

Fiscal Management of Aggregate Demand: The Effectiveness of Labor Tax Credits

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- Design of counter-cyclical policies
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Mertens and Ravn (2013), Zidar (2019)
- A policy-driven approach
 - Quantitative HANK model
 - Effectiveness of various fiscal stabilization packages after a negative demand shock

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- Standard HANK model with three additional components
 - Heterogeneous stochastic discount factors → heterogeneous mpc
 - An extensive labor supply margin → heterogeneous labor elasticities
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⇒ Relevant framework to quantify fiscal stabilization packages

- Demand-driven recession
 - Negative shock to marginal utility: unexpected, deterministic, transitory

Fiscal Stabilization Packages

- Three fiscal stabilization packages

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 - Targeted-Transfer (TT) Package: a transfer targeted to low-income households

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 - Targeted-Transfer (**TT**) Package: a transfer targeted to **low-income** households
 - Unemployment Insurance (**UI**) Package: a transfer to **unemployed** households

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- Output multiplier above 0.9, compared to ≈ 0.6 for UI & 0.4 for TT
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- Robustness and implementability

- Other fiscal packages: Consumption tax cuts?

Literature

- Effects of **monetary policy** and **government spending** in HANK models

Kaplan, Moll, and Violante (2018), Hagedorn, Manovskii, and Mitman (2019), Bilbiie (2020), Auclert, Rognlie, and Straub (2023), Ferriere and Navarro (2024), Alves and Violante (2023)

- Quantitative effects of **UI extensions** in recessions

Mitman and Rabinovich (2015), Kekre (2022), Gorn and Trigari (2024), Bardoczy and Guerreiro (2023), Broer, Druedahl, Harmenberg, and Oberg (2024)

- **Optimal** fiscal and monetary policy in HANK

Bhandari, Evans, Golosov, and Sargent (2021), Le Grand and Ragot (2024), McKay and Wolf (2023)

- Stabilization and **labor taxes** in HANK

Broer et al. (2025), Le Grand, Ragot and Bourany (2024)

Environment

A HANK model with some twists

■ Households

- Bond economy with borrowing constraint
- Stochastic discount factors
- Indivisible labor choice
- Idiosyncratic labor productivity shocks + unemployment shocks

■ NK block with sticky prices

- Linear technology in labor
- Monetary authority implements a standard Taylor rule

■ Government

- Finances spending, transfers, and UI benefits with debt, labor taxes, and capital taxes

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Working households

- Individual **state**: asset a , discount factor β , productivity x , and employment $\eta \in \{e, u\}$

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- Value function when employment is $\eta = e$

$$V_t(a, x, e, \beta) = \max_{c, h, a'} \{ \log c - Bh + \beta \mathbb{E}_t [V_{t+1}(a', x', \eta', \beta') | x, \beta, e] \} \quad \text{s.t.}$$

$$c + a' = a + y^\ell + y^k - \mathcal{T}_t(y^\ell, y^k) + T_t + d_t^h(x),$$

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- **Preference shock** on discrete labor choice, distributed **Gumbel** with variance ρ_h
+ $\rho_h \geq 0$ calibrated to discipline labor elasticities

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+ $\rho_h \geq 0$ calibrated to discipline labor elasticities
- AR(1) process for **discount factor**, **productivity** and **employment** status
- Flat capital tax τ^k , **progressive** loglinear **labor** tax (λ_t, τ^ℓ)

Heathcote, Storesletten, and Violante (2017)

Households

Unemployed households

- Value function when in unemployment island $\eta = u$

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- Unemployment benefits function of hourly wage

Kekre (2022)

$$\mathcal{B}_t(w_t x) = \zeta \min(\mathcal{R} w_t x \bar{h}, \overline{ui}) + \chi w_t x \bar{h}$$

+ ζ to match fraction of recipients, \mathcal{R} the replacement rate, \overline{ui} the UI cap

+ χ to capture household labor income received while in unemployment

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Firms

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 - Sticky prices a la Rotemberg

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$$G_t + (1 + r_t)D_t + T_t + \int \mathcal{B}_t(w_t x) d\mu_t = D_{t+1} + \int \mathcal{T}_t(y_t^\ell, y_t^k) d\mu_t$$

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- Fiscal rule with parameter Φ_D for public debt, λ_t clears the budget constraint

Uhlig (2010)

- $\Phi_D = 0$ for constant debt, all adjustment in tax level
- $\Phi_D = 1$ for constant taxes, all adjustment in debt

Calibration

Steady State

Households

- Quarterly model calibrated to liquid wealth

Steady State Households

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- Stochastic $\beta \in \{\bar{\beta} - \Delta, \bar{\beta}, \bar{\beta} + \Delta\}$, duration of 50 years Krusell and Smith (1998)
 - $\bar{\beta}$ s.t. $r \equiv 3.5\%$ annually
 - Δ s.t. top-quintile liquid wealth $\approx 90\%$ (SCF)

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- Labor supply decisions
 - B to match employment $\approx 78\%$
Jang, Sunakawa, and Yum (2023)
 - ρ_h to match annual labor elasticity of ≈ 0.5 for the bottom quartile
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Triest (1990), Eissa and Liebman (1996), Kleven and Kreiner (2006), Meghir and Phillips (2010)

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Triest (1990), Eissa and Liebman (1996), Kleven and Kreiner (2006), Meghir and Phillips (2010)
- Productivity $(\rho_x, \sigma_x) = (0.989, 0.287)$
Chang and Kim (2007)

Steady State

Firm and government

- Technology: $\varepsilon = 7$, $\Theta = 200 \rightsquigarrow$ Phillips curve slope $\varepsilon/\Theta = 0.035$

Galí and Gertler (1999)

- Dividends redistributed linearly in x : $d_t(x) = \bar{d}_t x$

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Chen, Imrohoroglu, and Imrohoroglu (2007), Heathcote, Storesletten, and Violante (2017), Ferriere, Grübener, Navarro, and Vardishvili (2023)

- Spending $G/Y = 10\%$, transfers $T/Y = 8\%$, debt $D/Y = 100\%$

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 $\chi = 0.15$ to match $C_u/C_e \approx 75\%$

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- Automatic responses: $\Phi_\Pi = 1.5$, $\Phi_D = 0.75$

Steady State Unemployment

- Job finding rates and separation rates across hourly wage distribution

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- Job finding rates are constant in the distribution distribution

Mueller (2017)

- Monthly finding rate of 0.32 $\Rightarrow \pi_{\eta}(e|u) = 0.691$

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- Separation rates falling in hourly wage/productivity x

