

The Labor Demand and Labor Supply Channels of Monetary Policy

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October 17, 2024

Macroeconomics Seminar
Chinese University of Hong Kong

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What we do

- ▶ 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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 - ▶ **Quits** from employment (E) to non-employment
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- ▶ Holding **supply-driven flows** fixed, decline in employment is **twice as large**

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- ▶ Model achieves close fit for aggregate labor market flows
- ▶ But 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 to N \uparrow (Michaels, 2024), labor force participation \downarrow , inflation \uparrow

Data & Methodology

Labor Market Flows

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

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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**

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

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- ▶ Quits to U/N reflect forward-looking behavior about labor supply: after quitting, workers are less likely to re-enter labor force (and more likely to exit) ▶

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

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- ▶ 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”, 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:

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

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

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- Implement methodology from Bauer & Swanson (2023)
 - Use 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
 - Avoids known issues of HFI estimation
 - Additional noise from labor market flows requires more valid instrument

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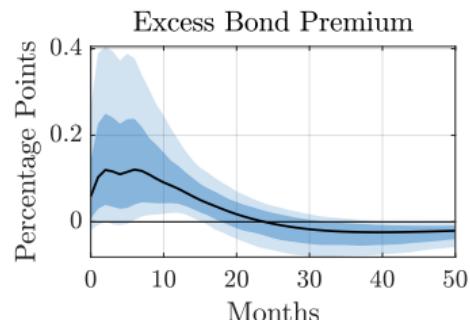
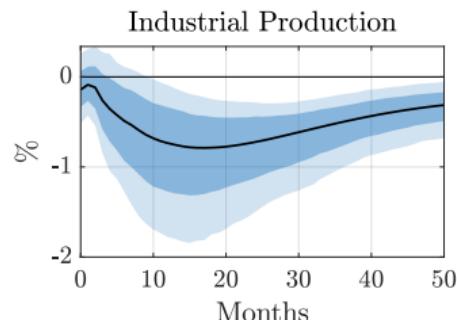
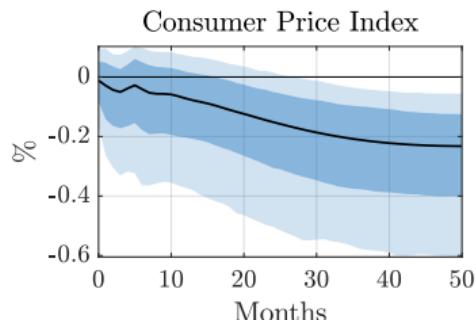
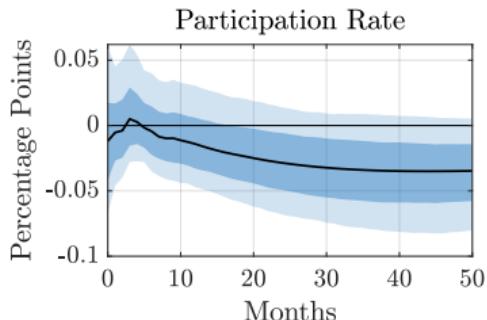
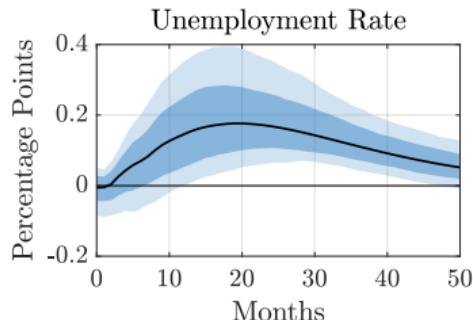
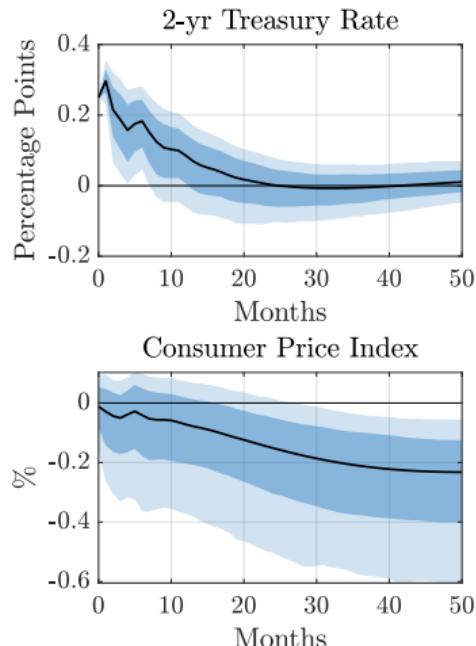
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- ▶ Labor market flows added one-by-one to the main VAR

Estimates

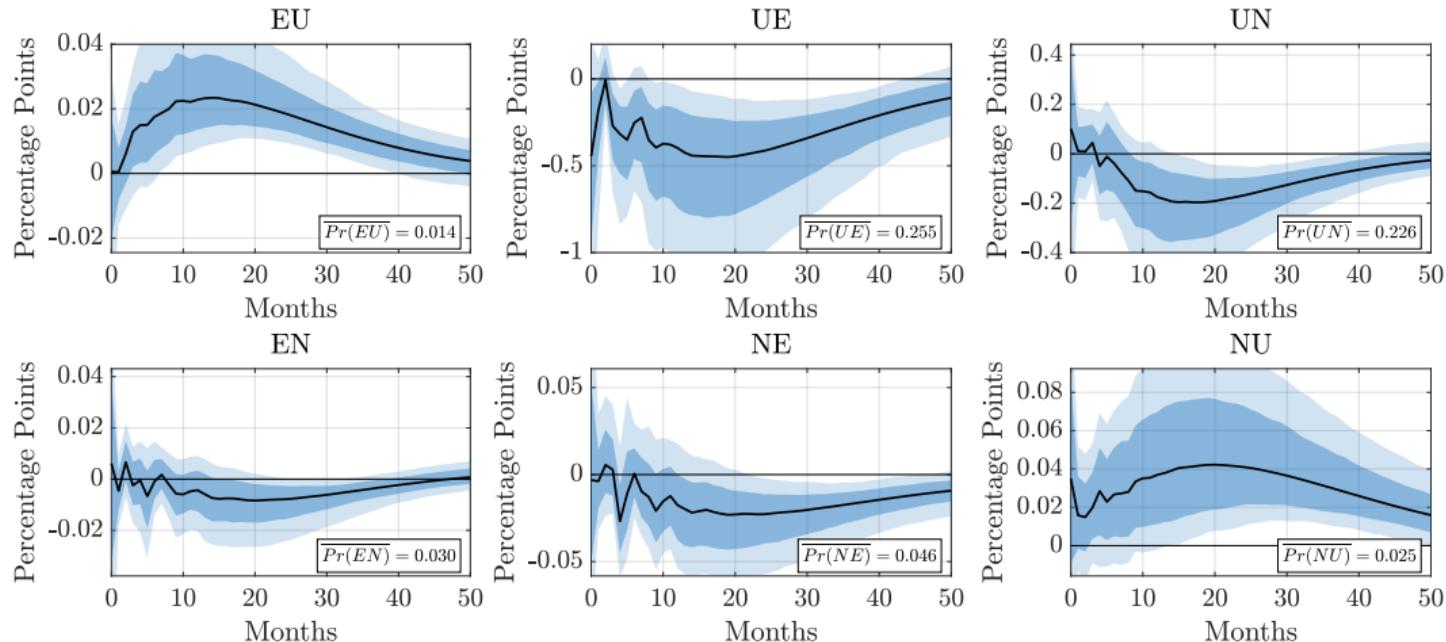
Baseline VAR



Robust F -statistic: 13.05

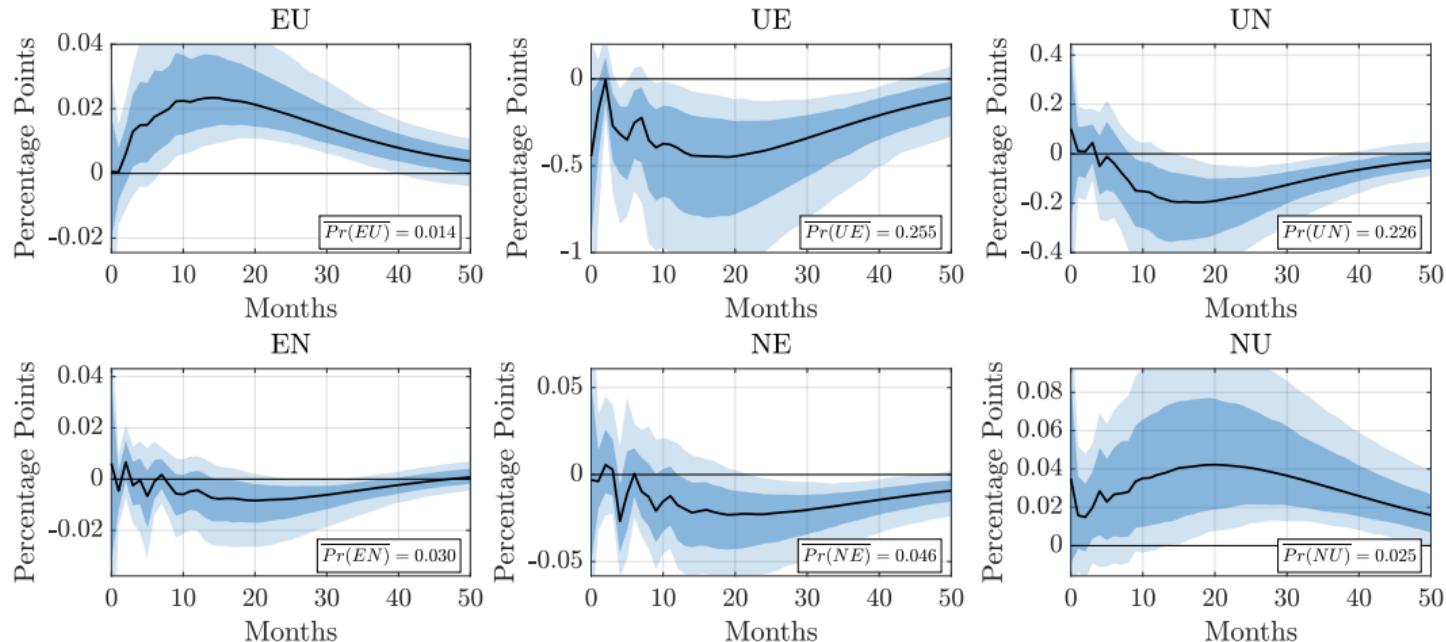
- ▶ Monthly data, 1978:M1–2019:M12
- ▶ Dark and light shaded regions report **68%** and **90%** confidence intervals

Response of Labor Market Flows



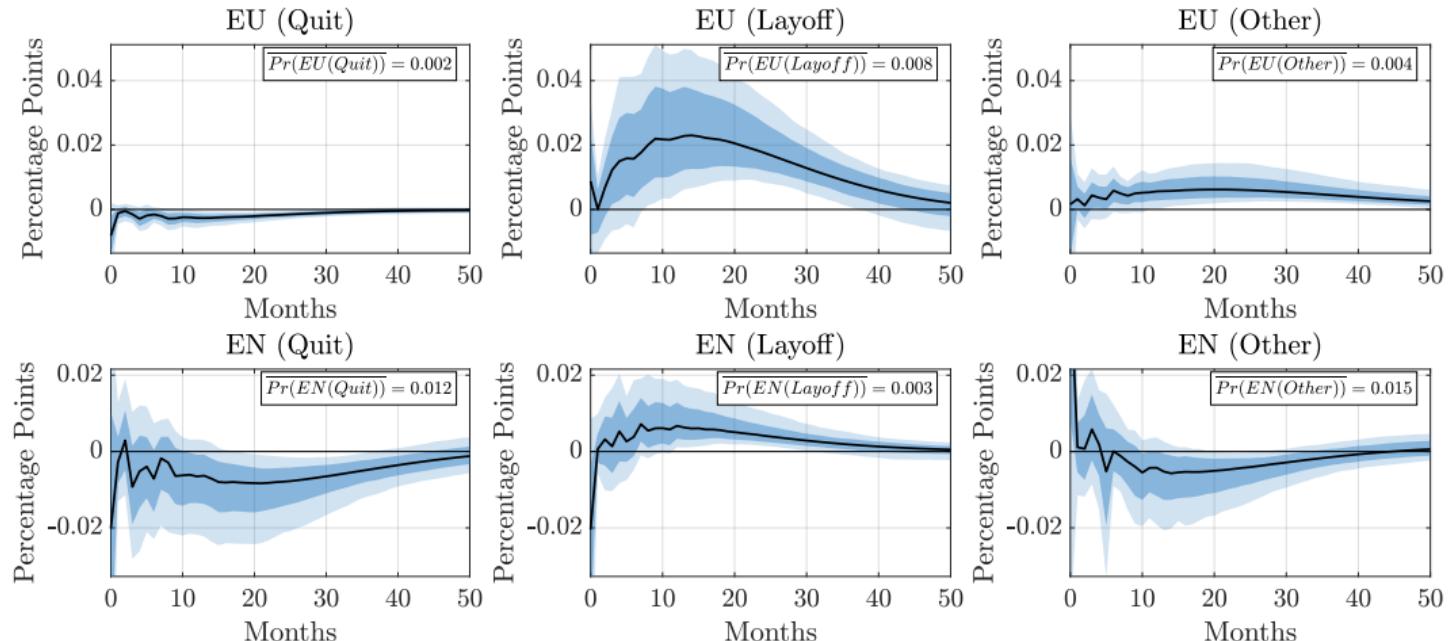
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Response of Labor Market Flows



