Can Deficits Finance Themselves?

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  - Simple mechanism: deficit today $\rightarrow$ demand-driven boom $\rightarrow$ **inflation** $\uparrow$, **tax base** $\uparrow$
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Q: how important is such **self-financing**? can there be *full* **self-financing**?

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- **1-word intuition**—discounting: "ignore" far-ahead tax + front-loaded Keynesian cross

- **Practical relevance**: holds in many environments & quantitatively powerful

  general aggregate demand (incl. HANK), active monetary policy, investment, distortionary taxation, ...

Environment

Non-policy block

- **Aggregate demand**
  - Unit continuum of OLG households with survival probability $\omega \in (0, 1]$. Nests standard PIH model with $\omega = 1$, and mimics HANK (break Ricardian equivalence) with $\omega < 1$.

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  - Optimal consumption-savings behavior yields aggregate demand relation: ▸ Details

$$c_t = \underbrace{(1-\beta\omega)}_{\text{MPC}} \times \left(\underbrace{d_t}_{\text{wealth}} + \underbrace{\mathbb{E}_t \left[\sum_{k=0}^{\infty} (\beta\omega)^k \left(y_{t+k} - t_{t+k} \right) \right]}_{\text{post-tax income}} \underbrace{- \gamma \mathbb{E}_t \left[\sum_{k=0}^{\infty} (\beta\omega)^k r_{t+k} \right]}_{\text{real rates}} \right) \tag{1}$$

Key features: (i) elevated MPC + (ii) addt'l discounting of future income & taxes

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Key features: (i) elevated MPC + (ii) addt'l discounting of future income & taxes

- **Aggregate supply**
  - Nominal rigidities + union bargaining gives a standard NKPC relation: ▸ Details

$$\pi_t = \kappa y_t + \beta \mathbb{E}_t [\pi_{t+1}] \tag{2}$$

Policy block

- **Monetary policy**
  - Monetary authority responds to output fluctuations:

$$\underbrace{i_t - \mathbb{E}_t\left[\pi_{t+1}\right]}_{\equiv r_t} \;=\; \phi \times y_t \tag{3}$$

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  - Issue nominal debt. Log-linearized government budget constraint (in real terms):
$$d_{t+1} = (1+\bar{r}) \times (d_t - t_t) + \frac{\bar{d}}{\bar{y}} r_t - \frac{\bar{d}}{\bar{y}} \left(\pi_{t+1} - \mathbb{E}_t\left[\pi_{t+1}\right]\right) \tag{4}$$

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$$t_t = \underbrace{\tau_d \times (d_t + \varepsilon_t)}_{\text{fiscal adjustment}} + \underbrace{\tau_y y_t}_{\text{tax base financing}} - \underbrace{\varepsilon_t}_{\text{"stimulus checks"}} \tag{5}$$

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    For transparent intuition look at H-rule: $\tau_{d,t} = 0$ initially, then $= 1$ after H so $d_{H+1} = 0$.

Equilibrium & sources of financing

- **Eq'm existence & uniqueness** Full eq'm characterization

Proposition

Suppose that $\omega < 1$ *and* $\tau_y > 0$. *The economy* (1) - (5) *has a unique bounded eq'm.*

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- Our **Q**: how are fiscal deficits in this eq'm financed?
  - From the intertemporal gov't budget constraint:

$$\underbrace{\varepsilon_0}_{\text{deficit}} = \underbrace{\tau_d \times \left(\varepsilon_0 + \sum_{k=0}^{\infty} \beta^k \mathbb{E}_0\left(d_k\right)\right)}_{\textbf{fiscal adjustment}:\ (1-\nu)\times\varepsilon_0} + \underbrace{\overbrace{\frac{\bar{d}}{\bar{y}}\left(\pi_0 - \mathbb{E}_{-1}\left(\pi_0\right)\right)}^{\text{debt erosion}} + \overbrace{\sum_{k=0}^{\infty} \beta^k \tau_y \mathbb{E}_0\left(y_k\right)}^{\text{tax base expansion}}}_{\textbf{self-financing}:\ \nu\times\varepsilon_0}$$

  - Next: characterize ν as a function of fiscal adjustment delay (τ_d or H)

The Self-Financing Result

Self-financing fiscal stimulus

Theorem

*The **self-financing share ν** has the following properties:*

1. ***[Monotonicity]*** *It is increasing in the delay of fiscal adjustment (i.e., it is increasing in H and decreasing in τ_d).*

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   a) *Gov't debt returns to steady state even without any fiscal adjustment:*