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- Monthly separation rates of $\approx 1.4\%$ and 0.7% below and above median, respectively

$$\Rightarrow \pi_{\eta}(u|e, x) = \phi_0 x^{\phi_1}, \text{ with } \phi_0 = 0.029 \text{ and } \phi_1 = -0.446$$

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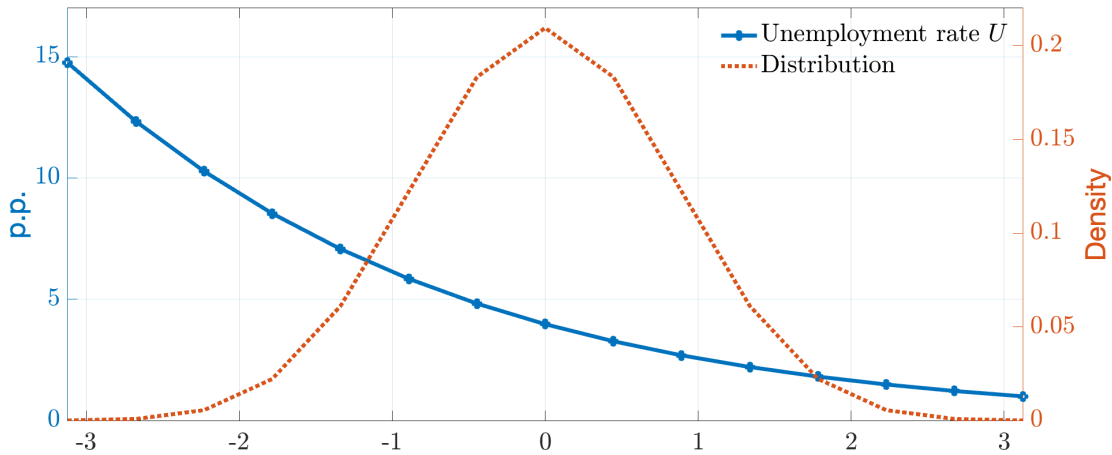
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- **Average unemployment rate** at 4.3% with unequal incidence in the distribution

Steady State Unemployment in the Distribution



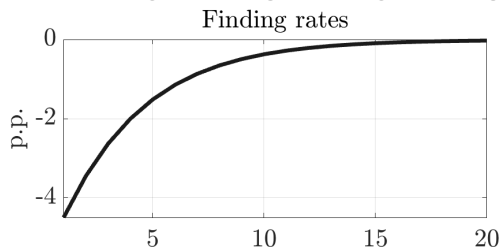
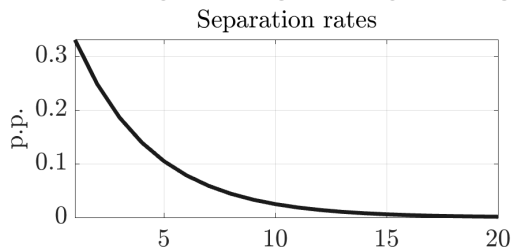
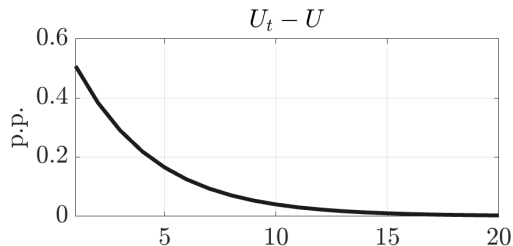
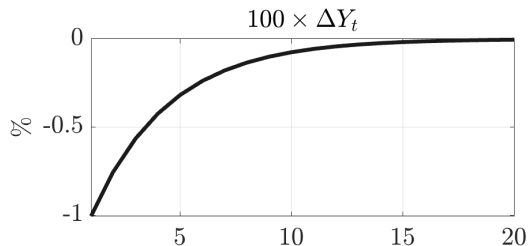
Unemployment and the Business Cycle

- **Okun's law** type of relation between output and unemployment
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Ball, Leigh, and Loungani (2017)

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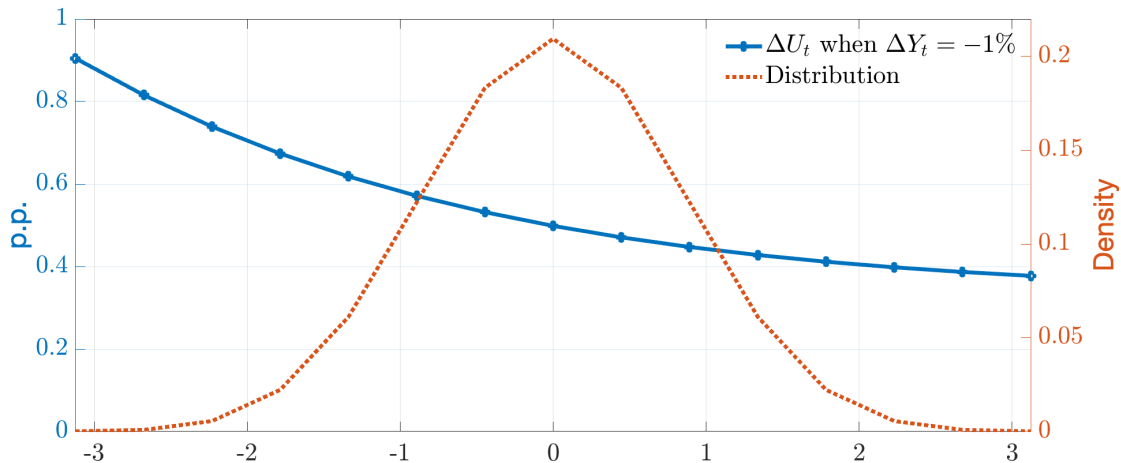
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- **Job finding rates** increase with ΔY_t
 - **Elasticity** of job finding rates to aggregate unemployment of -0.6
Mueller (2017)
 - + Homogeneous increase in job finding rates
- **Job separation rates** decrease with ΔY_t
 - **Elasticity** of separation rates to aggregate unemployment **larger for above-median workers**
Mueller (2017)
 - + Homogeneous additive increase in separation rates

Unemployment and the Business Cycle Okun's law



Unemployment and the Business Cycle

Okun's law



Investigating the Calibration

Household responses

■ Labor elasticities decline with income

Triest (1990), Eissa and Liebman (1996), Kleven and Kreiner (2006), Meghir and Phillips (2010), ...

