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

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- Design of counter-cyclical policies
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- A policy-driven approach
  - Quantitative HANK model
  - Effectiveness of various 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

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

# Fiscal Stabilization Packages

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

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    + $\rho_h \geq 0$ calibrated to discipline labor elasticities

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

  - Flat capital tax $\tau^k$, progressive loglinear labor tax $(\lambda_t, \tau^\ell)$

    Heathcote, Storesletten, and Violante (2017)

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    + $\chi$ to capture household labor income received while in unemployment

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- Fiscal rule with parameter $\Phi_D$ for public debt, $\lambda_t$ 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

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# Calibration

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  - $\bar{\beta}$ s.t. $r \equiv 3.5\%$ annually
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  - $B$ to match employment $\approx 78\%$
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  - $\rho_h$ to match average annual labor elasticity of $\approx 0.3$
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- 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 $\varepsilon/\Theta = 0.035$

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    $\chi = 0.15$ to match $C_u/C_e \approx 75\%$
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  - Automatic responses: $\Phi_\Pi = 1.5$, $\Phi_D = 0.75$

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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

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

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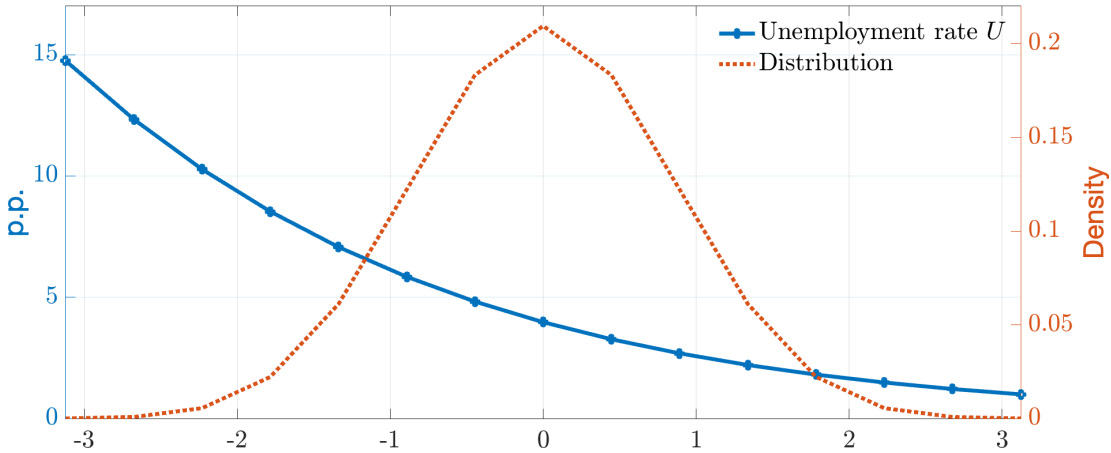
  $\Rightarrow$ $\pi_\eta(u|\ell, x) = \phi_0 x^{\phi_1}$, with $\phi_0 = 0.029$ and $\phi_1 = -0.446$
- Average unemployment rate at 4.3% with unequal incidence in the distribution

# Steady State Unemployment in the Distribution



# Unemployment and the Business Cycle

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  - Okun coefficient $c_{OK} = 0.5$

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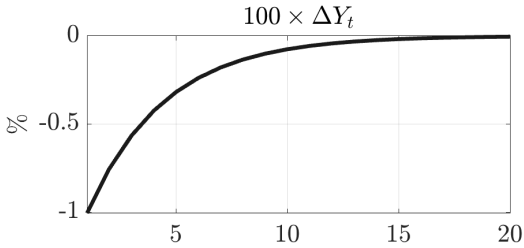
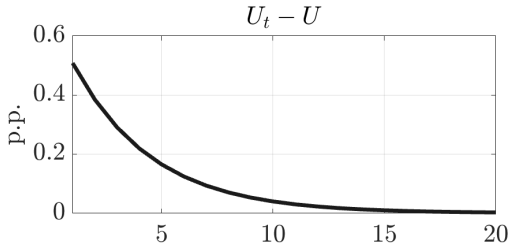
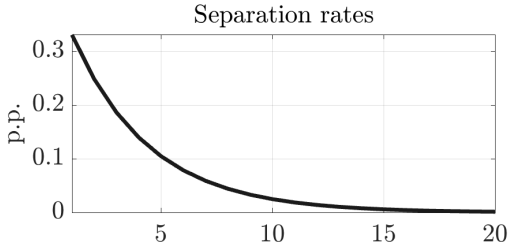
  - Elasticity of job finding rates to aggregate unemployment of $-0.6$
    Mueller (2017)
    + Homogeneous increase in job finding rates

