The Unemployment-Risk Channel in Business-Cycle Fluctuations

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Introduction

- **Unemployment-risk channel (URC):** *Re-inforcing feedback loop*
  1. **Households:** Unemployment ↑
     ⇒ (precautionary) savings ↑
     ⇒ goods demand ↓
  2. **Firms:** Goods demand ↓
     ⇒ labor demand ↓
     ⇒ unemployment ↑

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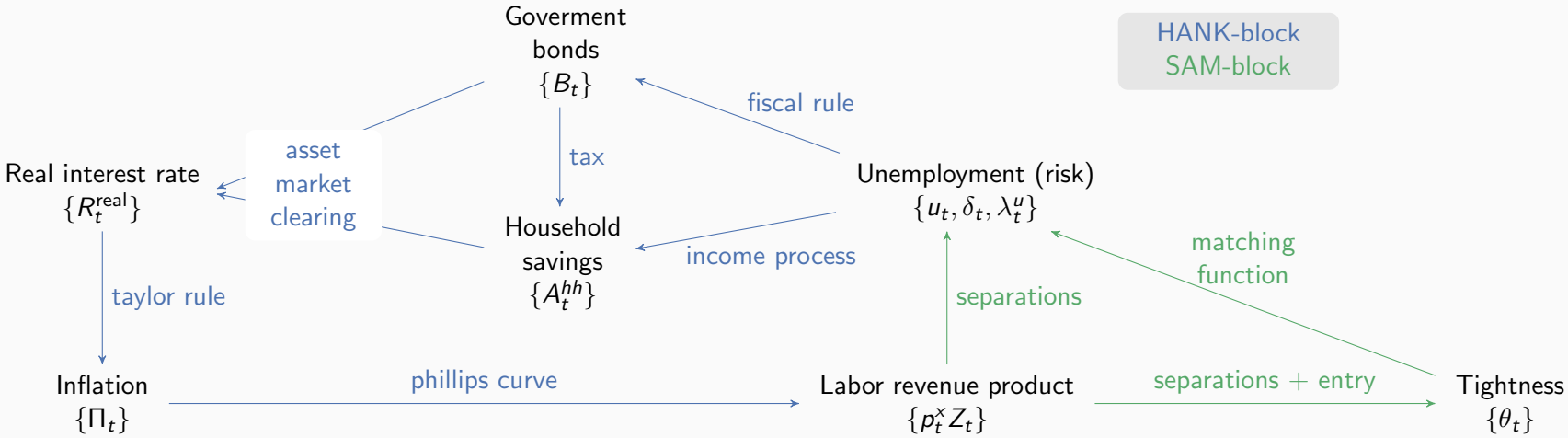
- **Questions:**
  1. ***What determines the strength of the URC?***
     separation vs. duration risk?
     share of hand-to-mouth households?
     tax- or debt-financing?
  2. ***Which fiscal stabilization policies are most cost-effective?***
     UI level or duration?
     public spending or transfers?
     wage or hiring subsidy?

Our model



- **3 central propagation steps:**
  1. **Search-and-matching** (endogenous separations and sluggish entry)
  2a. **Bond demand** (incomplete markets + income process with separation and duration risk + heterogeneous discount factors)
  2b. **Bond supply** (fiscal rule)
  3. **Sticky prices** (phillips curve + taylor rule)
- **Our model:** Each step can be varied in a flexible manner
- **Limitation:** Fixed supply of labor and capital

Results

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Results

1. Endogenous separations and sluggish entry strongly amplify fluctuations of unemployment
2. Larger share of hand-to-mouth households is strongly dampening despite larger drop of consumption in unemployment
3. More debt-financing is strongly dampening due to larger bond supply response
4. UI extensions is the most cost-effective fiscal stabilization tool at the margin across a range of calibrations - higher UI level or transfers are the worst

Literature

Improve our understanding of existing HANK-SAM models

a) Steps in propagation mechanism

b) Best calibration strategy

c) Effectiveness of policy tools

Gorneman et al. (2016), Den Haan et. al. (2018), McKay-Reis (2020), Challe (2020), Ravn and Sterk (2021), Kekre (2022), Graves (2022), Cho (2022)

SAM - sluggish entry: Coles-Kelishomi (2018), Fujita-Ramey (2007), Haefke-Reiter (2020), Leduc and Liu (2020), Mercan et. al. (2021), Engbom (2021)

SAM - endogenous separations: Mortesen-Pissarides (1994), Den Haan et. al. (2000), Shimer (2012), Fujita-Ramey (2012), Barnichon (2012), Trigari (2019)

RANK-SAM: Walsh (2005), Gertler et. al. (2008), Trigari (2009), Gali (2010), Christiano et al. (2016)

HANK - fiscal rules: Kaplan et. al. (2018), Hagedorn et. al. (2019), and Alves et. al. (2020)

Consumption in unemployment: Aguiar and Hurst (2005), Eusepi and Preston (2015), Chodorow-Reich and Karabarbounis (2016), Harmenberg and Öberg (2021), Graves (2022), Ganong et al. (2019)

Plan

1. Model
2. Stylized facts
3. Calibration
4. Propagation
5. Policy
6. Conclusion

Model

Model components

1. **Search-and-matching:**
   - Production with labor only
   - Sluggish vacancy posting due to idiosyncratic stochastic entry cost
   - Separations due to idiosyncratic stochastic continuation cost
   - Exogenous wage rule

2a. **Households:**
   - **Workers:** Receive wage or UI + self-insure by saving
   - **Capitalists:** Collect and consume all profits

2b. **Government:** Finances UI through taxes and debt

3. **Sticky prices:**
   - **Phillips curve:** Rotemberg price adjustment costs
   - **Central bank:** Taylor rule

1. Search-and-matching

- **Job value** and **separation rate**, δ_t, with elasticity ψ

$$V_t^j = p_t^x Z_t - (w_t - \text{wage subsidy}_t) + \beta^{\text{firm}} \mathbb{E}_t \left[(1 - \delta_{t+1})(V_{t+1}^j - \mu_{t+1}) \right]$$

$$\delta_t = \delta_{ss} \left(\frac{V_t^j}{V_{ss}^j} \right)^{-\psi}, \quad \mu_{t+1} \text{continuation cost}$$

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- **Matching function:** $\lambda_t^v = A \theta_t^{-\alpha}$, $\lambda_t^u = A \theta_t^{1-\alpha}$
- **Wage rule:** $w_t = (u_t / u_{ss})^{\eta_u}$

2a. Household problem

$$V_t^w(\beta_i, u_{it}, a_{it-1}) = \max_{c_{it}} \frac{c_{it}^{1-\sigma}}{1-\sigma} + \beta_i \mathbb{E}_t \left[V_{t+1}^w (\beta_i, u_{it+1}, a_{it}) \right]$$

$$\text{s.t.} \quad a_{it} + c_{it} = R_t^{\text{real}} a_{it-1} + \text{transfer}_t + (1-\tau_t) y_t$$

$$y_t = \begin{cases} w_t & \text{if } u_{it} = 0 \\ \text{UI}_{it} \overline{\phi}_t w_t + (1 - \text{UI}_{it}) \underline{\phi} w_t & \text{else} \end{cases}$$

$$\text{UI}_{it} = \mathbb{1}_{\text{it}}^{\text{UI}} \cdot \begin{cases} 1 & \text{if } u_{it} \leq \overline{u}_t \\ u_{it} - \overline{u}_t & \text{if } u_{it} \in (\overline{u}_t, \overline{u}_t + 1) \\ 0 & \text{if } u_{it} \geq \overline{u}_t + 1 \end{cases}$$

$$a_{it} \geq 0$$

- **Months in unemployment counter:** u_{it}
  with separation rate $\delta_t(1-\lambda_t^u)$ and job-finding rate λ_t^u
- **High unemployment insurance :** UI_{it}
  Eligibility probability: $\Pr[\mathbb{1}_{\text{it}}^{\text{UI}} = 1] = \pi^{\text{UI}}$ (at EU transition)
- **Distribution:** $\boldsymbol{D}_t$ over β_i, u_{it} and a_{it-1}

2b. Government

- **Fiscal rule:**

$$\tau_t = \tau_{ss} + \omega q_{ss} \frac{B_{t-1} - B_{ss}}{Y_{ss}^{hh}}$$

where ω determines response of taxes to fluctuations in debt level

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where ω determines response of taxes to fluctuations in debt level

- **Government budget with long term bonds:**

$$\begin{aligned} q_t(B_t - \delta B_{t-1}) = & B_{t-1} \\ & + (1-\tau_t)\left(\overline{\phi}_t \mathrm{UI}_t^{hh} + \underline{\phi}\left(u_t - \mathrm{UI}_t^{hh}\right)\right) w_t \\ & - \tau_t(1-u_t)w_t \\ & + \text{wage subsidy}_t \cdot (1-u_t) \\ & + \text{hiring subsidy}_t \cdot \lambda_t^v((1-\delta_{ss})v_{t-1} + \iota_t) \\ & + \text{public spending}_t \\ & + \text{public transfer}_t \end{aligned}$$

where $\mathrm{UI}_t^{hh} = \int \mathbb{1}\{u_{it} > 0\} \mathrm{UI}_{it} d\boldsymbol{D}_t$

3. Sticky Prices

1. **Standard New Keynesian production structure** with Rotemburg adjustment costs

$$1-\epsilon_p+\epsilon_p p_t^x \quad = \quad \phi(\Pi_t-1)\Pi_t-\phi\beta\mathbb{E}_t\left[(\Pi_{t+1}-1)\Pi_{t+1}\frac{Z_{t+1}(1-u_{t+1})}{Z_t(1-u_t)}\right]$$