- Compute labor responses to a 1% change in after-tax rate: **average** annual **elasticity** at **0.30**

Erosa, Fuster, and Kambourov (2016)

Income quartile	1	2	3	4
Labor elasticity	0.44	0.34	0.25	0.22

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■ Marginal propensities to consume (mpc) Parker, Souleles, Johnson, and McClelland (2013), Kaplan and Violante (2014), ...

- Compute mpc out of a \$500 rebate: **average** quarterly **mpc** at **0.13**
- **Decline with wealth**: from 0.20 to 0.03 from 1st to 4th wealth quartile
- Larger for **unemployed** at **0.32**, consumption drops by 10% when falling into unemployment
Saporta-Eksten (2014), Ganong and Noel (2019)

Investigating the Calibration Tax shocks

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- Compute tax multipliers as in Mertens and Ravn (2013)
 - Tax multiplier at about 0.6 in the model, vs. above 2 in the data
 - Peaks on impact in the model, at 3 quarters in the model

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Tax shocks

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 - Tax multiplier at about 0.6 in the model, vs. above 2 in the data
 - Peaks on impact in the model, at 3 quarters in the model
- Replicate a tax shock on bottom-90 vs. top-10 as in Zidar (2019)
 - Tax cut on bottom-90 increases employment by 1% in the model vs. above 3% in the data
 - Tax cut on the top-10 has no effects
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Investigating the Calibration Tax shocks

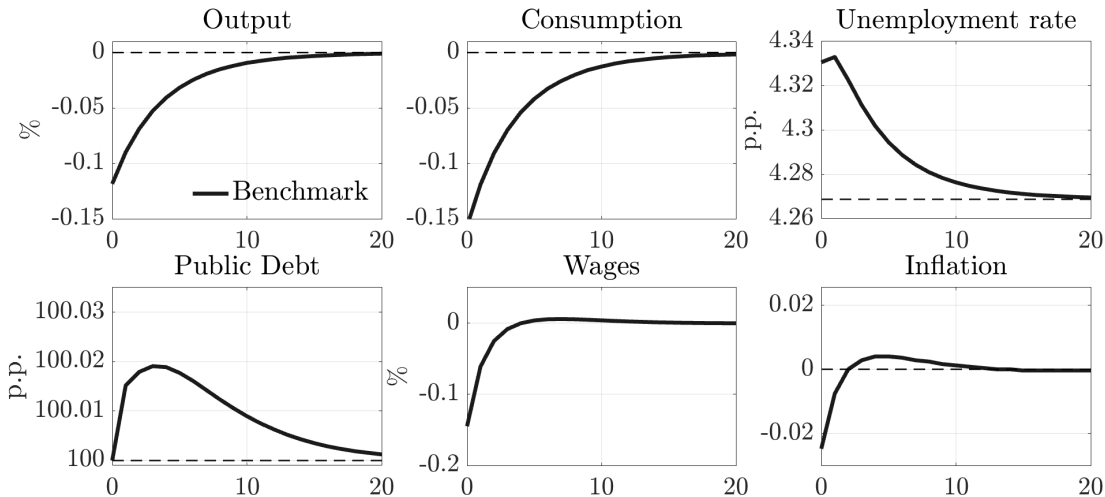
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 - Peaks on impact in the model, at 2 years in the model
- ⇒ Conservative calibration regarding tax responses

Recession

Benchmark No Fiscal Stabilization

- Recession induced by a negative demand shock: $(1 - \omega_t)u(c_t, n_t)$
 - ω_0 such that $\Delta Y_t = -0.1\%$ on impact
 - Reverts to $\omega = 0$ with persistence $\rho_\omega = 0.75$ at the quarterly level
- Unexpected, transitory, perfect foresight: a 'MIT' shock

Benchmark No Fiscal Stabilization



Three Fiscal Stabilization Packages TT Package

■ A Targeted Transfer (TT) Package

- Design to mimic checks sent in 2008: For all low-income households, based on last-year income
- An “automatic stabilizer” flavor: Phase out over time with persistence ρ_ω

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- An “automatic stabilizer” flavor: Phase out over time with persistence ρ_ω
- Temporary transfer modeled as a **logistic** function

Ferriere, Grübener, Navarro, and Vardishvili (2023)

$$\hat{T}_t(y) = m_t \frac{2 \exp(-\chi y / \bar{y})}{1 + \exp(-\chi y / \bar{y})}, \quad m_t \text{ the transfer at } y = 0, \chi \text{ the phasing-out speed}$$

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+ “Based on **last-year** income”: $\tilde{y}(x, \eta, \beta)$

- **Calibration** such that *total cost* equals a one-time check of \$200 to all households
 - + Initial check at $y = 0$ is $m_0 = \$900$
 - + Quick phase-out at $\chi = 12$: only 20% households receive more than \$50 at $t = 0$

Three Fiscal Stabilization Packages

UI Package

- A Unemployment Insurance (UI) Package
 - A check to **all** unemployed households, phase out with persistence ρ_ω

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 - + Initial check equal to \$1,1000