- $pEU \uparrow$ & $pUE \downarrow \Rightarrow$ Consistent with narrative of **decline** in **labor demand**
- $pNU \uparrow$, $pUN \downarrow$, & $pEN \downarrow \Rightarrow$ 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

Additional Results

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Use of Chair speeches and orthogonalized shocks necessary for our estimates 

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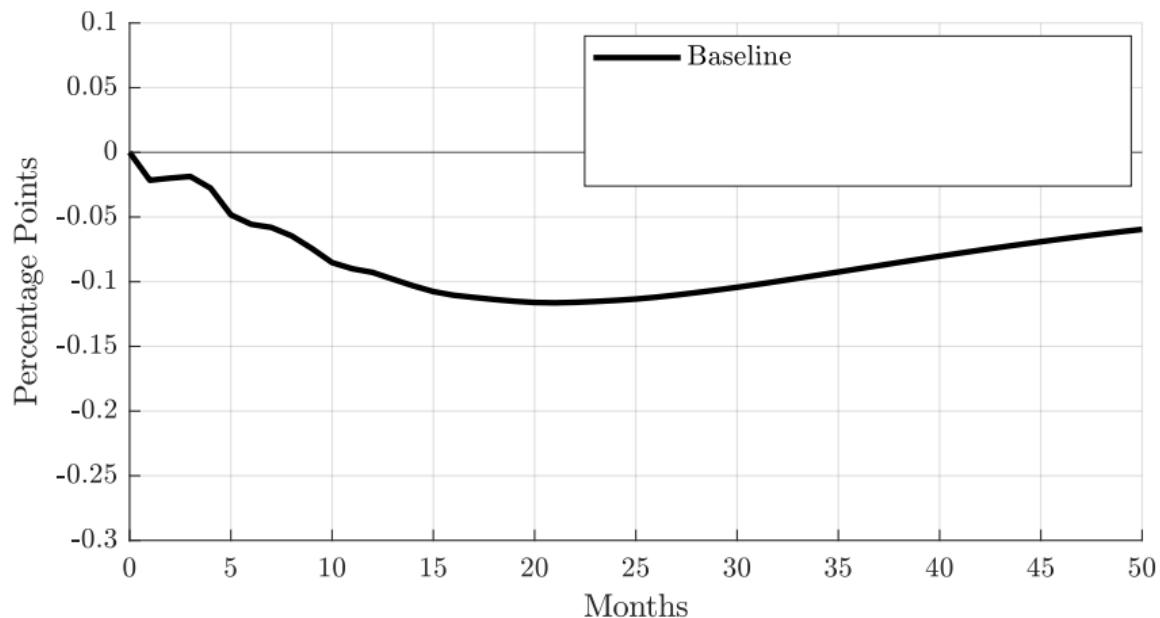
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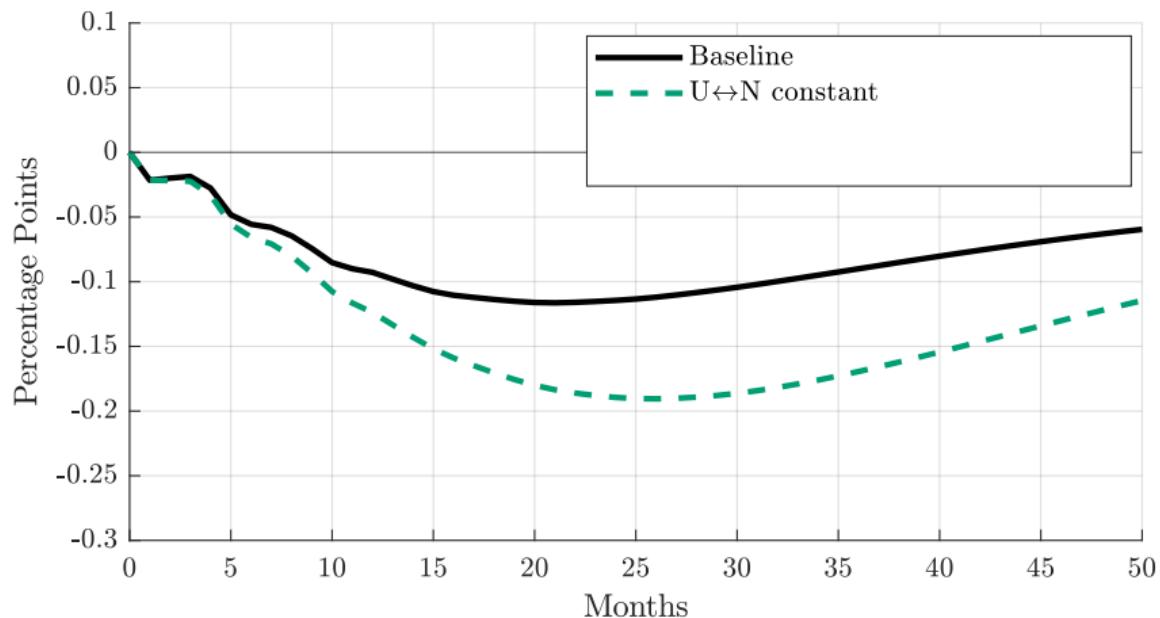
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- ▶ Assess contribution of flow p_{XY} to stock Z by replacing $\{p_{XY}\}_t$ with steady-state value, \bar{p}_{XY}
- ▶ Study behavior of resulting hypothetical stock \tilde{Z} to isolate role of flow p_{XY}
- ▶ Can also study hypothetical stock from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

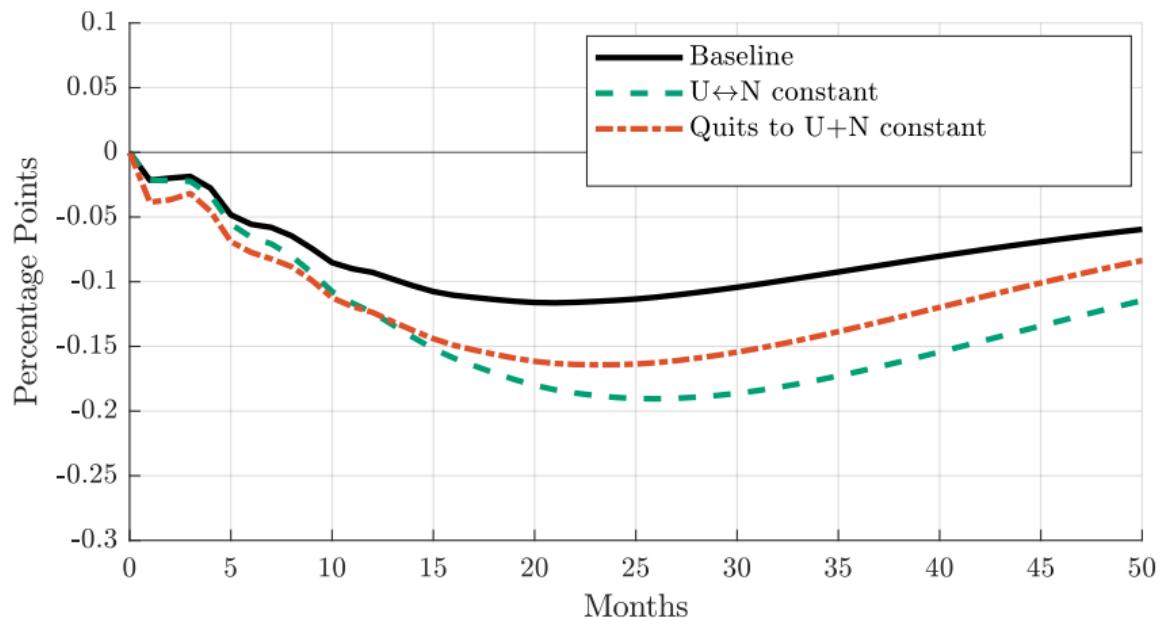
Decomposing Employment Response to a Monetary Policy Shock



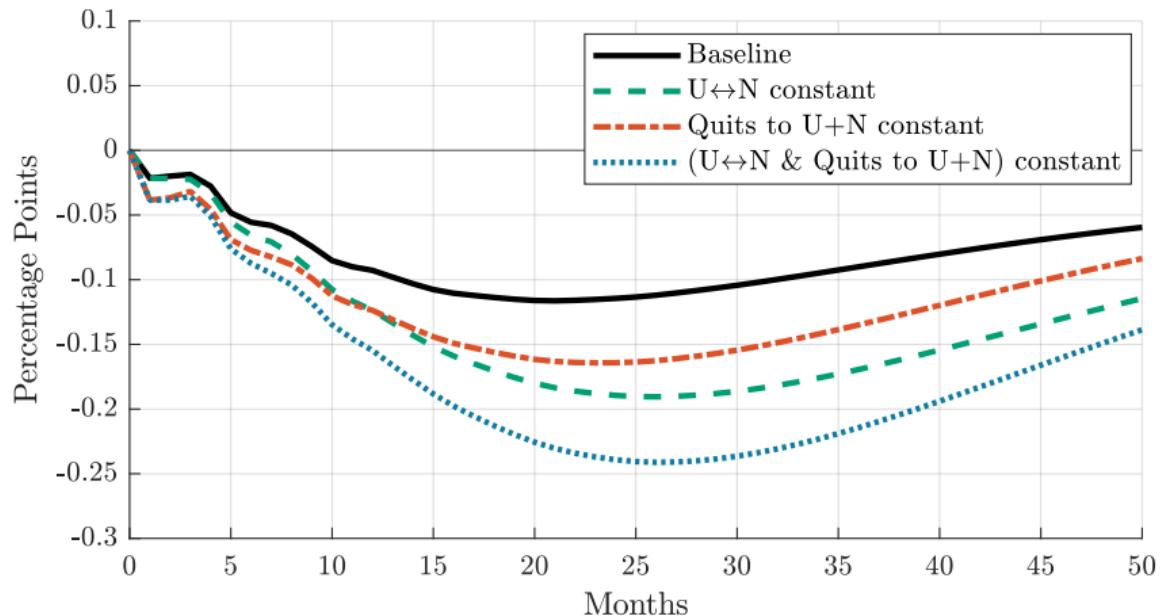
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Decomposing Employment Response to a Monetary Policy Shock



- ▶ Holding supply-driven flows fixed \Rightarrow 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**

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:

Defined over

- ▶ a = assets
- ▶ z = idiosyncratic productivity: $\log z' = \rho_z \log z + \varepsilon_z$, $\varepsilon_z \sim N(0, \sigma_z^2)$
- ▶ κ = cost of job search, iid from logistic distribution: mean = μ_κ , scale = σ_κ

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

subject to

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

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where

$$V_U^s(a', z) = f_s \cdot \max \left\{ \overbrace{\mathbb{E} V_E(a', z'), \mathbb{E} \tilde{V}_U(a', z', \kappa')}^{\text{Accept or Reject Job Offer}} \right\} + (1 - f_s) \mathbb{E} \tilde{V}_U(a', z', \kappa')$$

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

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

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

where

$$\begin{aligned} V_N^s(a', z) &= f_s \cdot \max \left\{ \overbrace{\mathbb{E} V_E(a', z'), \mathbb{E} V_N(a', z', \kappa')}^{\text{Accept or Reject Job Offer}} \right\} + (1 - f_s) \mathbb{E} V_N(a', z', \kappa') \\ V_N^{ns}(a', z) &= f_{ns} \cdot \max \left\{ \mathbb{E} V_E(a', z'), \mathbb{E} V_N(a', z', \kappa') \right\} + (1 - f_{ns}) \mathbb{E} V_N(a', z', \kappa') \end{aligned}$$

Estimation: A Monetary Policy Shock in the Model

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

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- ▶ Estimate remaining parameters to match IRFs of labor market flows, à la Christiano, Eichenbaum, Evans (2005) or Auclert, Rognlie, Straub (2020):

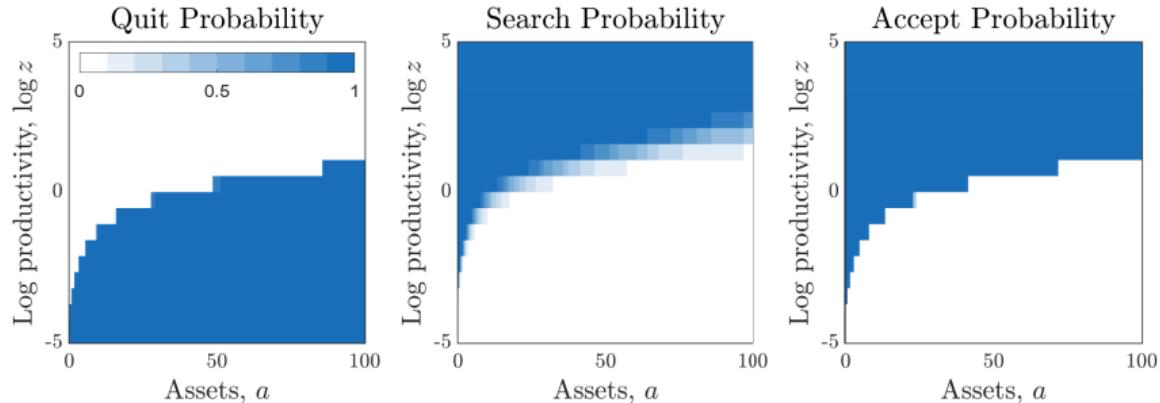
$$\theta_{EST} \equiv \{\rho_z, \sigma_z, \mu_\kappa, \sigma_\kappa, \psi, \delta_L, f_s\}$$

$$\hat{J} = \{EU_t, EN_t, UE_t, UN_t, NE_t, NU_t\}_{t=0}^{50}$$

$$\hat{\theta}_{EST} = \arg \min_{\theta_{EST}} (J(\theta_{EST}) - \hat{J})' \Sigma^{-1} (J(\theta_{EST}) - \hat{J})$$