2. **Taylor rule:**

$$R_t \quad = \quad R_{ss}\Pi_t^{\phi}$$

3. **Fisher equation:**

$$R_t^{\text{real}} = R_{t-1}/\Pi_t$$

Equilibrium

1. **No arbitrage** requires

$$\frac{1+\delta_q q_{t+1}}{q_t} = R^{\text{real}}_{t+1}$$

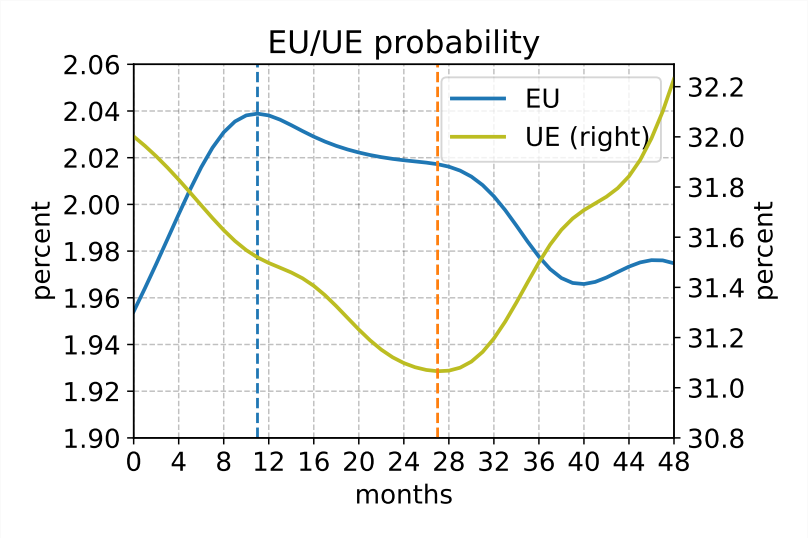
2. **Asset market clearing:**

$$q_t B_t = \int a^{\star}_t(\beta_i, u_{it}, a_{it-1}) d\boldsymbol{D}_t$$

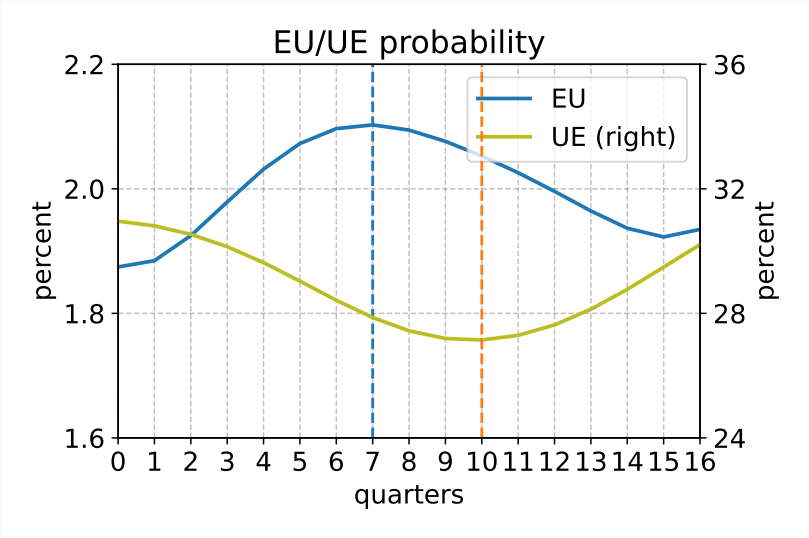
Stylized facts

Separations and job-finding in the U.S. I

Monetary policy shock



Technology shock

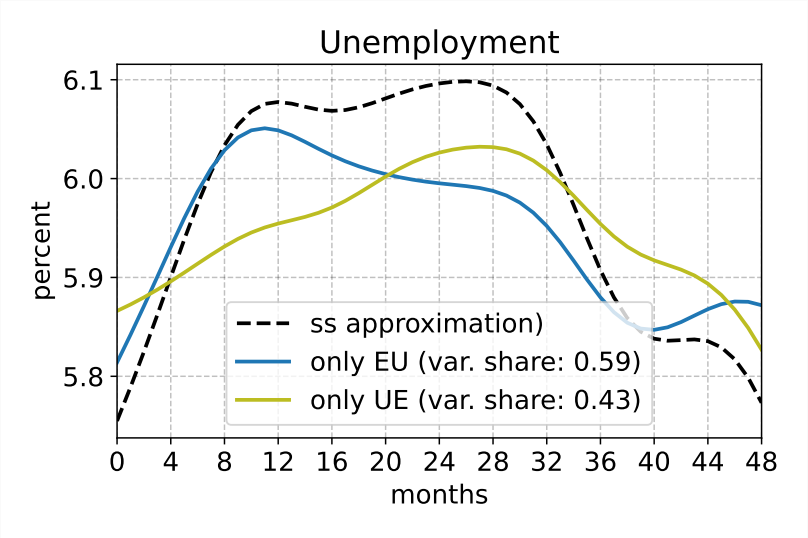


Source: CPS, 1967-2020

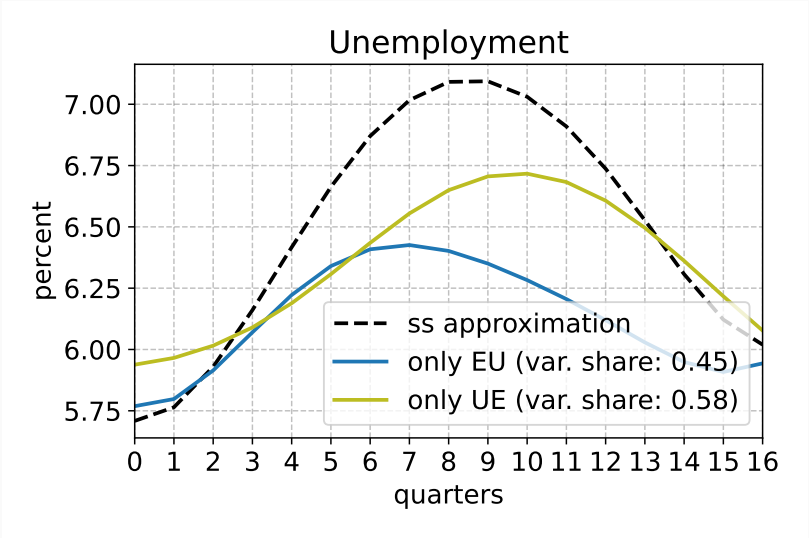
- **Stylized Fact #1:**
  Separation rate leads job-finding rate by 12-18 months
  Same pattern true in unconditional time-series data (see the paper)

Separations and job-finding in the U.S. II

Monetary policy shock



TFP shock

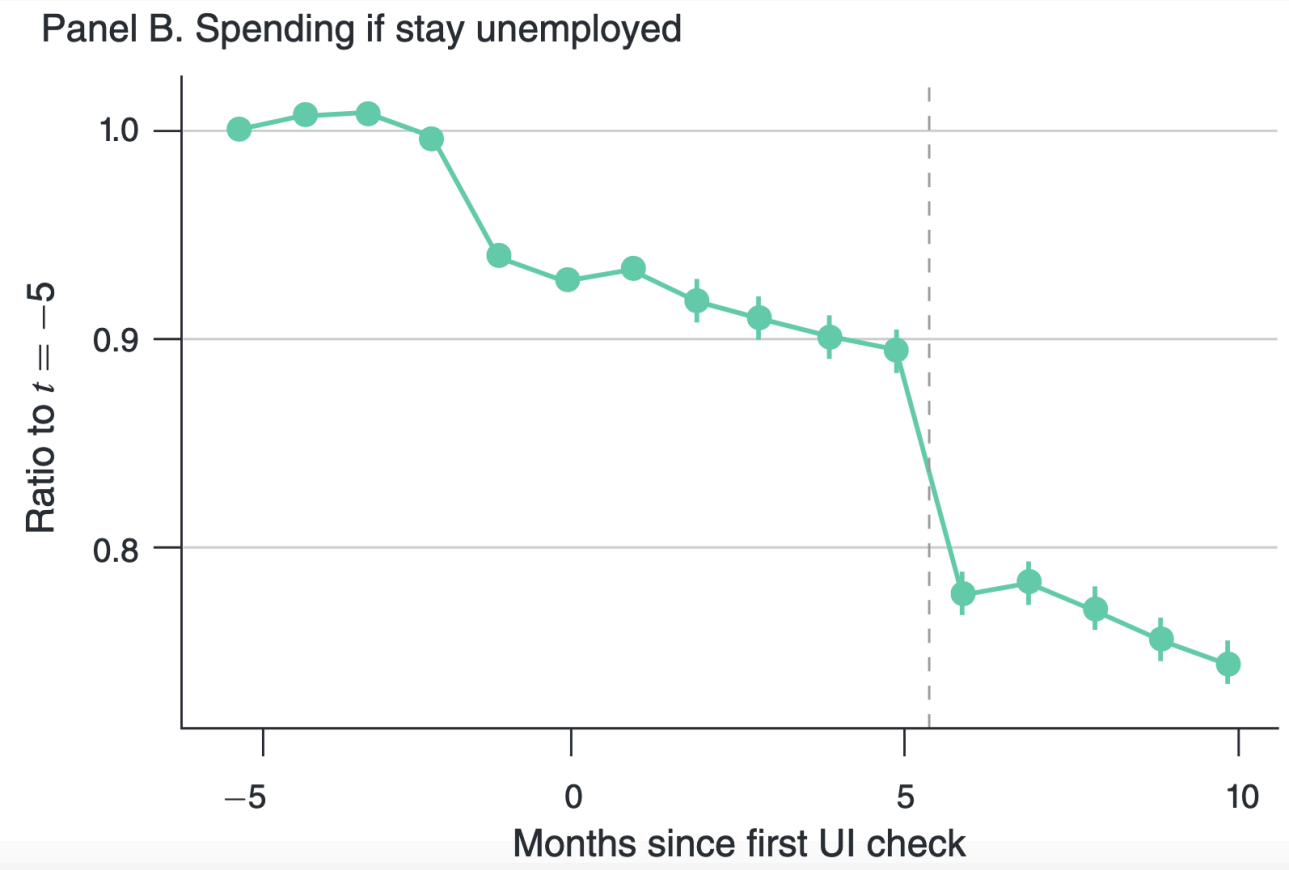


Source: CPS, 1967-2020

- **Stylized Fact #2:**
  Separations account for 40-60 percent of unemployment response
  Same pattern true in unconditional time-series data (see the paper)

Consumption effect of unemployment

- **Stylized fact #3:** Consumption ~20% lower for unemployed
- **Stylized fact #4:** Drop at UI exhaustion of ~45% of income drop



Source: Ganong et. al. (2019)

Calibration

Calibration targets

- **Targets:**
  1. Data on separation rate, unemployment duration and tightness
  2. EU share of unemployment volatility ~ 40
  3. UE lag relative to EU ~ 6 months
  4. Unemployed have ~ 20 percent lower consumption
- **Baseline:**
  1. 15% HtM households *(more later)*
  2. Tax-financing *(more debt-financing later)*
- **Simplifications:**
  1. Only TFP shocks
  2. Unit unemployment variance with flexible prices
  3. Fixed real wage

SAM parameters

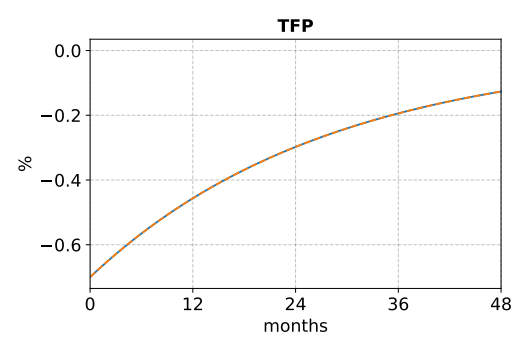
Parameter	Value	Source / Target
Firm discount factor, β^{firm}	$0.98^{1/12}$	Standard
Matching function elasticity, α	0.60	Petrongolo and Pissarides (2001)
Separation rate, δ_{ss}	0.027	Data
Job-finding rate, λ^u_{ss}	0.31	Data
Tightness, θ_{ss}	0.60	Hagedorn and Manovskii (2008)
Technology shock, persistence, ρ_Z	0.965	Coles and Kelishomi (2018)
Technology, standard deviation, σ_Z	0.007	Coles and Kelishomi (2018)
Separation elasticity, ψ	1.0	EU share of unemployment volatility
Entry elasticity, ξ	0.02	UE lag relative to EU
Wage level, w_{ss}	0.66	$var(u_t) = 1.0$ with flexible prices
Wage elasticity, η_w	0.00	Simplification

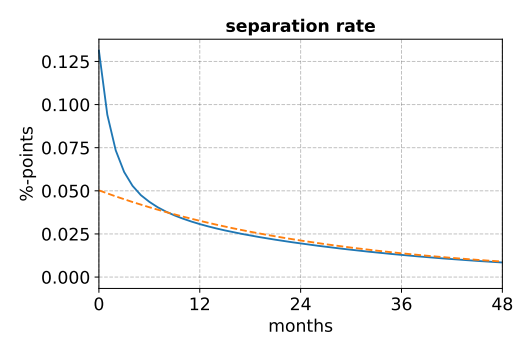
HANK parameters

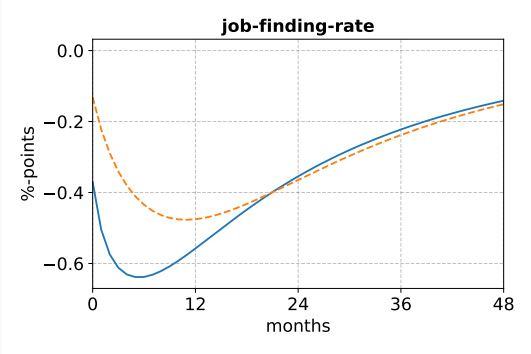
Parameter	Value	Source / Target
Discount factors, β_i^{12}	$\{0.00, 0.96, 0.98\}$	Baseline
... population shares	$\{0.15, 0.70, 0.15\}$	
CRRA coefficient, σ	2	Standard
High UI, $\overline{\phi}$	0.76	Kekre (2022)
Low UI, $\underline{\phi}$	0.55	Kekre (2022)
UI probability, π^{UI}	0.5	Kekre (2022)
UI duration, $\overline{u}$	6.0	Standard
Degree of tax financing, ω	0.90	Baseline
Bond maturity, δ_q	$1 - 1/60$	Standard
Value of bonds, $q_{ss} B_{ss}$	1.0	Consumption drop in unemployment
Substitution elasticity, ϵ_p	6	Standard
Rotemberg cost, ϕ	600.0	Standard
Taylor rule parameter, ϕ_π	1.5	Standard

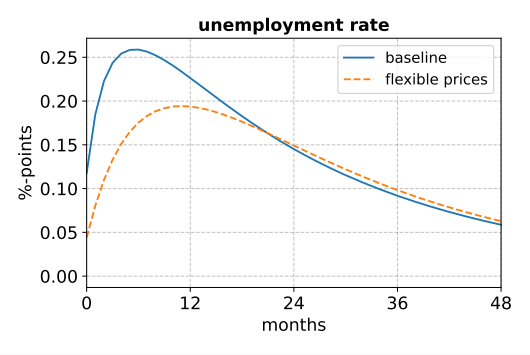
Propagation

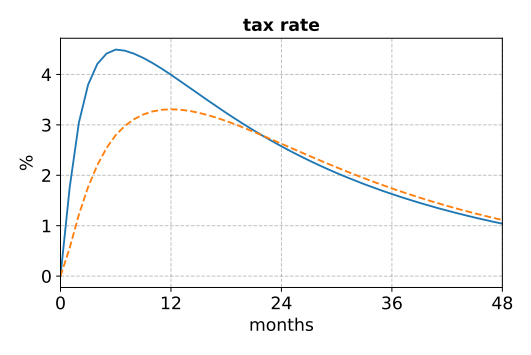
Equilibrium paths with baseline calibration