Three Fiscal Stabilization Packages

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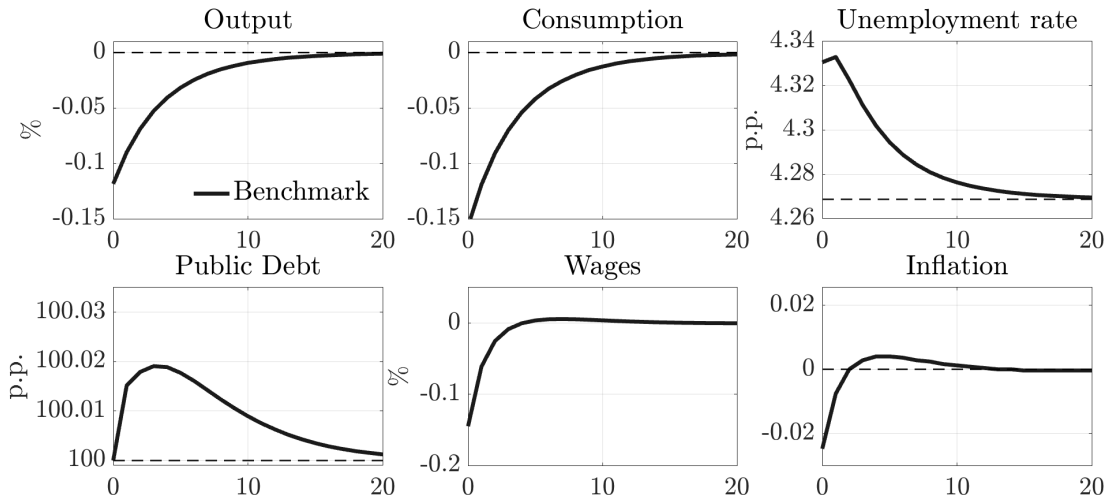
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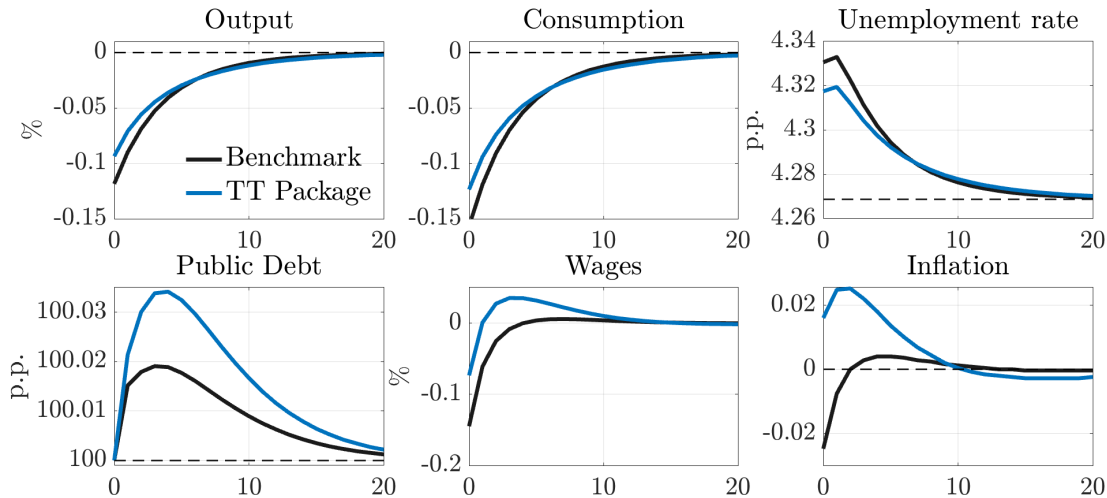
Stabilization Packages

Impulse Response Functions



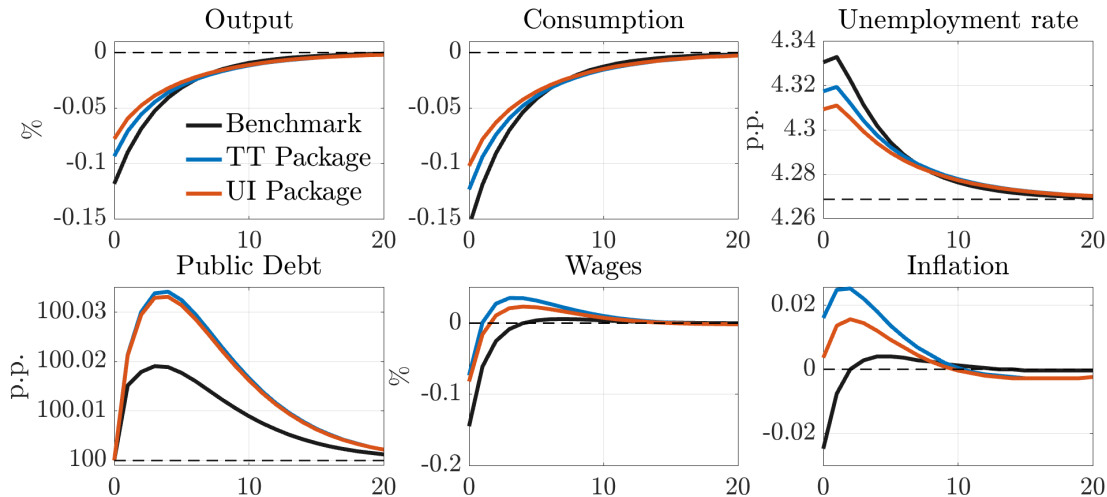
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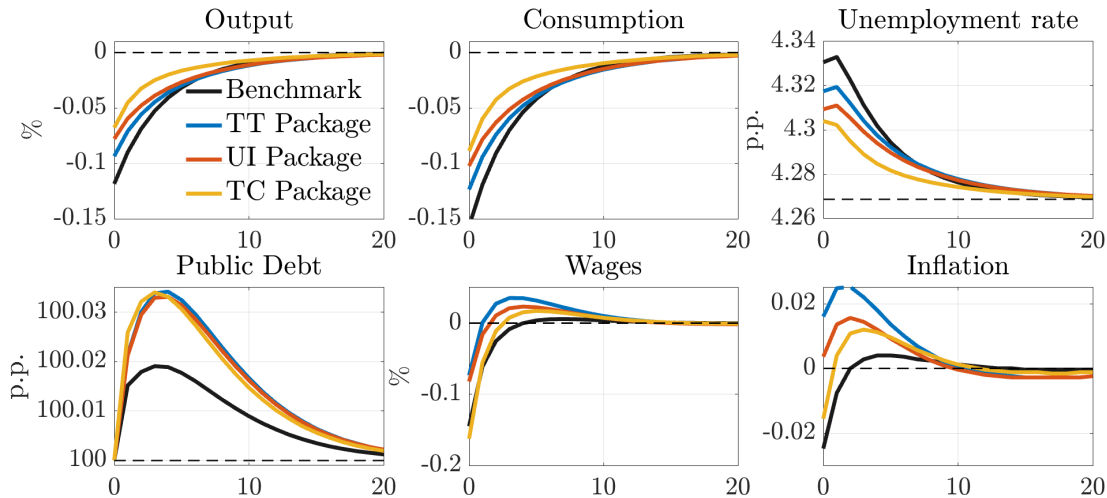
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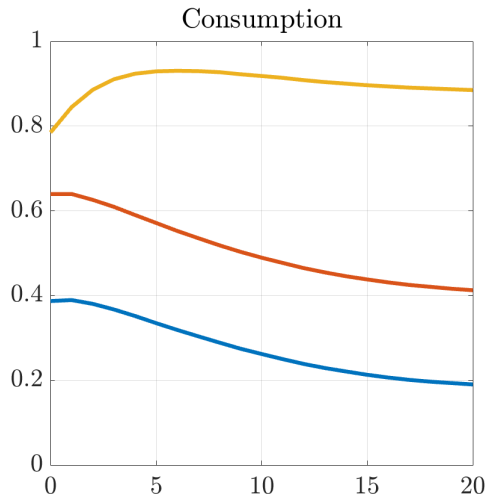
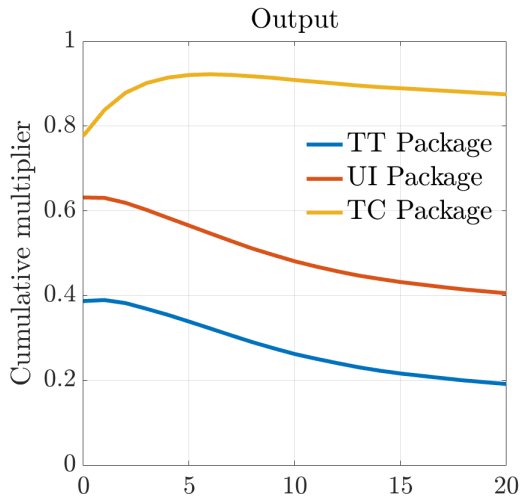


