Response to a Monetary Policy Shock



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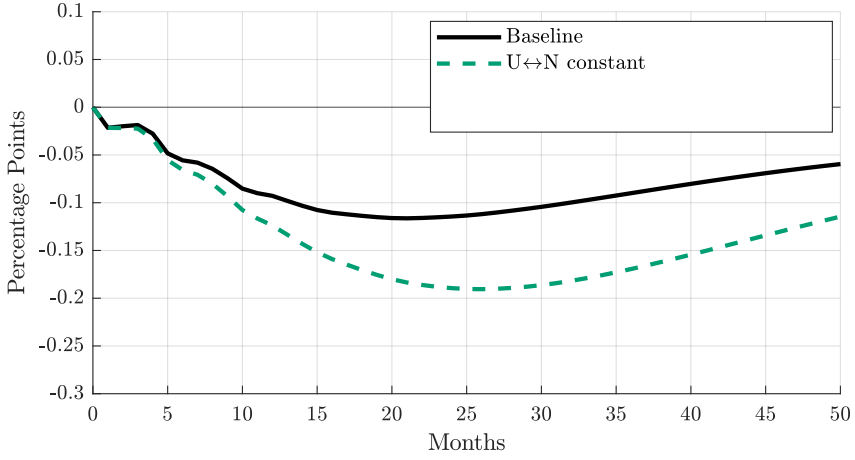

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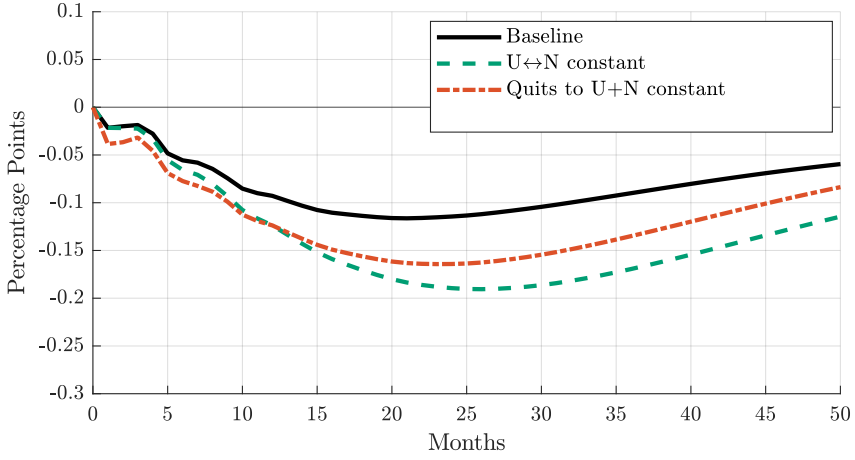

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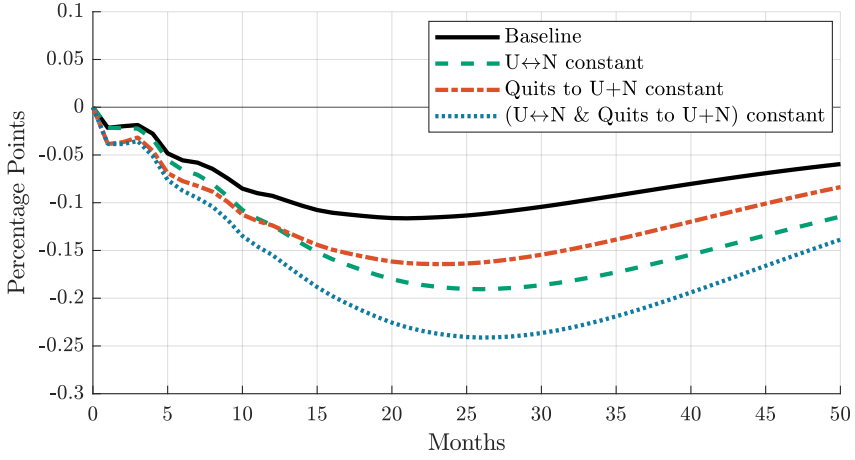

- Holding supply-driven flows fixed ⇒ Employment falls twice as much

Controls for composition | Participation | Unemployment

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- Estimate key model parameters to match response of labor market flows to contractionary monetary policy shock
  - Study by feeding responses for layoff rate, job-finding rate, interest rate and wages
- Main Results:
  1. Model achieves close fit for all labor market flows
  2. Consistent with recent evidence on MPCs and MPEs
  3. Implies quantitatively important increase in labor supply

▸ Timing

Value Functions

Let $V_E(a, z)$, $V_U(a, z, \kappa)$, and $V_N(a, z, \kappa)$ represent the values of being employed, UI-eligible non-employed, and UI-ineligible non-employed

- $a =$ assets
- $z =$ idiosyncratic productivity: $\log z' = \rho_z \log z + \epsilon_z$, $\epsilon_z \sim N(0, \sigma_z^2)$
- $\kappa =$ cost of job search, iid from logistic distribution: mean $= \mu_\kappa$, scale $= \sigma_\kappa$

Value Functions

Let $V_E(a,z)$, $V_U(a,z,\kappa)$, and $V_N(a,z,\kappa)$ represent the values of being employed, UI-eligible non-employed, and UI-ineligible non-employed

$$V_E(a,z) = \max_{c,a'} \Big\{ u(c) + \beta \max\{ \underbrace{\mathbb{E}\, V_N(a',z',\kappa')}_{\text{Quit}}, \underbrace{\mathbb{E}\big[\delta_L V_U(a',z',\kappa') + (1-\delta_L) V_E(a',z')\big]}_{\text{Do Not Quit}} \} \Big\}$$

subject to

$$c + a' = \bar{R}a + (1-\tau)wz + T, \quad a' \geq 0$$

Value Functions

Let $V_E(a,z)$, $V_U(a,z,\kappa)$, and $V_N(a,z,\kappa)$ represent the values of being employed, UI-eligible non-employed, and UI-ineligible non-employed

$$V_U(a,z,\kappa) = \max_{c,a'} \left\{ u(c) + \max \left\{ \underbrace{(1-\kappa)\psi + \beta \mathcal{V}_U^s(a',z)}_{\text{Search}}, \underbrace{\psi + \beta \mathcal{V}_U^{ns}(a',z)}_{\text{Do Not Search}} \right\} \right\}$$

subject to

$$c + a' = \bar{R}a + (1-\tau)\min\{\phi w z, \bar{\phi}\} + T, \quad a' \geq 0$$

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where

$$\mathcal{V}_U^s(a',z) = f_s \cdot \max\{\overbrace{\mathbb{E}\, V_E(a',z'), \mathbb{E}\, \tilde{V}_U(a',z',\kappa')}^{\text{Accept?}}\} + (1-f_s)\,\mathbb{E}\, \tilde{V}_U(a',z',\kappa')$$

$$\mathcal{V}_U^{ns}(a',z) = f_{ns} \cdot \max\{\mathbb{E}\, V_E(a',z'), \mathbb{E}\, V_N(a',z',\kappa')\} + (1-f_{ns})\,\mathbb{E}\, V_N(a',z',\kappa')$$

$$\tilde{V}_U(a,z,\kappa) = \delta_{UI} V_N(a,z,\kappa) + (1-\delta_{UI}) V_U(a,z,\kappa).$$