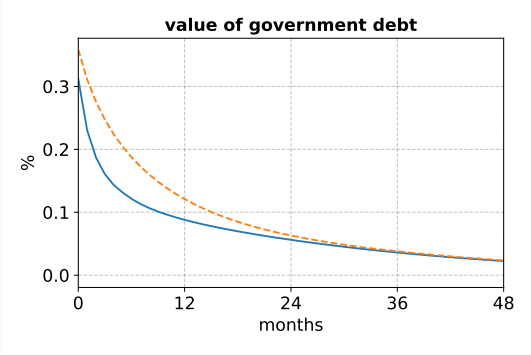


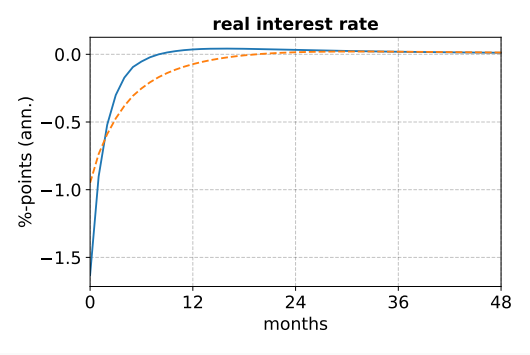


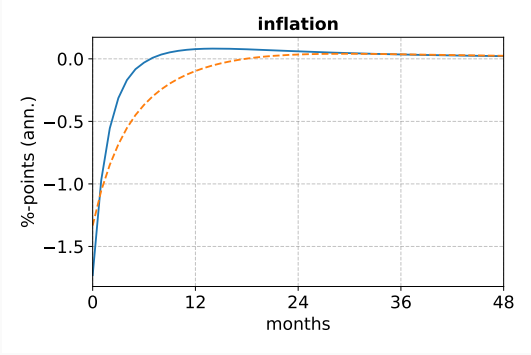






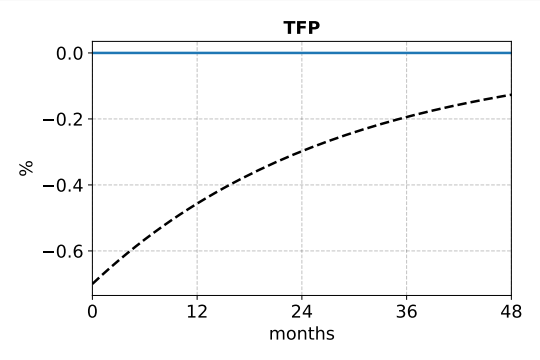


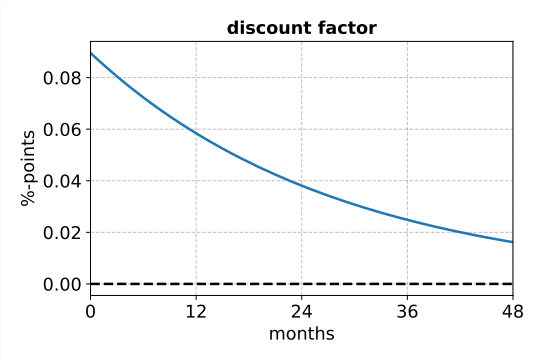


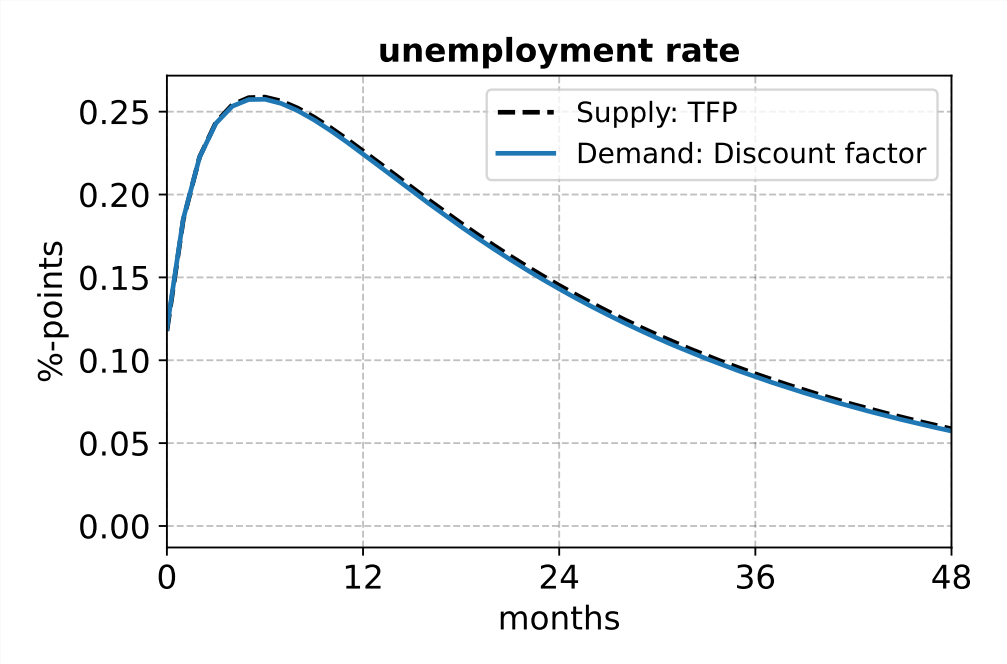


Equivalence: Demand vs. supply

- **Result:** The labor market dynamics are the same for demand and supply shocks (up to a scaling factor)



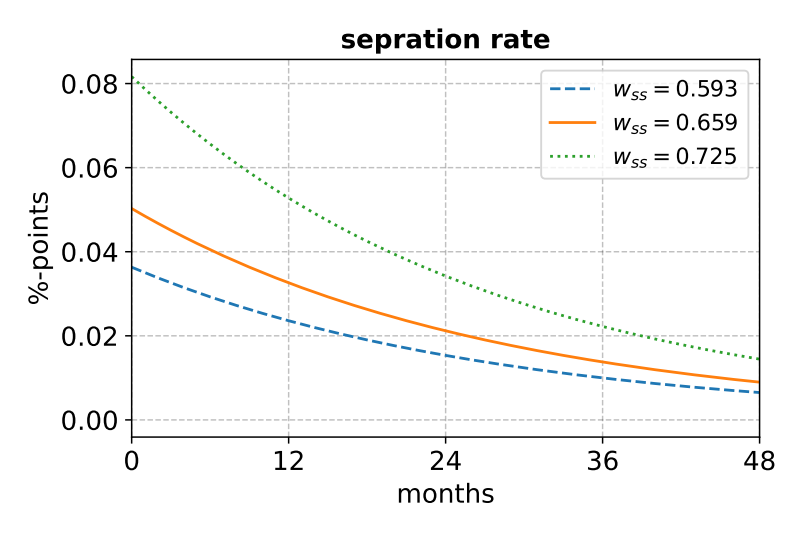


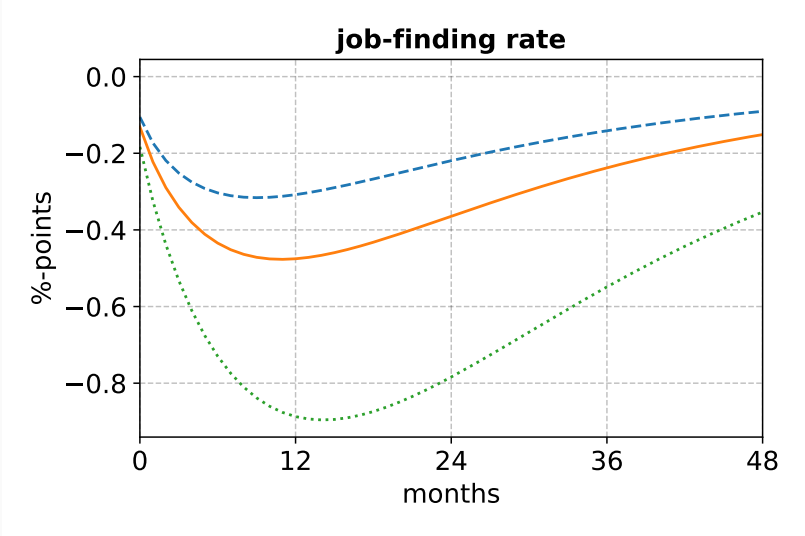


Propagation (of technology shock)

- **3-step propagation channel:**
  1. **Search-and-matching**
  2a. **Bond demand**
  2b. **Bond supply**
  3. **Sticky prices**
- **Now:** Quantitatively illustrate the propagation in each step

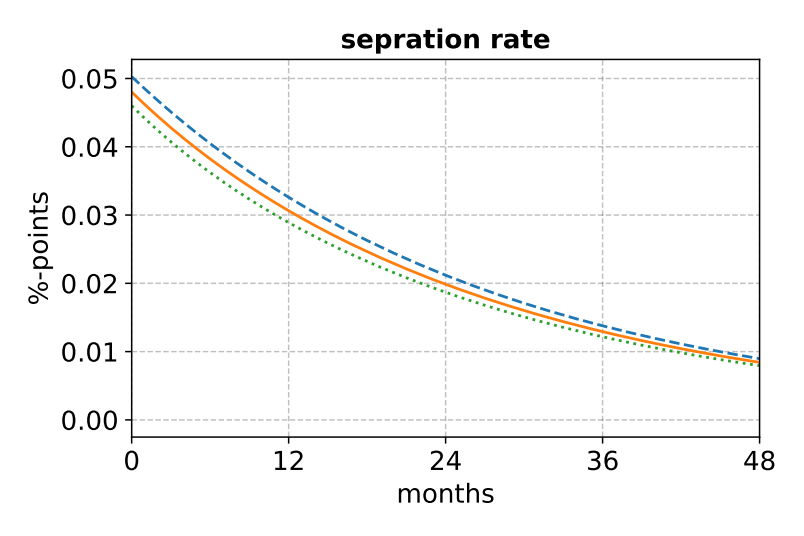
1. SAM: Steady state wage, w_{ss}

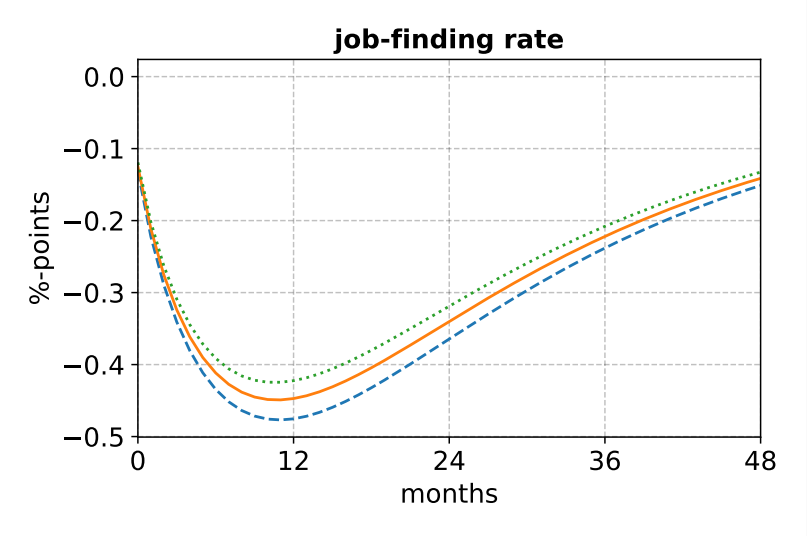




- **Result:** Controls overall volatility of unemployment (risk)