Stabilization Packages

Impulse Response Functions



Stabilization Packages Multipliers



Deeper recession

Stabilization Packages

Decomposition

- Decomposition between *consumption channel* and *labor channel*

Stabilization Packages

Decomposition

■ Decomposition between *consumption channel* and *labor channel*

- Use equilibrium prices and taxes and unemployment risk of the **no-stabilization** benchmark

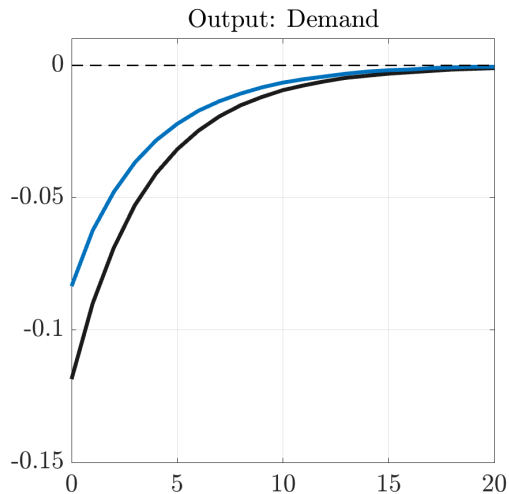
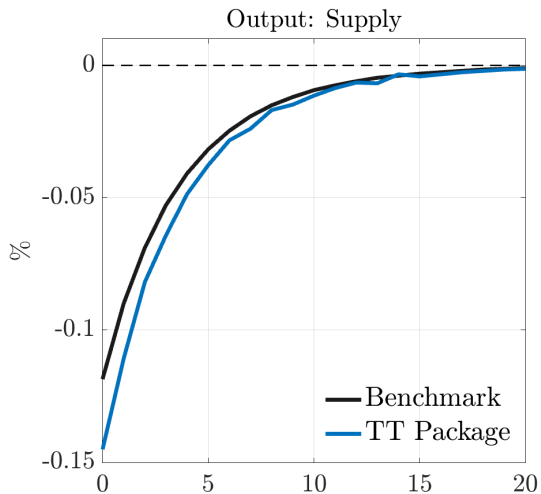
$$\{r_t^b, w_t^b, \lambda_t^b, \pi_{\eta,t}^b, d_t^b\}$$

- Compute for each package TT, UI, TC

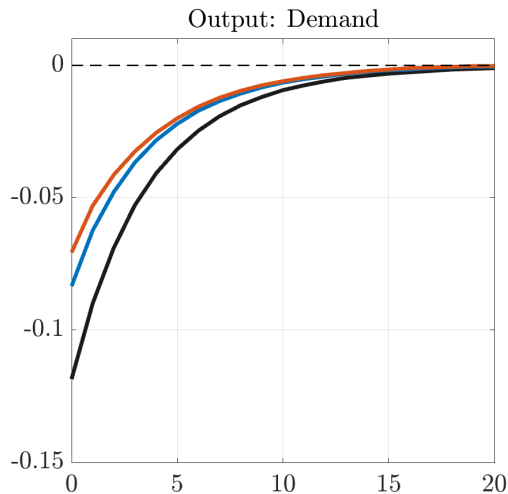
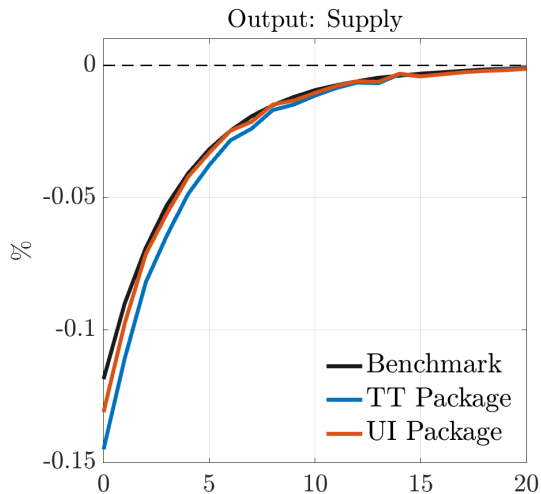
- + **Supply output** $Y_t^s = L_t$ using households' **labor supply** policy

- + **Demand output** $Y_t^d = C_t + \Theta_t + G_t + f$ using households' **consumption** policy

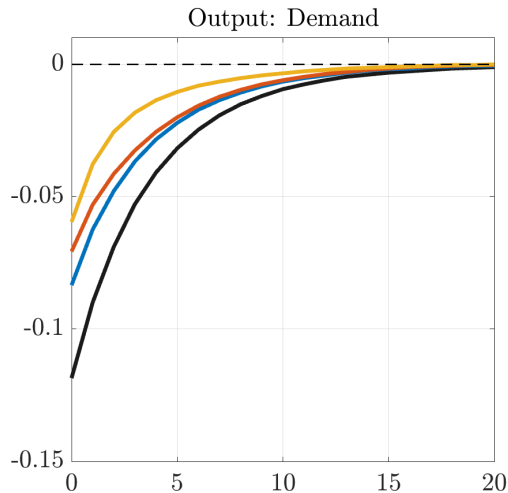
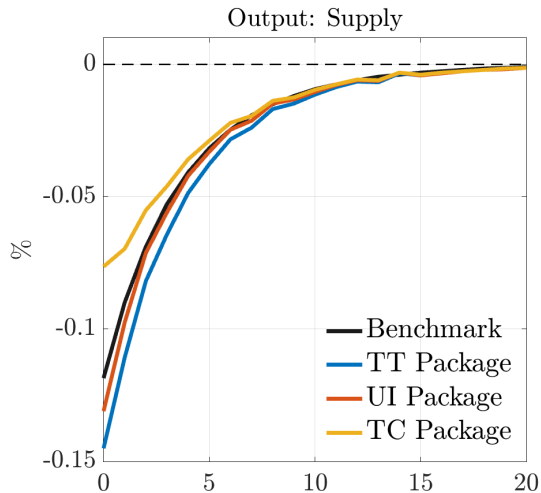
Three Fiscal Stabilization Packages Decomposition