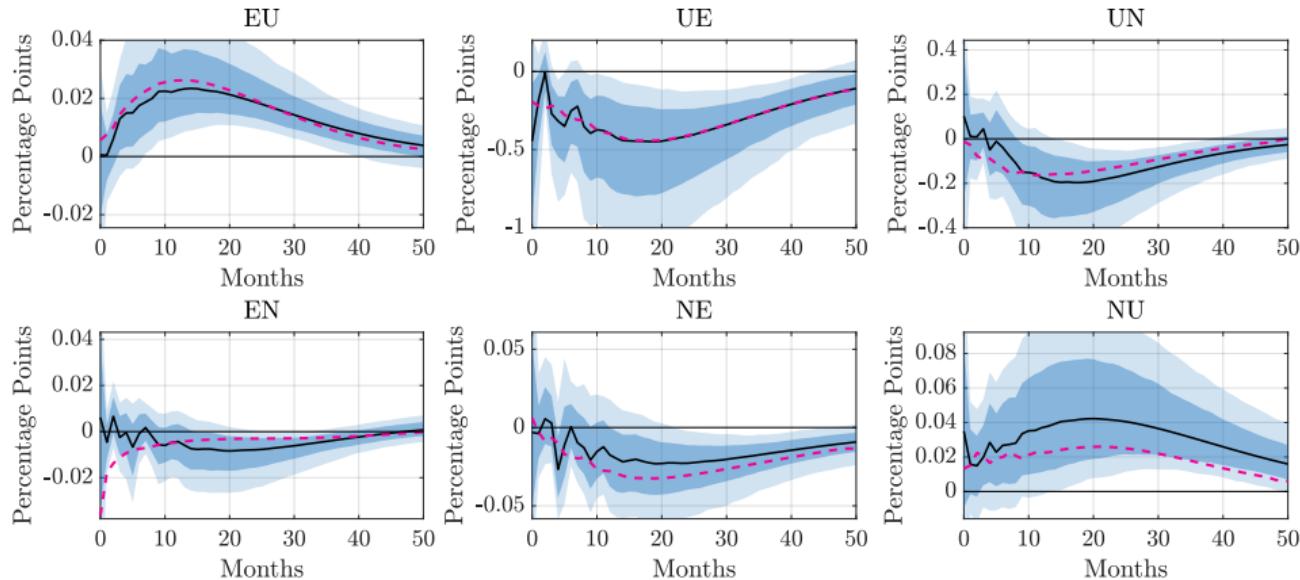
► Model parameters

Results: Steady State



- ▶ Model generates substantial heterogeneity in labor force attachment
- ▶ Near-perfect fit for steady-state flow rates between E, U and N 
- ▶ 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?**

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**

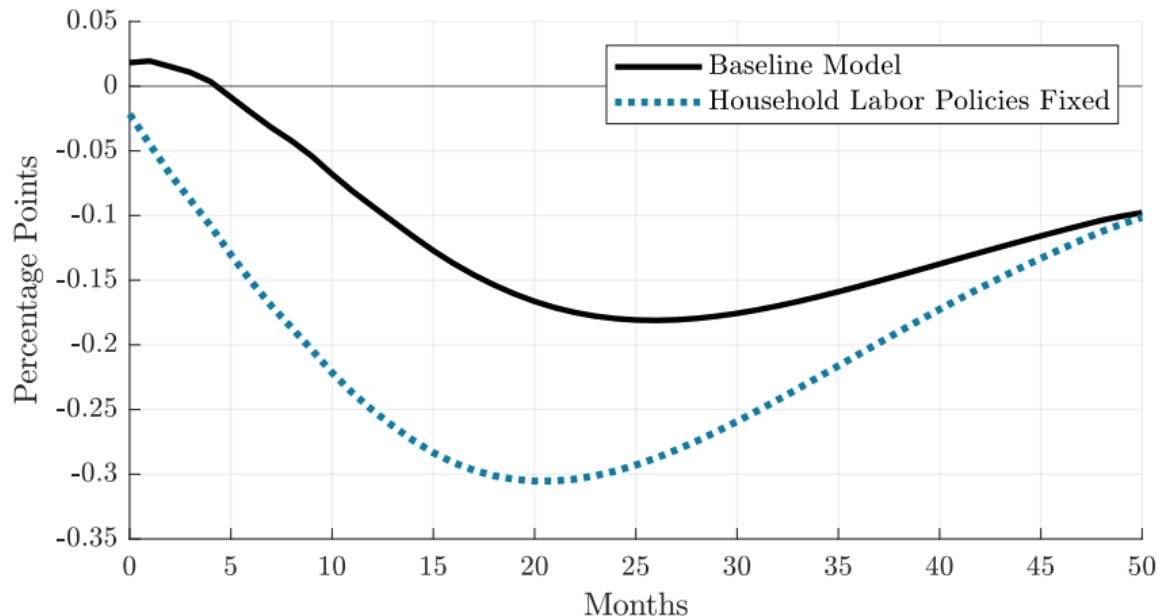
The Role of Labor Supply

- ▶ 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

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- ▶ 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

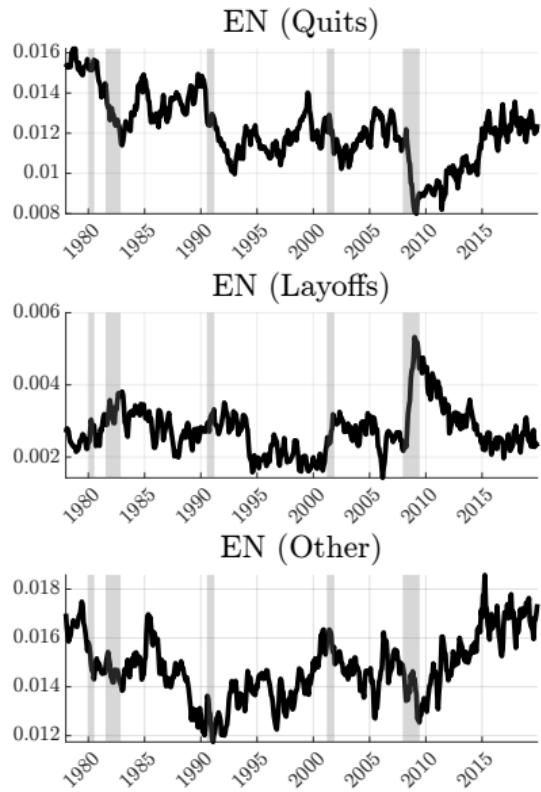
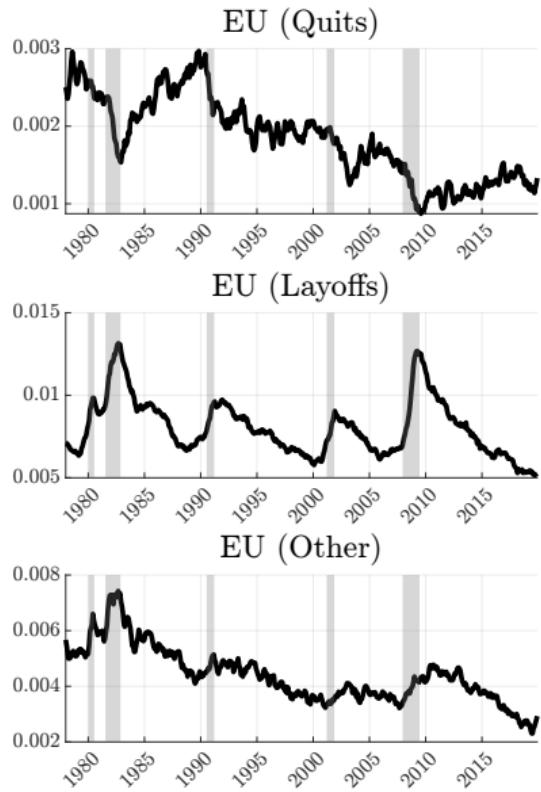
Note: x denotes the variable in each column, Y denotes HP-filtered log real GDP. Standard deviations and correlations are computed for HP-filtered quarterly averages. The sample is 1978-2019.

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.

Decomposition of EU Flows



◀ Back

Relevance of Distinction Between Quits and Layoffs

Post-EU Transition Rates: Quits vs Layoffs

From	To		
	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

<i>Sample period</i>	$\Pr(\text{Quit} \mid \text{Layoff})$	$\Pr(\text{Layoff} \mid \text{Quit})$
pre-Redesign	0.039	0.208
post-Redesign	0.007	0.026

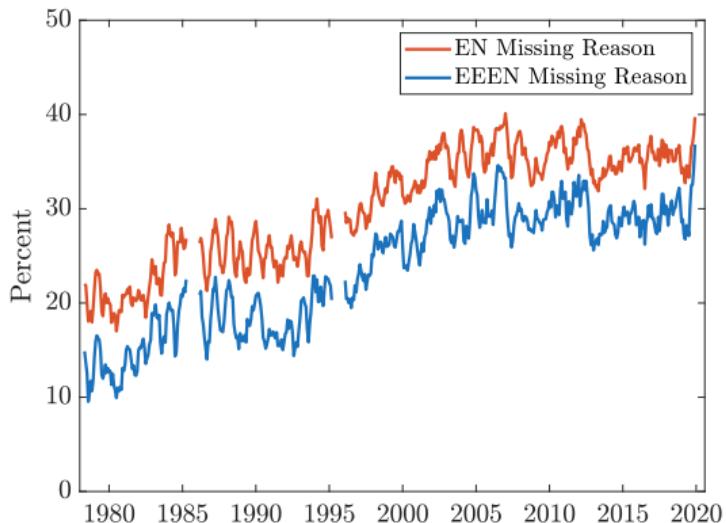
Note: The first row shows the probability of individuals switching their reason for unemployment from layoff to quit (in the first column), or from quit to layoff (in the second column), prior to the 1994 CPS redesign. The second row shows the same, but for the period following the redesign.

Transition Rates Across E-U-U Individuals

	<i>From</i>	<i>To</i>		
		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

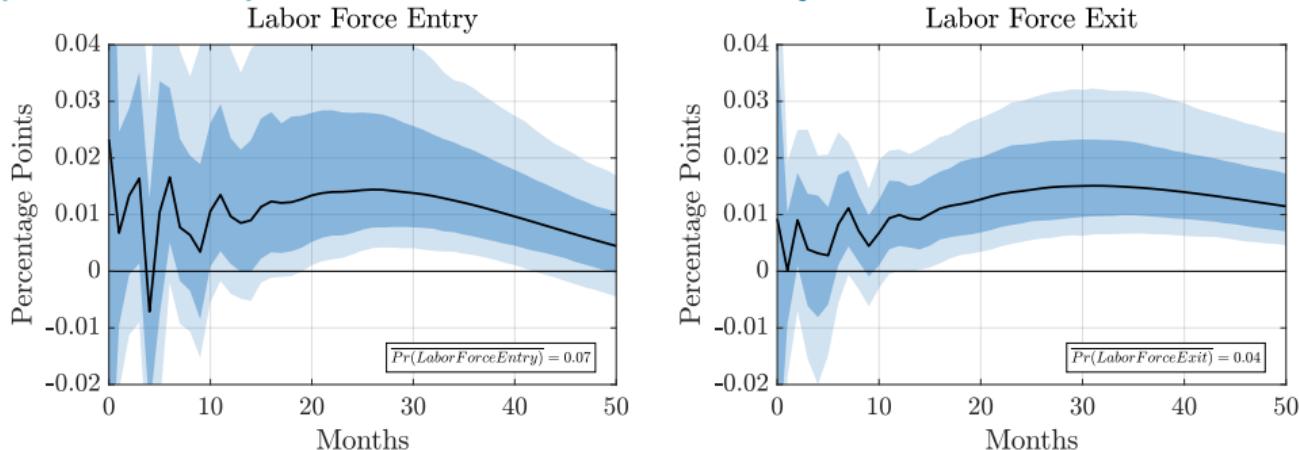
Note: Transition rates are shown for individuals that are in their second month of unemployment following an employment spell, split by reason for unemployment. The rates are computed for the period prior to the 1994 CPS redesign.

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.

