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

Axelle Ferriere[1] and Gaston Navarro[2]

[1]PSE, CNRS & CEPR [2]Federal Reserve Board

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- Design of counter-cyclical policies
  - Monetary policy: short-term nominal interest rate
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- A policy-driven approach
  - Quantitative HANK model
  - Effectiveness of fiscal stabilization packages after a negative demand shock

Framework

- Standard HANK model with three additional components
  - Heterogeneous stochastic discount factors $\rightarrow$ heterogeneous mpc
  - An extensive labor supply margin $\rightarrow$ heterogeneous labor elasticities
  - Unemployment risk of heterogeneous incidence & varying with the cycle

$\Rightarrow$ Relevant framework to quantify fiscal stabilization packages

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

Fiscal Stabilization Packages

- Quantify stabilization properties of three packages
  - Targeted-Transfer **(TT)** Package: a transfer targeted to low-income households
  - Unemployment Insurance **(UI)** Package: a transfer to unemployed households
  - Tax Credit **(TC)** Package: a transfer targeted to low-income *working* households

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- Robustness and implementability

Environment

A HANK Model

- Households
  - Bond economy with borrowing constraint
  - Idiosyncratic labor productivity shocks and unemployment shocks
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- Firms with sticky prices
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- Government: fiscal and monetary authorities
  - Fiscal authority finances spending, transfers, UI benefits and debt with labor and capital taxes
  - Monetary authority implements a standard Taylor rule

Households

- Individual state: asset a, discount factor β, productivity x, and employment status η
  - Two "islands": $\eta = u$ when unemployed; $\eta = \ell$ when possibility to work

Households **Working households**

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- Value function when possibility to work $\eta = \ell$

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

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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)

Dividends

Households **Unemployed households**

- Value function when unemployed $\eta = u$

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  - Unemployment benefits function of hourly wage

    Kekre (2022)

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

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

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  - AR(1) process for discount factors, productivity and employment status

Firms and Government

- Standard two-layer structure with a final-good producer and intermediate good producers
  - Sticky prices a la Rotemberg yield standard Philipps Curve

$$\left(\Pi_t - \bar{\Pi}\right)\Pi_t + \frac{\varepsilon - 1}{\Theta} = \frac{\varepsilon}{\Theta} w_t + \frac{1}{1 + r_{t+1}}\left(\Pi_{t+1} - \bar{\Pi}\right)\Pi_{t+1}\frac{Y_{t+1}}{Y_t}$$

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- Fiscal authority faces a standard borrowing constraint

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

  - Fiscal rule with parameter Φ_D for public debt adjustment
    Uhlig (2010)

    + $\Phi_D = 0$: all adjustment in tax level λ_t; $\Phi_D \to 1$: all adjustment in public debt D_t

Fiscal rule

Calibration

Steady State Households

- Quarterly model calibrated to liquid wealth

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- Stochastic β to match wealth inequality
- Labor supply decisions
  - B to match employment rate of 78%, ρ_h to match average annual labor elasticity of 0.3

    Jang, Sunakawa, and Yum (2023), Ferriere and Navarro (2024)

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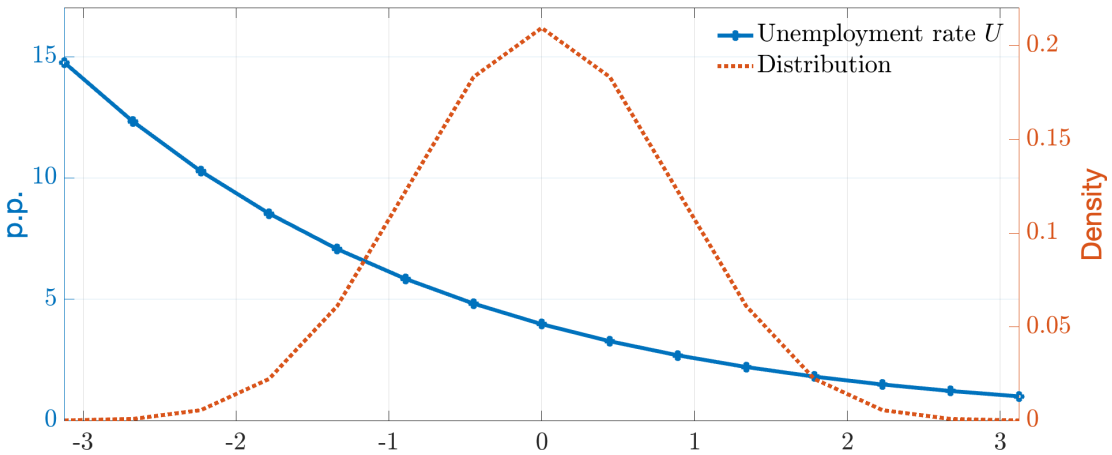
- Productivity $(\rho_x, \sigma_x) = (0.989, 0.287)$

  Chang and Kim (2007)
- Job finding rates constant in hourly wage, separation rates falling in hourly wages

  Mueller (2017)
  - Average unemployment rate at 4.3% with unequal distribution

Unemployment: Functional forms

Steady State Unemployment



Firm and government

- Monetary policy:
  - Slope of the Phillips curve: $(\varepsilon - 1)/\Theta = 0.03$
    Galí and Gertler (1999)
  - Taylor rule coefficient $\Phi_\Pi = 1.5$