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Investigating the Results

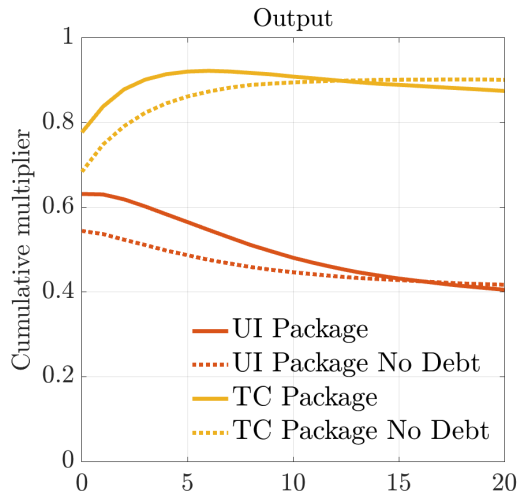
1. Role of public debt
2. Distributional effects across packages
3. Alternative rules for monetary policy
4. Implementability

1. Role of Public Debt

- Compute benchmark and stabilization output paths with **constant debt** $\Phi_D = 0$

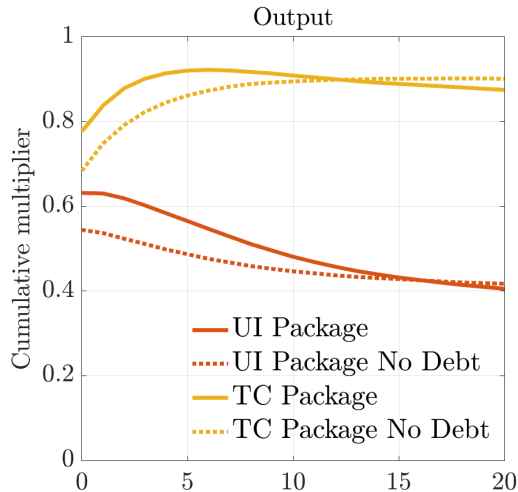
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- TC Package No Debt \equiv temporary shock in labor tax progressivity
 \Rightarrow Stabilizes the economy

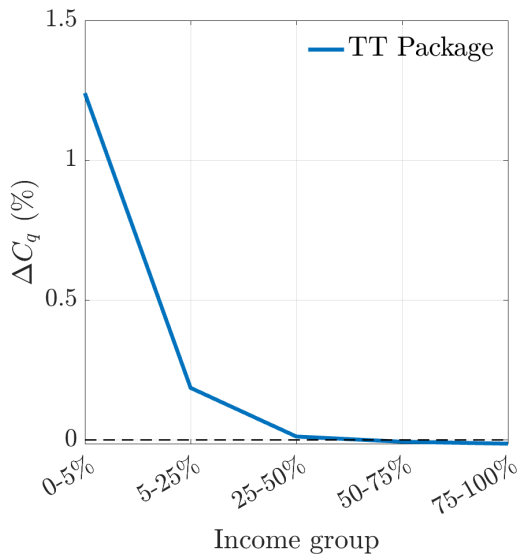


2. Distributional Effects

- Consumption by income group
 - Compare with and without stabilization

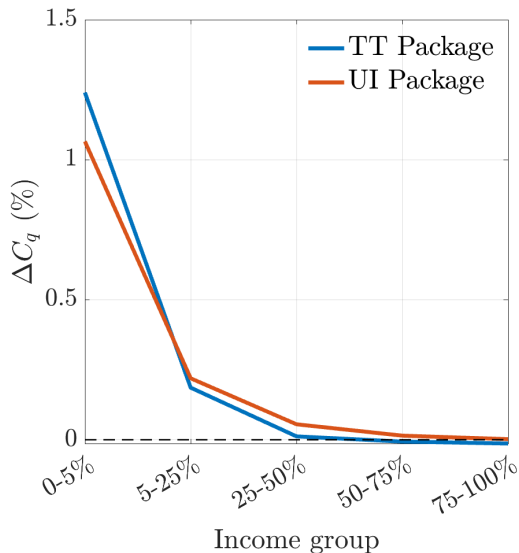
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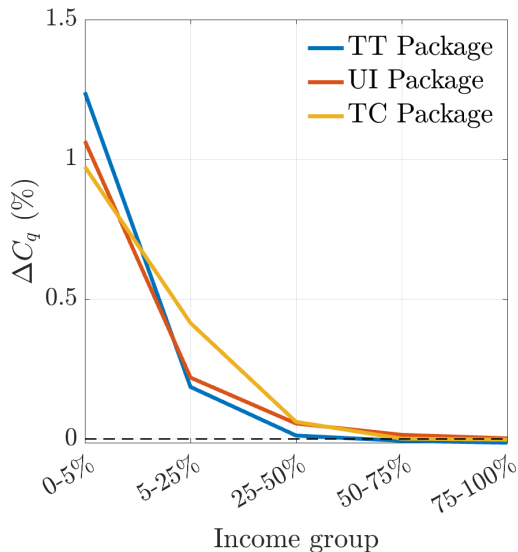
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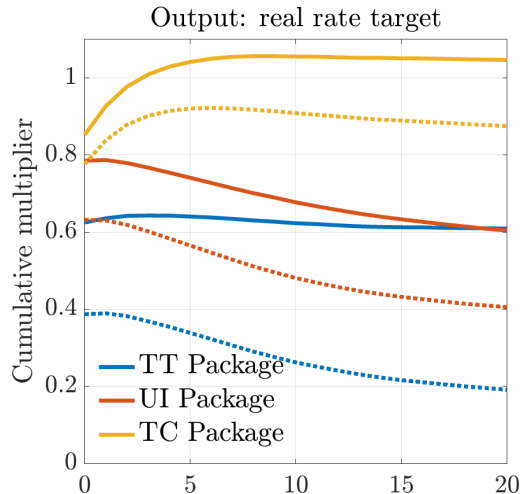


3. Monetary Policy Identical real rate

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- Compare packages under benchmark real rate
- TC package remains most effective
 - Larger multipliers than with Taylor rule
 - Especially for the TT package, less for the TC package



