Fiscal stimulus policies according to HANK-SAM

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Research question and approach

Research question
Which fiscal policies are most cost effective in stabilizing unemployment?

Motivation
Resurgence of countercyclical fiscal policies as stabilization tool

- ▶ Government: expenditures
- ▶ Households: cash transfers $+$ UI increases and extensions
- ▶ Firms: retention and hiring subsidies

Approach
Compute fiscal multipliers for different fiscal policies in an equilibrium model with empirically grounded interaction between firm hiring-and-firing decisions and consumption-saving decisions of households.

Literature

Fiscal multipliers in HANK

Kaplan et al. (2018), Hagedorn et al. (2019), Alves et al. (2020), Carroll et al. (2023)

HANK-SAM

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

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

RANK-SAM: Walsh (2005), Gertler et al. (2008), Trigari (2009), Gali (2010), Ravenna-Walsh (2012), Christiano et al. (2016).

Consumption effects of unemployment (risk): Gruber (1997), Aguiar-Hurst (2005), Eusepi-Preston (2015), Chodorow-Reich-Karabarbounis (2016), Kolsrud et al. (2018), Harmenberg-Öberg (2021), Graves (2022), Ganong-Noel (2019), Ganong et al. (2022).

This paper: Quantitative framework for consumer- *and* firm-side fiscal stimulus:
1. Realistic degree of partial insurance
2. Realistic hiring-and-firing dynamics

Model

Model overview

HA Households facing incomplete markets and endogenous income risk due to time-varying unemployment risk
- Government finances unemployment insurance and other expenditures through taxes and debt issuance

NK Central bank with inflation-targeting Taylor rule, intermediate-goods producers giving rise to a Phillips curve

SAM Frictional labor market with endogenous separations + sluggish vacancy creation

HA block: labor income

Labor income process

A worker either receives wage W, high replacement rate $\overline{\phi}_t$, or low replacement rate $\underline{\phi}$.

Wage A worker earns the wage W if employed

SAM A worker loses her job with probability δ_t, an unemployed worker finds a new job with probability $\lambda_{it}^u = \lambda_t^u s(u_{i,t-1})$; exogenous search intensity $s(\cdot)$ is declining in unemployment duration

UI Unemployment benefits are duration dependent, the worker receives replacement rate $\overline{\phi}_t$ for the first $\overline{u}_t$ months, and subsequently $\underline{\phi}$; with probability π^{UI}, the worker only receives replacement rate $\underline{\phi}$ (limited uptake)

blue denotes fiscal-policy variables

HA block: household problem

Workers consume income hand-to-mouth ($\beta_i = 0$), or self-insure against unemployment risk by accumulating government bonds ($\beta_i > 0$). Both types of workers face the same income process.

Value function (self-insuring worker)

The worker's value function is given by

$$V_t^w(u_{it}, a_{it-1}) = \max_{c_{it}, a_{it}} \frac{c_{it}^{1-\sigma}}{1-\sigma} + \beta_i \underline{V}_{t+1}^w(u_{it}, a_{it}),$$
$$\text{s.t. } a_{it} + c_{it} = R_t^{\text{real}} a_{it-1} + (1-\tau_t) y_t(u_{it}) + Div_t + T_t.$$
$$a_{it} \geq 0.$$

The worker receives labor income net of taxes $(1-\tau_t) y_t(u_{it})$, dividends from firm ownership Div_t, and (potentially) a transfer from the government T_t.

HA block: government

▶ The government raises taxes, issues bonds and spends funds on unemployment insurance, government consumption, universal transfers to all households, retention subsidies to matched firms, and hiring subsidies to newly formed matches.

▶ Long-term bonds: one unit of government bonds is a promise to a sequence of geometrically decaying coupon payments, paying out δ_q^{k-1} units of consumption k periods into the future.

SAM block

Separation decision

A firm must pay continuation cost $\chi \sim G \Rightarrow$ cutoff $\chi_{c,t}$. Resulting Bellman equation:

$$V_t^j = P_t^X Z_t - W + \text{retention subsidy}_t + \beta^{\text{firm}} \mathbb{E}_t \left[\int^{\chi_{c,t+1}} (V_{t+1}^j - \chi_{t+1}) dG(\chi_{t+1}) \right].$$

Functional-form assumption on G: $\delta_t = \delta_{ss} \left(\frac{V_t^j}{V_{ss}^j} \right)^{-\psi}$.