Value Functions

Let $V_E(a,z)$, $V_U(a,z,\kappa)$, and $V_N(a,z,\kappa)$ represent the values of being employed, UI-eligible non-employed, and UI-ineligible non-employed

$$V_N(a,z,\kappa) = \max_{c,a'} \left\{ u(c) + \max\left\{ \underbrace{(1-\kappa)\psi + \beta \mathcal{V}_N^s(a',z)}_{\text{Search}}, \underbrace{\psi + \beta \mathcal{V}_N^{ns}(a',z)}_{\text{Do Not Search}} \right\} \right\}$$

subject to

$$c + a' = \bar{R}a + T, \quad a' \geq 0$$

where

$$\mathcal{V}_N^s(a',z) = f_s \cdot \max\{\overbrace{\mathbb{E}\, V_E(a',z'), \mathbb{E}\, V_N(a',z',\kappa')}^{\textit{Accept?}}\} + (1-f_s)\,\mathbb{E}\, V_N(a',z',\kappa')$$

$$\mathcal{V}_N^{ns}(a',z) = f_{ns} \cdot \max\{\mathbb{E}\, V_E(a',z'), \mathbb{E}\, V_N(a',z',\kappa')\} + (1-f_{ns})\,\mathbb{E}\, V_N(a',z',\kappa')$$

Estimation: A Monetary Policy Shock in the Model

- Feed in response of job-finding rate, layoff rate, real interest rates and wages from the data
- Overall response of labor market flows also determined by endogenous changes in policy functions + distribution of households across labor market states

Estimation: A Monetary Policy Shock in the Model

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- Calibrate a number of parameters, $\theta_{EXT} \equiv \{\beta, \gamma, \bar{R}, \delta_{UI}, w, \alpha, \phi, \bar{\phi}, \tau, T\}$
  - Assume $u(c) = \frac{c^{1-\gamma}-1}{1-\gamma}$, $f_{ns} = \alpha f_s$

Estimation: A Monetary Policy Shock in the Model

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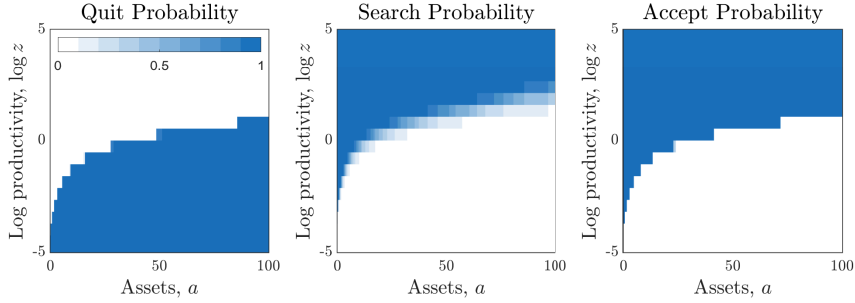
- Overall response of labor market flows also determined by endogenous changes in policy functions + distribution of households across labor market states
- Calibrate a number of parameters, $\theta_{EXT} \equiv \{\beta, \gamma, \bar{R}, \delta_{UI}, w, \alpha, \phi, \bar{\phi}, \tau, T\}$
- Estimate remaining parameters to match IRFs of labor market flows
  - À la Christiano, Eichenbaum, Evans (2005) or Auclert, Rognlie, Straub (2020)

$$\theta_{EST} \equiv \{\rho_z, \sigma_z, \mu_\kappa, \sigma_\kappa, \psi, \delta_L, f_s\}$$
$$\hat{J} = \{EU_t, EN_t, UE_t, UN_t, NE_t, NU_t\}_{t=0}^{50}$$
$$\hat{\theta}_{EST} = \arg\min_{\theta_{EST}} (J(\theta_{EST}) - \hat{J})' \Sigma^{-1} (J(\theta_{EST}) - \hat{J})$$

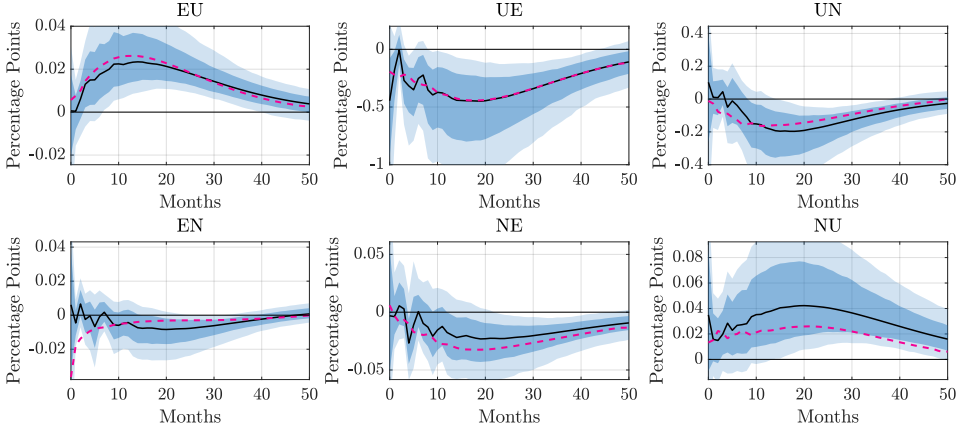
▸ Model parameters

Results: Steady State



1. Model has near-perfect fit for steady-state flow rates between E, U and N
2. Model produces quarterly MPC of 7-8%, annual MPE of 2-3%
   In line with (recent) literature

Response of Labor Market Flows: Model vs Data



- Labor market flows from model (magenta lines) largely fall within 68% CI's
- Is fit achieved through change in composition or change in policy functions?

▸ Response of Quits and Layoffs ▸ Response of Labor Market Stocks

The Role of Labor Supply

- Ability of model to match response of labor market flows could reflect endogenous changes in composition or household labor supply

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- Ability of model to match response of labor market flows could reflect endogenous changes in composition or household labor supply
- For example, decrease in UN flows could reflect
  - Greater mass of "likely searchers" in non-employment, or
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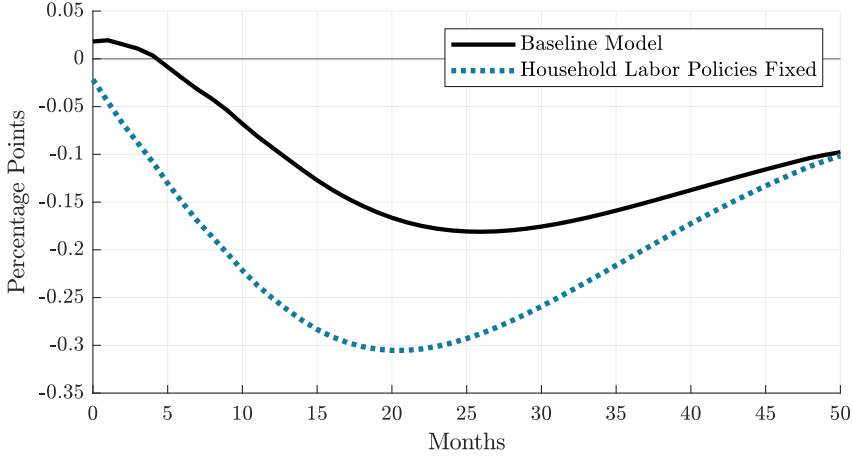
The Role of Labor Supply