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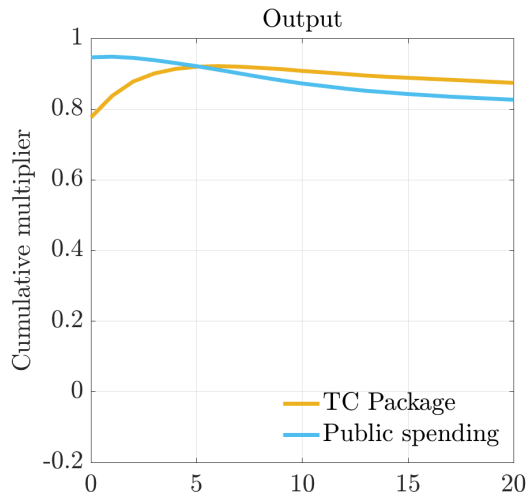
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- A systematic response of the EITC could implement the TC package
- Systematic fluctuations in payroll taxes could implement the TC package
 - Easy to implement, would appear on the paycheck of workers every month

Further Fiscal Packages

- Two other typical fiscal stabilization packages
 - Government spending shock with persistence ρ_w
 - A one-time lump-sum check to all households, of an amount of \$200
- Consumption taxes?

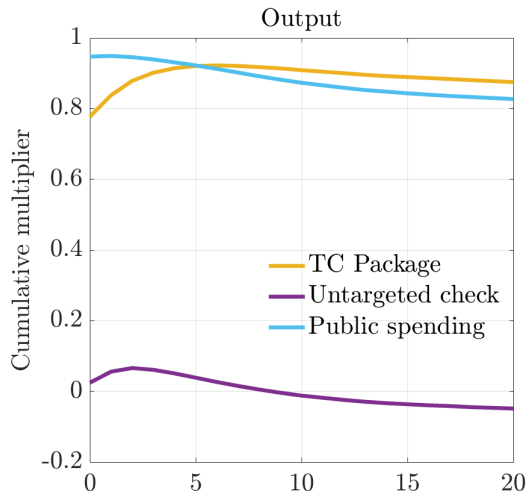
Further Fiscal Packages G and T packages

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 - + ... but negative consumption multiplier



Further Fiscal Packages G and T packages

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 - + ... but negative consumption multiplier
- Lump-sum check has modest stabilization properties



Further Fiscal Packages τ^c package?

- New proposal to use **consumption taxes** as an automatic stabilizer
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- The paths for **prices** (and etc.) are **identical** across the two packages :

$$\{r_t^c, w_t^c, \Pi_t^c, d_t^c, \lambda_t^c, D_t^c\} = \{r_t^g, w_t^g, \Pi_t^g, d_t^g, \lambda_t^g, D_t^g\}$$

- The paths for **consumption** compare as follows:

$$C_t^c = C_t^g + (G_t^g - G_t^c)$$

Further Fiscal Packages Intuition

- With log preferences, using the budget constraint $(1 + \tau_t^c)c + a' = y_t^\ell + y_t^k - \mathcal{T}_t$,

$$V_t(a, x, \cdot) = \max_{h, a'} \{ \log(y_t^\ell + y_t^k - \mathcal{T}_t - a') - Bh + \beta \mathbb{E}_t V_{t+1}(a', x', \cdot) \} - \log(1 + \tau_t^c)$$

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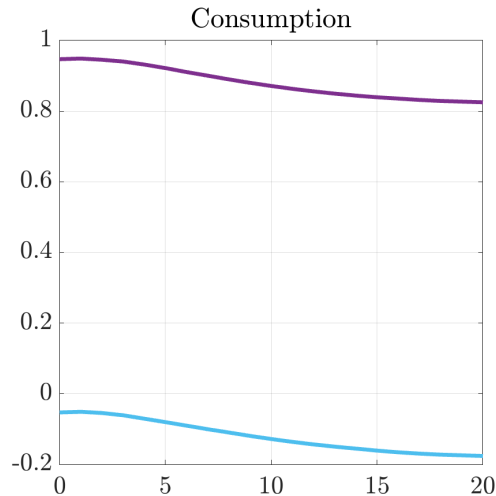
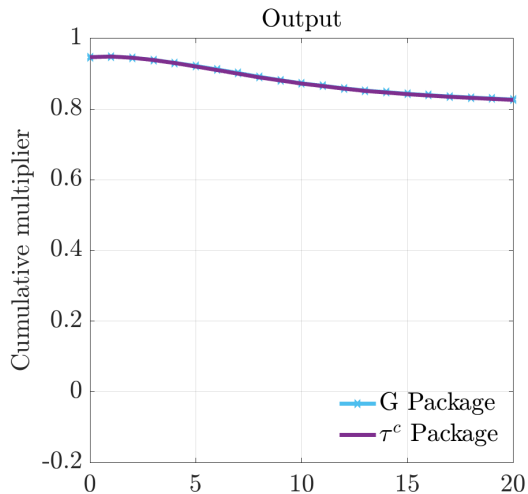
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-
- Robust to: capital, sticky wages, also in RANK, etc.
 - Key assumption: log preferences

Stabilization Packages

Multipliers



Conclusion

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- A temporary increase in labor income tax progressivity can stabilize the economy
 - Operates also through consumption and labor supply responses

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Thank you!

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Fiscal Rule

- Public debt adjusts as a function of Φ_D

$$D_{t+1} = (1 - \phi_D)D + \phi_D \left(\hat{G}_t - \tau^k r_t A_t - \mathcal{R}_t^\ell \right), \text{ where}$$

- \hat{G}_t captures total government expenditures, including debt repayments

$$\hat{G}_t = G_t + T_t + \mathcal{U}_t + (1 + r_t)D_t$$

- \mathcal{R}_t^ℓ captures fiscal revenues at steady-state labor tax schedule

$$\mathcal{R}_t^\ell = w_t L_t - \lambda \int (w_t x h_t(a, x, \eta, \beta))^{1-\gamma} d\mu_t(a, x, \eta, \beta)$$

Dividends

- Assume dividends linearly distributed on x

$$\delta_t = \sum_x \tilde{\delta}_t(x) \pi(x) = \sum_x \left(\frac{\delta_t}{\mathbb{E}[x]} x \right) \pi(x)$$

- Minimize wealth effects of fluctuations in dividends

Farhi and Werning (2020)

Unemployment and the Business Cycle

Okun's law

- Finding and separation rates distribution depend on U_t Mueller (2017)