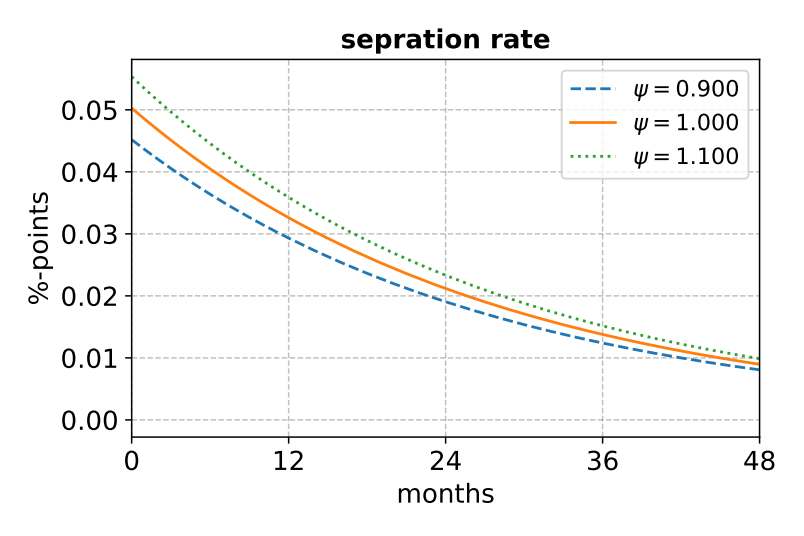
1. SAM: Wage rule, η_u

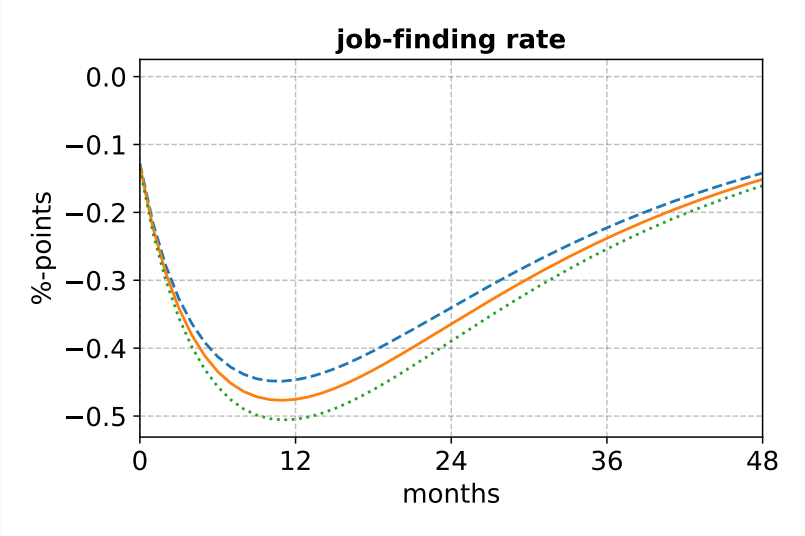




- **Result:** Higher elasticity dampens fluctuations

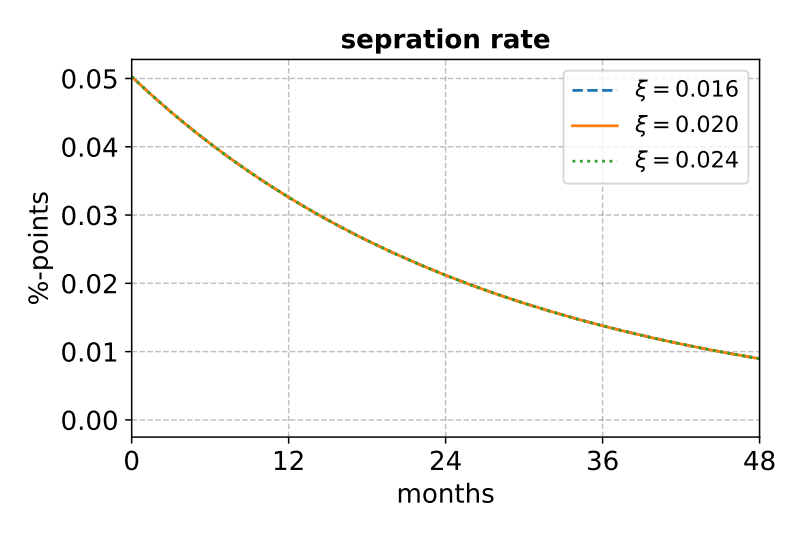
1. SAM: Separation elasticity, ψ

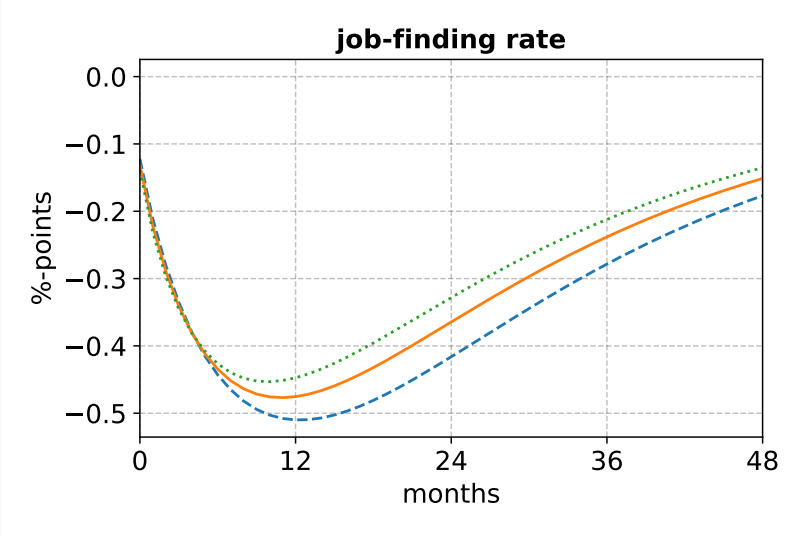




- **Result I:** Higher elasticity amplified fluctuations
- **Result II:** Separations play larger role

1. SAM: Entry elasticity, ξ



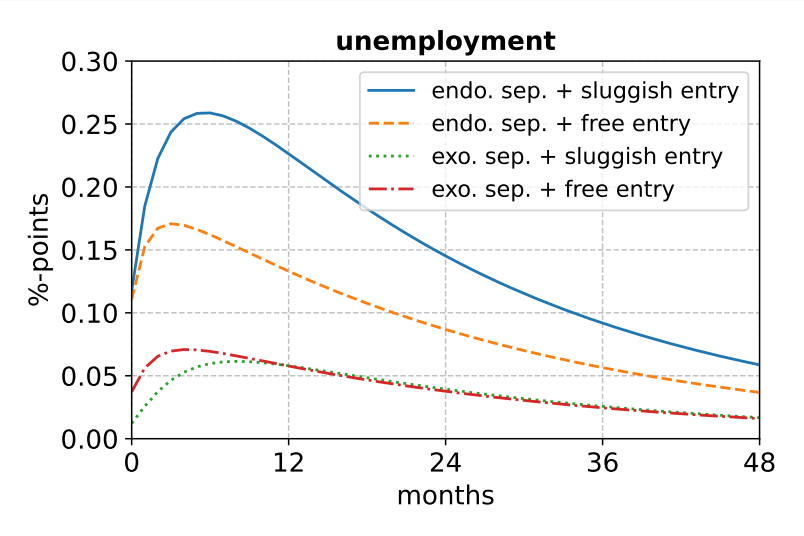


- **Result I:** More sluggishness amplifies fluctuations
- **Result II:** Job-finding play larger role later on

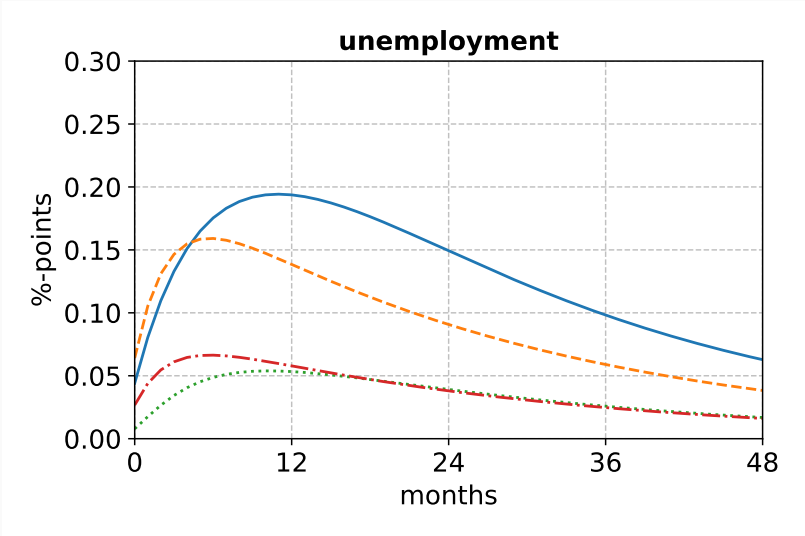
1. SAM: Exogenous separation and free entry

- **Result:** Much lower volatility of unemployment with exogenous fluctuations and free entry.

(a) baseline calibration

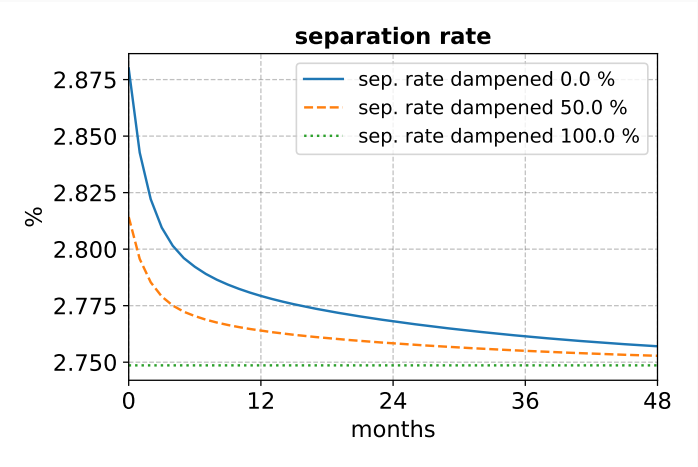


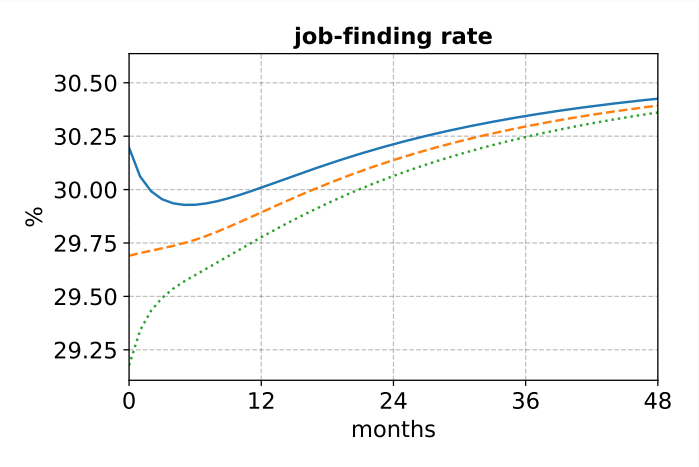
(c) Flexible prices ($\phi \to 0$)

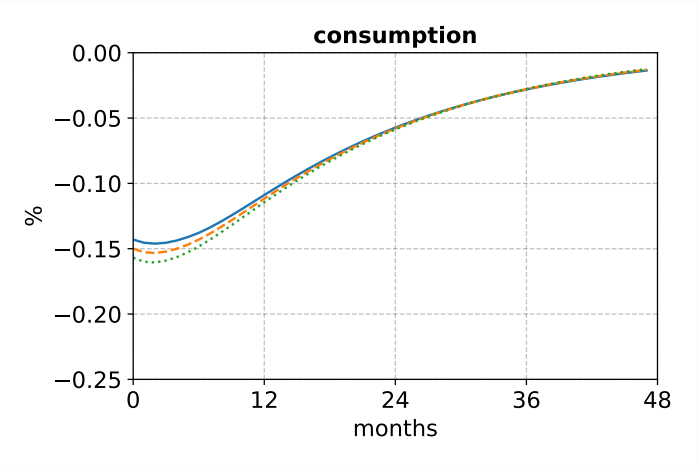


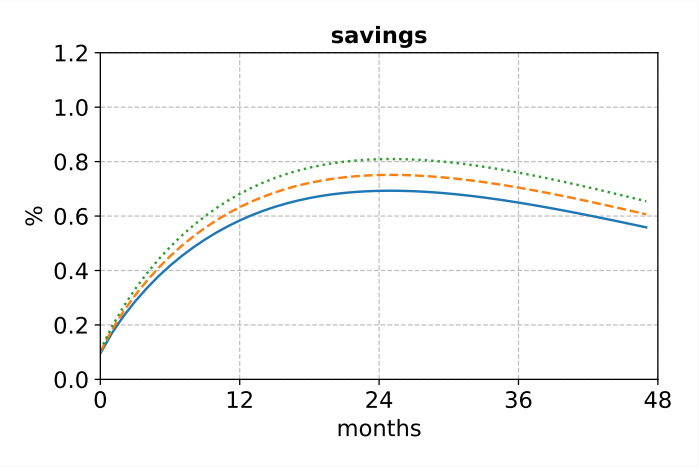
2a. Bond demand: Type of unemployment risk I

- **Experiment:** *Dampen equilibrium path of separation rate and adjust job-finding rate to keep unemployment fixed*
- **Result I:** Lower consumption and higher saving