- Ability of model to match response of labor market flows could reflect endogenous changes in composition or household labor supply
- For example, decrease in UN flows could reflect
  - Greater mass of "likely searchers" in non-employment, or
  - Higher propensity to search for employment of all workers
- To assess relative importance of two channels, simulate model holding labor supply policy functions at steady state
  - If changes in labor supply do not matter, employment should be unaffected

The Role of Labor Supply: Employment Response



- Finding: Employment drops by additional $\approx 70\%$
  - Indicates broad-based increase in labor supply to contractionary monetary shock

Conclusion

Conclusion

- Estimate substantial response of supply-driven labor market flows to contractionary monetary policy shock
- Holding supply-driven flows at steady state, fall in employment doubles
- Use heterogenous agent model with frictional labor markets and participation margin to understand role of household labor supply
- Model fit to labor flows achieved through broad-based increase in labor supply
- Empirical evidence + model findings consistent with important role of labor supply in monetary transmission mechanism
- Future/ongoing work: study labor supply response to Covid-era transfers (e.g., "Great Resignation") and evaluate role in for subsequent inflation

Extra Slides

Cyclical Properties of Labor Market Stocks and Flows

Cyclicality of Labor Market Stocks

	Employment-Population Ratio	Unemployment Rate	Participation Rate
mean(x)	61.14	6.19	65.16
std(x)/std(Y)	0.72	8.25	0.23
corr(x, Y)	0.83	−0.85	0.35

Note: x denotes the variable in each column, Y denotes HP-filtered log real GDP. Standard deviations and correlations are computed for HP-filtered quarterly averages. The sample is 1978-2019.

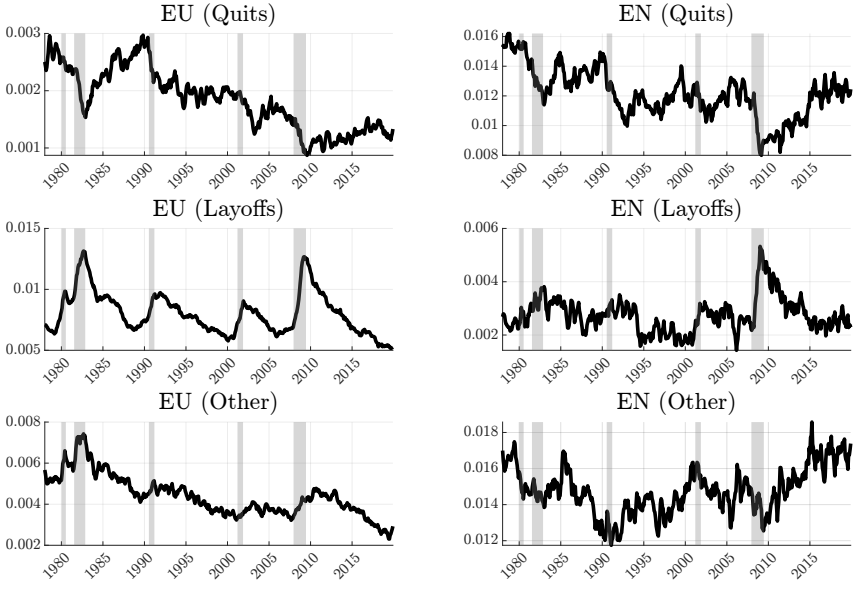
Cyclicality of Labor Market Flows

	EU	EN	UE	UN	NE	NU
mean(x)	0.014	0.030	0.255	0.226	0.046	0.025
std(x)/std(Y)	5.20	2.46	5.69	4.14	3.00	5.22
corr(x, Y)	−0.83	0.49	0.78	0.71	0.65	−0.68

Note: x denotes the variable in each column, Y denotes HP-filtered log real GDP. Standard deviations and correlations are computed for HP-filtered quarterly averages. The sample is 1978-2019.

Back

Decomposition of EU Flows



Back

Relevance of Distinction Between Quits and Layoffs

Post-EU Transition Rates: Quits vs Layoffs

	To		
From	E	U	N
E – U(Quit)	0.448	0.399	0.153
E – U(Layoff)	0.426	0.468	0.106

Note: Transition rates are shown for individuals that are in their first month of unemployment following an employment spell, split by reason for unemployment.

Back

Relevance of Distinction Between Quits and Layoffs

	Average Probability
Want Job | E-N(Quit)	0.224
Want Job | E-N(layoff)	0.528
NE |Want Job	0.152
NE | Do Not Want Job	0.039
NU | Want Job	0.177
NU | Do Not Want Job	0.013

Note: The top section shows the probability that individuals want a job, split by the reason for leaving to nonparticipation. The bottom section shows the probabilities of moving to employment, split by whether or not nonparticipants report wanting a job.

Back

Robustness of Quit/Layoff Distinction

Sequences of Reasons for U among E-U-U Individuals

Sample period	Pr(Quit |Layoff)	Pr(Layoff |Quit)
pre-Redesign	0.039	0.208
post-Redesign	0.007	0.026

Note: The first row shows the probability of individuals switching their reason for unemployment from layoff to quit (in the first column), or from quit to layoff (in the second column), prior to the 1994 CPS redesign. The second row shows the same, but for the period following the redesign.

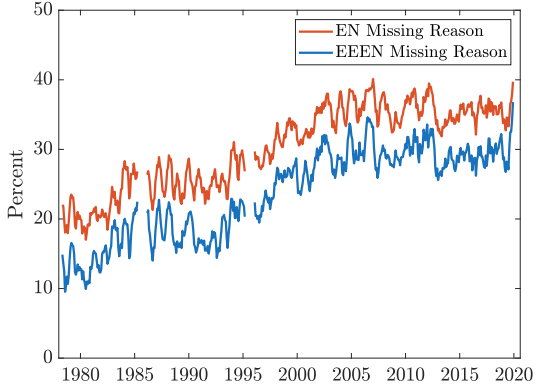
Transition Rates Across E-U-U Individuals

		To		
	From	E	U	N
(*a*)	E − U(Quit) − U(Layoff)	0.339	0.553	0.108
(*b*)	E − U(Quit) − U(Quit)	0.343	0.536	0.121
(*c*)	E − U(Layoff) − U(Quit)	0.352	0.557	0.091
(*d*)	E − U(Layoff) − U(Layoff)	0.264	0.667	0.068

Note: Transition rates are shown for individuals that are in their second month of unemployment following an employment spell, split by reason for unemployment. The rates are computed for the period prior to the 1994 CPS redesign.