- Finding rate elasticity decreases homogeneously with ΔY_t

$$\log \pi_{\eta,t}(e|u, x) = \log \pi_{\eta}(e|u) - \log (1 - \bar{\phi}_e \Delta Y_t)$$

- Separation rate elasticity increases with ΔY_t

$$\pi_{\eta,t}(u|e, x) = \pi_{\eta}(u|e, x) - \bar{\phi}_u \Delta Y_t x^{-\phi_{u,x}}$$

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- Joint calibration:

- + $\bar{\phi}_e$ s.t. finding elasticity to $U \approx -0.6$
- + $\phi_{u,x} = 0$ elasticity of separation rates larger for above-median workers
- + $\bar{\phi}_u = 0.33$ to get $c_{OK} = 0.5$

Labor elasticities

Two approaches

- Labor elasticities decline with income
 - Compute labor responses to a temporary tax shock
Erosa, Fuster, and Kambourov (2016)
 - + Annual hours response to a 1% change in after-tax rate for one year
 - + Aggregate labor elasticity is 0.30, declining with income

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- Simulate steady-state model annually and run applied-micro regression

Rogerson and Wallenius (2009), Chang and Kim (2006)

- + Estimate b_1 in $\log h_{in} = b_0 + b_1 \log \tilde{w}_{in} - b_2 \log c_{in} + \varepsilon_{in}$
- + Aggregate labor elasticity is 0.45, declining with income

Labor elasticities

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■ Labor elasticities decline with income

- Compute labor responses to a temporary tax shock

Erosa, Fuster, and Kambourov (2016)

- + Annual hours response to a 1% change in after-tax rate for one year
- + Aggregate labor elasticity is 0.30, declining with income

- Simulate steady-state model annually and run applied-micro regression

Rogerson and Wallenius (2009), Chang and Kim (2006)

- + Estimate b_1 in $\log h_{in} = b_0 + b_1 \log \tilde{w}_{in} - b_2 \log c_{in} + \varepsilon_{in}$
- + Aggregate labor elasticity is 0.45, declining with income

Income quartile	1	2	3	4
Labor elasticity: tax shock	0.44	0.34	0.25	0.22
Labor elasticity: regression	0.56	0.59	0.50	0.26

Marginal propensities to consume

Distribution x wealth

- Marginal propensities to consume decline with wealth

Wealth quartile	1	2	3	4
mpc	0.20	0.15	0.07	0.03

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- Multipliers are **similar** to the baseline

3. Monetary Policy More accommodative policy rule

- Effectiveness of fiscal packages depend on constraints on monetary policy
- Consider a richer Taylor rule:

$$\ln \left(\frac{1 + i_{t+1}}{1 + \bar{i}} \right) = \Phi_{\Pi} \ln \left(\frac{\Pi_t}{\bar{\Pi}} \right) + \Phi_Y \ln \left(\frac{Y_t}{\bar{Y}} \right)$$

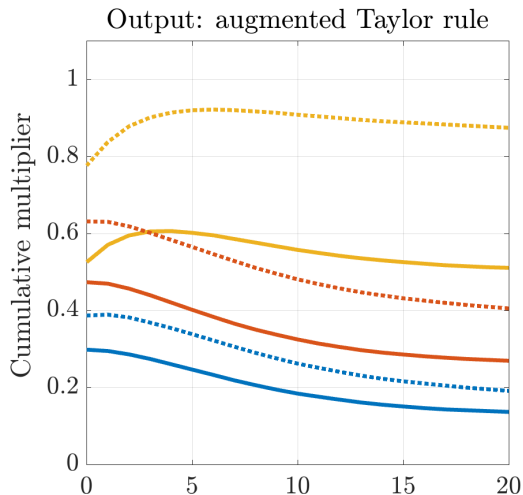
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- TC package remains **most effective**
 - **Lower multipliers** than with Taylor rule



Robustness Steeper labor elasticities

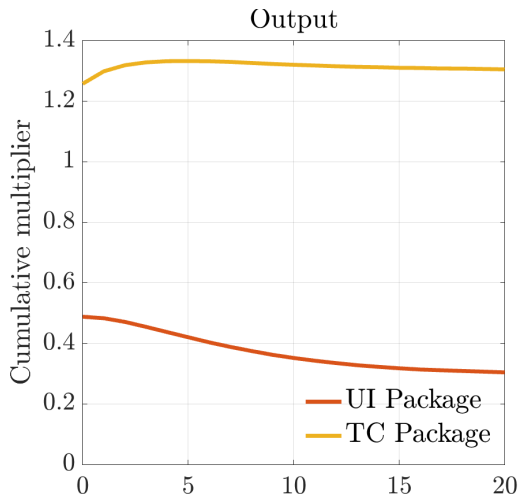
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Mertens and Ravn (2013)
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- TC Package \Rightarrow **large output** multiplier



Robustness

Sticky wages

- Alternative modeling of nominal rigidities with sticky wages

Erceg, Henderson, and Levin (2000) Ferriere and Navarro (2024)

- Two-layer structure with a labor packer and labor unions

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■ Competitive labor packer

- Produces a final labor bundle combining labor from unions $N_t = \left(\int_0^1 n_{kt}^{\frac{\varepsilon-1}{\varepsilon}} \right)^{\frac{\varepsilon}{\varepsilon-1}}$

⇒ Implies labor demand $n_{kt}^d = (W_{kt}/W_t)^{-\varepsilon} N_t$, where $W_t = w_t P_t$

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- Set wages w_t subject to adjustment cost
- Hire households labor in a competitive market at wage rate w_t^h

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■ Theorem: Under linear labor technology, equivalence between price and wage stickiness

■ Labor union maximization problem

$$J_t^w(W_{kt-1}) = \max_{W_{kt}, n_{kt}} \left\{ d_{kt}^w + \frac{1}{1+r_{t+1}} J_{t+1}^w(W_{kt}) \right\} \quad \text{s.t.}$$

$$d_{kt}^w = \left(\frac{W_{kt}}{P_t} - w_t^h \right) n_{kt} - \Theta_t^w(W_{kt}, W_{kt-1}) - f_w$$

$$n_{kt} = \left(\frac{W_{kt}}{W_t} \right)^{-\varepsilon_w} N_t$$

$$\Theta_t^w(W_{kt}, W_{kt-1}) = \frac{\Theta^w}{2} \left(\frac{W_{kt}}{W_{kt-1}} - \bar{\Pi} \right)^2 N_t$$

⇒ Implies a standard **wage Philipps Curve**