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- Fiscal policy:
  - Labor tax progressivity $\tau_\ell = 0.1$, transfers $T/Y = 8\%$
    Heathcote, Storesletten, and Violante (2017), Ferriere, Grübener, Navarro, and Vardishvili (2023)
  - Capital tax $\tau_k = 35\%$, spending $G/Y = 10\%$, debt $D/Y = 100\%$
    Chen, Imrohoroglu, and Imrohoroglu (2007), Ferriere and Navarro (2024)
  - Unemployment benefits: $\zeta = 40\%$, $\mathcal{R} = 50\%$, $\overline{ui} = 65\%\bar{y}$, $\chi = 15\%$ to match $C_u/C_e \approx 70\%$
    Kekre (2022), Gorn and Trigari (2024)
  - Debt adjustment $\Phi_D = 0.75$

Unemployment and the Business Cycle

- Okun's law type of relation between output and unemployment
  - Okun coefficient $c_{OK} = 0.5$
    Ball, Leigh, and Loungani (2017)

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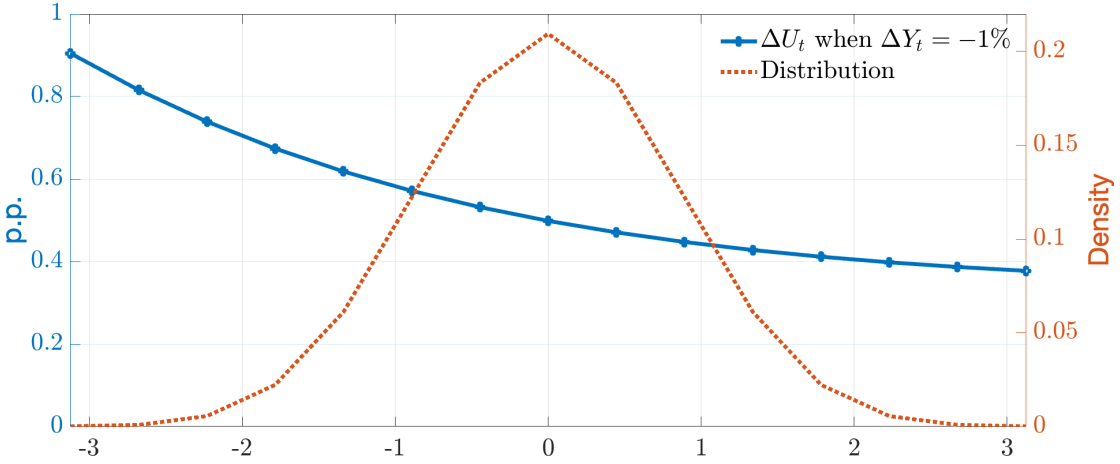
- Job finding rates increase with ΔY_t
  - Elasticity of job finding rates to aggregate unemployment of -0.6
    Mueller (2017)
- Job separation rates decrease with ΔY_t
  - Elasticity of separation rates to aggregate unemployment larger for above-median workers
    Mueller (2017)

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

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) decline with wealth

  Parker, Souleles, Johnson, and McClelland (2013), Kaplan and Violante (2014), ...

  – Compute mpc out of a $500 rebate: average quarterly mpc at 0.13

  – Larger for unemployed at 0.32, consumption drops by 10% when falling into unemployment

  Saporta-Eksten (2014), Ganong and Noel (2019)

Investigating the Calibration **Aggregate responses**

- Aggregate tax multipliers as in Mertens and Ravn (2013)
  - Tax multiplier above 2 in data vs. 0.6-0.7 in model
  - Peaks at 3 quarters in data

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$\Rightarrow$ Conservative calibration

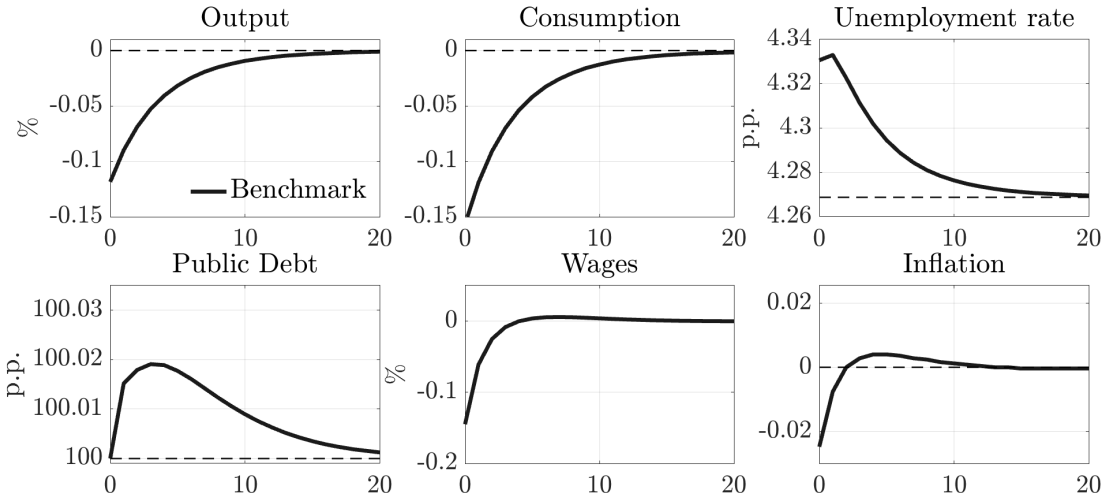
  - Small aggregate responses
  - Moderate heterogeneity in labor elasticities
  - Rather large response of unemployment