Back

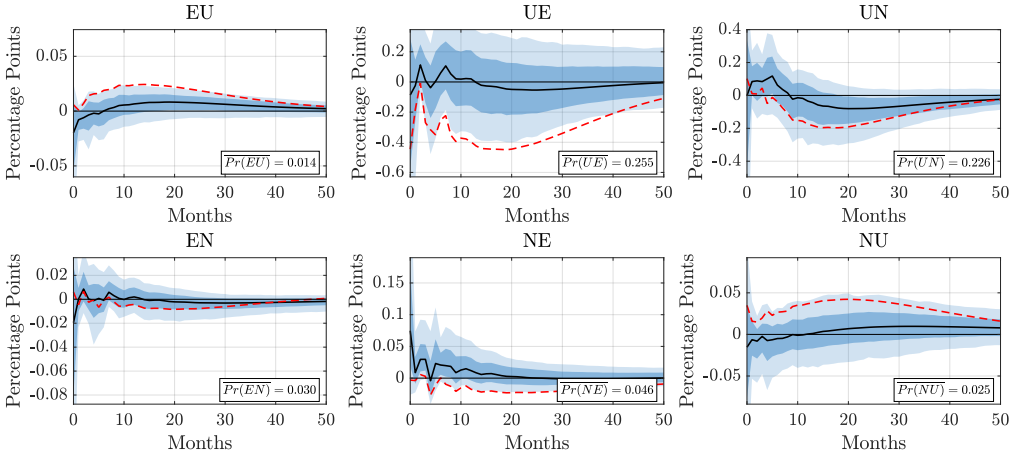
Fraction of EN Transitions with Missing Reason



Note: The red line shows the proportion of individuals making an EN transition for which there is missing data on the reason for leaving the last job. The blue line shows the same calculation for individuals that were employed in each of the first three months before moving to nonparticipation. Series are smoothed using a centered 5-month moving average.

Back

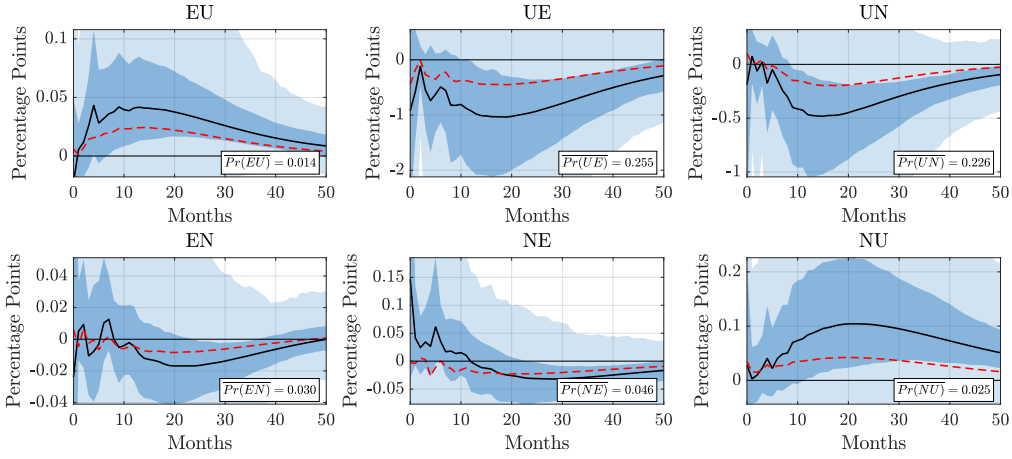
Labor Market Flows: No Speeches (Not Orthogonalized)



- High-frequency shocks from announcements only (e.g. Gertler & Karadi (2015))
- Dashed red lines report our baseline estimates

Back

Labor Market Flows: No Speeches (Orthogonalized)

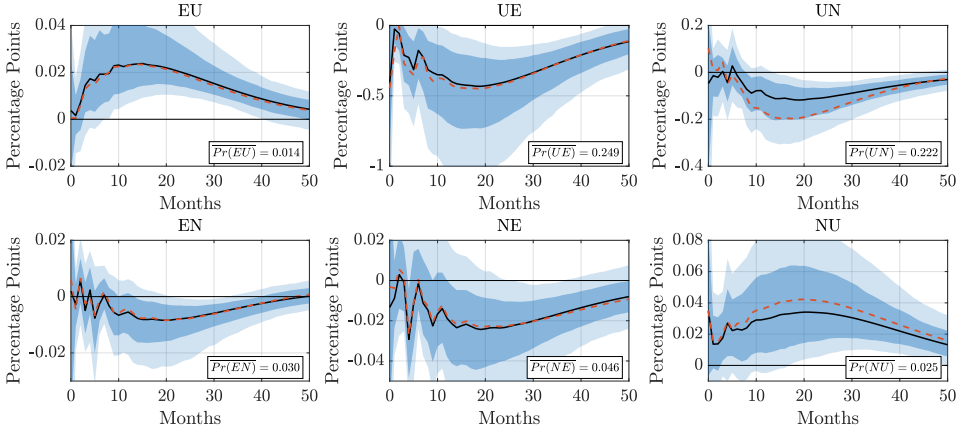


Robust F-statistic from Baseline VAR: 0.48

- From announcements only, orthogonalized as in Bauer & Swanson (2023)
- Dashed red lines report our baseline estimates

Back

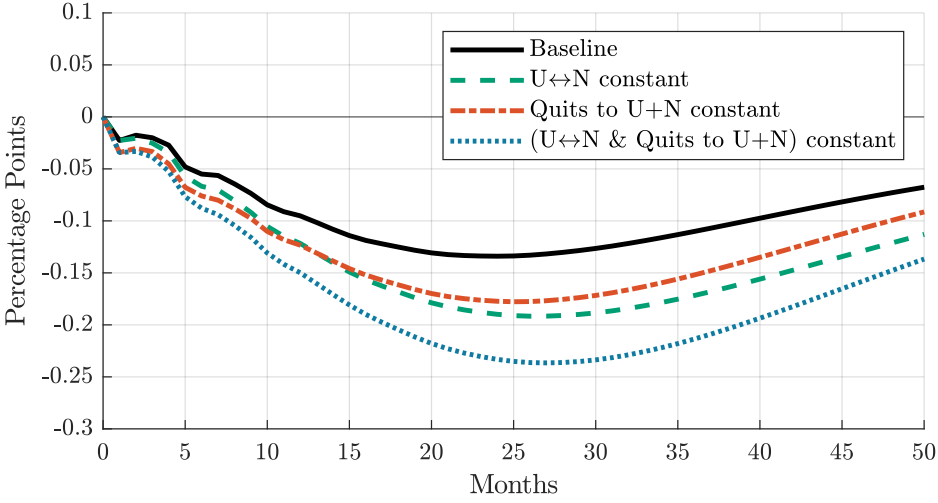
Labor Market Flows: Holding Composition Fixed



- Composition-adjusted flows by ex-ante characteristics, à la Elsby et al. (2015)
- Fix shares using bins for age × gender × education × reason for unemployment
- Dashed red lines report our baseline estimates