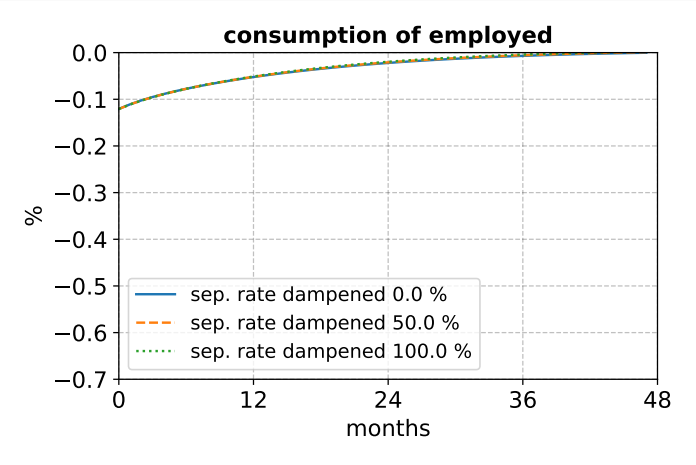


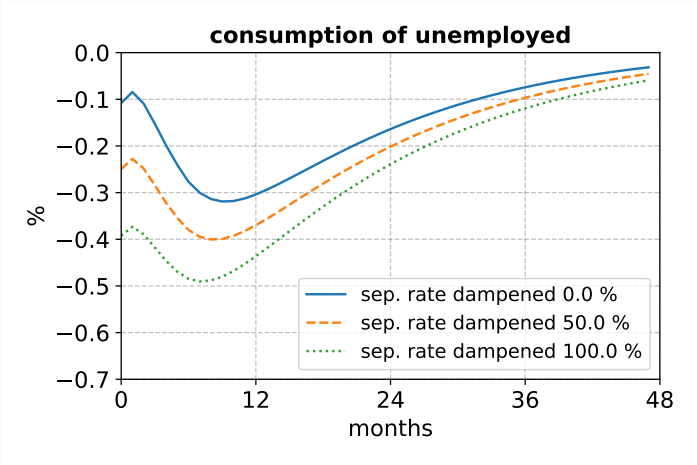


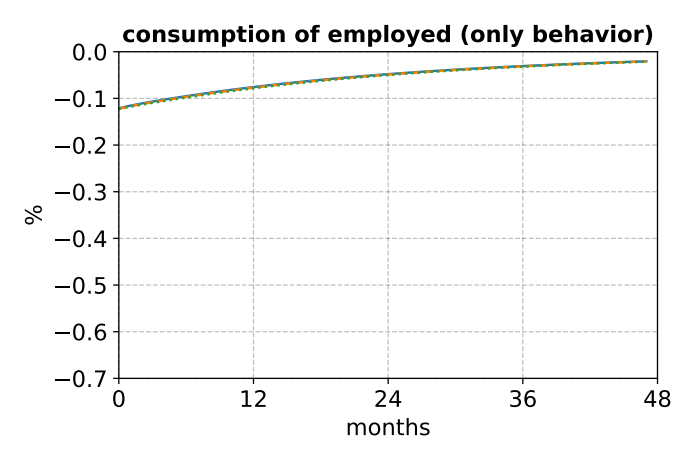


2a. Bond demand: Type of unemployment risk II

- **Experiment:** *Dampen equilibrium path of separation rate and adjust job-finding rate to keep unemployment fixed*
- **Result II:** Consumption higher for employed, lower for unemployed

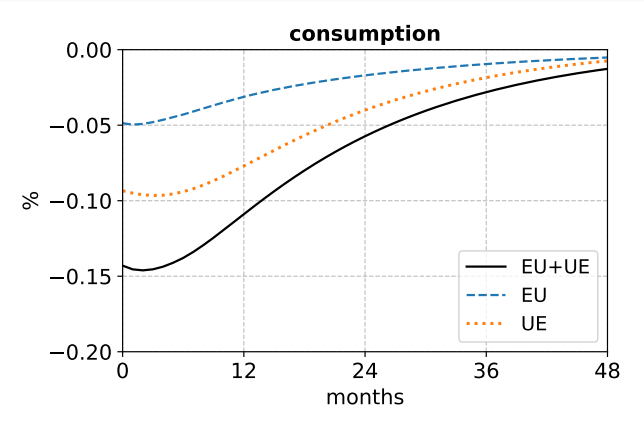


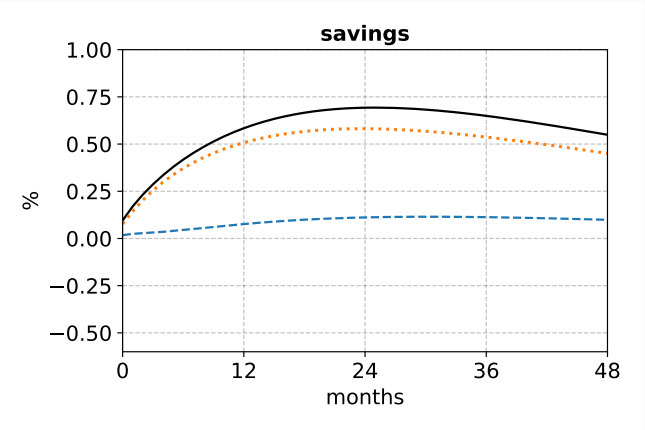


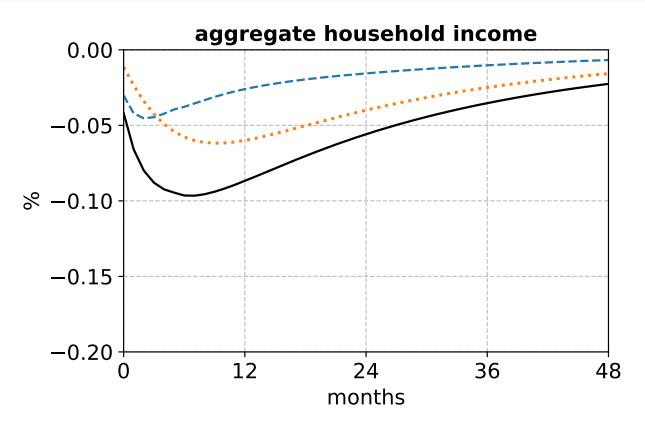


2a. Bond demand: Job-finding rate matters most

- **Experiment:** *Feed in the equilibrium path(s) of the separation rate and/or the job-finding rate*
- **Result:** Job-finding rate more important than separation rate

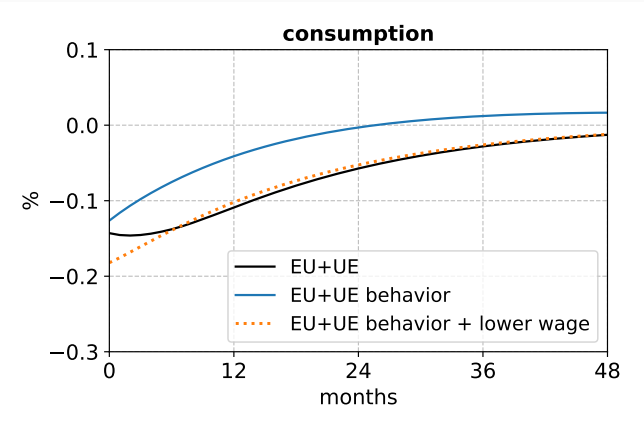


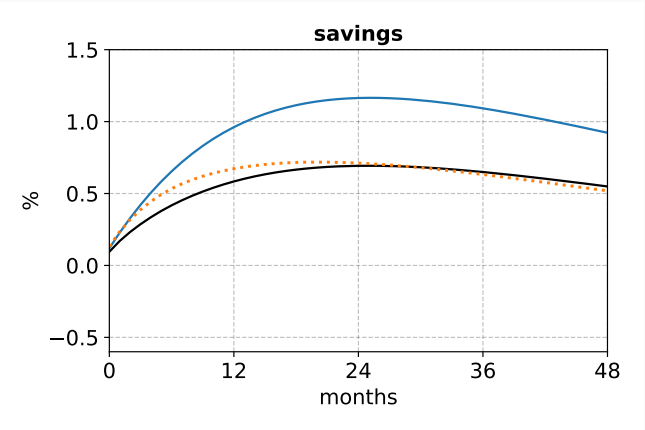


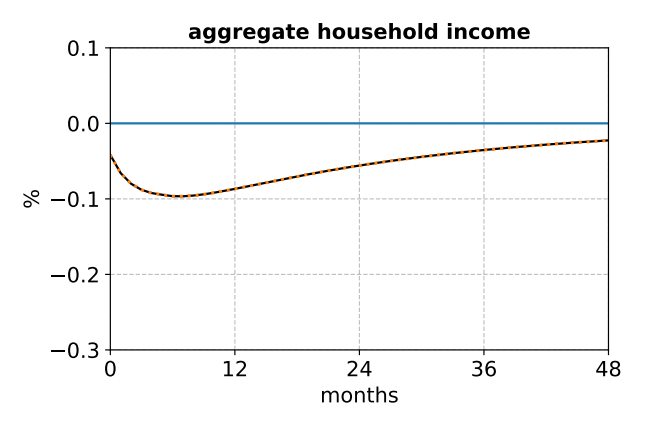


2a. Bond demand: Behavioral response matters most

- **Experiment:** *Simulate with only change in behavior and lower wage path to get same aggregate household income path*
- **Result:** Behavioral response and aggregate income effect is key

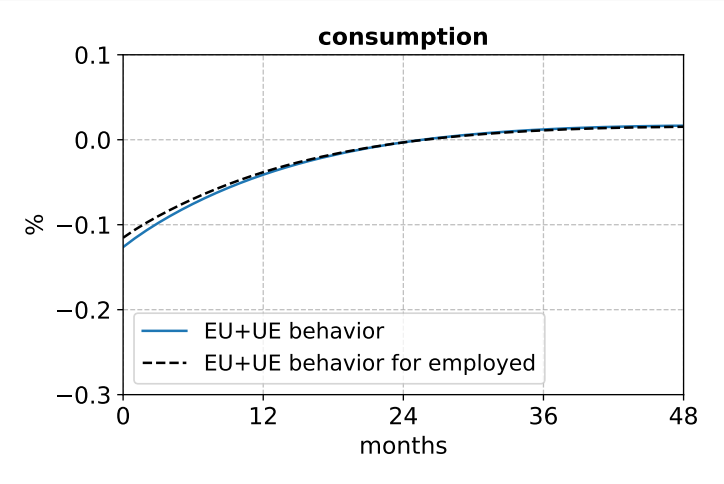


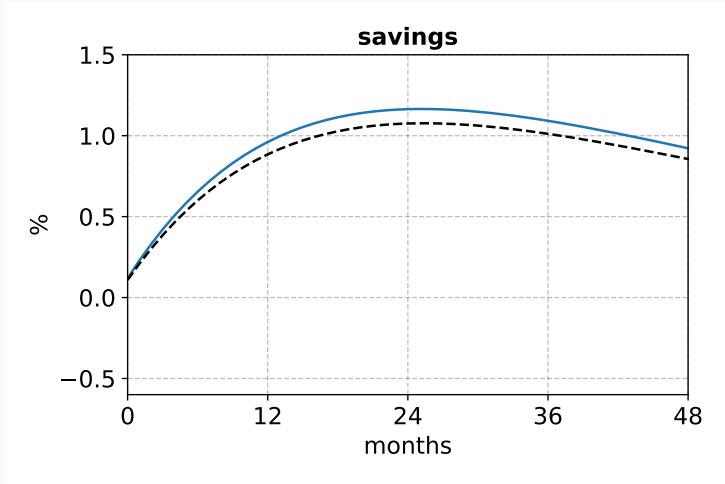




2a. Bond demand: Behavior of employed matters most

- **Experiment:** *Simulate with only change in behavior of employed*
- **Result:** Behavior of unemployed





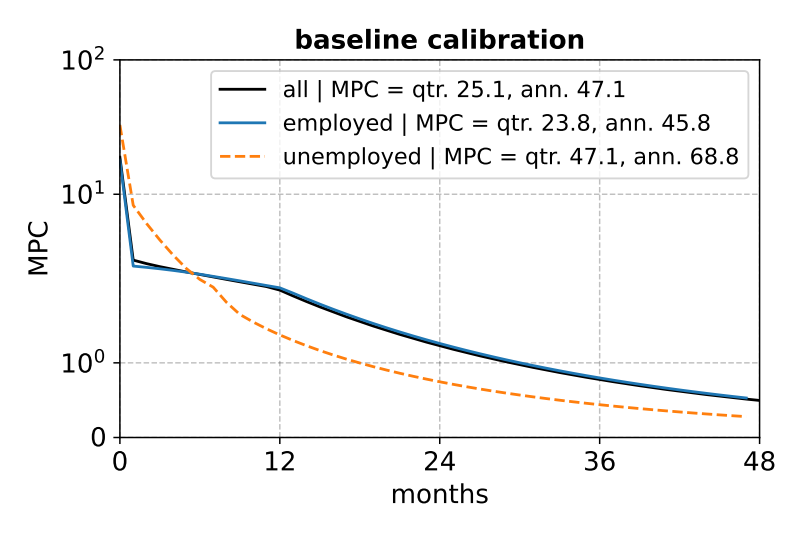
2a. Bond demand: Hand-to-mouth households