Participation: Response of Labor Force Entry and Exit



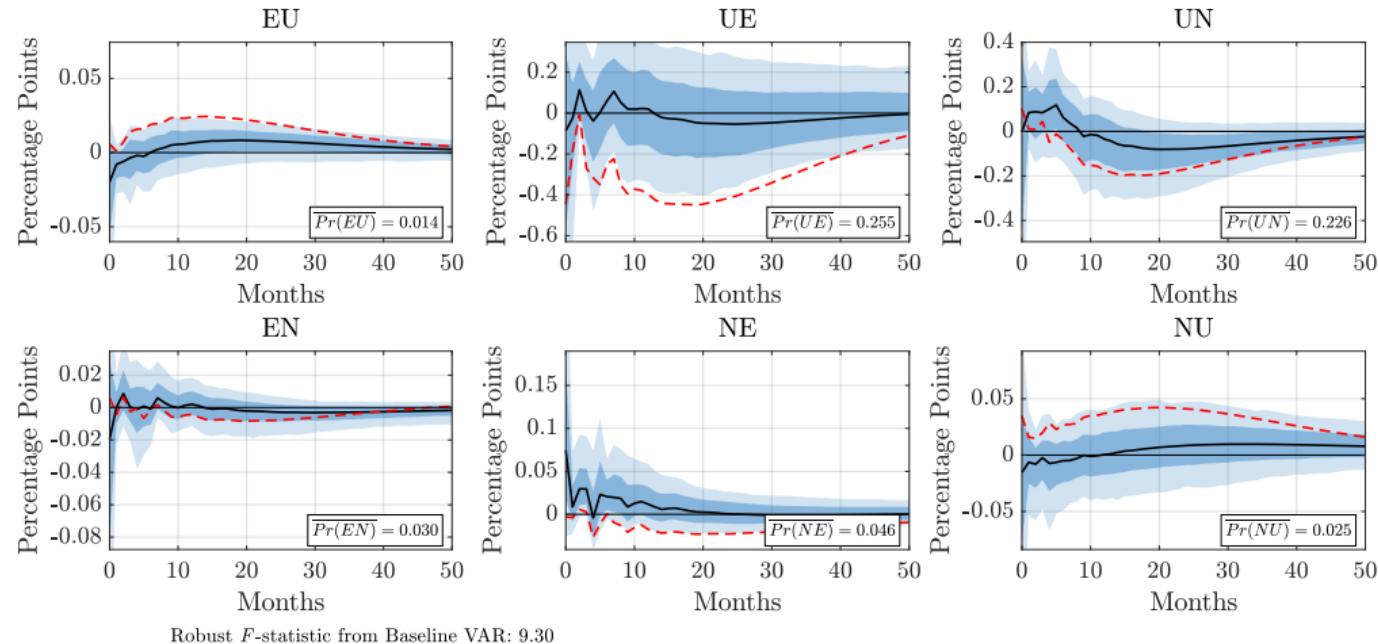
- ▶ Participation falls due to **higher exit rate**, offset by **rise in entry**
- ▶ Increase in exits driven by u_{t-1} , attenuated by EN_t and UN_t

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

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

where u denotes the unemployment rate (and $\overline{UN} >> \overline{EN}$)

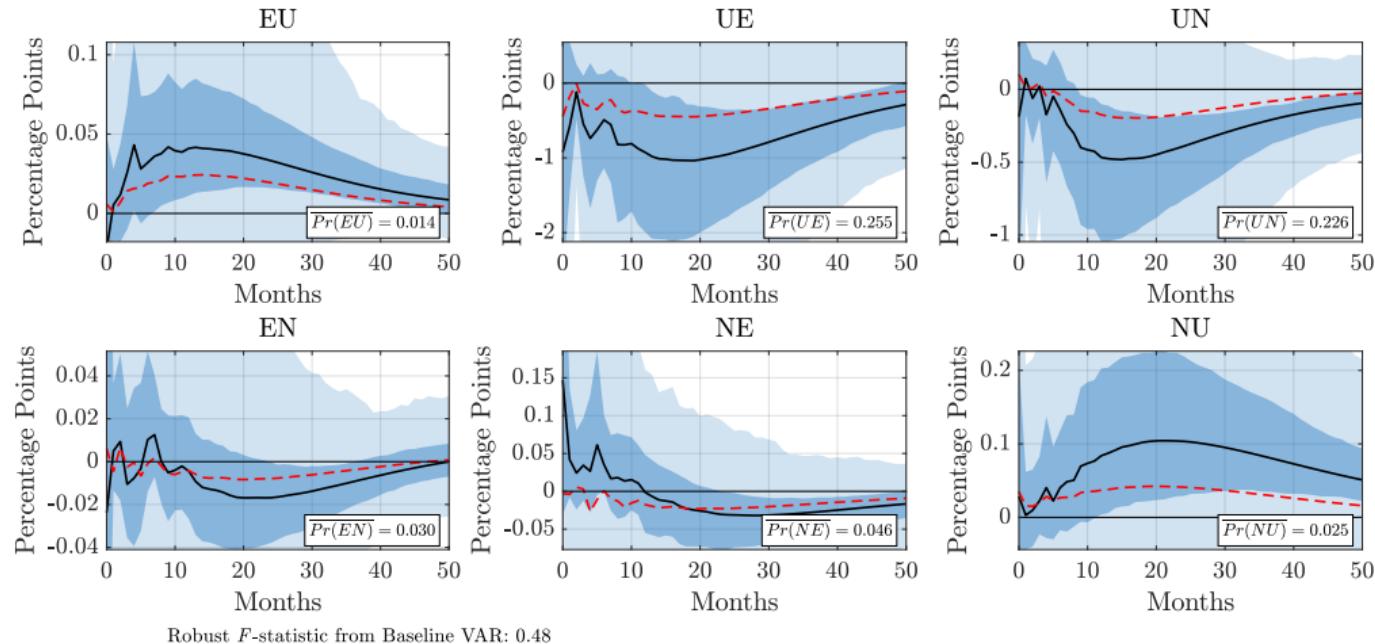
Labor Market Flows: No Speeches (Not Orthogonalized)



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

◀ Back

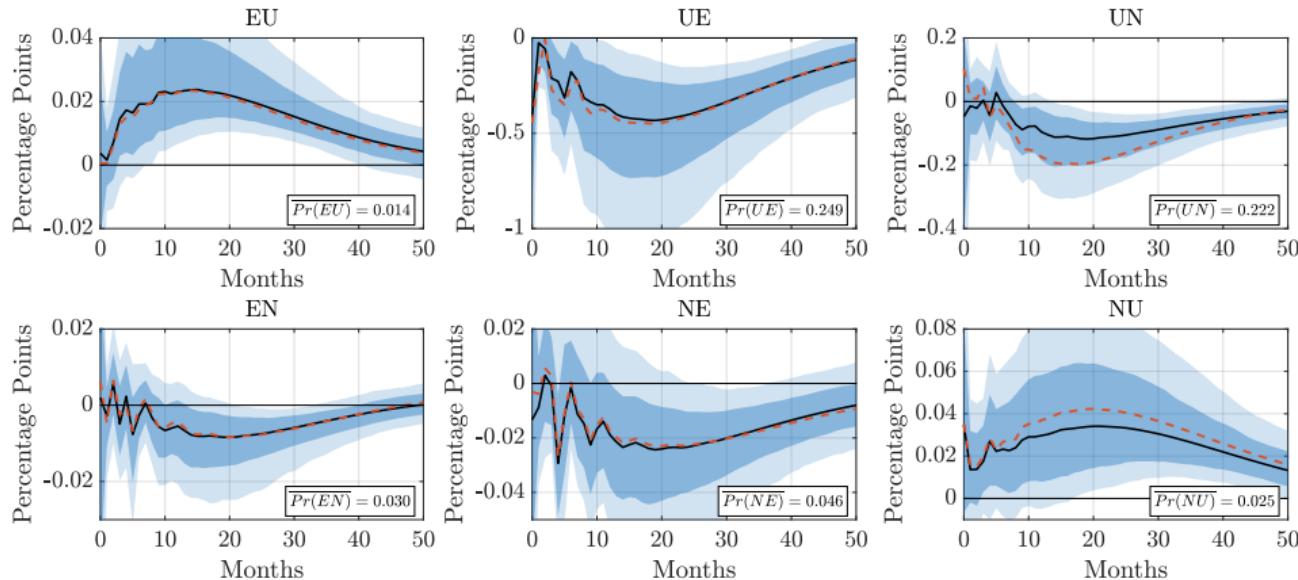
Labor Market Flows: No Speeches (Orthogonalized)



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

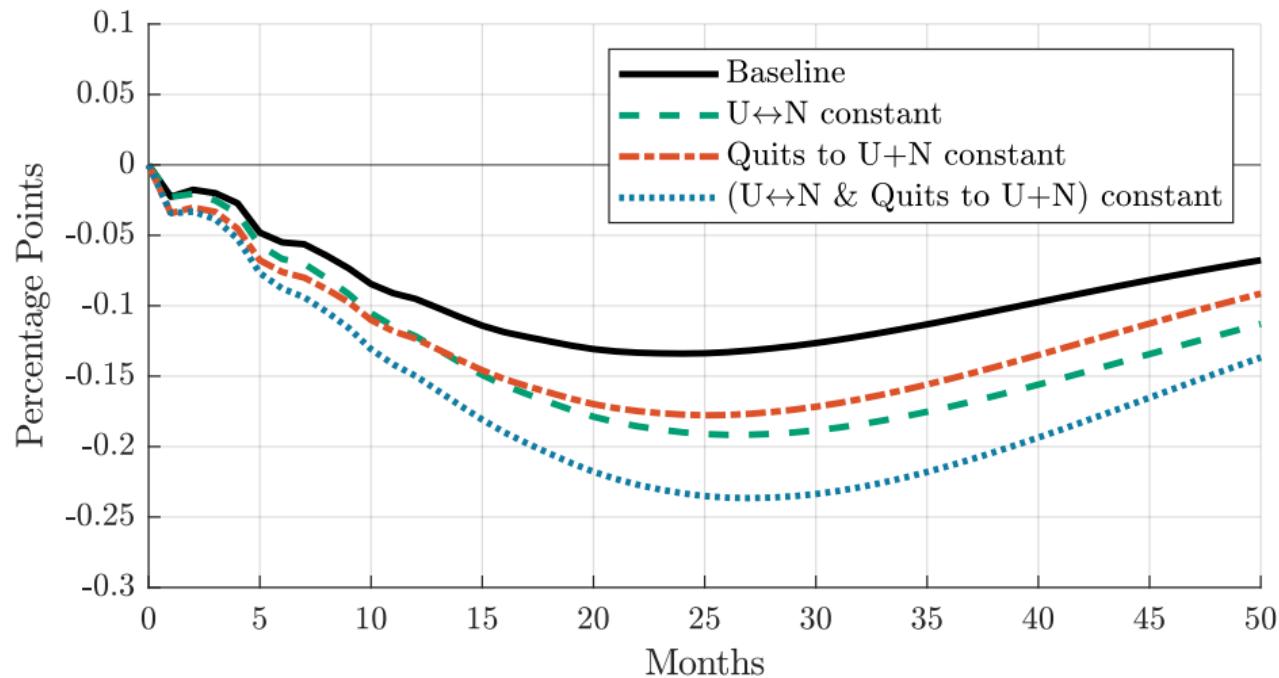
◀ Back

Labor Market Flows: Holding Composition Fixed

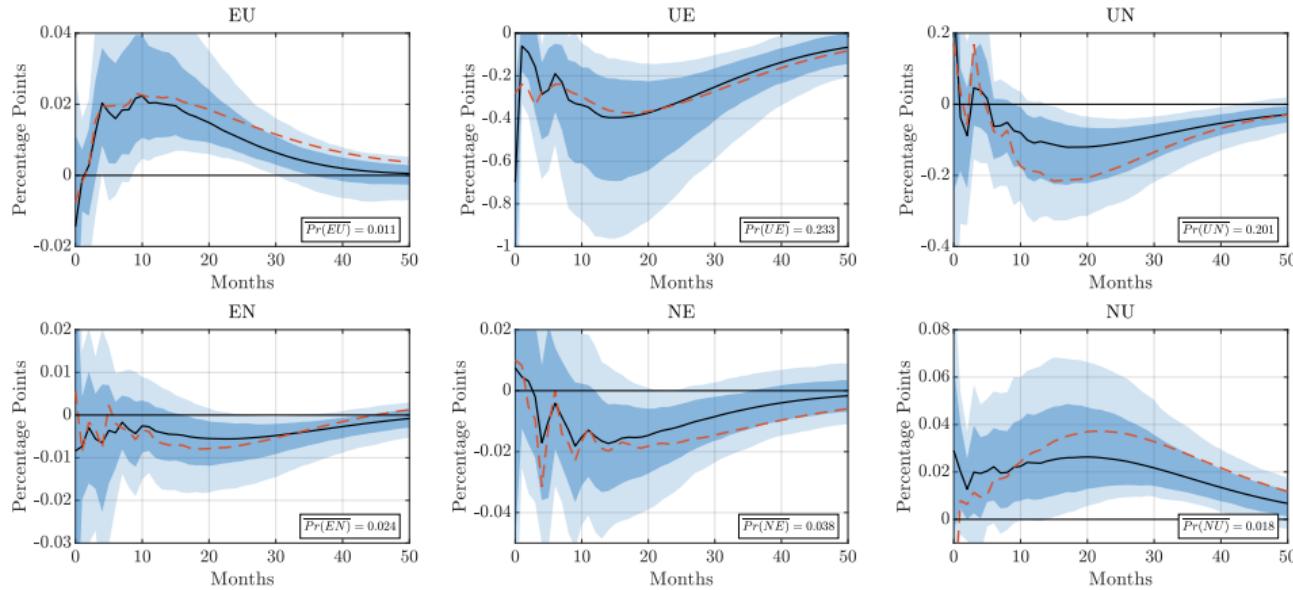


- ▶ Composition-adjusted flows by ex-ante characteristics, à la Elsby et al. (2015)
- ▶ Fix shares using bins for age × gender × education × reason for unemployment
- ▶ Dashed red lines report our **baseline estimates**