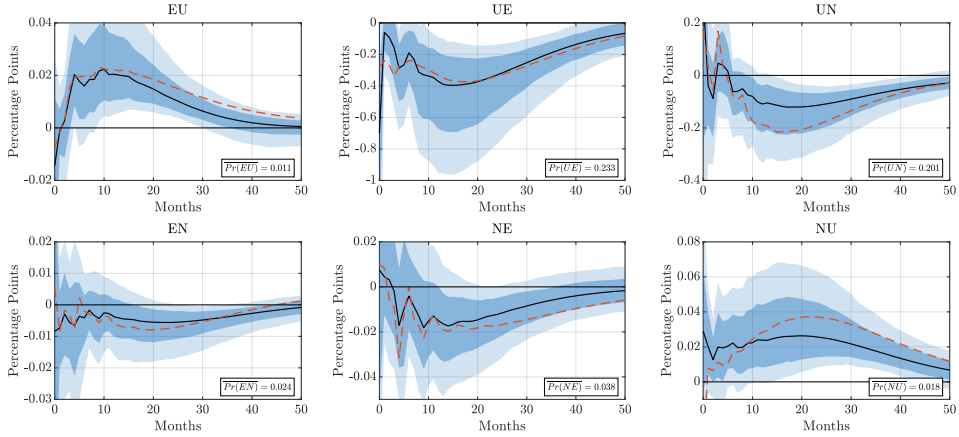
Back

Decomposing Employment Response: Holding Composition Fixed



Back

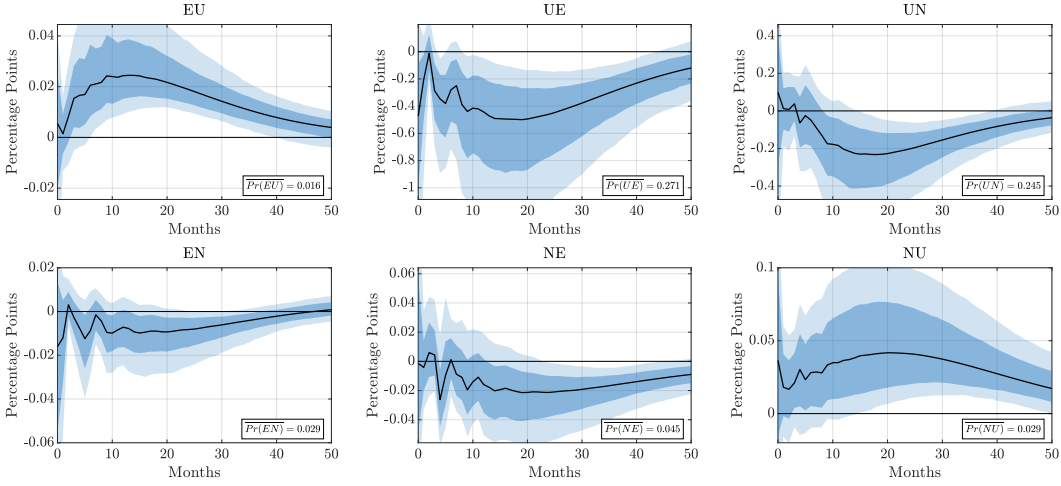
Labor Market Flows: Holding Composition Fixed (Full Controls)



- Fix shares using bins for age × gender × education × reason for unemployment × **labor market status one year ago**
- Dashed red lines are responses for unadjusted flows with the same sample

Back

Labor Market Flows: Corrected for Time-Aggregation

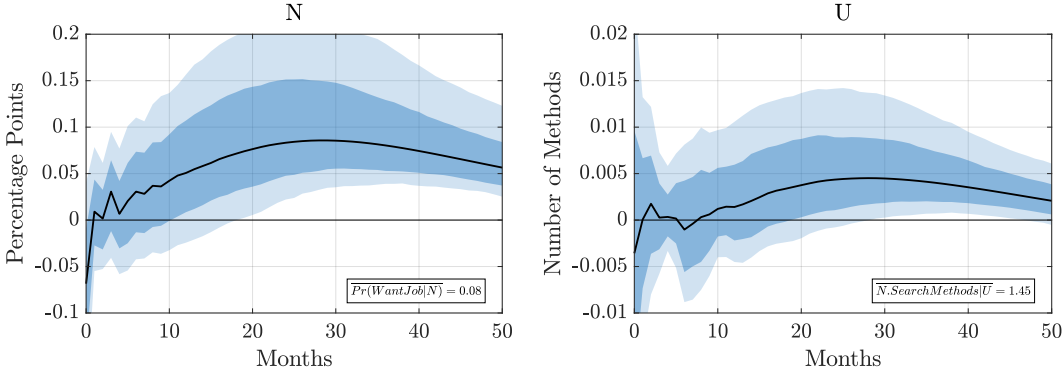


Back

Intensive Margins of Labor Supply

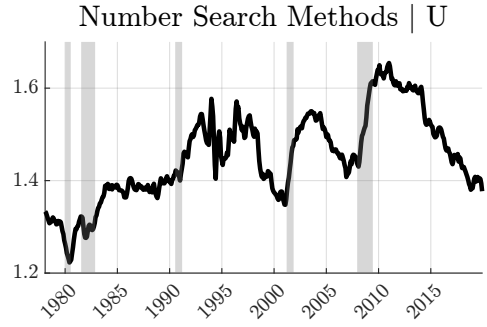
Intensive margins of job search consistent with behavior of NU/UN flows:

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



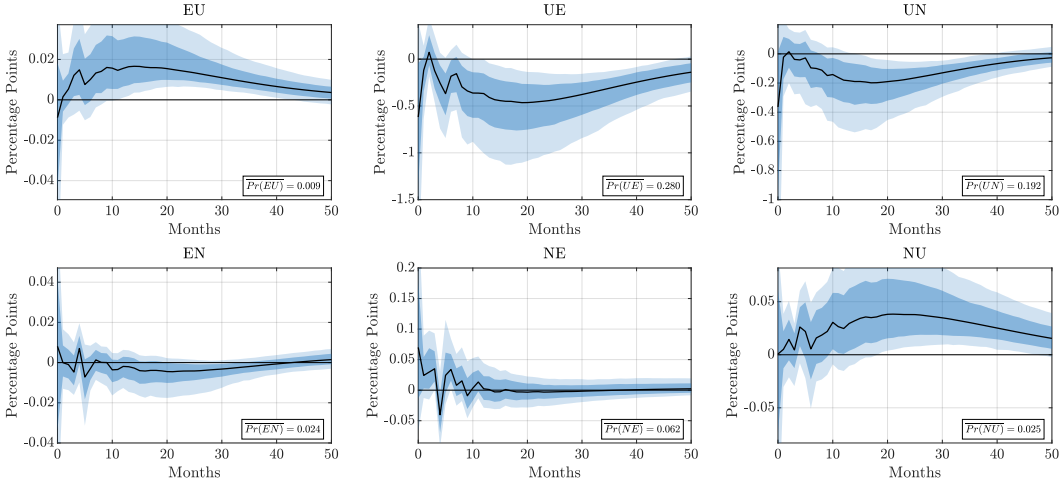
Back

Intensive Margins: Time-Series



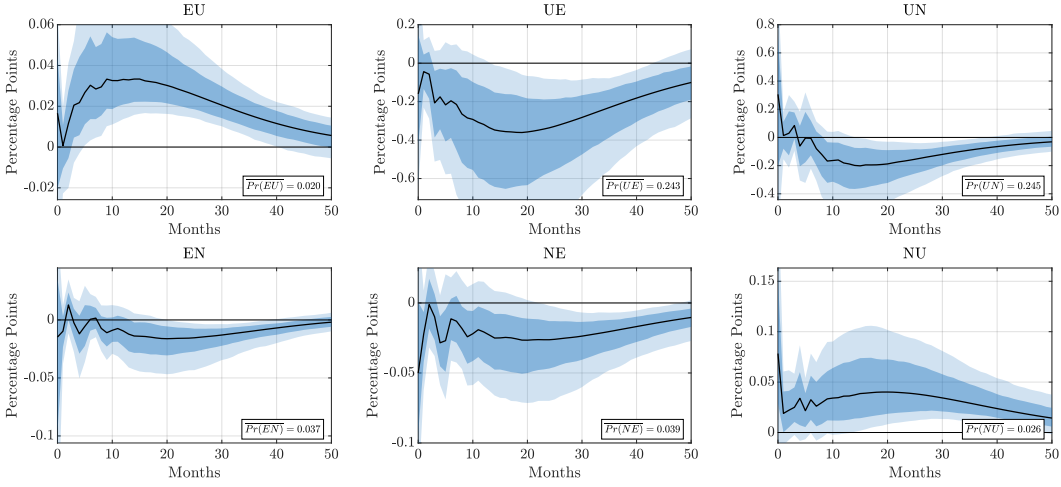
Back

Labor Market Flows: Higher-Educated



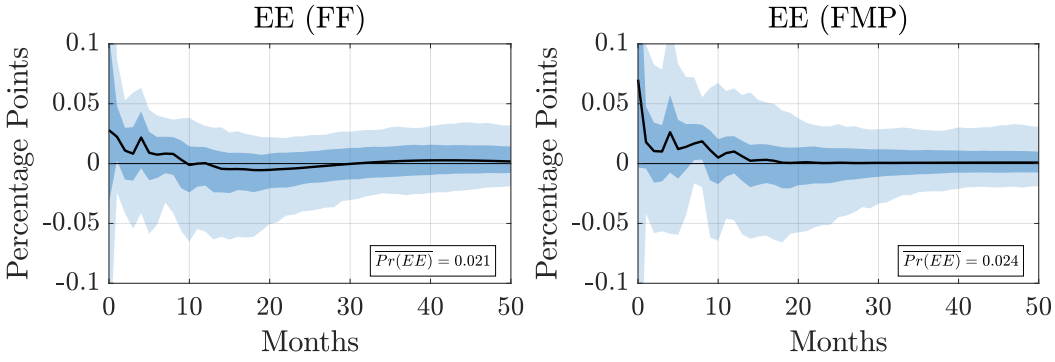
Back

Labor Market Flows: Lower-Educated



Back

Response of Job-to-Job Flows (1995-2019)

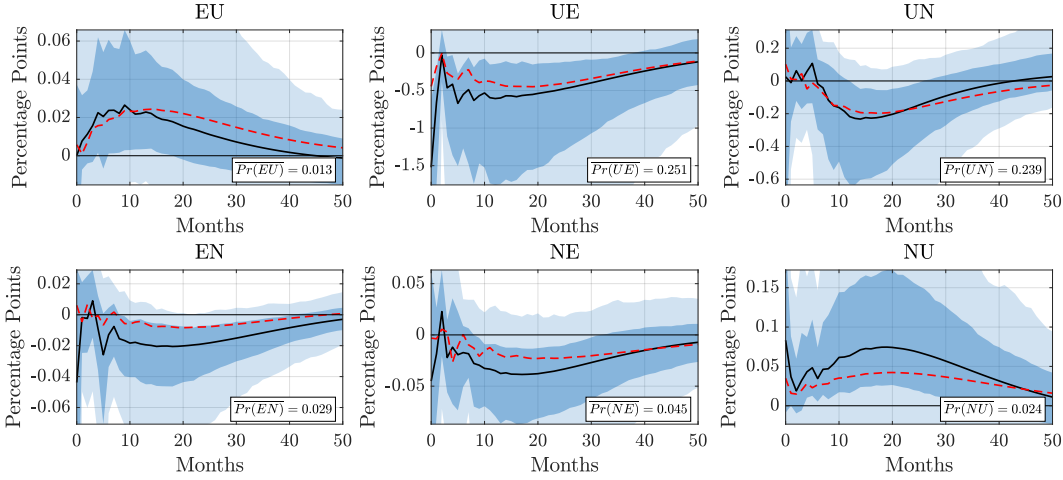


Robust F-statistic from Baseline VAR: 5.44

- Use measures from Fujita, Moscarini, Postel-Vinay (2024)
- No response of EE rate to monetary policy shocks

Back

Response of Labor Market Flows (1995-2019)

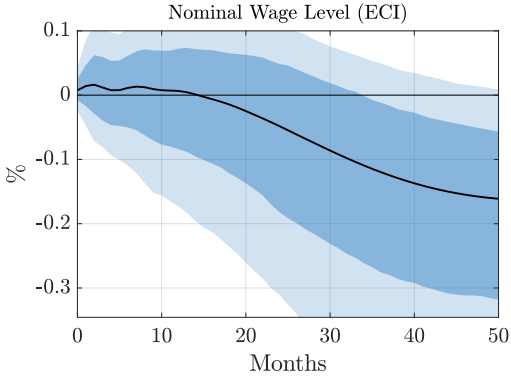


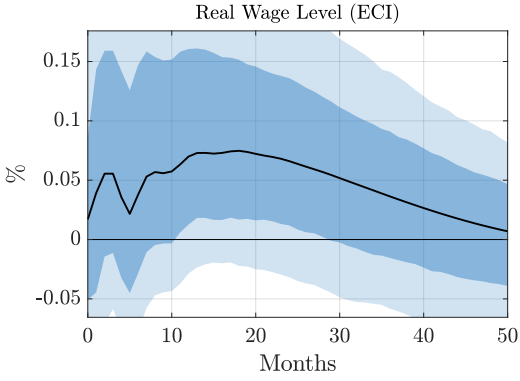
Robust F-statistic from Baseline VAR: 5.44

- Dashed red lines report impulse responses using full sample

Back

Response of Wages

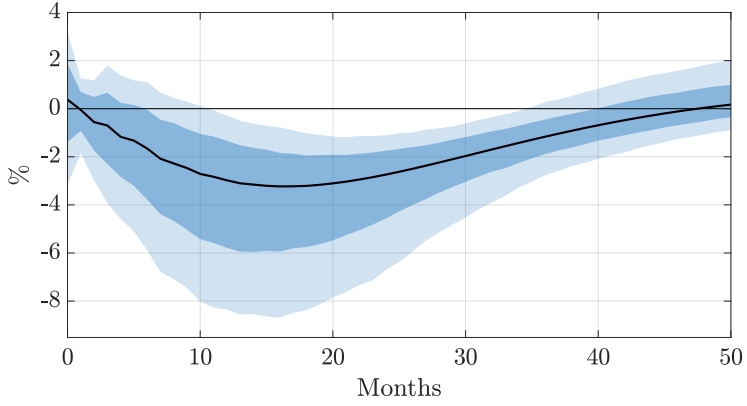




- Nominal wages decline slower than CPI → real wages rise slightly in short-run

Back

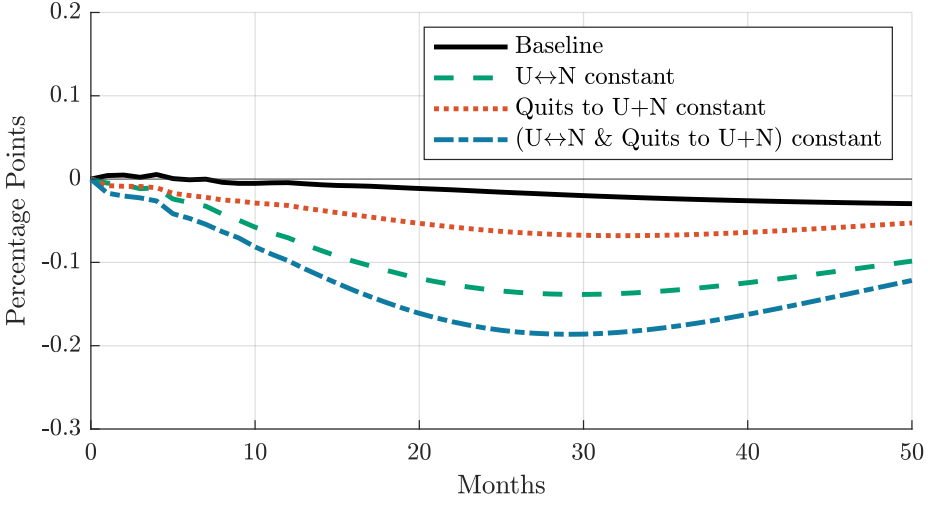
Response of Vacancies



- Use extended help-wanted index of Barnichon (2010)