Vacancy-creation decision

Mass F of entrants draw entry cost $c \sim H$. Bellman equation for vacancy value:

$$V_t^v = -\kappa + \lambda_t^v (V_t^j + \text{hiring subsidy}_t) + (1 - \lambda_t^v)(1 - \delta_{ss})\beta^{\text{firm}} \mathbb{E}_t[V_{t+1}^v].$$

Functional-form assumption on H: entrants $\iota_t = \iota_{ss} \left(\frac{V_t^v}{V_{ss}^v} \right)^{\xi}$.

Key parameters: elasticities ψ, ξ of separations and vacancy creation

Model mechanism

Model mechanism

▶ One simplifying assumption: Profits are consumed by hand-to-mouth capitalists
($\rightsquigarrow$ profits from NK and SAM blocks do not enter HA block)

▶ With these assumptions, the three blocks interact in a transparent manner
$\rightsquigarrow$ can summarize model with flow chart ("directed graph")
$\rightsquigarrow$ propositions
$\rightsquigarrow$ heuristics for interpreting the quantitative results

Model overview – under profit assumption
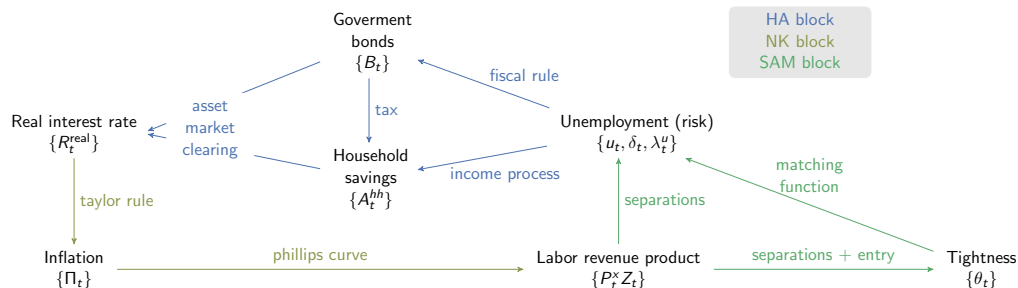
Sequence-space Jacobian summary of model

The model is summarized by three linear operators M_{HA}, M_{NK} and M_{SAM}:

$$\mathbf{s} = M_{SAM}(\mathbf{p^x} + \mathbf{z}), \qquad \mathbf{r}^{real} = M_{HA}\mathbf{s}, \qquad \mathbf{p^x} = M_{NK}\mathbf{r}^{real}.$$

Boldface: vectors of paths, $\mathbf{x} = [x_0, x_1, \ldots]$. Note: not a DAG, cyclical feedback loop.
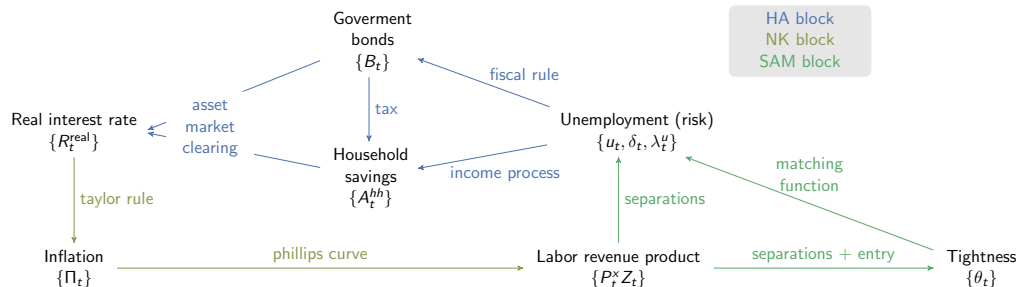
Model overview – under profit assumption
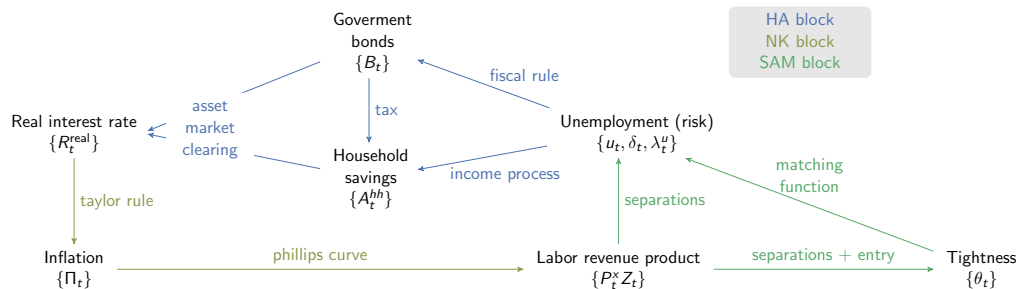
Proposition (unemployment response to a productivity shock)