Decomposing Employment Response: Holding Composition Fixed

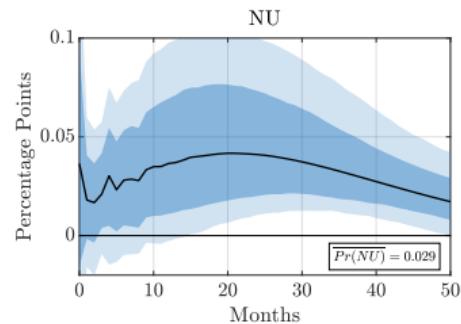
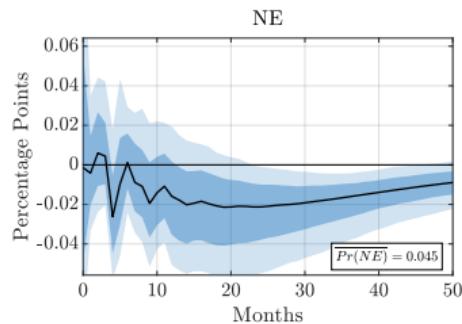
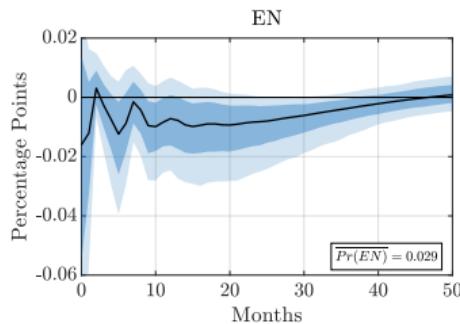
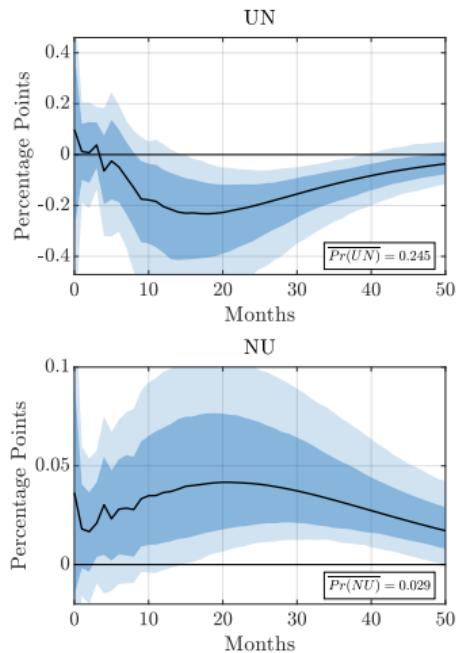
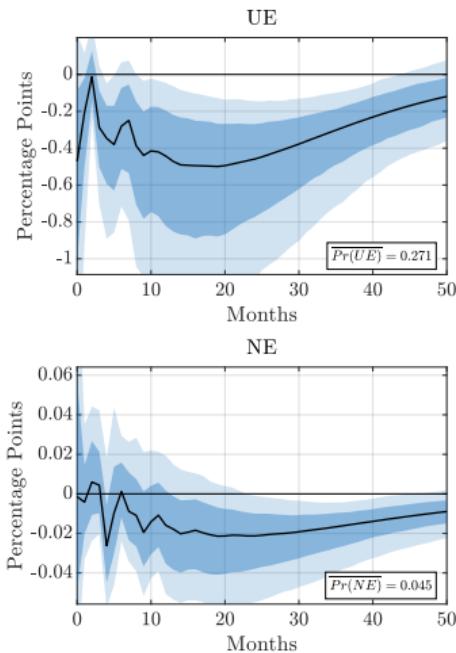
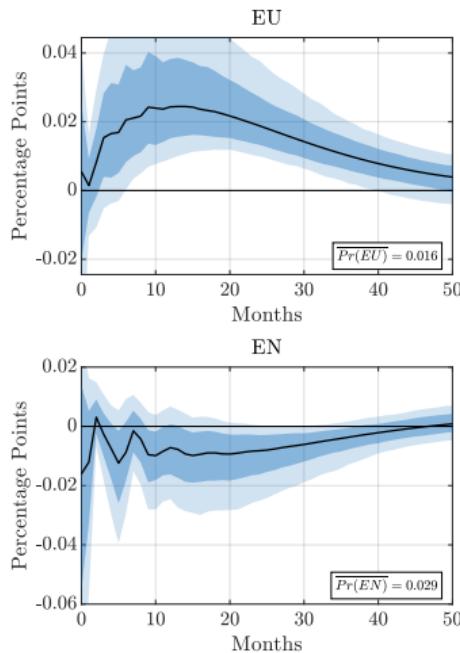


Labor Market Flows: Holding Composition Fixed (Full Controls)



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

Labor Market Flows: Corrected for Time-Aggregation

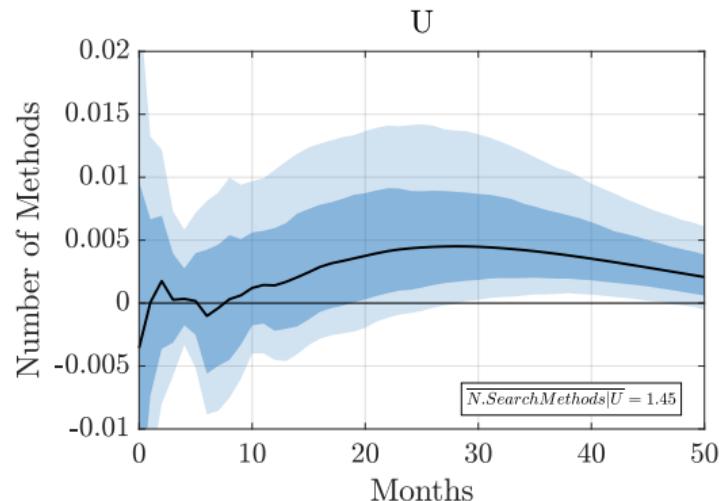
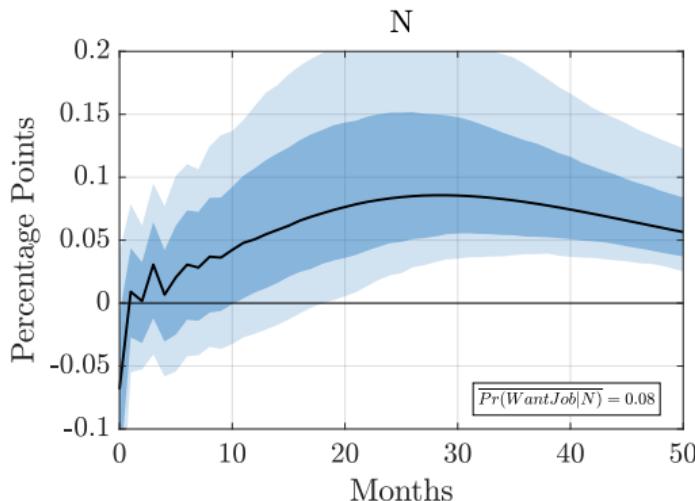


◀ Back

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

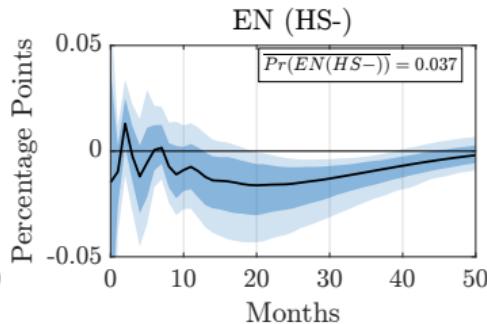
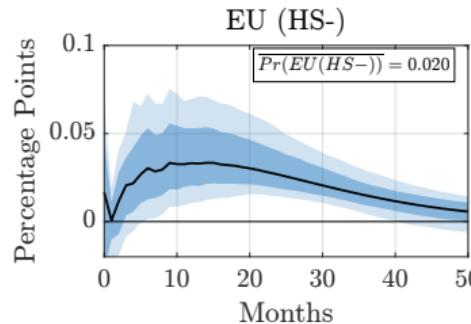
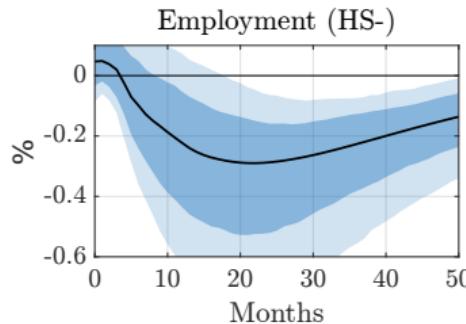
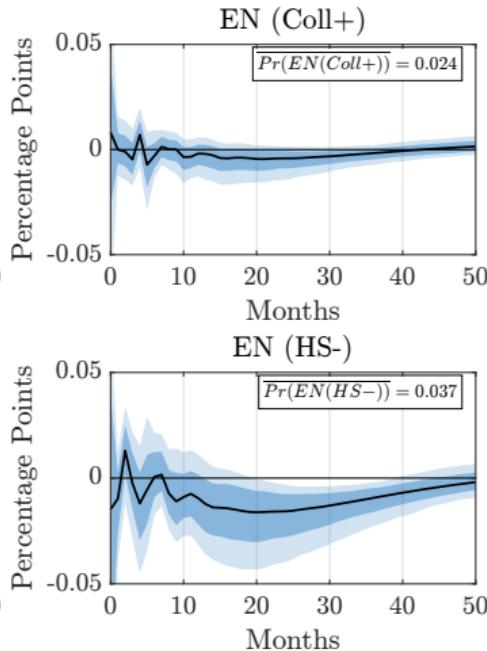
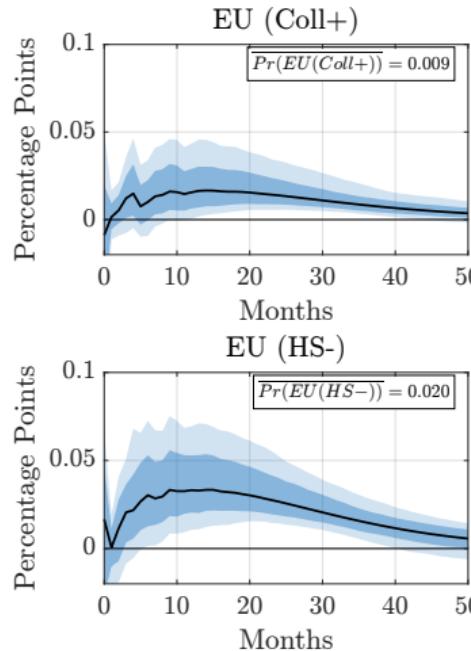
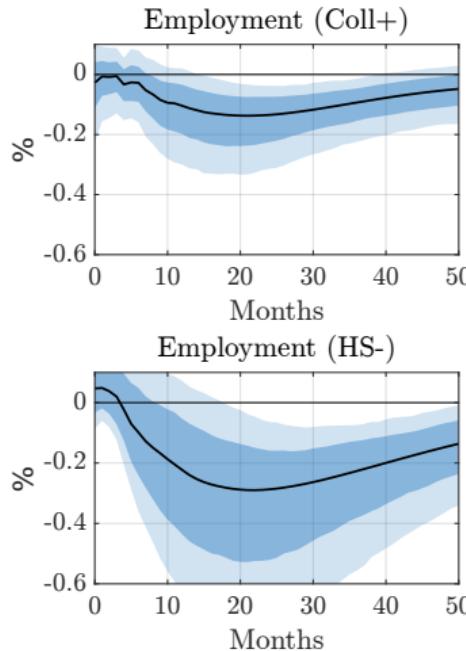