- **Alternative HtM calibration of discount factors:**
  1. Same discount factors, $\beta_i^{12} \in \{0.00, 0.96, 0.98\}$
  2. Equal population shares, $\{0.15, 0.70, 0.15\} \to \{1/3, 1/3, 1/3\}$
- **Implications:**
  1. Lower relative consumption of unemployed: $-19.2 \to -21.2$ %
  2. Larger drop at exhaustion: $34.7 \to 46.5$ % of income drop

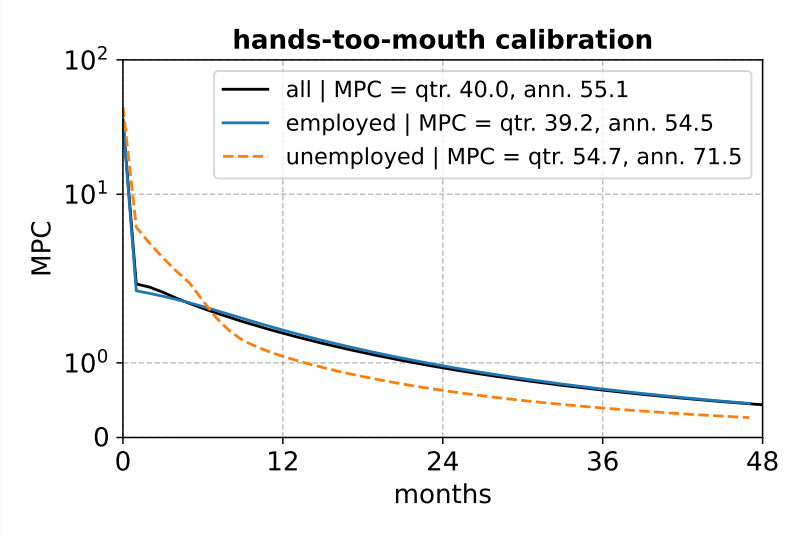
2a. Bond demand: Higher and more homogenous MPCs

- **Result:** MPCs narrows between employed and unemployed.

(a) baseline calibration



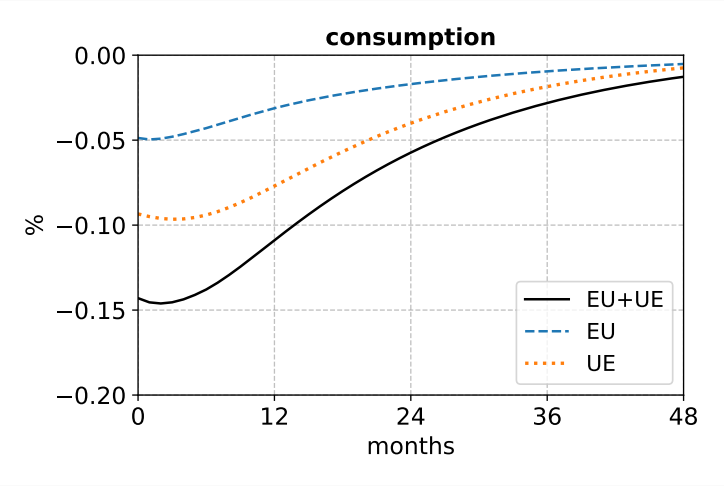
(b) hand-to-mouth calibration

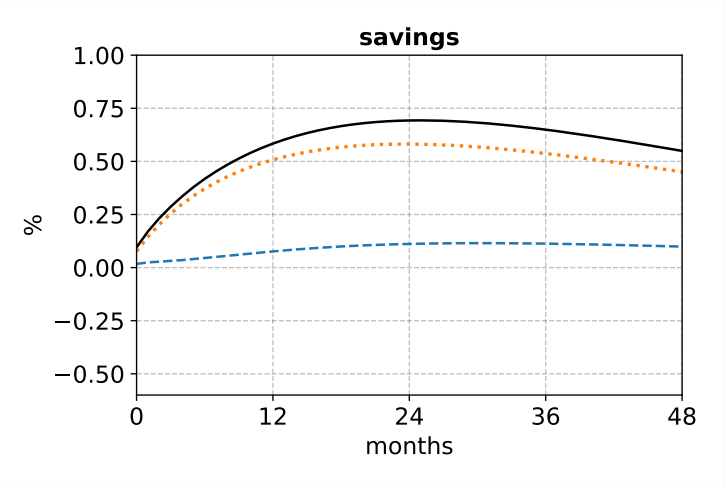


2a. Bond demand: Smaller savings response

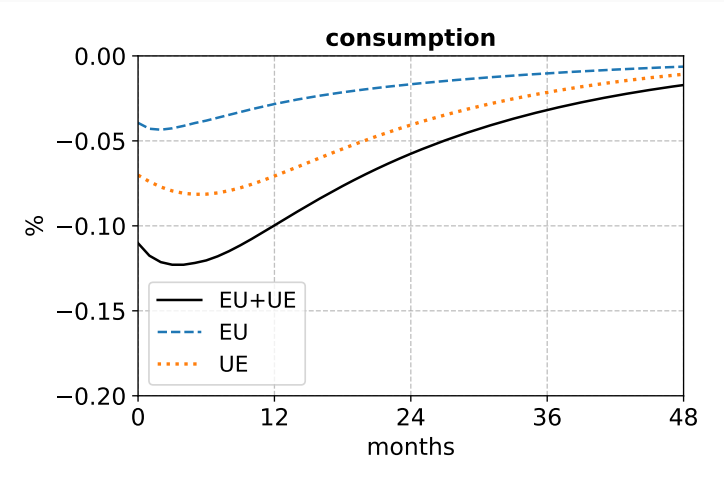
- **Result:** HtM households dampen the savings response a lot.