Recession

Benchmark No Fiscal Stabilization

- Recession induced by a negative demand shock: $(1-\omega_t)u(c_t, n_t)$
  - ω_0 such that $\Delta Y_0 = -0.12\%$, reverts to steady state at persistence $\rho_\omega = 0.75$ quarterly
  - Unexpected, transitory, perfect foresight: a 'MIT' shock

Benchmark No Fiscal Stabilization



Stabilization Packages

- Total cost equivalent to a one-time check of $\$200$ to all households

Stabilization Packages TT Package

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- A Targeted Transfer **(TT)** Package
  - Design to mimic checks sent in 2008
    - + Targeting low-income households, based on last-year income
  - An "automatic stabilizer" flavor: Persistence ρ_ω quarterly

Stabilization Packages TT Package

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- A Targeted Transfer **(TT)** Package
  - Design to mimic checks sent in 2008
    - + Targeting low-income households, based on last-year income
  - An "automatic stabilizer" flavor: Persistence ρ_ω quarterly
  - Temporary transfer modeled as a logistic function
    Ferriere, Grübener, Navarro, and Vardishvili (2023)
    - + Phasing out with "no-recession income" $\tilde{y}(x, \eta, \beta)$
    - + Initial maximum check of $900, with quick phase out: 20% hh receive more than $\$50$

Stabilization Packages UI Package

- A Unemployment Insurance **(UI)** Package
  - A transfer to all unemployed households
    - + Initial check of $\$1{,}1000$, persistence ρ_ω quarterly

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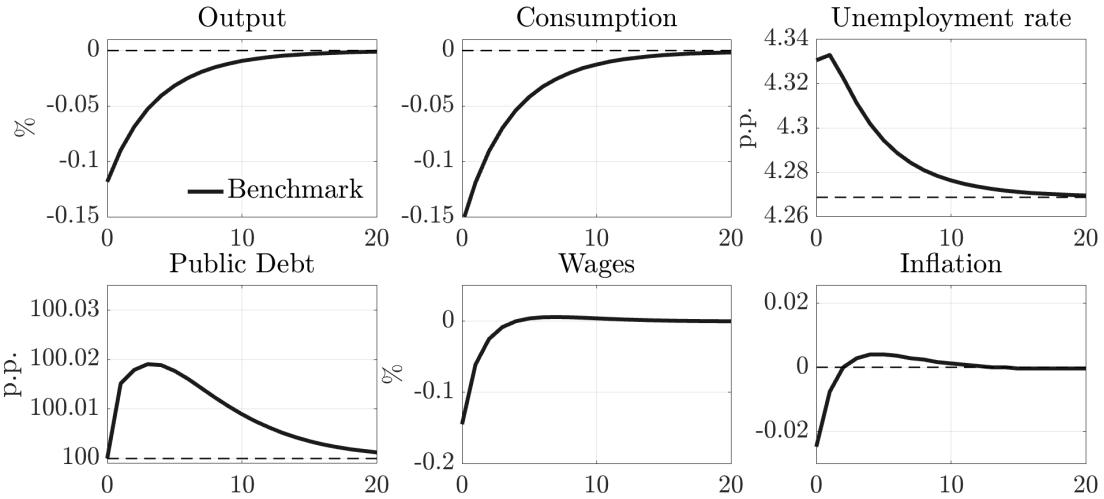
Stabilization Packages UI Package & TC Package

- A Unemployment Insurance **(UI)** Package
  - A transfer to all unemployed households
    - + Initial check of $\$1{,}1000$, persistence ρ_ω quarterly

- A Tax Credit **(TC)** Package
  - A transfer to working low-income households
    - + Eligible **only if** $\eta = \ell$ and $h = \bar{h}$; phasing out with current labor income $y_\ell = w_t x \bar{h}$
    - + Initial check of $\$800$ with phasing-out slower than TT, persistence ρ_ω quarterly

Stabilization Packages Impulse Response Functions



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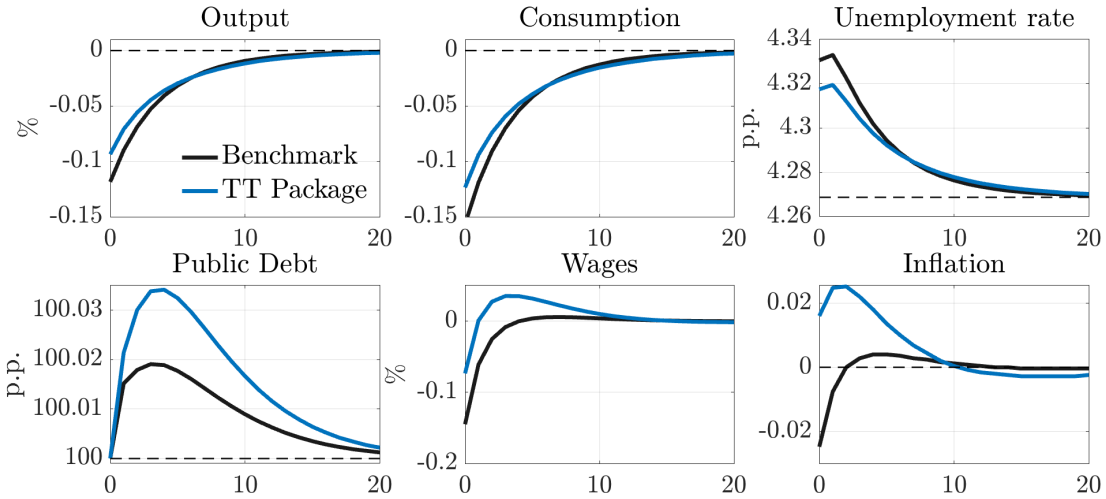