The response of unemployment is given by

$$\mathbf{u} = M_u(I - M_{\mathsf{SAM}}M_{\mathsf{NK}}M_{\mathsf{HA}})^{-1}M_{\mathsf{SAM}}\mathbf{z}$$

where M_u is given by the relation $\mathbf{u} = M_u\mathbf{s}$.
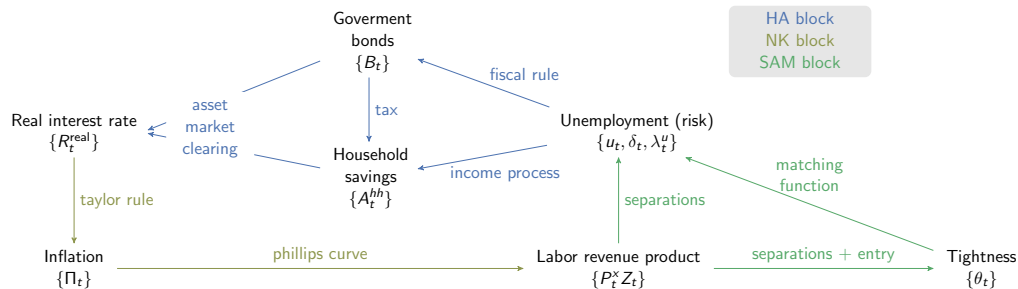
Model overview – under profit assumption

Proposition (unemployment response to a government-expenditure shock)

The response of unemployment is given by

$$\mathbf{u} = M_u(I - M_{\mathsf{SAM}} M_{\mathsf{NK}} M_{\mathsf{HA}})^{-1} M_{\mathsf{SAM}} M_{\mathsf{NK}} M_g \mathbf{g}$$

where M_g is the partial-equilibrium response of the real interest rate to $\mathbf{g}$.

Model overview – under profit assumption

Heuristics for quantitative policy evaluation

▶ The comparison of demand-side (HA) policies is insensitive to M_{NK}, M_{SAM}.

▶ The comparison of supply-side (SAM) policies is insensitive to M_{HA}, M_{NK}.

▶ The comparison of demand-side vs. supply-side policies depends on all blocks (including M_{NK})

Calibration

Calibration: key targets

Heterogeneous-agent block

Match (i) consumption drop upon unemployment and (ii) upon unemployment-benefits expiration.

- ▶ MPC untargeted but reasonable (0.41 quarterly)

unemployment insurance   consumption profile upon unemployment   duration-dependent job-finding rate

Search-and-matching block

Match aggregate facts on (i) the contribution of separation rate and job-finding rate to unemployment dynamics and (ii) that separations lead the job-finding rate *with* the elasticities of separations and vacancies to profitability.

- ▶ Data in favor of departure from standard DMP model: low elasticity of vacancy creation, positive elasticity of separations.