Intensive Margins: Time-Series



◀ Back

Heterogeneity in Labor Market Responses: Education



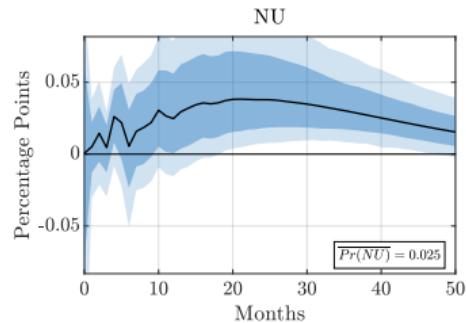
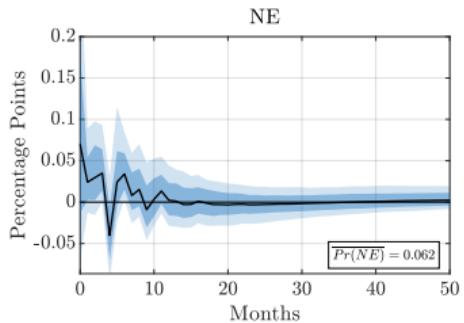
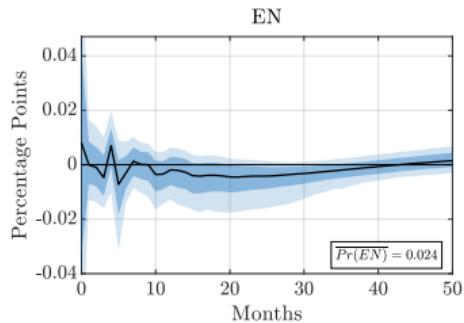
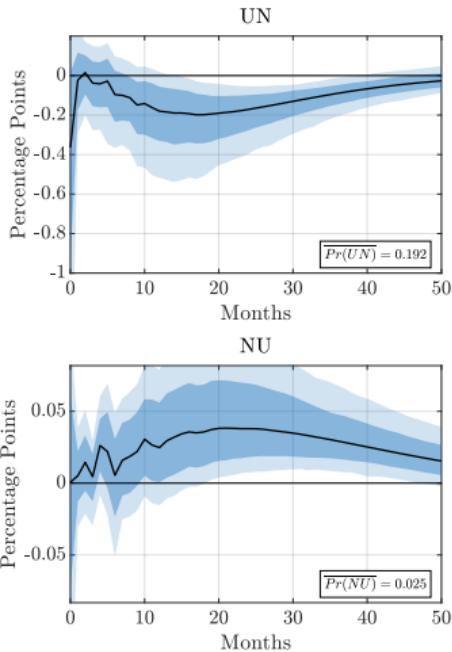
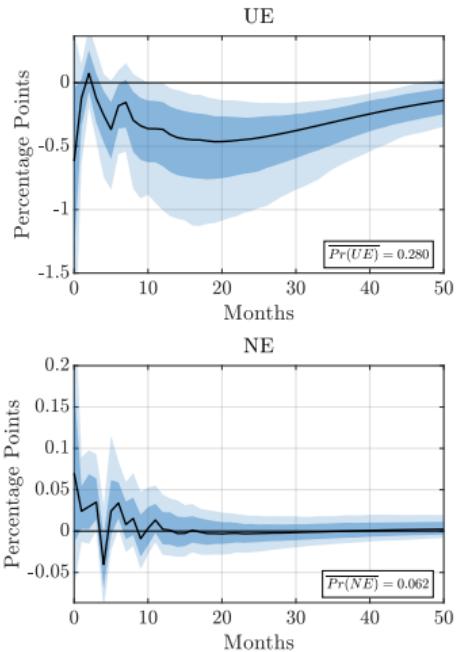
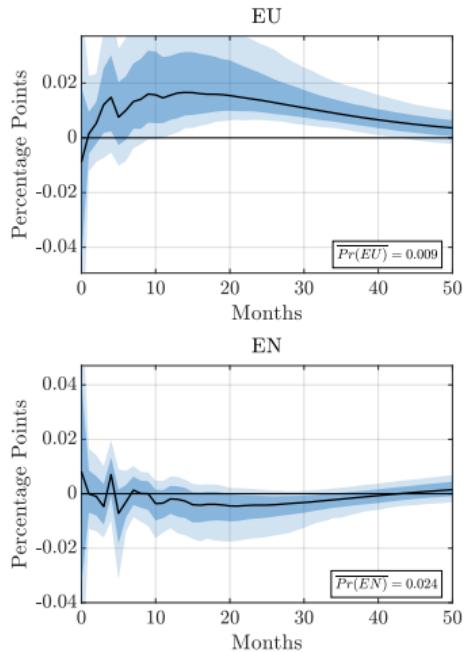
- Decline in E-to-N concentrated among less educated

► Flows: Coll+

► Flows: HS+

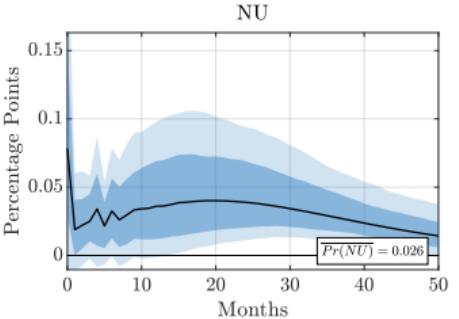
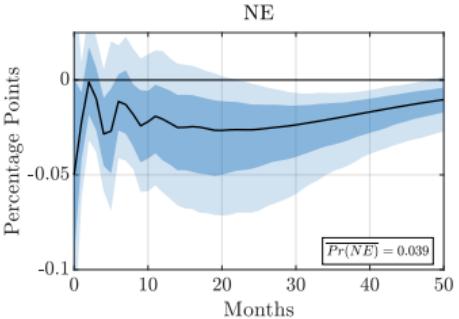
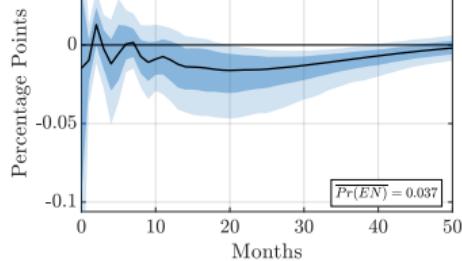
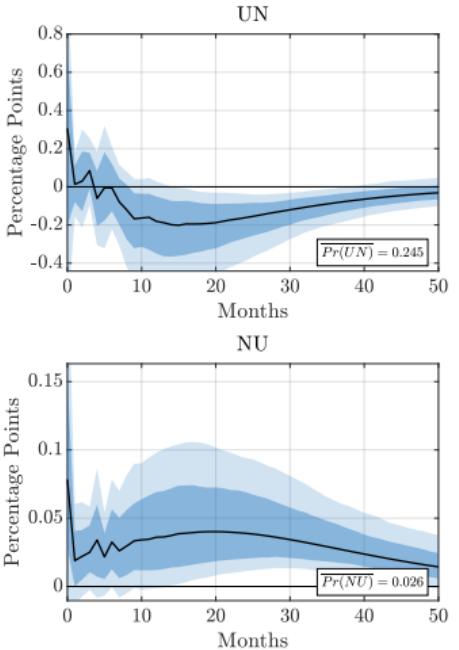
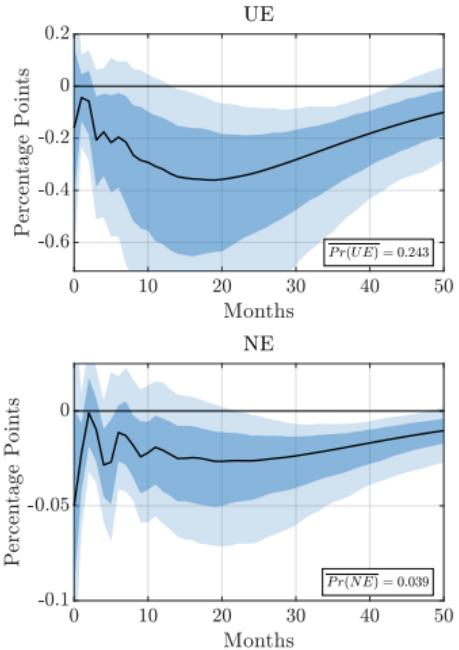
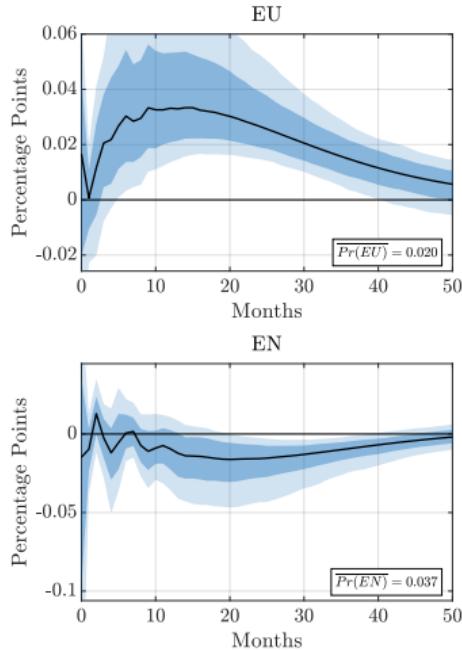
◀ Back

Labor Market Flows: Higher-Educated



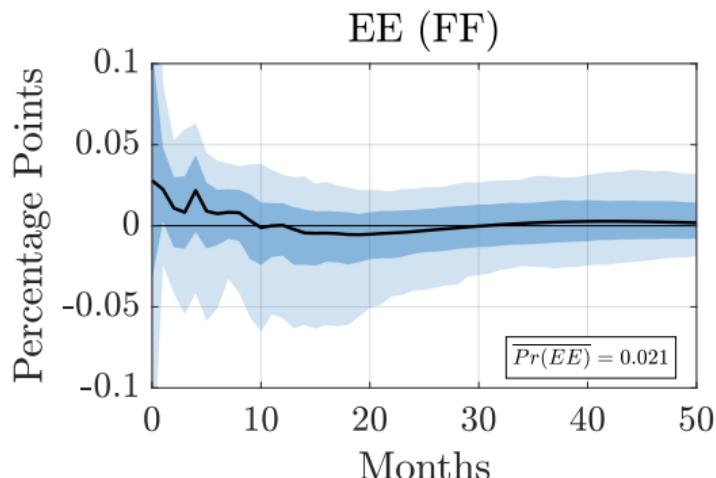
◀ Back

Labor Market Flows: Lower-Educated

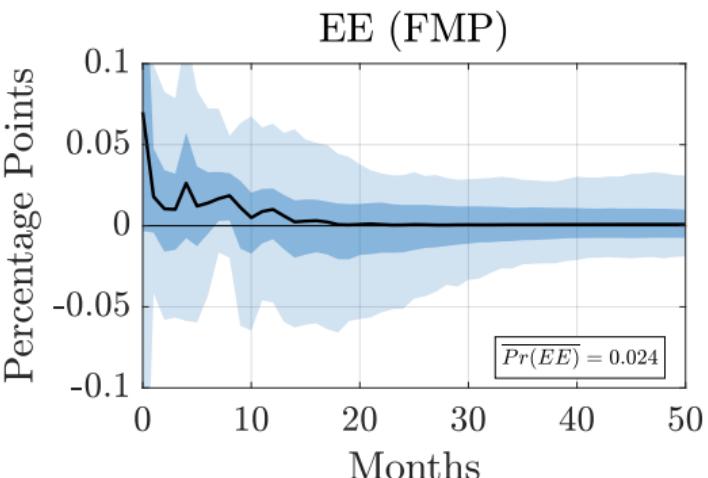


◀ Back

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

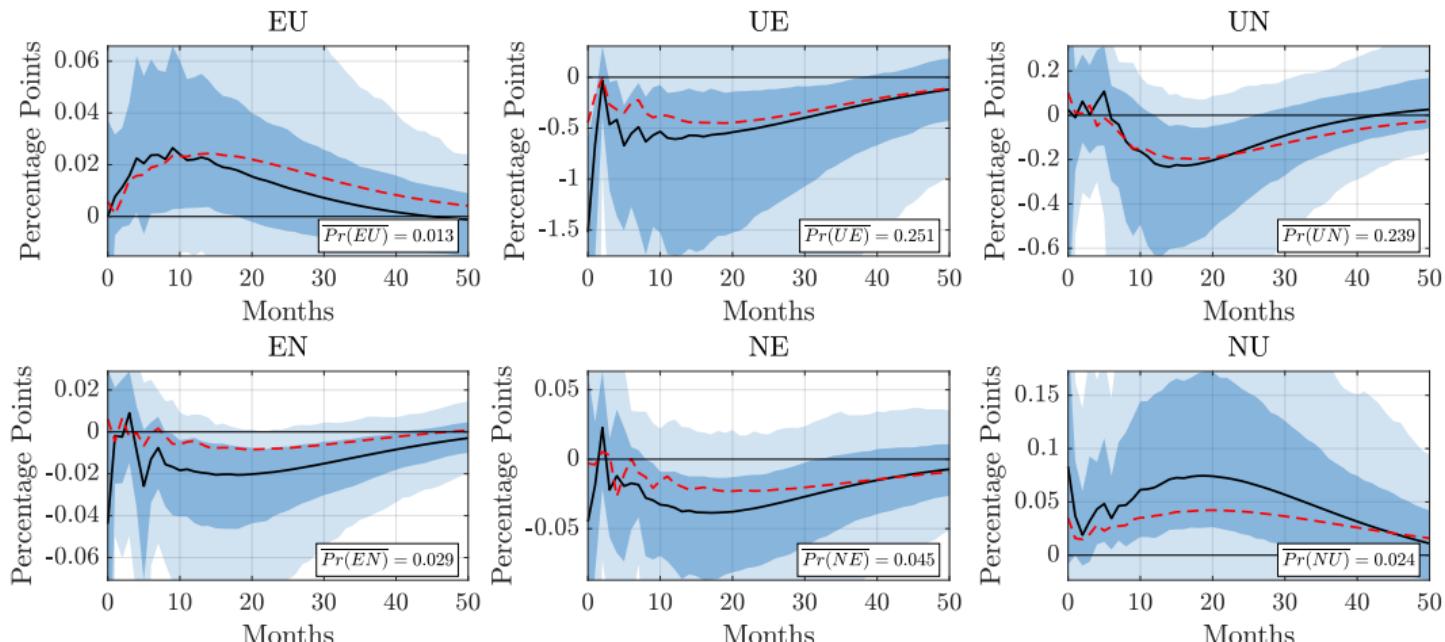


Robust F -statistic from Baseline VAR: 5.44



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

Response of Labor Market Flows (1995-2019)