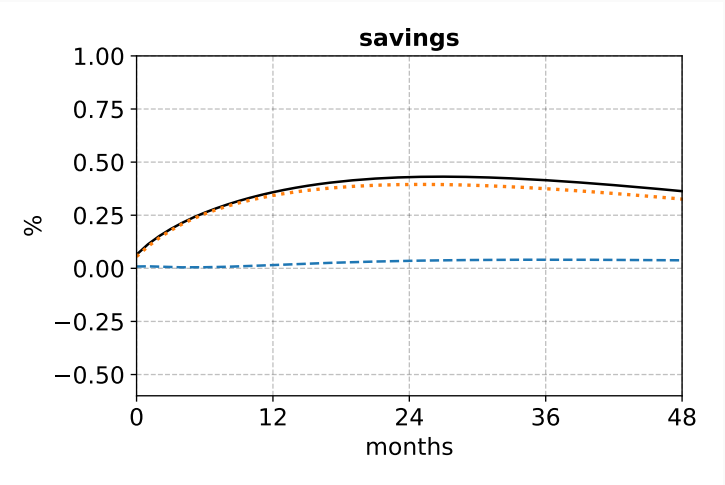
(a) baseline calibration



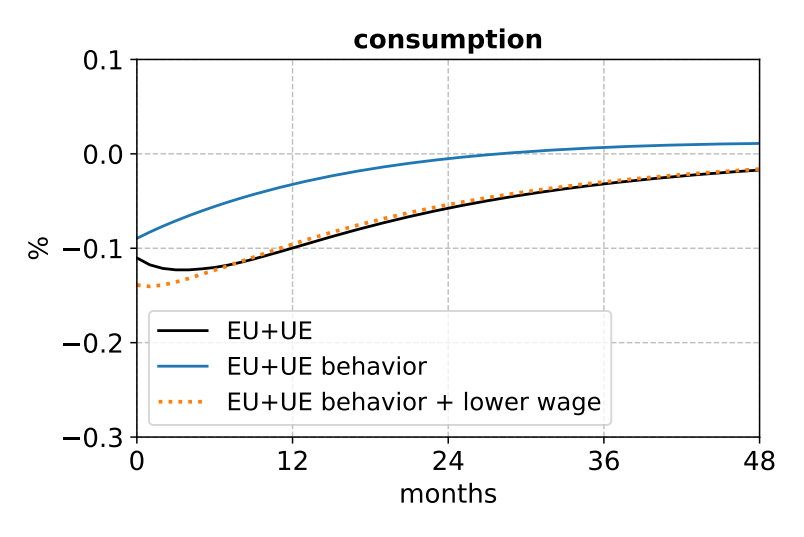


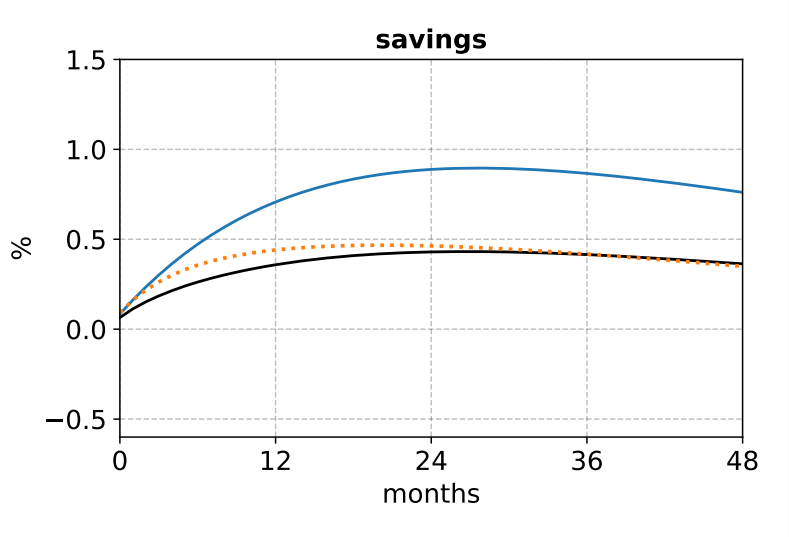
(b) hand-to-mouth calibration

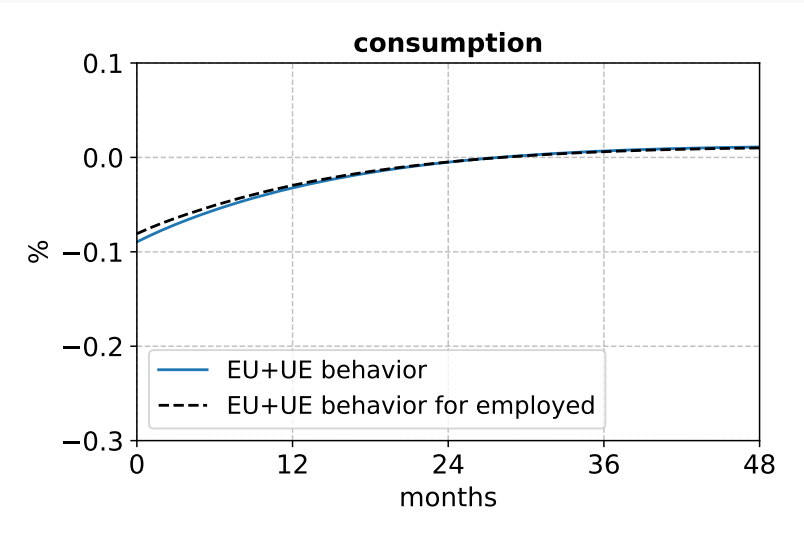


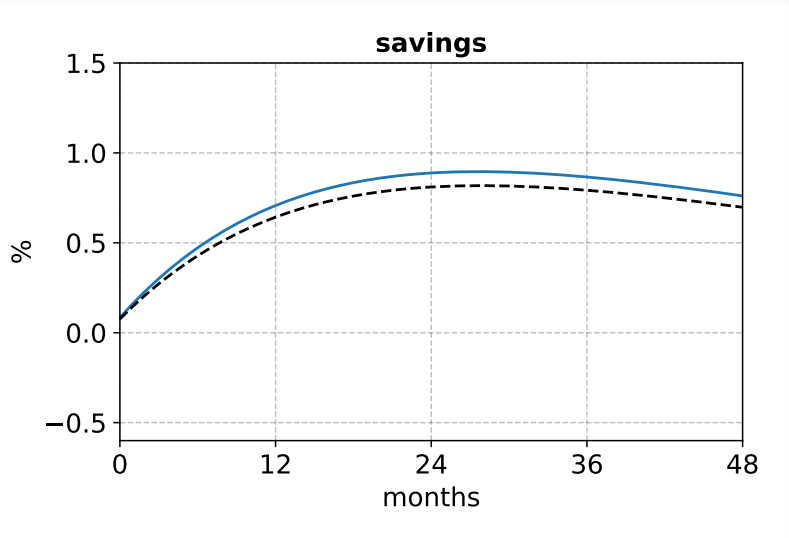


2a. Bond demand: Behavior still matters most









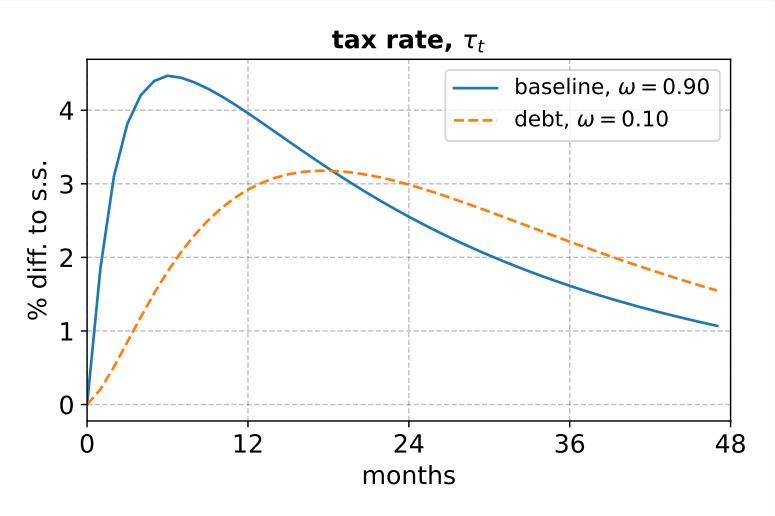
2b. Bond Supply: Tax vs. debt-financing

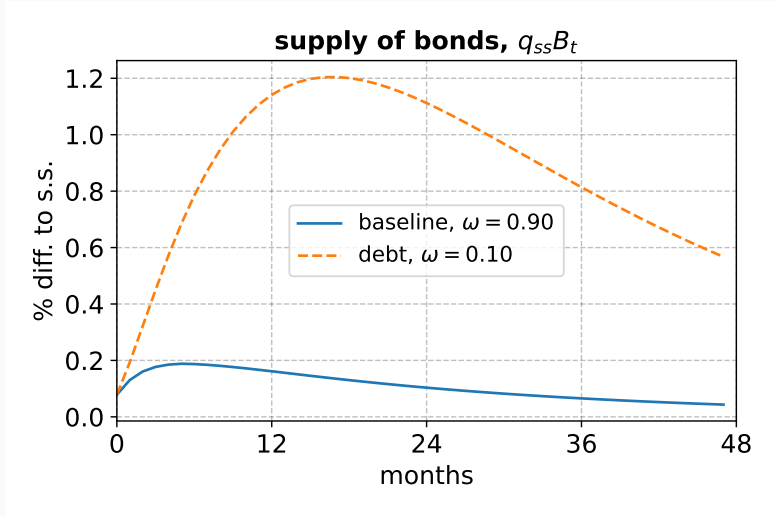
- **Experiment:** Feed in equilibrium path of unemployment for fixed real interest rate and forward accumulate from $B_{-1} = B_{ss}$:

$$\tau_t = \tau_{ss} + \omega q_{ss} \frac{B_{t-1} - B_{ss}}{w_{ss}(1 - u_t)}$$

$$B_t = \frac{(1 + \delta q_{ss})B_{t-1} + \phi w_{ss} u_t - \tau_t w_{ss}(1 - u_t)}{q_{ss}}$$

- **Interpretation:** ω controls the speed of tax adjustment
- **Result:** Large increase in bond supply





3. Sticky prices: Closing the loop

- **From real interest rate, R_t^{real}, intermediary goods prices, P_t^x:**

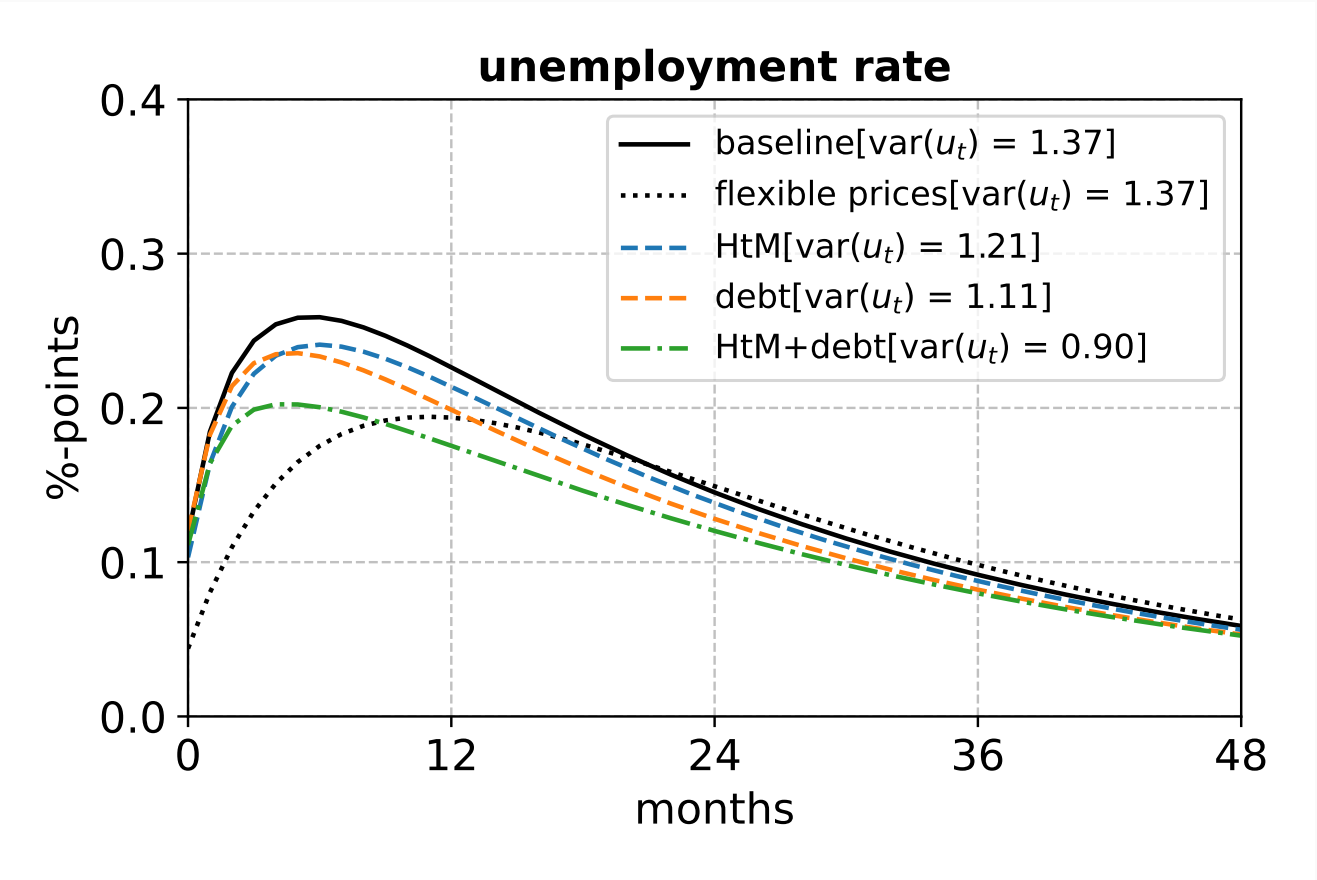
Fisher: $$R_t = R_t^{\text{real}} \Pi_{t+1}$$

Taylor: $$\Pi_t = \left(\frac{R_t}{R_{ss}} \right)^{\frac{1}{\delta_\pi}}$$

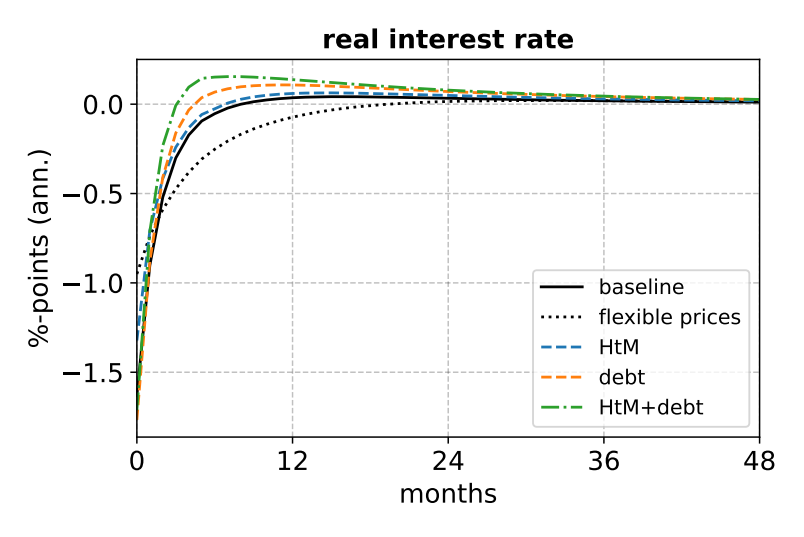
NKPC: $$p_t^x = \frac{\phi \left((\Pi_t - 1)\Pi_t - \beta \left[(\Pi_{t+1} - 1)\Pi_{t+1} \frac{Z_{t+1}(1-u_{t+1})}{Z_t(1-u_t)} \right] \right) + \epsilon_p - 1}{\epsilon_p}$$

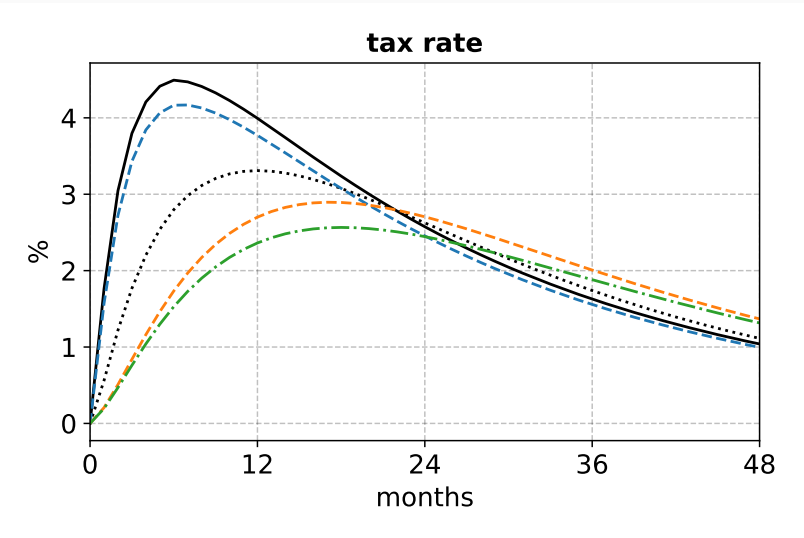
Bringing all together it all together

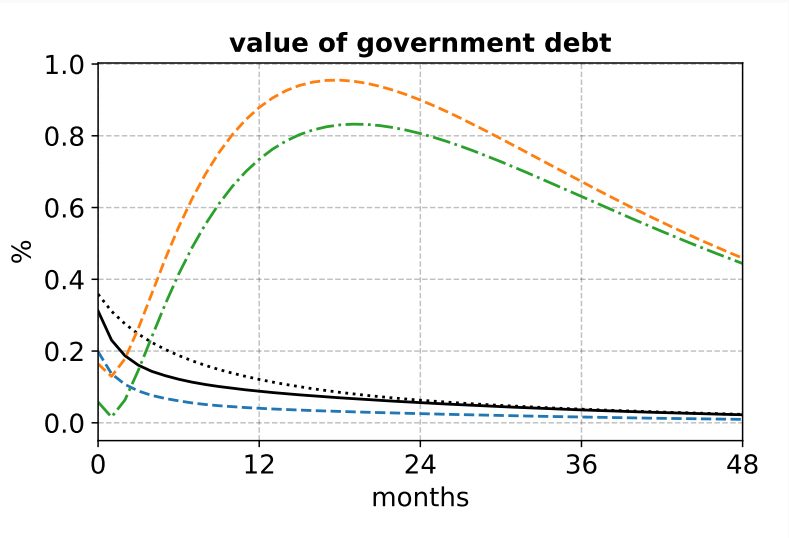
- **Equilibrium path in alternative models:**
  1. **HtM:** Dampens fluctuations
  2. **Debt-financing:** Dampens fluctuations
  3. **Both:** Less volatility than with flexible prices