dynamics of job-finding rate and separations

New-Keynesian block: standard values

Comparison with RA and standard DMP
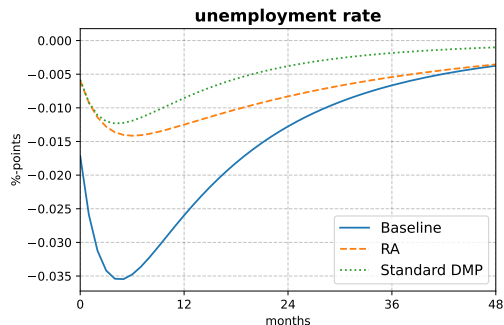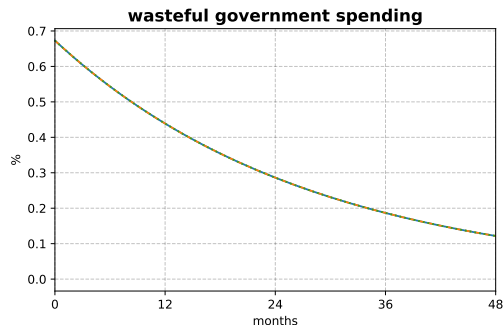
- ▶ RA: replace heterogeneous-agent block with a representative agent
- ▶ Standard DMP: replace our labor-market calibration with standard DMP calibration (exogenous separations, infinitely elastic vacancy creation)
- ▶ Both the calibrated HA block and the calibrated SAM block amplify fiscal multipliers

Results

Policy experiments

- Compare public spending, household transfer, UI level increase, UI duration extension, retention subsidy, hiring subsidy
- Fix path of unemployment, compare tax expenses
- Cumulative fiscal multiplier: $\sum d\text{output}_t / \sum d\text{taxes}_t$

Results: large variation in fiscal multipliers
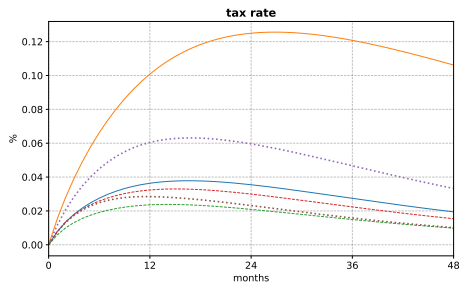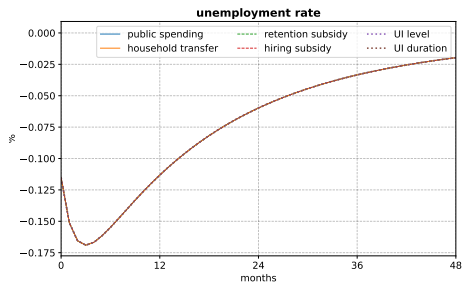
- Same unemployment path engineered with the six different policies
- Large variation in tax expenses ⤳ large variation in fiscal multipliers

Results: large variation in fiscal multipliers
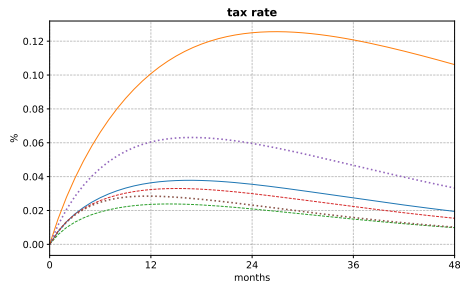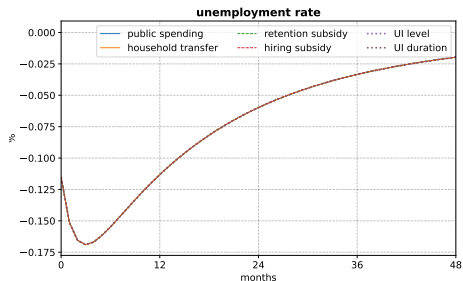
Fiscal multipliers

	HA/demand				SAM/supply	
	G	**transfer**	**UI level**	**UI duration**	**retention**	**hiring**
baseline	0.60	0.11	0.25	0.60	1.02	0.70

Results: calibration matters, but cross-block dependence is small

Relative fiscal multipliers and the labor market

		HA/demand			SAM/supply	
	G	**transfer**	**UI level**	**UI duration**	**retention**	**hiring**
baseline	1.0 [0.60]	0.19	0.41	1.00	1.72	1.17
free entry	1.0 [0.37]	0.21	0.43	1.00	1.62	1.84
exo. sep.	1.0 [0.13]	0.22	0.46	1.00	1.52	4.26

▶ Relative fiscal multipliers of demand-side policies insensitive to labor-market calibration

▶ Retention subsidies are powerful in our calibration since vacancy creation is inelastic and separations are elastic (compared to DMP)