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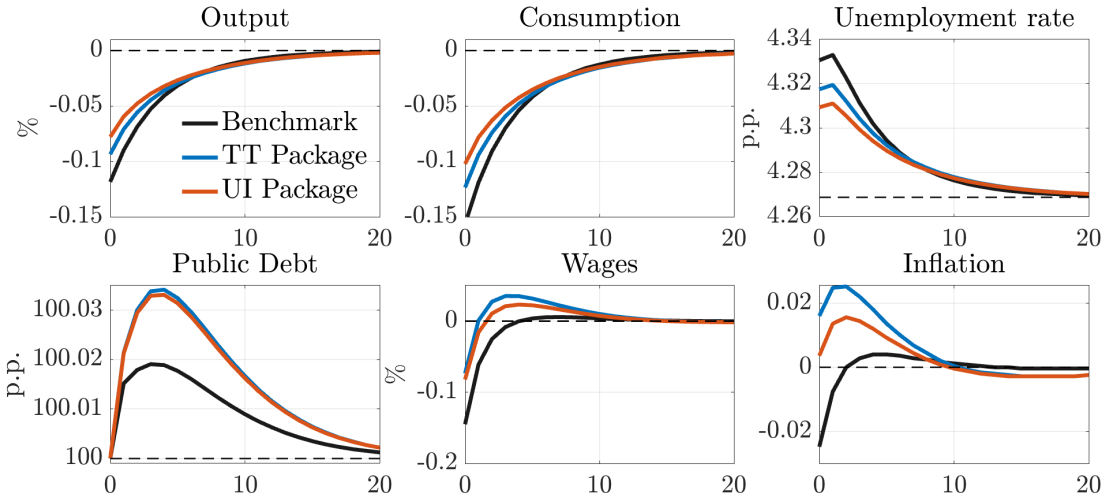

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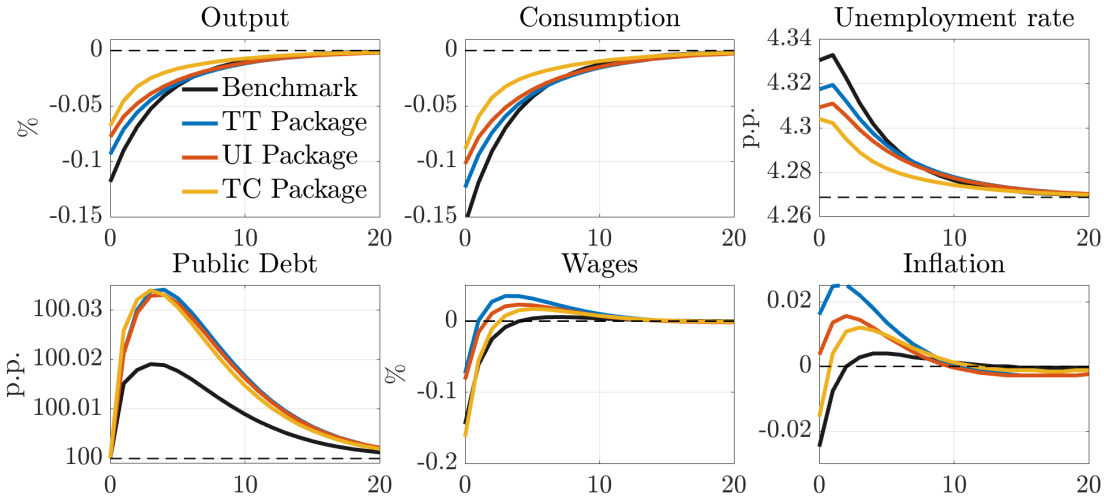
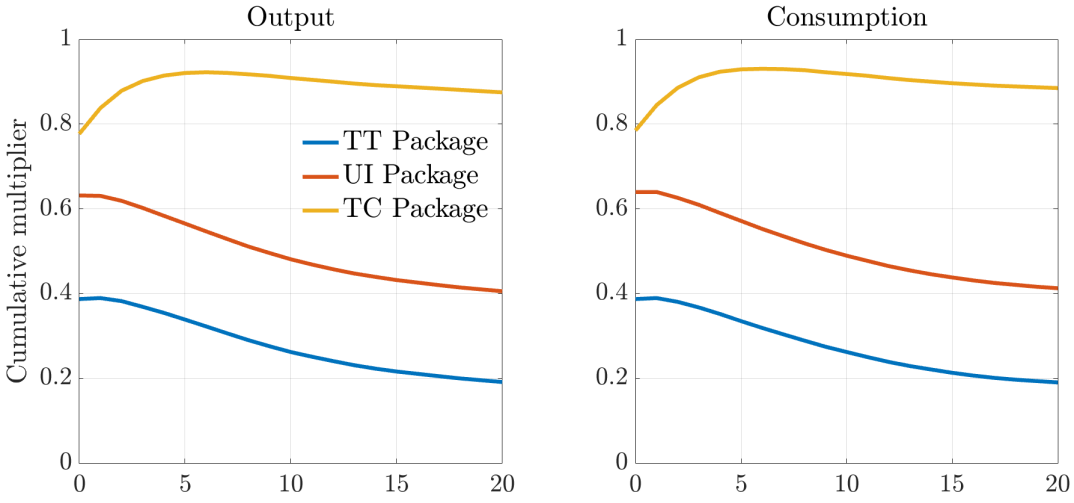