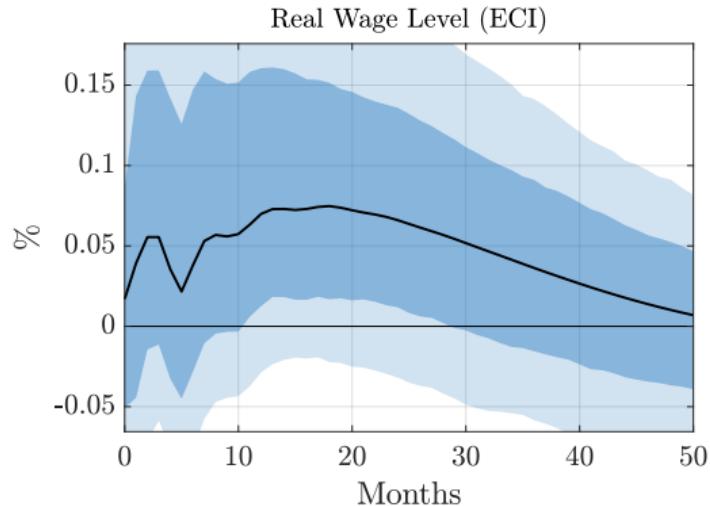
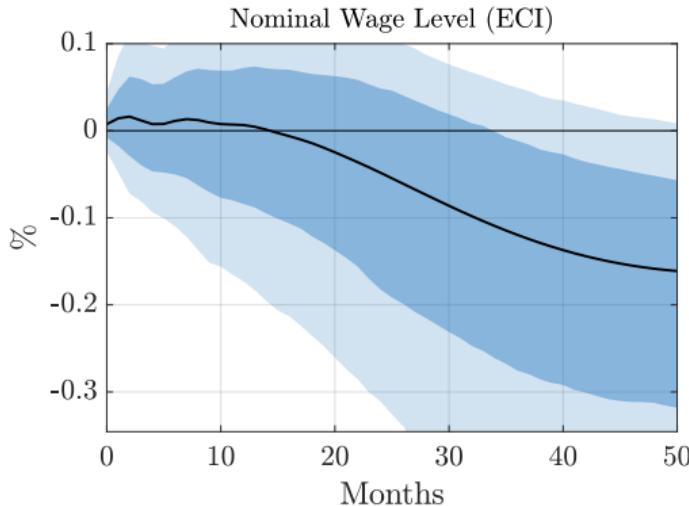


Robust F -statistic from Baseline VAR: 5.44

- Dashed red lines report impulse responses using full sample

◀ Back

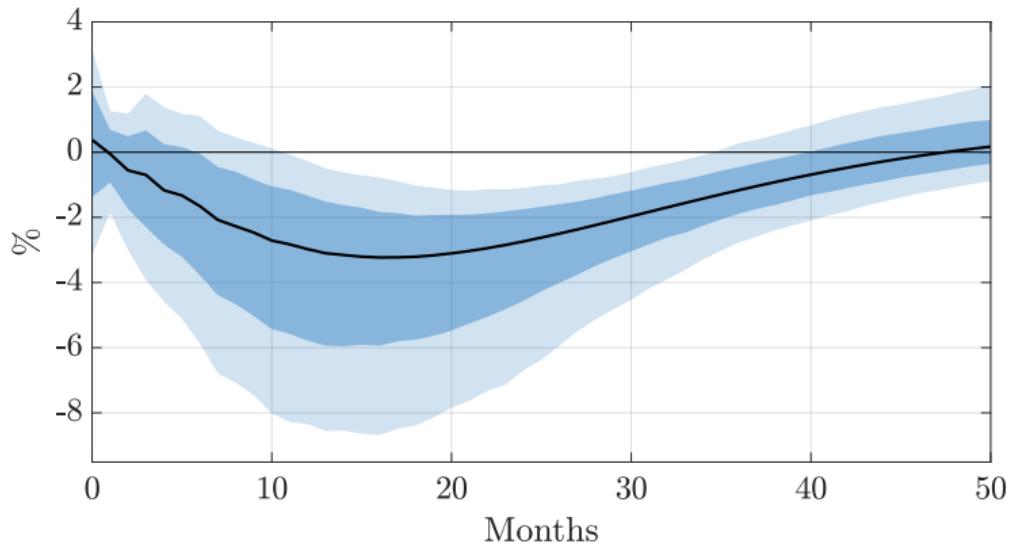
Response of Wages



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

◀ Back

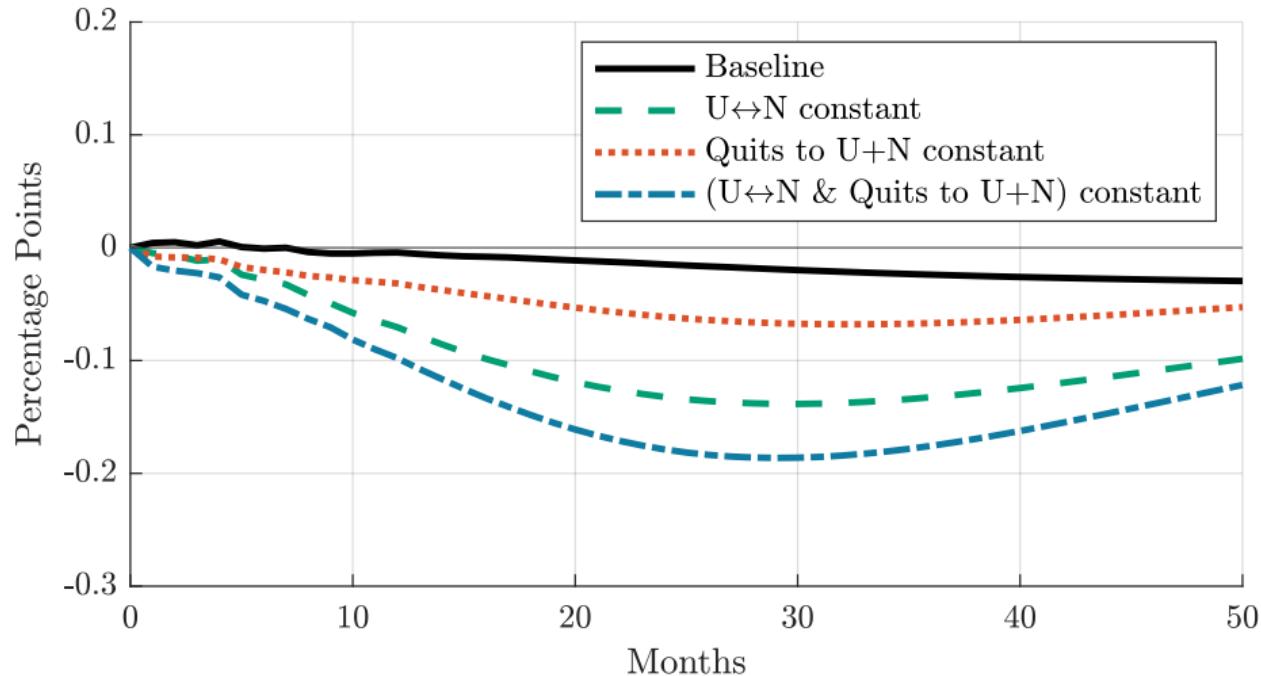
Response of Vacancies



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

◀ Back

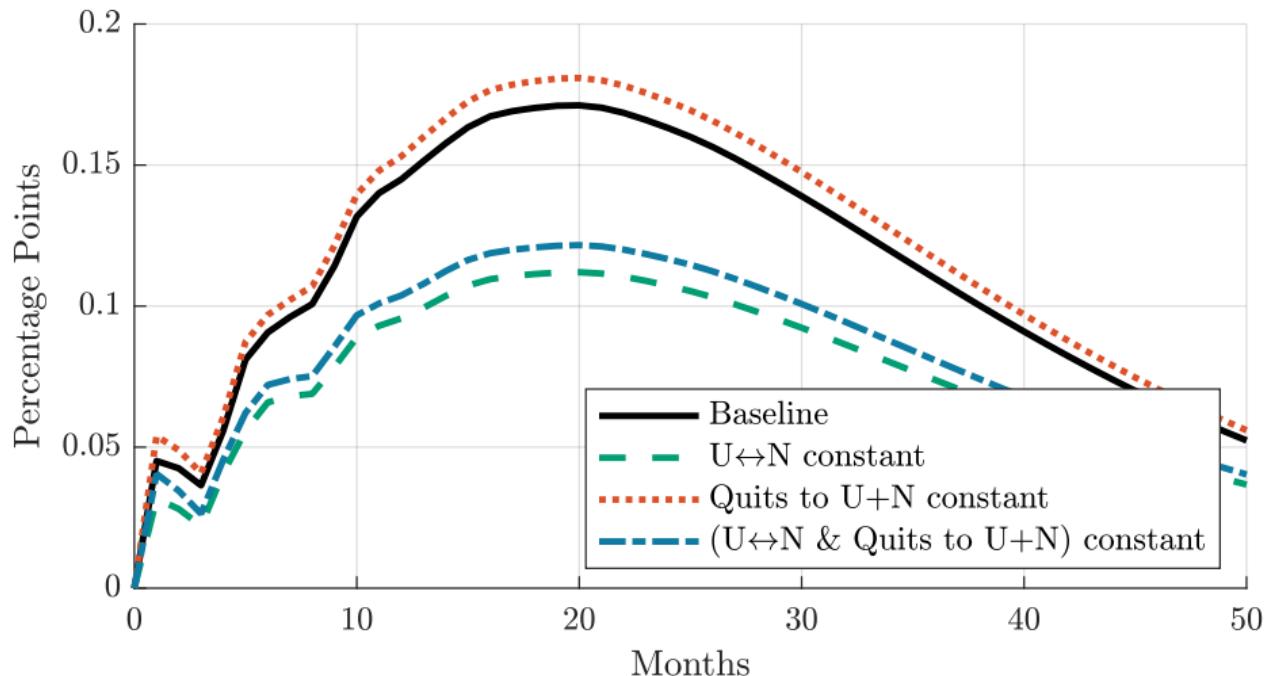
Participation Response to a Monetary Policy Shock



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

◀ Back

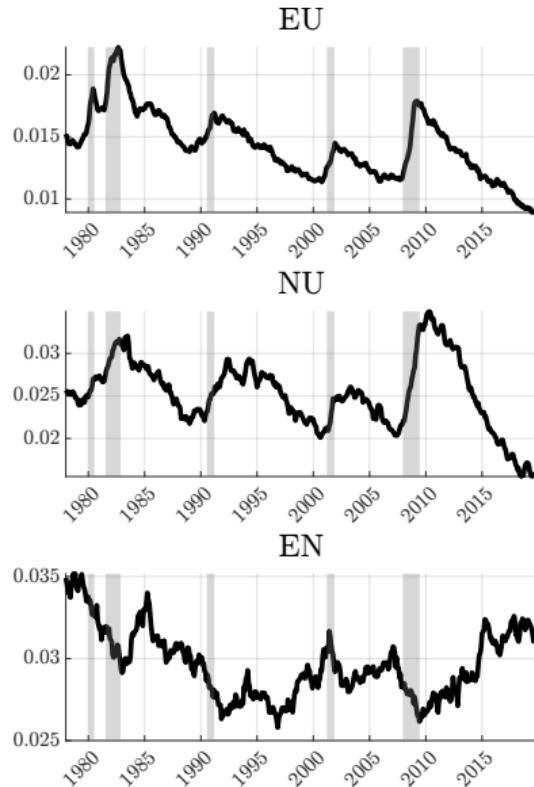
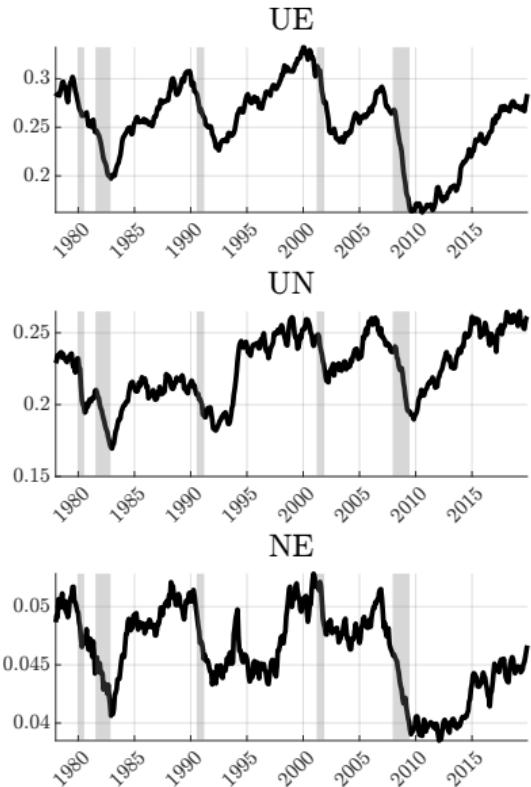
Unemployment Response to a Monetary Policy Shock