Results: calibration matters, but cross-block dependence is small

Relative fiscal multipliers and liquidity

		HA/demand			SAM/supply	
	G	**transfer**	**UI level**	**UI duration**	**retention**	**hiring**
baseline	1.0 [0.60]	0.19	0.41	1.00	1.72	1.17
$A/Y = 3.623$	1.0 [0.53]	0.10	0.23	0.49	1.77	1.20
$A/Y = 1.228$	1.0 [0.73]	0.33	0.71	2.06	1.70	1.16

- ▶ Relative fiscal multipliers of supply-side policies insensitive to consumption-savings calibration
- ▶ With less liquidity, demand stimulus policies are more potent
- ▶ (not shown) More hand-to-mouth households *lowers* fiscal multipliers (less response to risk)

Results: efficacy of firm-side policies depends on the MPC of capitalists

Relative fiscal multipliers and firm ownership

		HA/demand			**SAM/supply**	
	G	**transfer**	**UI level**	**UI duration**	**retention**	**hiring**
baseline	1.0 [0.60]	0.19	0.41	1.00	1.72	1.17
0.5 div. to PIH	1.0 [0.56]	0.18	0.40	0.96	1.43	0.87
0.5 div. to PIH†	1.0 [0.75]	0.18	0.39	1.00	1.56	0.76

†: recalibrated model

- ▶ The efficacy of firm policies depends on the MPC of capitalists
- ▶ With dividends distributed to permanent-income households, the fiscal multipliers of firm subsidies are lower

Conclusion

Conclusion

- ▶ The fiscal multipliers for different fiscal policies depend on the entire structure of the economy...
- ▶ ...but the comparison of demand-side policies is largely insensitive to assumptions on the supply side, and vice versa
- ▶ Retention subsidies are a potent policy in our framework
    - ▶ Data: vacancies are "sluggish" $\Rightarrow$ better to target separations

## Unemployment insurance

US-style duration-dependent UI system:

- ▶ High replacement rate, 0.76, first 6 months
- ▶ Low replacement rate, 0.55, after 6 months
- ▶ With probability 0.52, households receive low UI immediately

(matching household income during unemployment spell, and share of unemployed with unemployment benefits)

Consumption upon unemployment

▶ **Stylized fact #1:** Consumption $\approx$ 20% lower for unemployed (Chodorow-Reich-Karabarbounis, 2016)

▶ **Stylized fact #2:** Drop at UI exhaustion of $\approx$ 45% of income drop (Ganong-Noel, 2019)
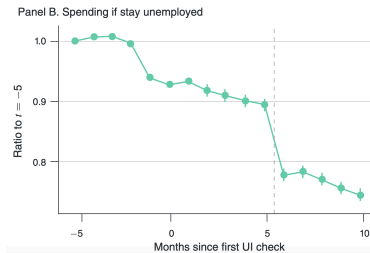
Source: Ganong-Noel (2019)