Stabilization Packages Multipliers



Stabilization Packages Decomposition

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

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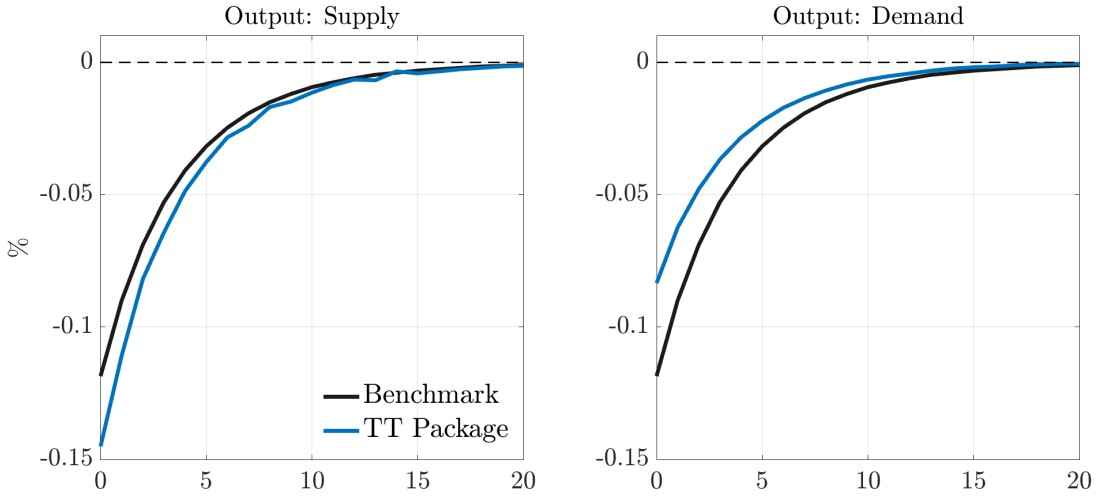
- Decomposition between *consumption channel* and *labor channel*
  - Use equilibrium prices and taxes and unemployment risk of the no-stabilization benchmark

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

  - Compute for each package TT, UI, TC
    - + Supply output using households' labor supply policy
    - + Demand output using households' consumption policy

Three Fiscal Stabilization Packages Decomposition



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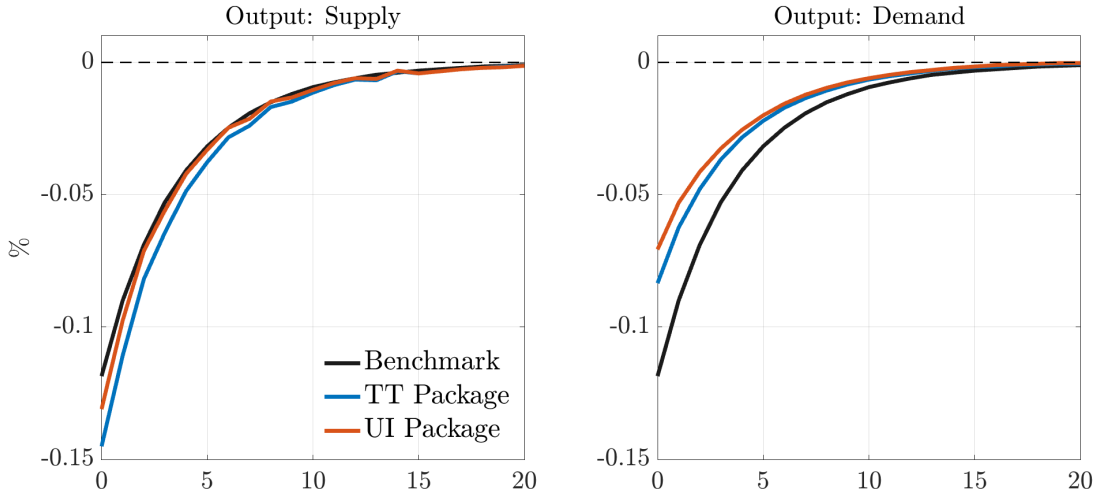