Back

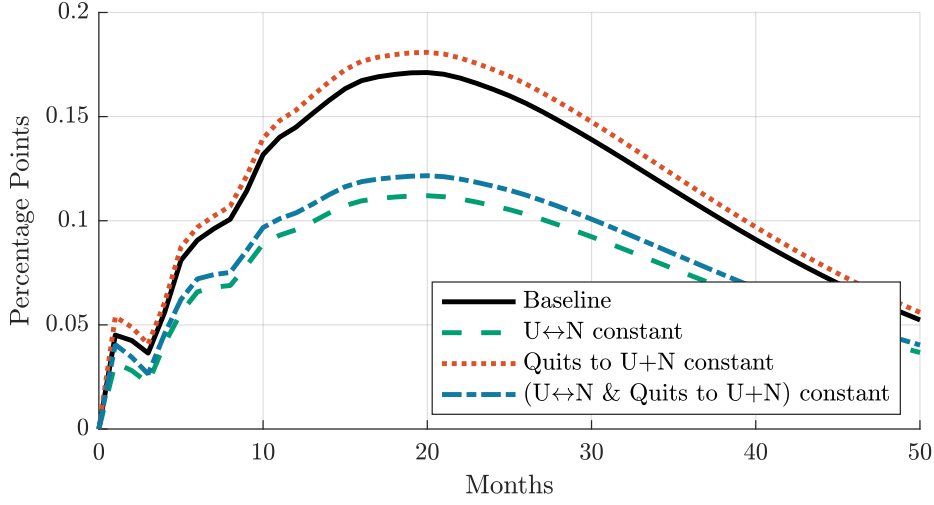
Participation Response to a Monetary Policy Shock



- With response of supply-driven flows fixed ⇒ Participation far more procyclical

Back

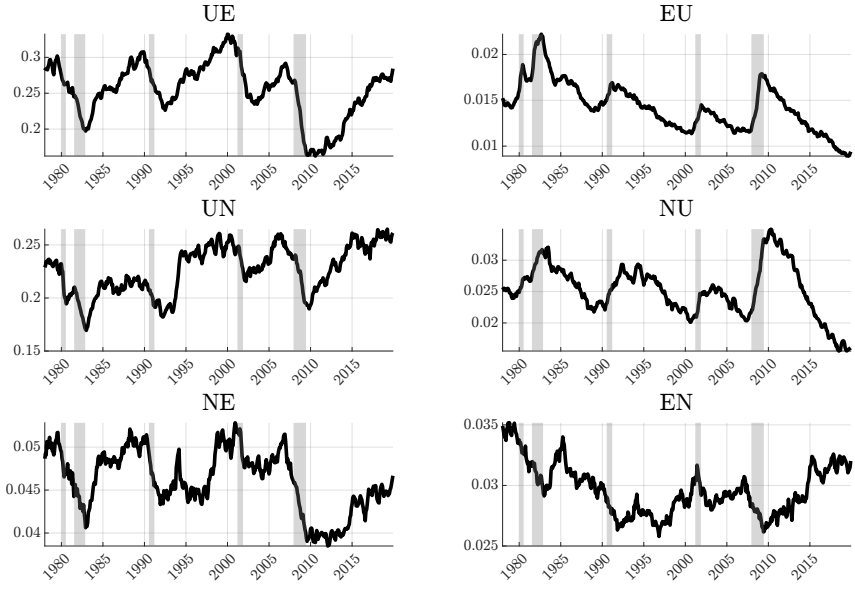
Unemployment Response to a Monetary Policy Shock