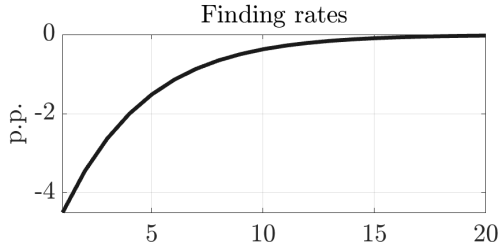
- Job separation rates decrease with $\Delta Y_t$
  - Elasticity of separation rates to aggregate unemployment larger for above-median workers
    Mueller (2017)
    + Homogeneous additive increase in separation rates

# Unemployment and the Business Cycle Okun's law



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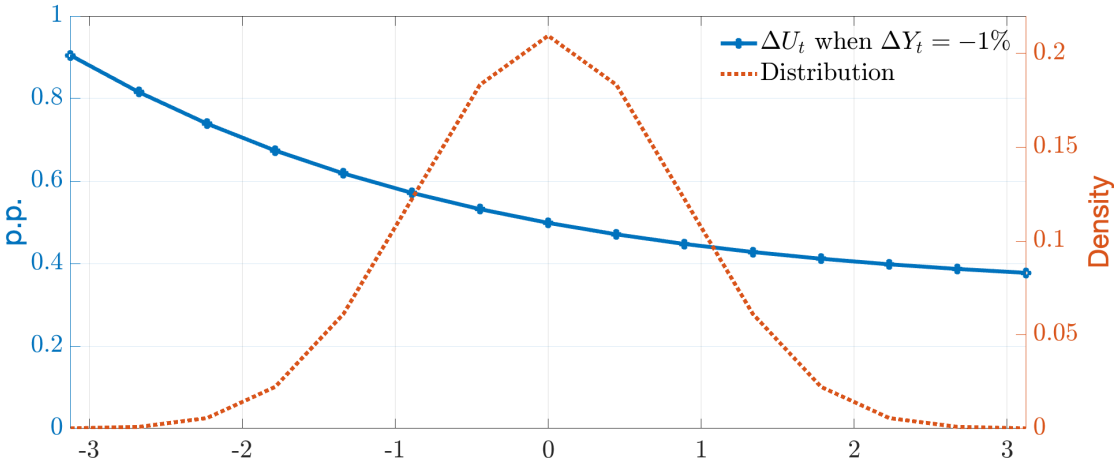

# Investigating the Calibration **Household responses**

- 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 |
|---|---|---|---|---|
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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)

Micro labor elasticity mpc

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- 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
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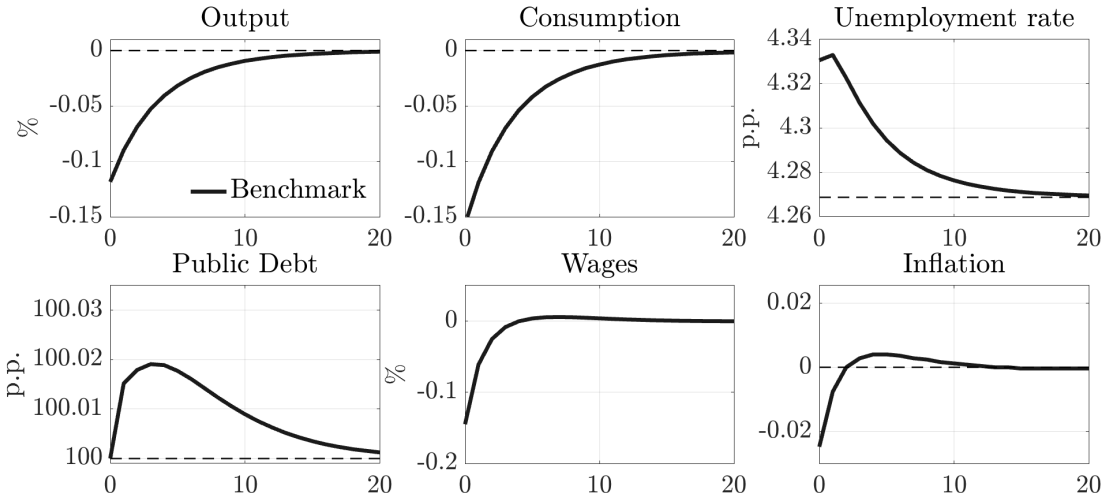
$\Rightarrow$ Conservative calibration regarding tax responses

# Recession

# Benchmark No Fiscal Stabilization

- Recession induced by a negative demand shock: $(1-\omega_t)u(c_t, n_t)$
  - $\omega_0$ 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