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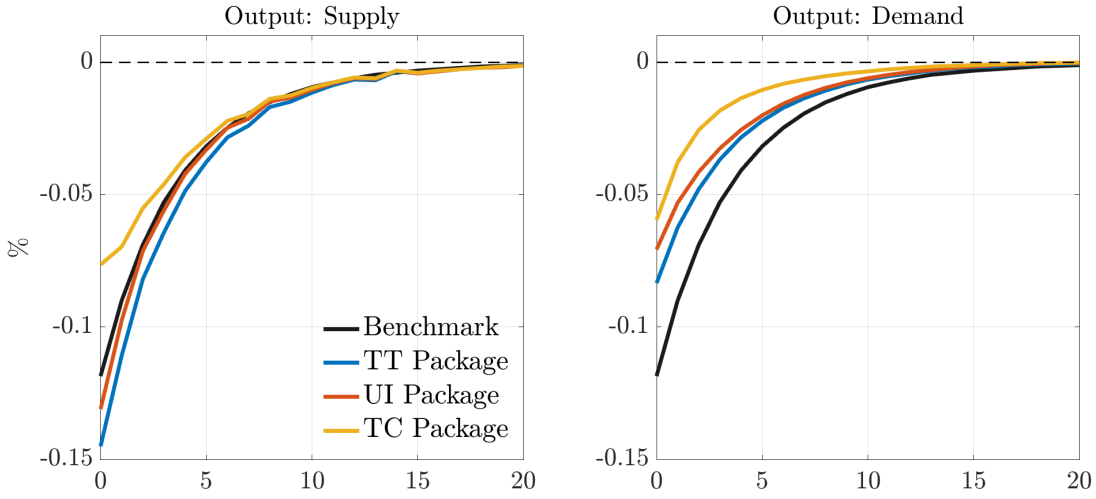

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  - Delayed labor responses in the data?
- Further discussion: public debt; distributional concerns; public spending

Constant Public Debt

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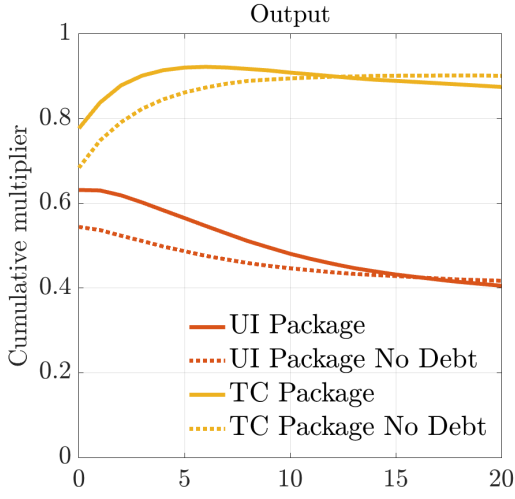

Constant Public Debt

- Assume constant debt $\Phi_D = 0$
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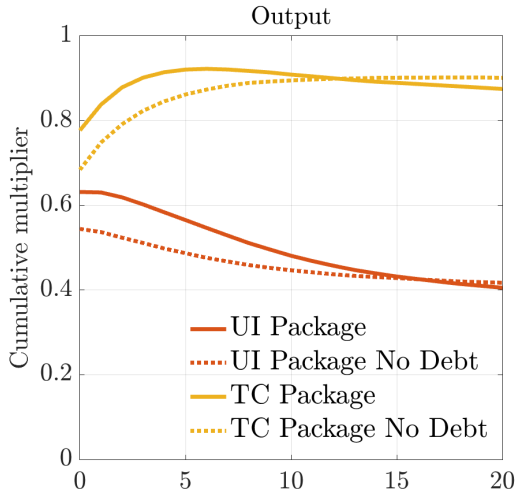
  - Stabilization output paths
- Financing stabilization packages with public debt increases multipliers
- TC Package No Debt

$\equiv$ Shock in labor tax progressivity

$\Rightarrow$ Stabilizes the economy



Distributional Effects of the TC Package

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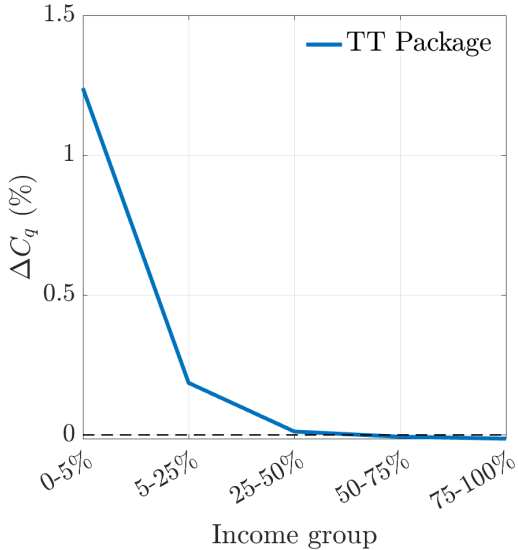

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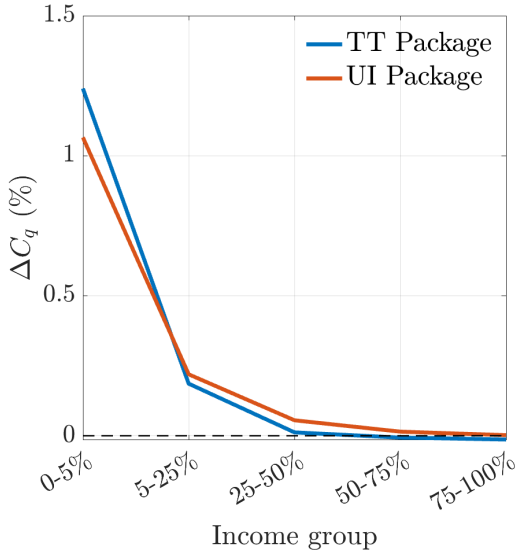
  - Compare with and without stablization
- TT Package targets the lowest-income
  - Better than UI Package