- Response of quits not important for unemployment dynamics

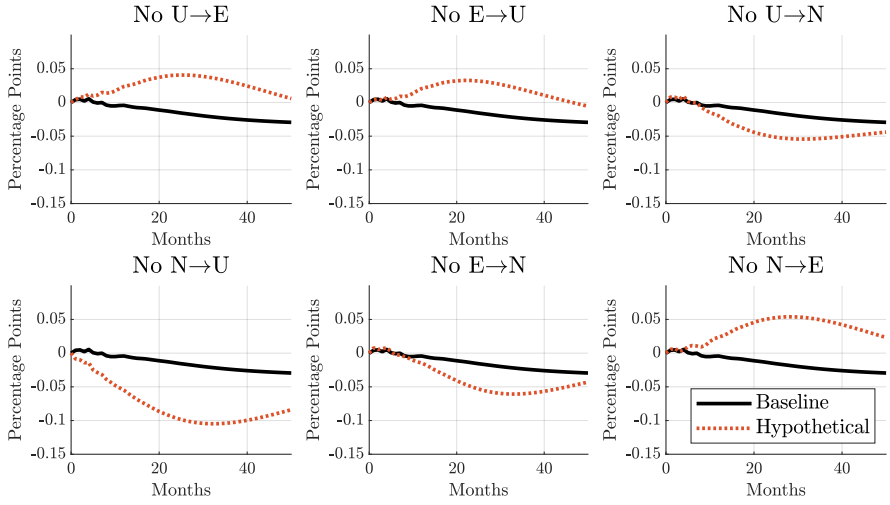
Back

Time Series of Labor Market Flows



Back

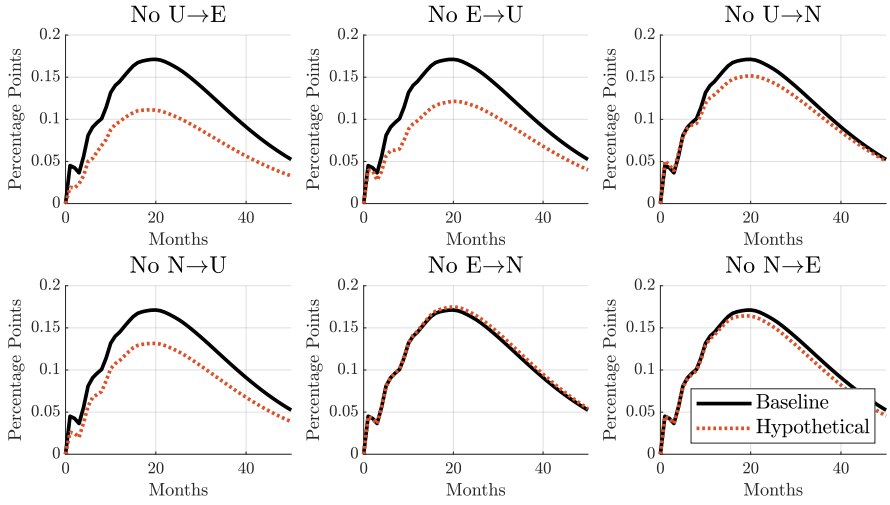
The Ins and Outs of Participation



- E→U and U→E are important for participation cycle

Back

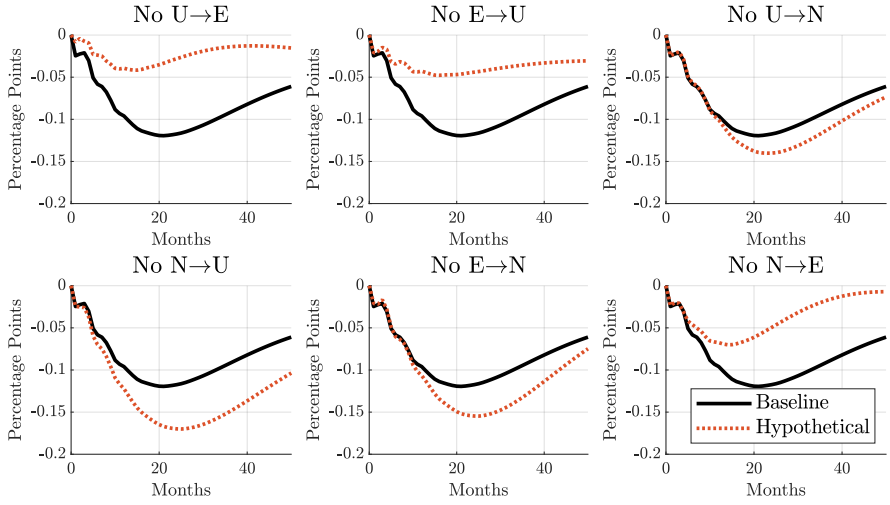
The Ins and Outs of Unemployment



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

Back

The Ins and Outs of Employment



- N→U more important than U→N for supporting employment

Back

Timing within a Model Period

1. All individuals draw a new value of productivity, z. Non-employed individuals draw an i.i.d. search cost, κ.
2. Employed individuals make consumption/saving decisions and choose whether or not to quit their job. Non-employed individuals make consumption/saving decisions and choose whether or not to search for a job.
3. Employed individuals who do not quit are exogenously laid off with probability δ. Non-employed individuals receive job offers with probabilities f_s or f_{ns}, depending on whether or not they actively search.
4. Non-employed individuals who receive job offers decide whether or not to accept such offers.
5. UI-eligible non-employed individuals who search and either do not receive a job offer or do not accept an offer are subject to UI expiry with probability δ_{UI}.

Back

Model Parameters

Calibrated

Parameter	Description	Value	Source/Target
β	Discount Factor	0.988	Quarterly MPC of 7-8%
R	Steady-State Real Interest Rate	1.001	1% Annual
γ	Risk Aversion Coefficient	2	Standard value
δ^{UI}	Benefit Exhaustion Probability	0.167	Expected duration of UI
w	Steady-State Wage	1	Normalization
α	Efficiency of Passive Search	0.6	Job-finding rate from N
ϕ	UI Replacement Rate	0.50	Graves (2023)
$\bar{\phi}$	Maximum UI Payments	1.85	Graves (2023)
τ	Labor Income Tax Rate	0.33	Auclert et al. (2021)
T	Lump-sum Transfer	0.24	Auclert et al. (2021)

Estimated

Parameter	Description	Value	Standard Error
ρ_z	Persistence of Labor Productivity	0.960	(0.004)
σ_z	Standard Deviation of Labor Productivity	0.362	(0.023)
μ_κ	Mean Value of Search Cost	0.783	(0.105)
σ_κ	Dispersion of Search Cost	0.167	(0.022)
ψ	Value of Leisure	0.421	(0.107)
δ	Steady-State Layoff Rate	0.019	(0.002)
f_s	Steady-State Job-Finding Rate	0.273	(0.028)

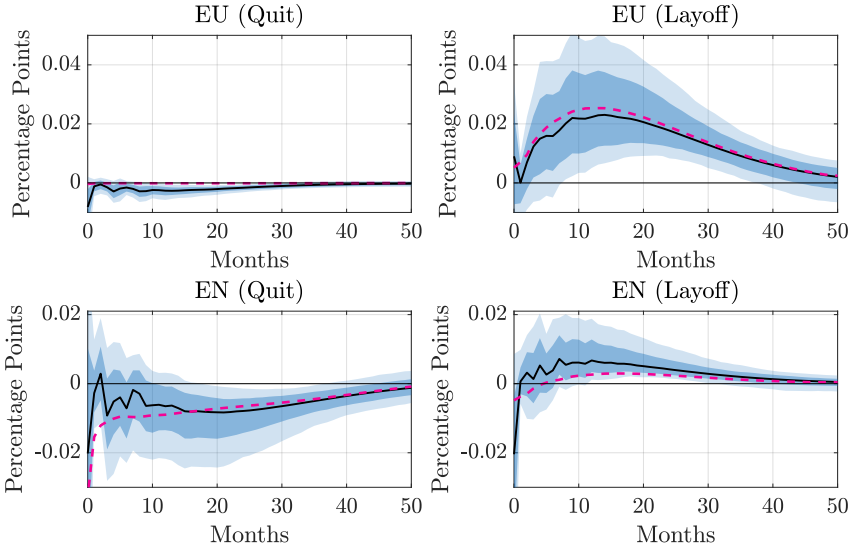
Back

Steady-State Labor Market Flows

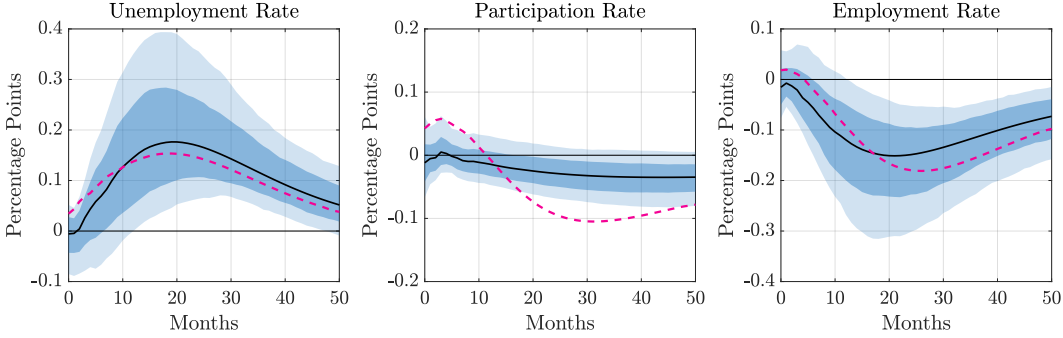
Transition Rate	Model	Data
EU	0.0143	0.0143
EN	0.0297	0.0296
UE	0.2547	0.2547
UN	0.2260	0.2262
NE	0.0462	0.0461
NU	0.0253	0.0252

Back

Response of Quits and Layoffs: Model vs Data



Response of Labor Market Stocks: Model vs Data



Back

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