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  - 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 $\rho_\omega$

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  - An "automatic stabilizer" flavor: Phase out over time with persistence $\rho_\omega$
  - 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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- 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 $\rho_\omega$
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  - 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 $t=0$

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  - Calibration such that equals a one-time lump-sum check of $\$200$
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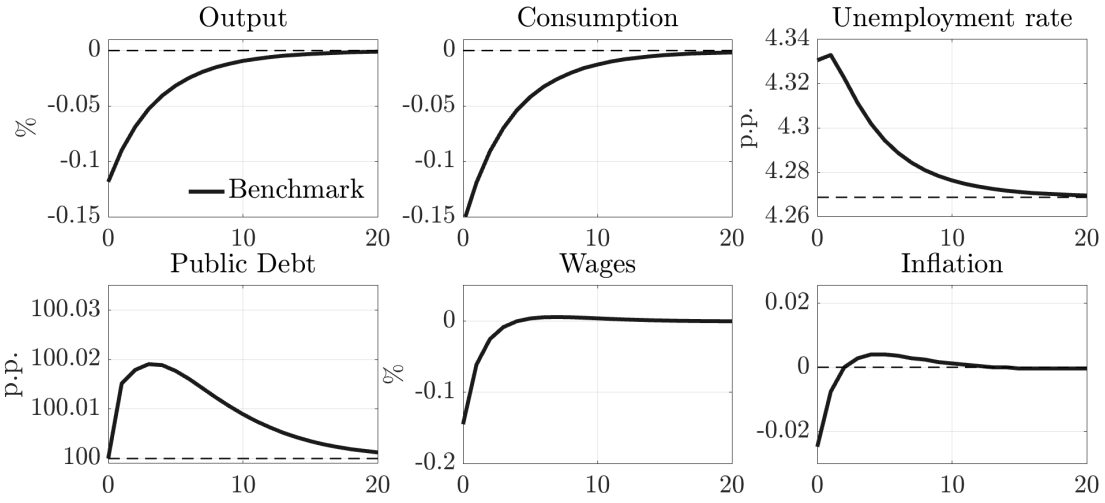
# Stabilization Packages Impulse Response Functions



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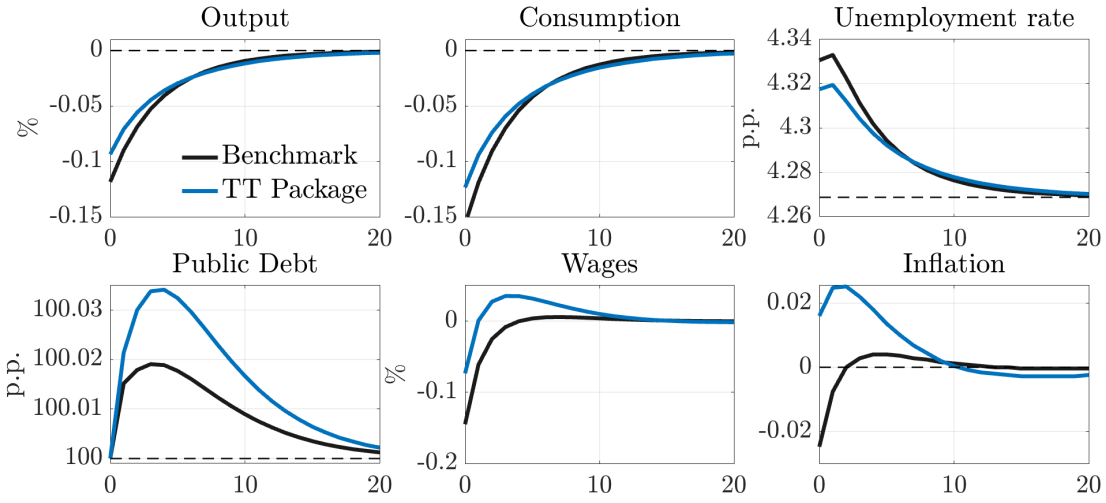