Household preferences and consumption upon unemployment

1. **Share of HtM households**: Consumption drop at expiration of UI
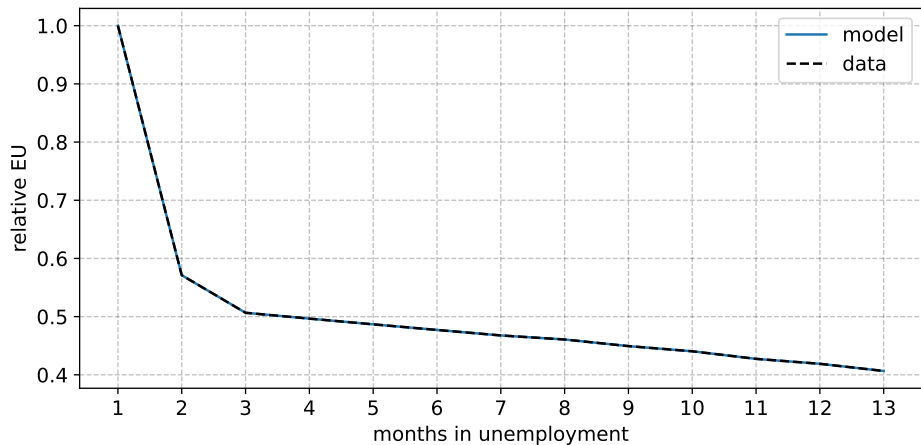2. **Discount factor**, β: Consumption drop during unemployment
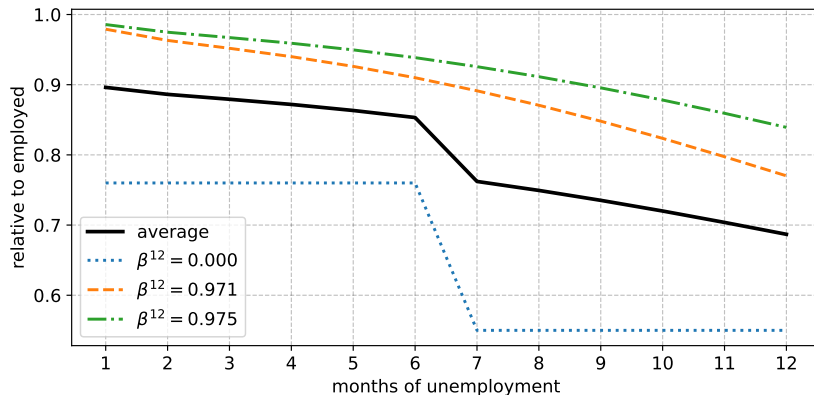
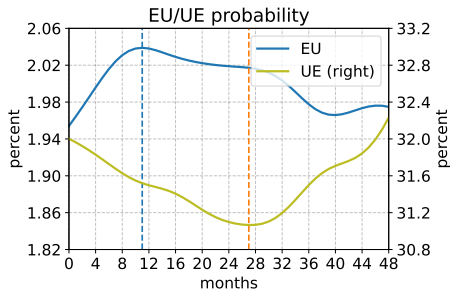**Note:** Calibration implies quarterly MPC at 41 % (in line with Johnson-Parker-Souleles, 2001). back

Relative job-finding rates

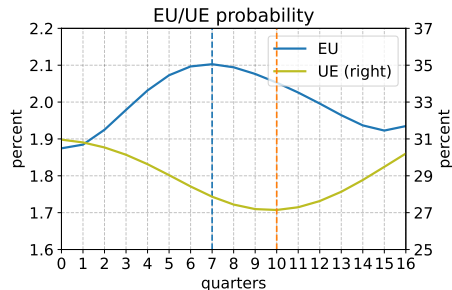**Job-finding rate relative to first month in unemployment:**
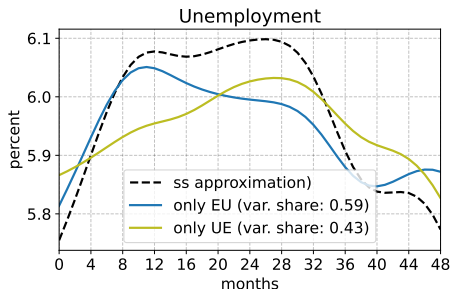
Separation rate leads job-finding rate

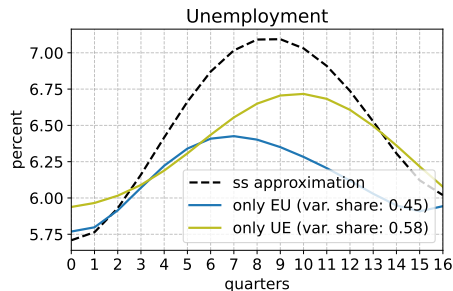**Source:** CPS 1967-2020; Romer-Romer MP shock; Fernald TFP shock.

Stylized Fact #3: *Separation rate leads job-finding rate by 9-16 months.*

Separation rate accounts for substantial share of unemployment

Monetary policy shock

Unemployment

- - - ss approximation)
— only EU (var. share: 0.59)
— only UE (var. share: 0.43)

TFP shock

Unemployment

- - - ss approximation
— only EU (var. share: 0.45)
— only UE (var. share: 0.58)

Source: CPS 1967-2020; Romer-Romer MP shock; Fernald TFP shock.

Stylized Fact #4: *Separations account for 40-60 percent of unemployment response.*

back