Underlying model dynamics



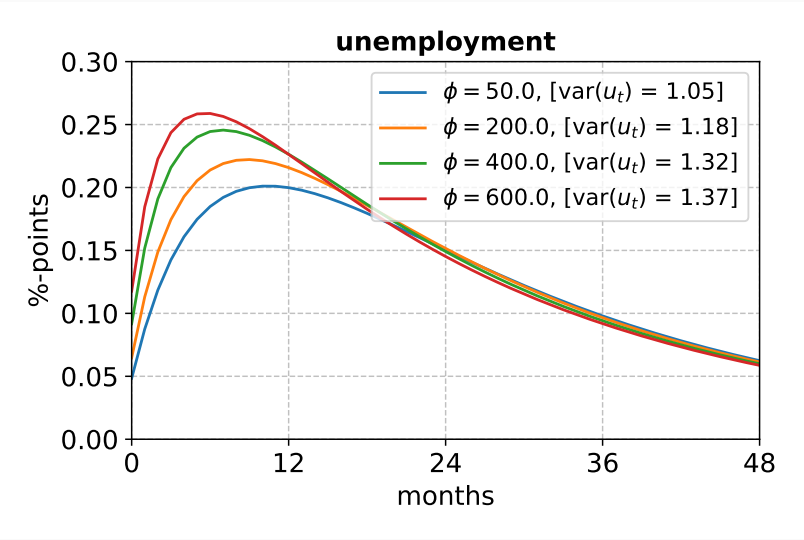




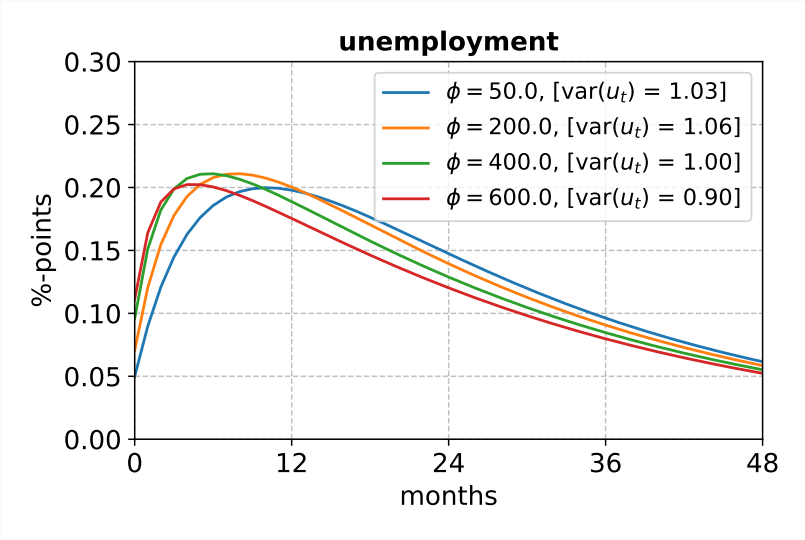
Varying Price stickiness

- **Baseline:** More price stickiness is *amplifying*
- **HtM+debt:** More price stickiness is (eventually) *dampening*

(a) baseline calibration



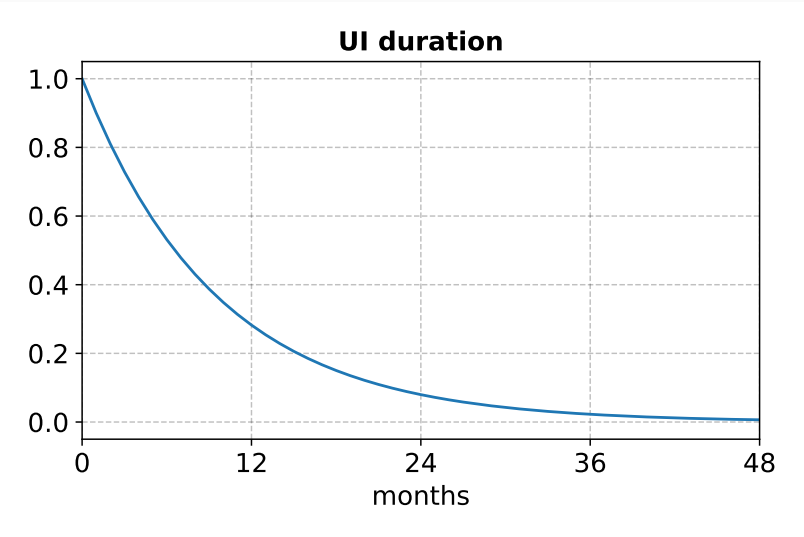
(a) HtM+debt calibration

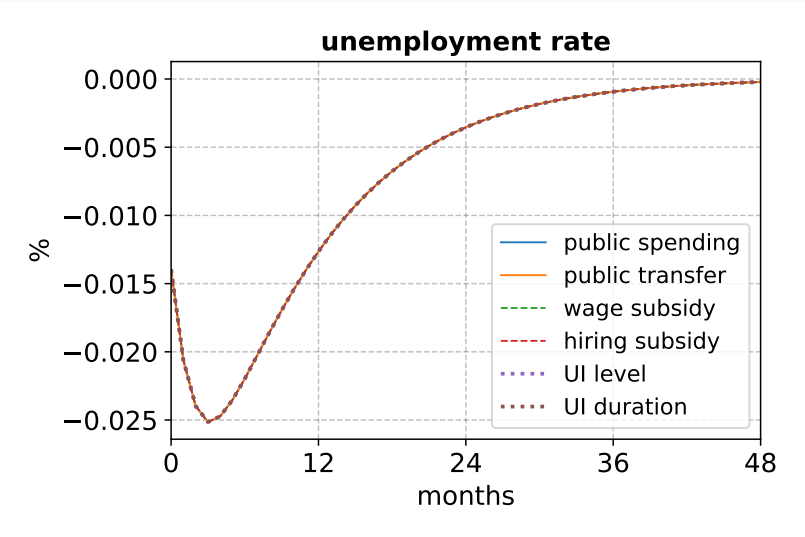


Policy

Policy experiment

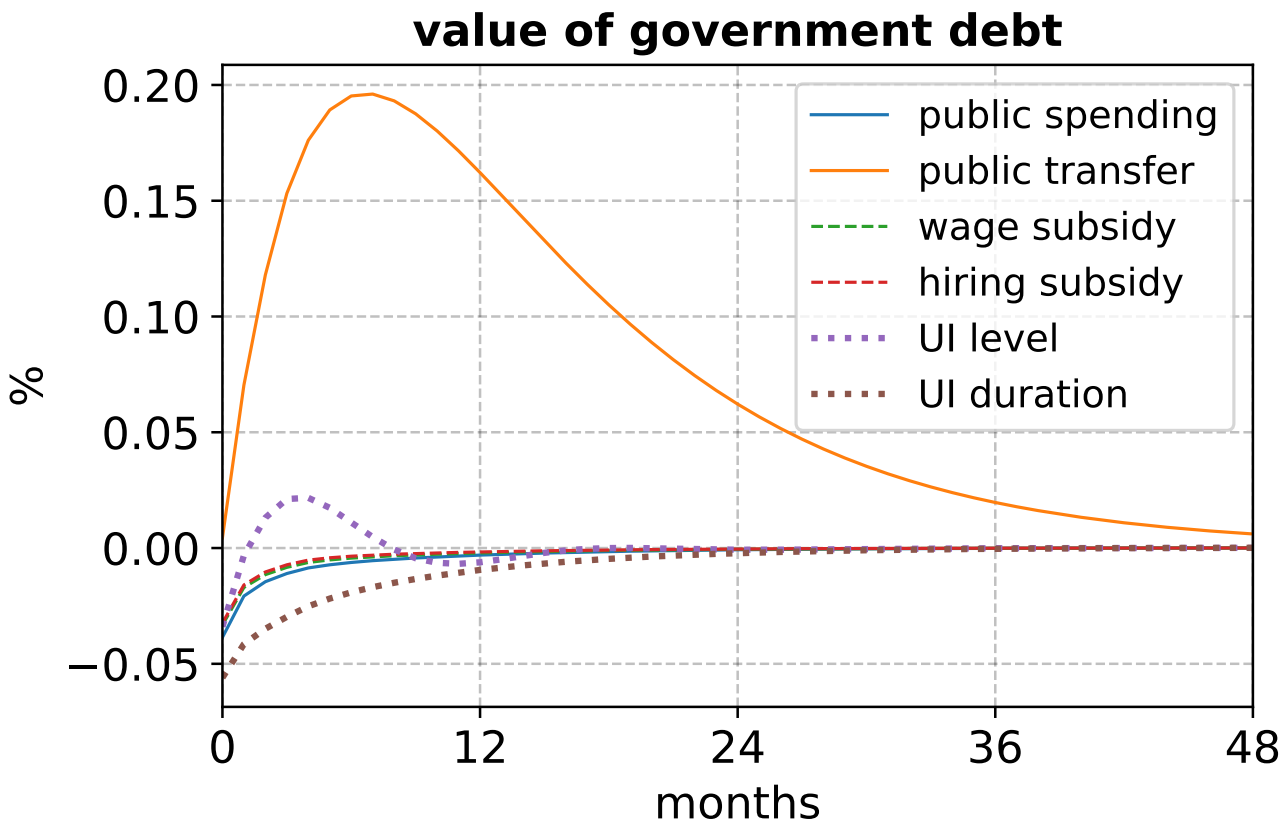
1. Consider the extension of UI duration below
2. Adjust other policy paths to get same unemployment path





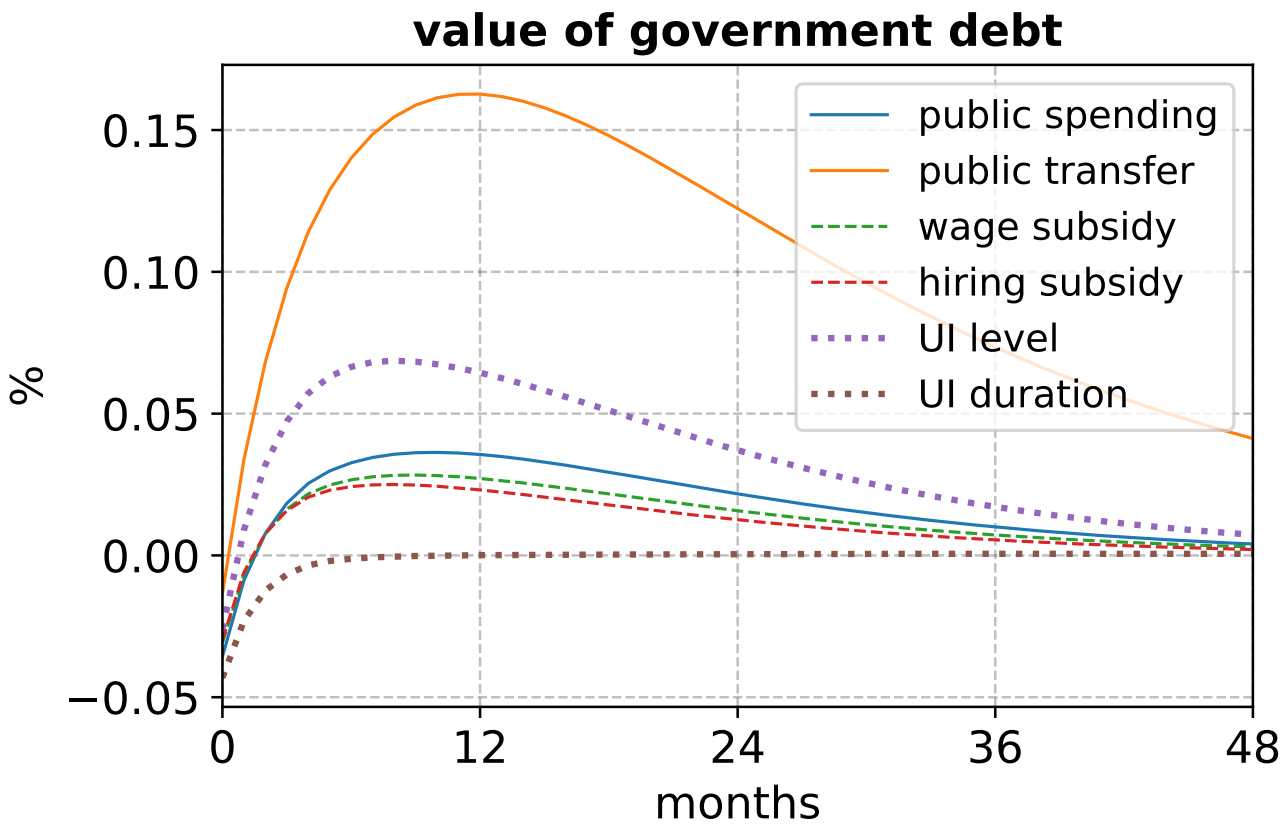
Baseline: UI duration extension is most cost-effective

- **Result:** UI duration extension is most cost-effective in terms of least accumulation of government debt



HtM+Debt: UI duration extension is most cost-effective

- **Result:** UI duration extension is most cost-effective in terms of least accumulation of government debt



Conclusion

Conclusion

1. **Endogenous separations and sluggish entry:** Amplification under flexible prices and shapes unemployment risk
2. **HtM households:** Dampening due to weaker bond demand response, despite larger consumption drop in unemployment
3. **Debt-financing:** Dampening due to stronger bond supply response

   2.+3.: We can have less volatility than with flexible prices

Policy: UI extensions is the most cost-effective fiscal stabilization tool at the margin across range of calibrations

On the agenda:

1. Detailed calibration / estimation
2. Welfare considerations
3. Supply of labor and capital