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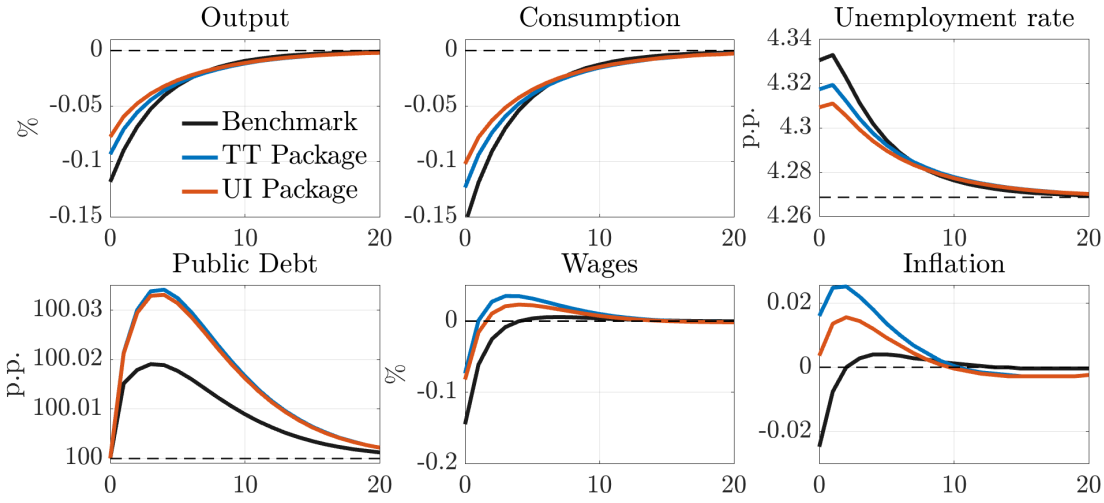

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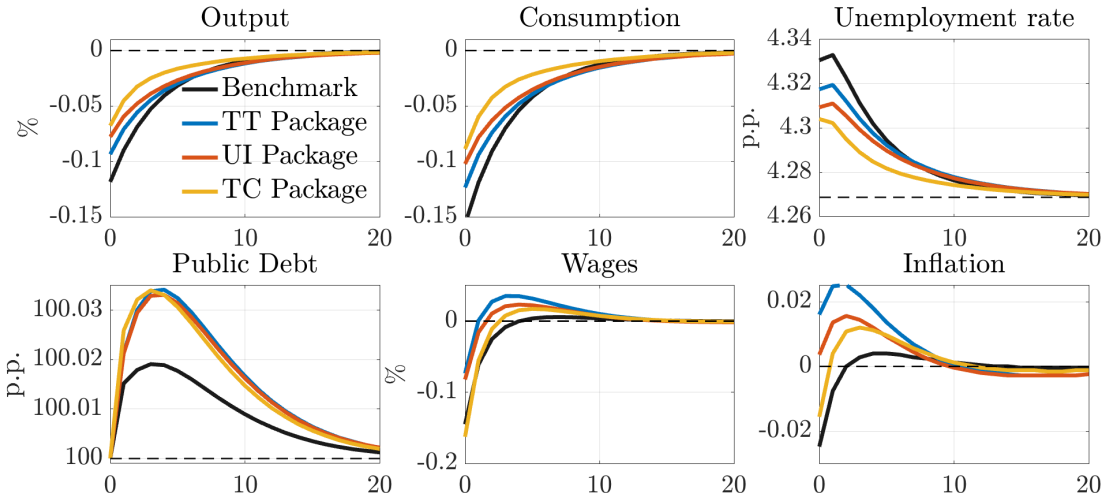

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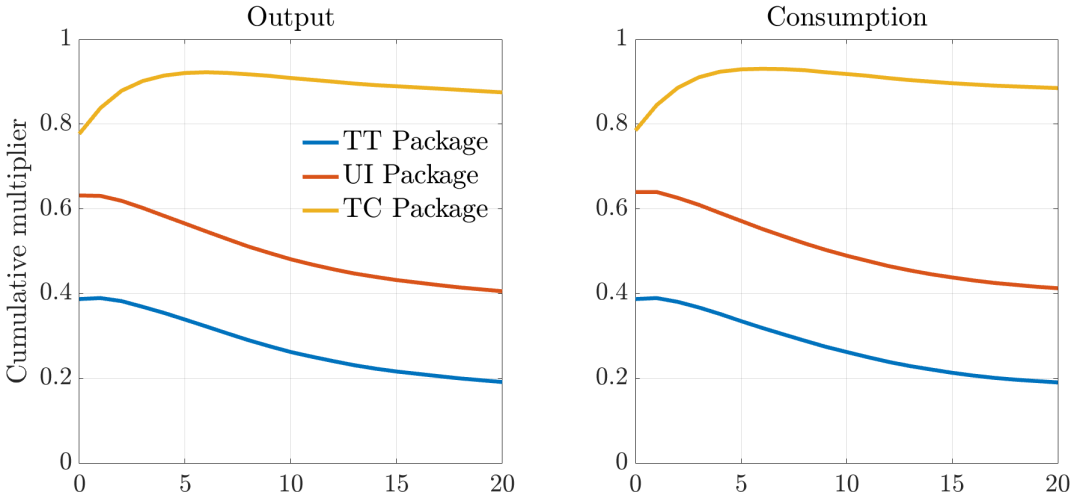