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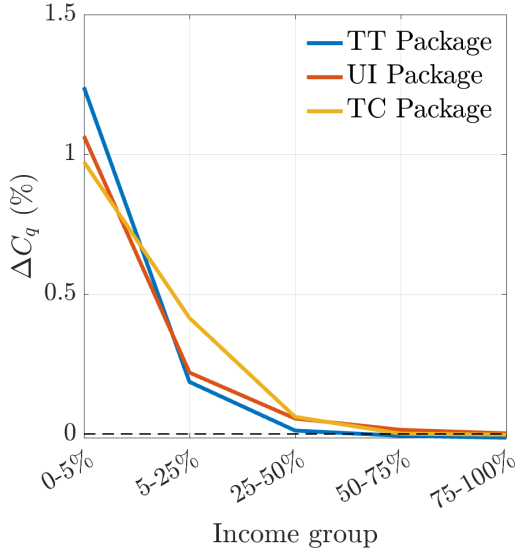
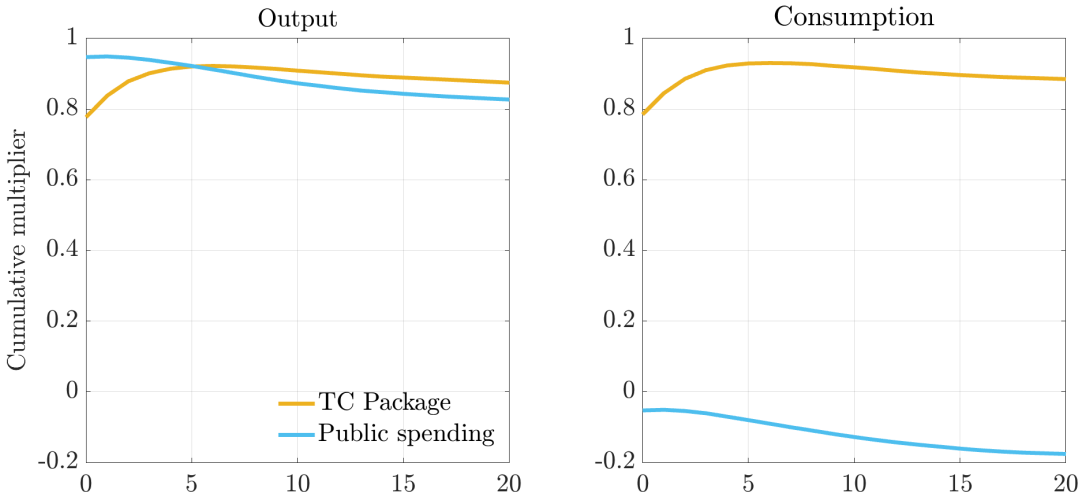


TC Package vs. Public Spending

TC Package vs. Public Spending **Stabilize private consumption**



Conclusion

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Thank you!

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- Quantitative effects of UI extensions in recessions

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

- Optimal fiscal and monetary policy in HANK

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- Stabilization and distribution of taxes in a TANK

  Bilbiie, Monacelli, and Perotti (2021)

Return

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)

Return

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

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

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

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

Return

Unemployment **Steady state calibration**

- Job finding rates are constant in the distribution
  Mueller (2017)
  - Monthly finding rate of $0.32 \Rightarrow \pi_\eta(\ell|u) = 0.691$

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Unemployment Business cycle calibration

- Separation rates fluctuate with the cycle such that

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

  - $+$ $\bar{\phi}_u$ for average response of separation rates: calibrated to match Okun coefficient
  - $+$ $\phi_{u,x}$ allows for heterogeneous responses of separation rates $\rightarrow \phi_{u,x} = 0$

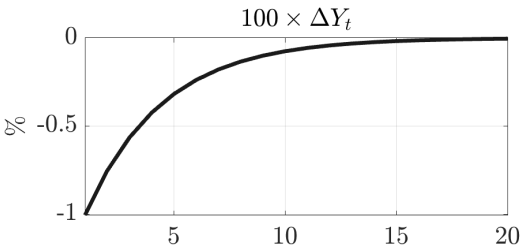
- Job finding rates to target a constant elasticity to aggregate unemployment

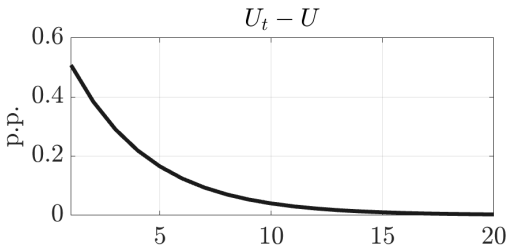
$$\log \pi_{\eta,t}(\ell|u, Y_t) = \log \pi_{\eta}(\ell|u) - \bar{\phi}_\ell \log(1 - \phi_{\ell,o} \Delta Y_t)$$

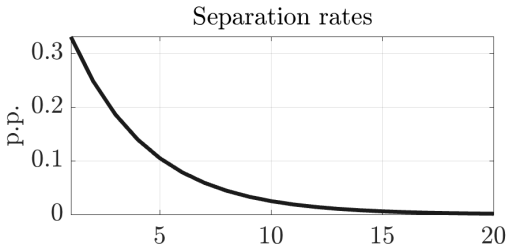
  - $+$ $\bar{\phi}_\ell = -0.6$ to match the elasticity of job finding rates to unemployment
  - $+$ $\phi_{\ell,o}$ to convert output change into unemployment