- ▶ Response of quits not important for unemployment dynamics

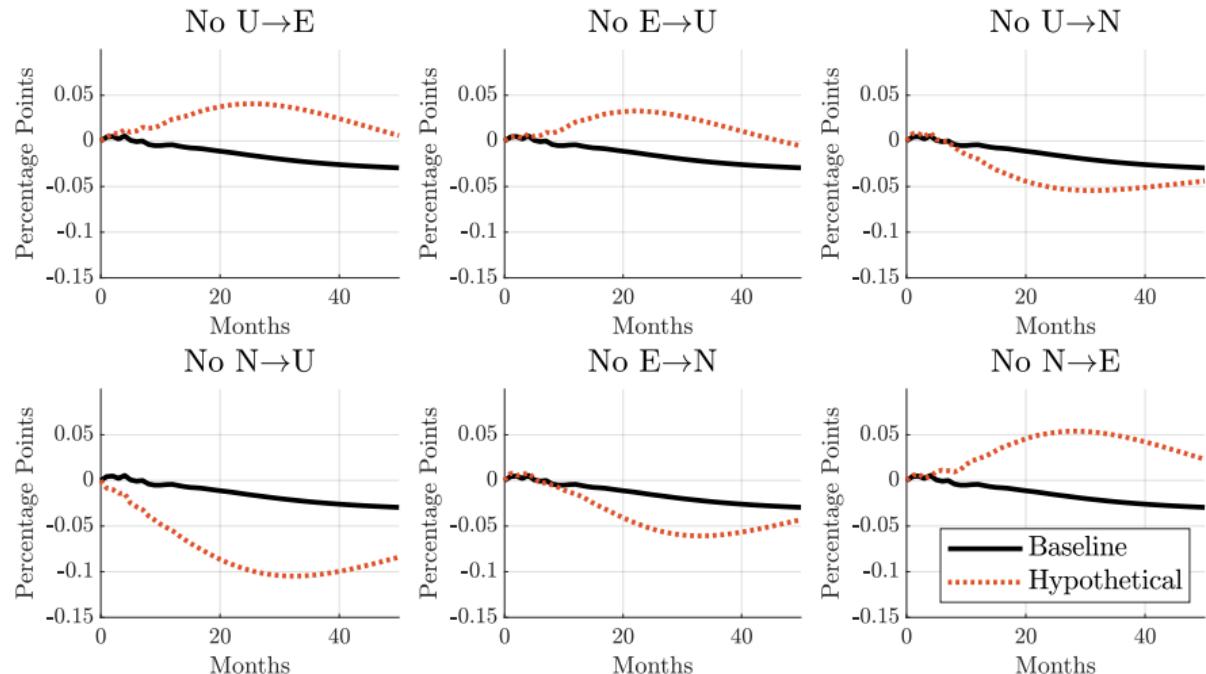
◀ Back

Time Series of Labor Market Flows



◀ Back

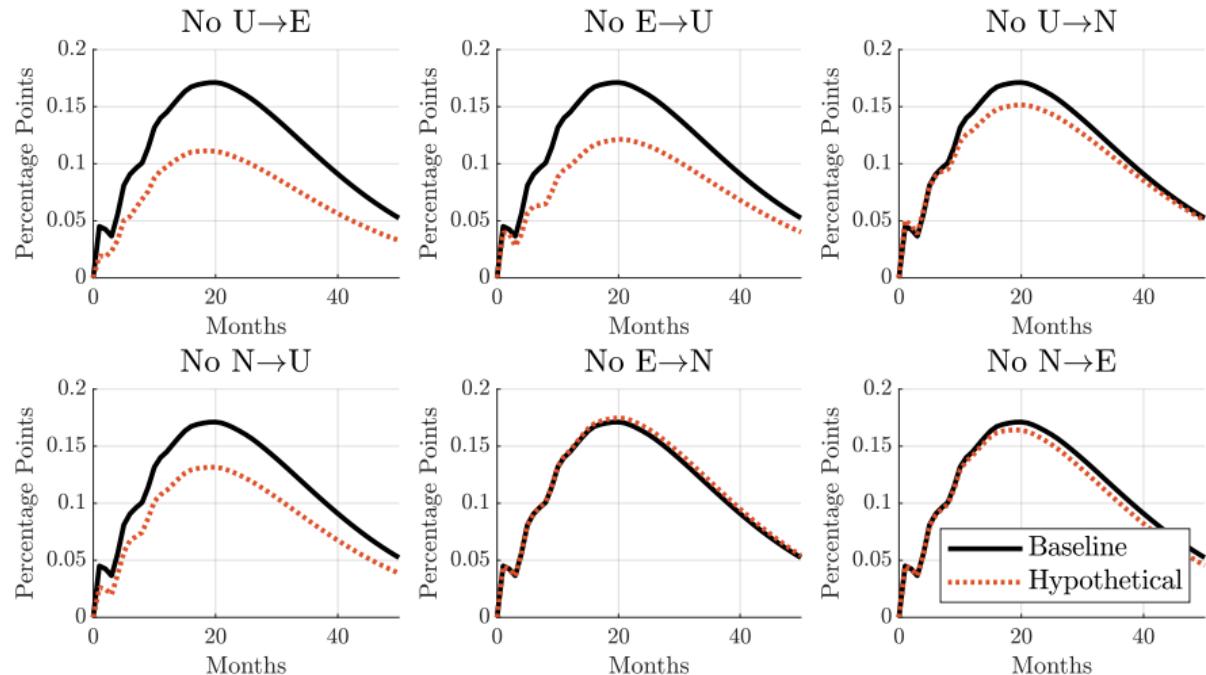
The Ins and Outs of Participation



- ▶ $E \rightarrow U$ and $U \rightarrow E$ are important for participation cycle

◀ Back

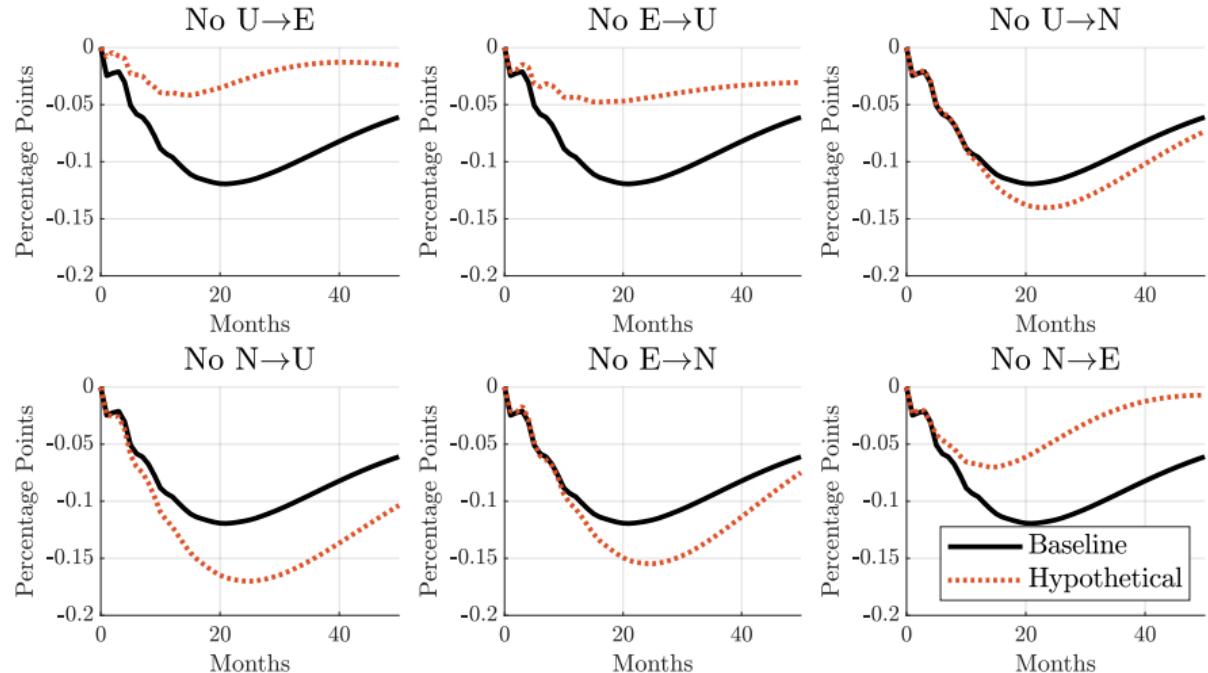
The Ins and Outs of Unemployment



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

◀ Back

The Ins and Outs of Employment



- $N \rightarrow U$ more important than $U \rightarrow N$ 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} .

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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)

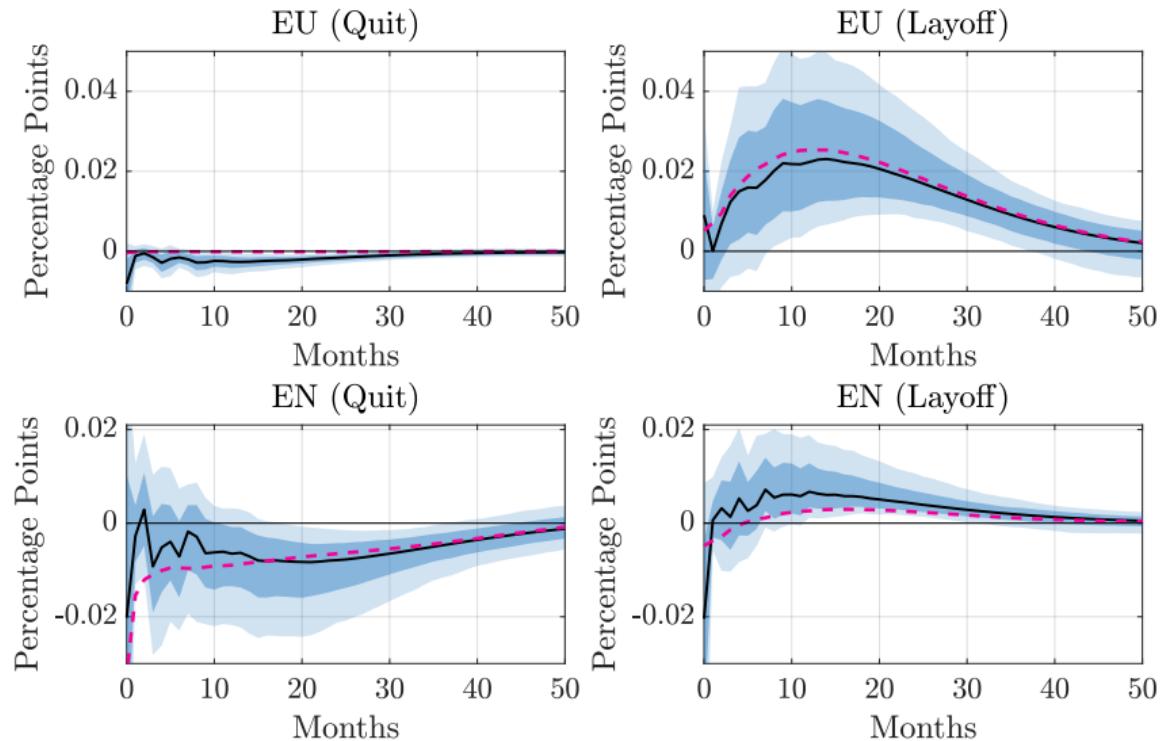
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Steady-State Labor Market Flows

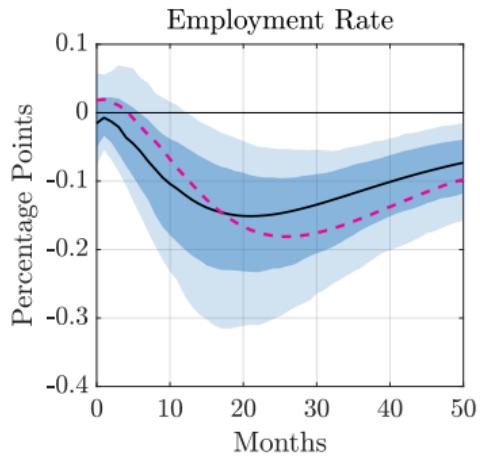
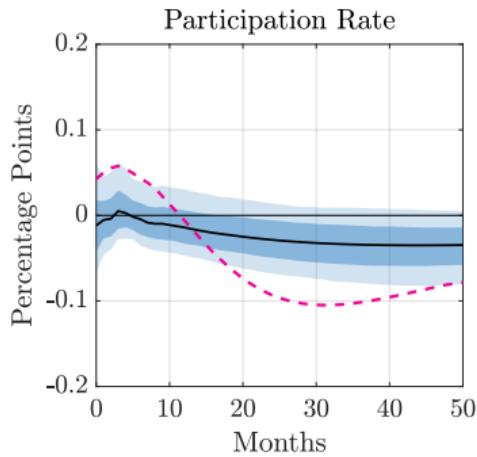
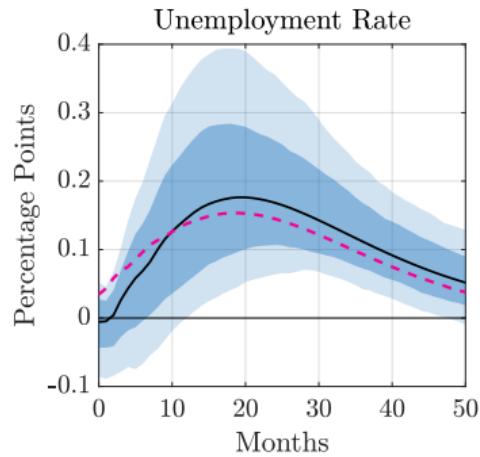
Transition Rate	Model	Data
EU	0.0143	0.0143
EN	0.0297	0.0296
UE	0.2547	0.2547
UN	0.2260	0.2262
NE	0.0462	0.0461
NU	0.0253	0.0252

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Response of Quits and Layoffs: Model vs Data



Response of Labor Market Stocks: Model vs Data



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