Deeper recession

# Stabilization Packages Decomposition

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

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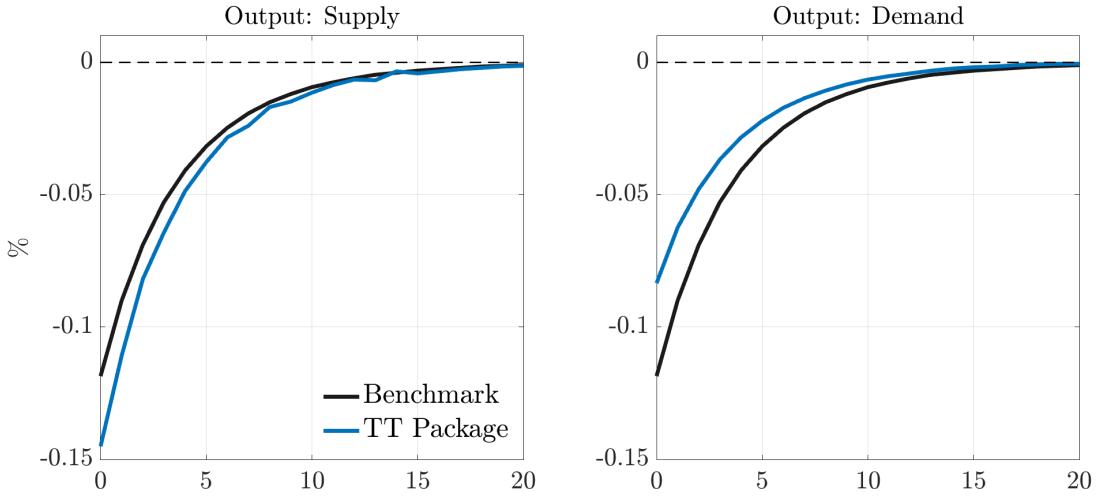
- Decomposition between *consumption channel* and *labor channel*
  - Use equilibrium prices and taxes and unemployment risk of the no-stabilization benchmark

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

  - 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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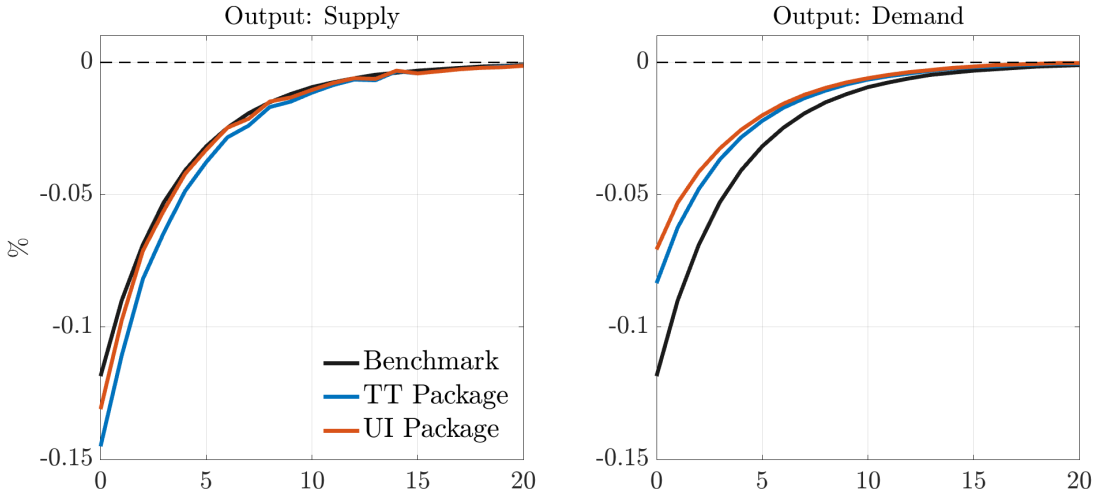