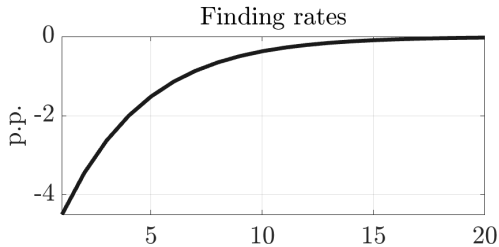
Return

Unemployment and the Business Cycle Okun's law









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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 $\log h_{in} = b_0 + b_1 \log \tilde{w}_{in} - b_2 \log c_{in} + \varepsilon_{in}$
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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

Return

Marginal propensities to consume **Distribution x wealth**

- Marginal propensities to consume decline with wealth

Wealth quartile	1	2	3	4
mpc	0.19	0.15	0.07	0.03

Return

Investigating the Calibration **Aggregate responses**

- Replicate a tax shock on bottom-90% vs. top-10% as in Zidar (2019)
  - Tax cut on bottom-90 increases employment by 3% in data vs. 1% in model
  - Tax cut on the top-10 has no effects both in data and model
  - Peaks at 2 years in data

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Targeted transfers **Functional forms**

- Temporary transfer modeled as a logistic function

  Ferriere, Grübener, Navarro, and Vardishvili (2023)

$$\hat{T}_t(y) = m_t \frac{2\exp(-\chi y/\bar{y})}{1+\exp(-\chi y/\bar{y})}$$

  - m_t is the transfer at $y = 0$
  - χ is the rate at which the transfer phase out with income, calibrated at $\chi = 12$

Return

Alternative calibration **Steeper labor elasticities**

- Lower variance ρ_h yields larger and steeper labor elasticities
  - + 0.45 average, 0.94 for first quartile
- Closer to evidence on effects of tax shocks
  - + Tax multipliers close to 1 (model) vs. > 2 Mertens and Ravn (2013)
  - + Bottom-90 tax cut increases employment by close to 2% vs. 3% Zidar (2019)
- MPC at 0.19 at quarterly level

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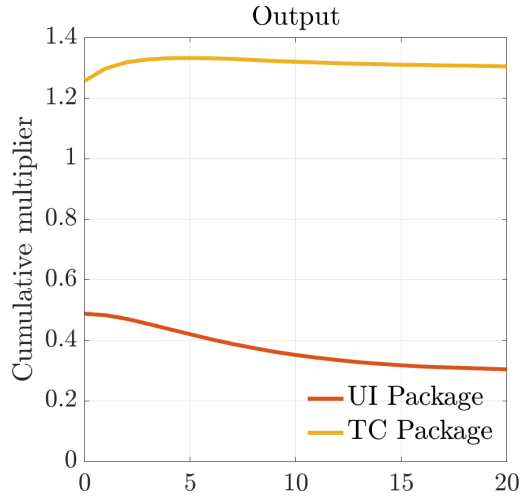
- TC Package $\Rightarrow$ **large output** multiplier



Return

Alternative Stabilization Packages Multipliers for G, T, UI extension

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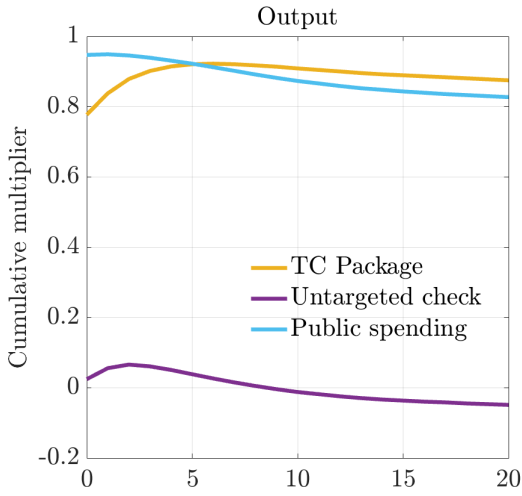
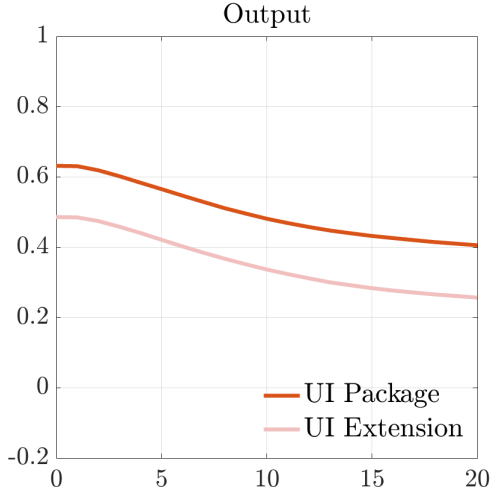
Alternative Stabilization Packages

Multipliers for G, T, UI extension





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Sticky Wages With idiosyncratic labor decisions

- 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 $N_t = \left(\int_0^1 n_{kt}^{\frac{\varepsilon-1}{\varepsilon}} \right)^{\frac{\varepsilon}{\varepsilon-1}}$

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

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

Return

Sticky Wages With idiosyncratic labor decisions

- Labor union maximization problem

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

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

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

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

$\Rightarrow$ Implies a standard wage Philipps Curve

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

Return