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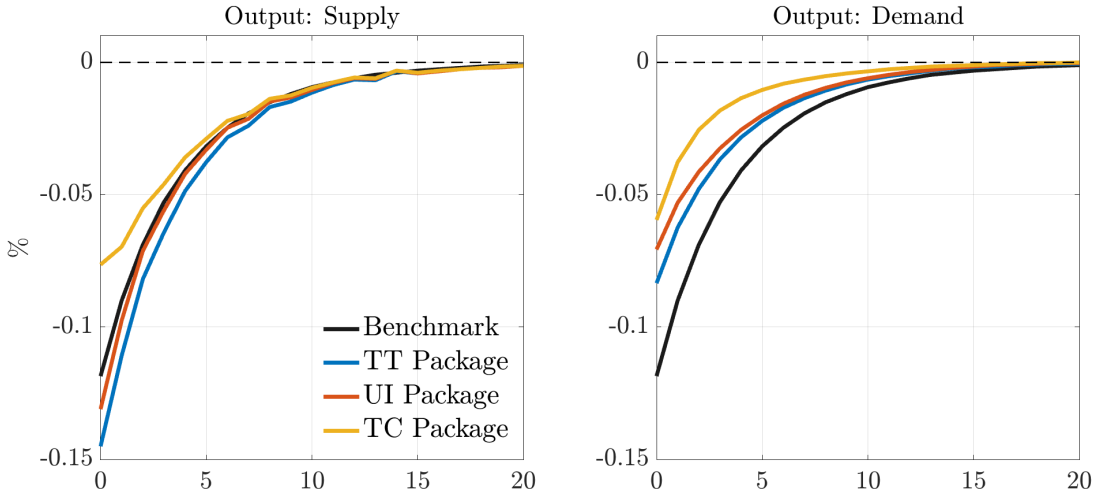

# Investigating the Results

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

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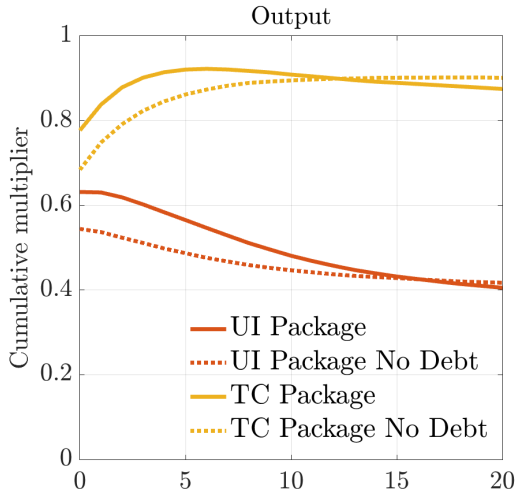

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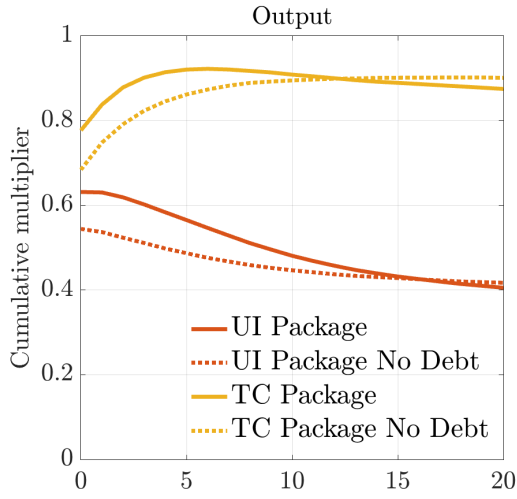
- TC Package No Debt $\equiv$ temporary shock in labor tax progressivity

  $\Rightarrow$ Stabilizes the economy



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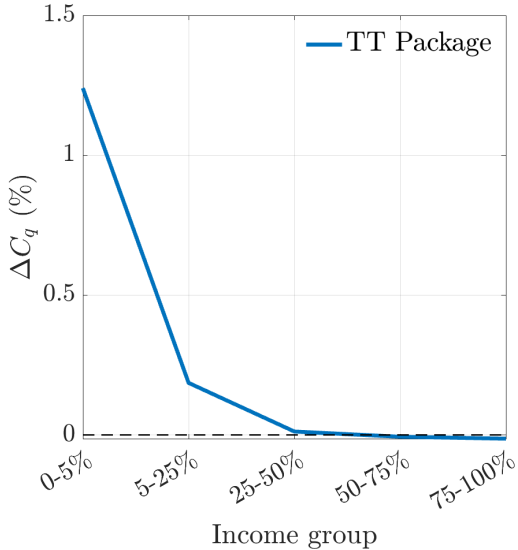

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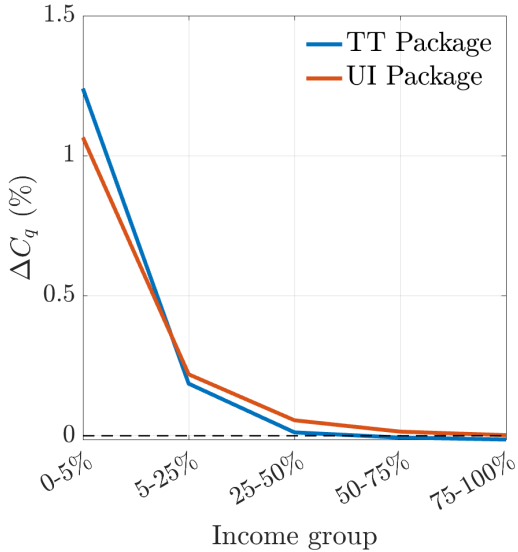

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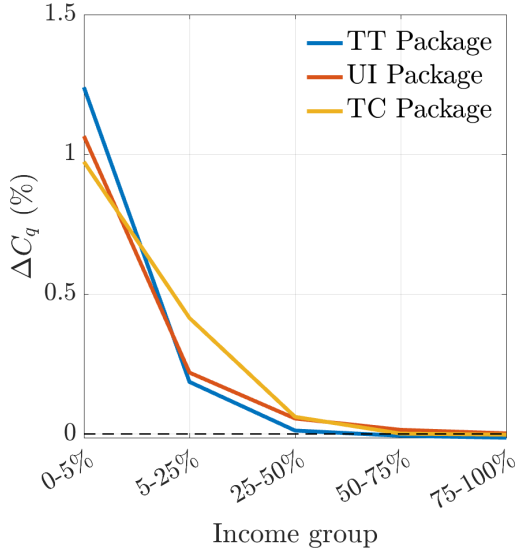

# 3. Monetary Policy **Identical real rate**

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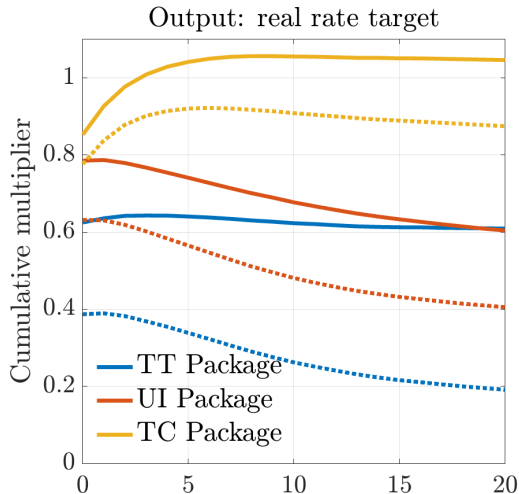
- Compare packages under benchmark real rate
- TC package remains most effective
  - Larger multipliers than with Taylor rule
  - Especially for the TT package, less for the TC package



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

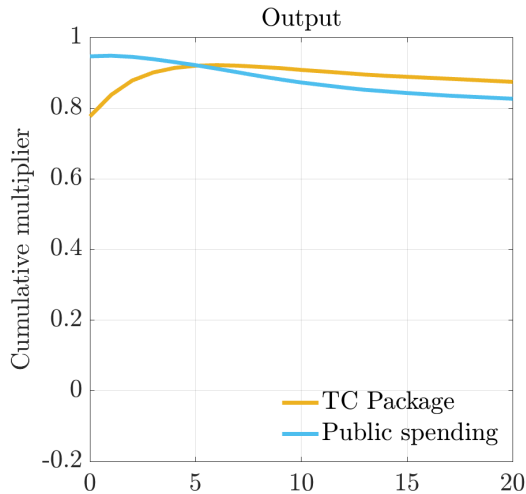
# Further Fiscal Packages

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

# Further Fiscal Packages $G$ and $T$ packages

– Public spending generates large output multiplier

  + . . . but negative consumption multiplier



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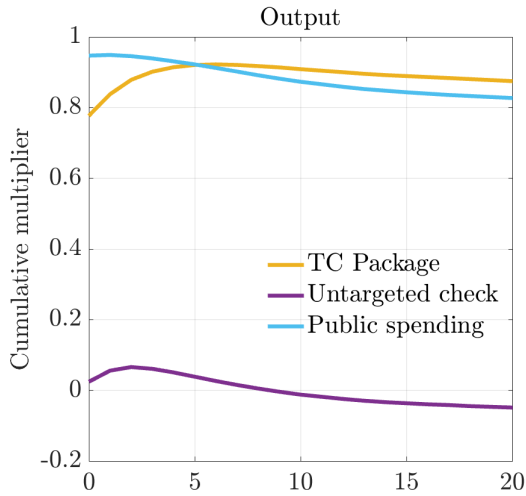
– Lump-sum check has modest stabilization properties



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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:

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

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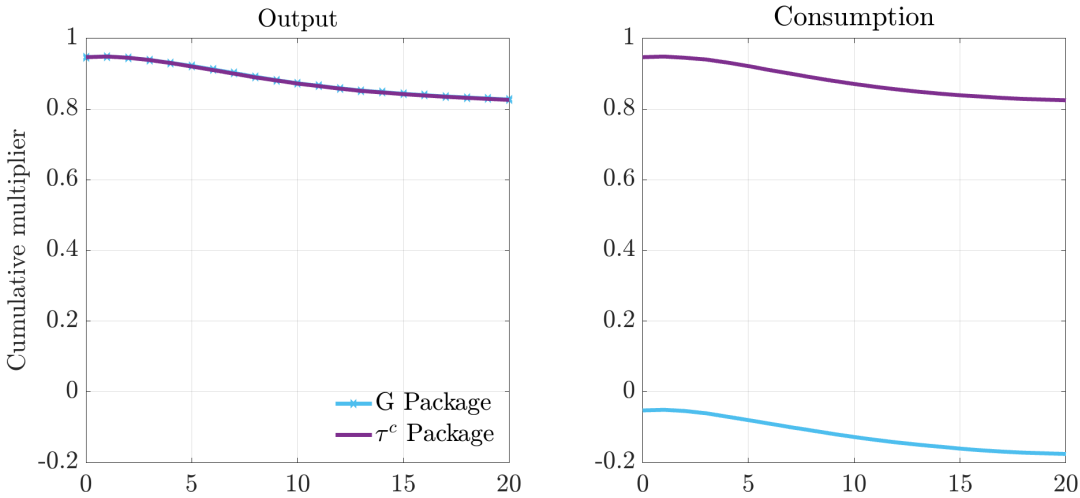
- Robust to: capital, sticky wages, also in RANK, etc.

- Key assumption: log preferences

# Stabilization Packages Multipliers



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**Thank you!**

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# Fiscal Rule

- Public debt adjusts as a function of $\Phi_D$

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

  - $\hat{G}_t$ 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

# 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

# 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 $\Delta Y_t$

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

  - Separation rate elasticity increases with $\Delta Y_t$

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

Return

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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 $c_{OK} = 0.5$

Return

# 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 | 0.20 | 0.15 | 0.07 | 0.03 |

Return

# Deeper Recessions Bigger Fiscal Packages

- Consider a recession of about $1\%$ on impact – compared to 12bp on impact in the baseline
- Implement fiscal packages costing $\$1500$ per household

Return

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- TC Package in the first quarter: equal to $\$1100$ per month for the bottom 5%, $\$500$ per month for the 5-15%
- UI Package in the first quarter: equal to $\$2800$ per month for all unemployed

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- Multipliers are similar to the baseline

Return

# 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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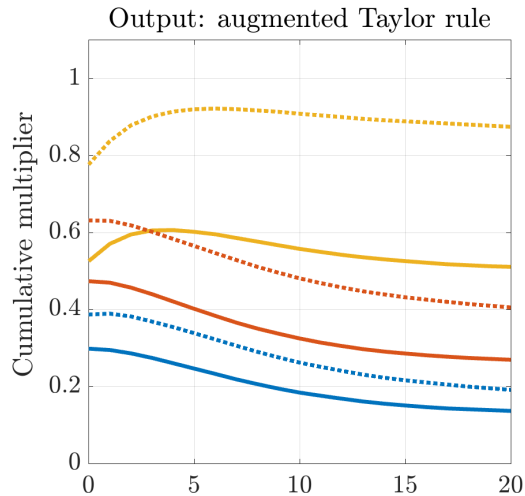
– TC package remains most effective
  – Lower multipliers than with Taylor rule




Return

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  - + Tax multipliers at $1.25$ (model) vs. $> 2$ Mertens and Ravn (2013)
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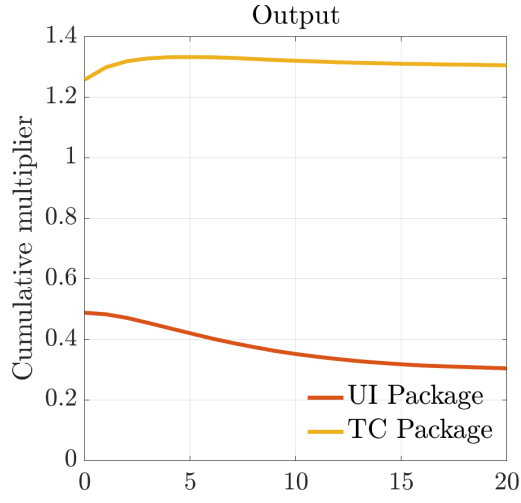
■ TC Package $\Rightarrow$ **large output** multiplier



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- 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 $w_t^h$

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

# Robustness Sticky wages

- 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