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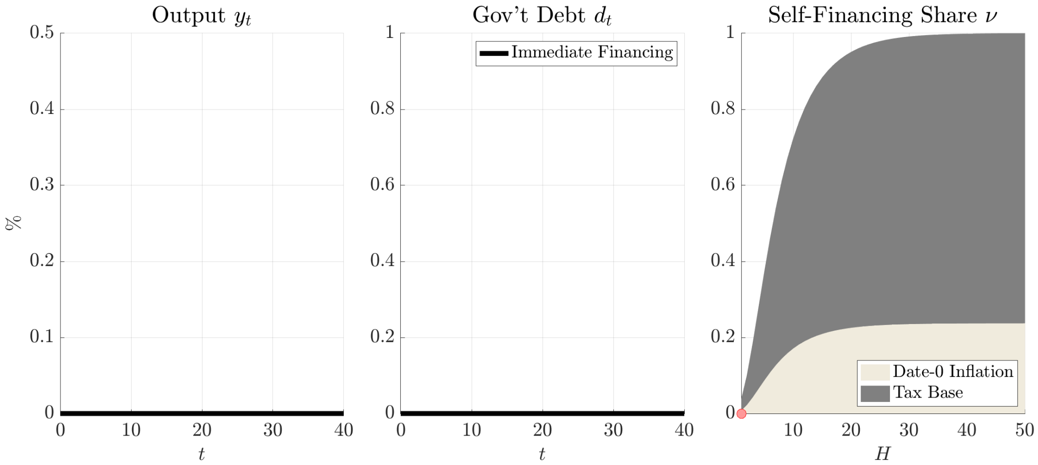
   b) *The share of self-financing coming from the tax base expansion is increasing in the strength of nominal rigidities. With rigid prices the cumulative output multiplier is $\frac{1}{\tau_y}$.*

A graphical illustration



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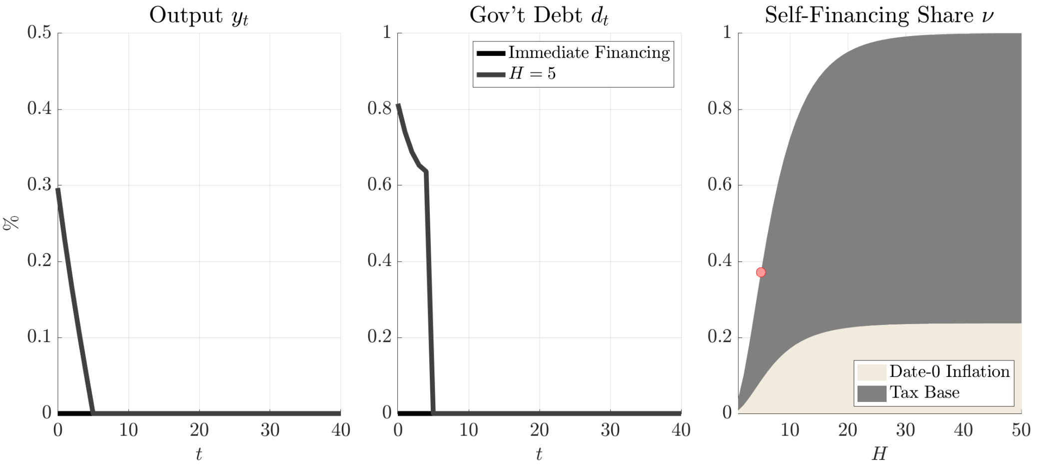

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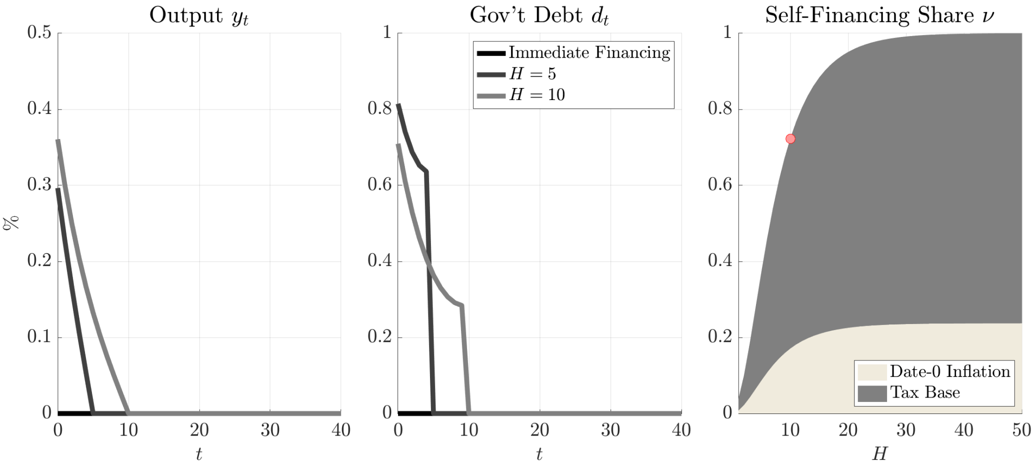

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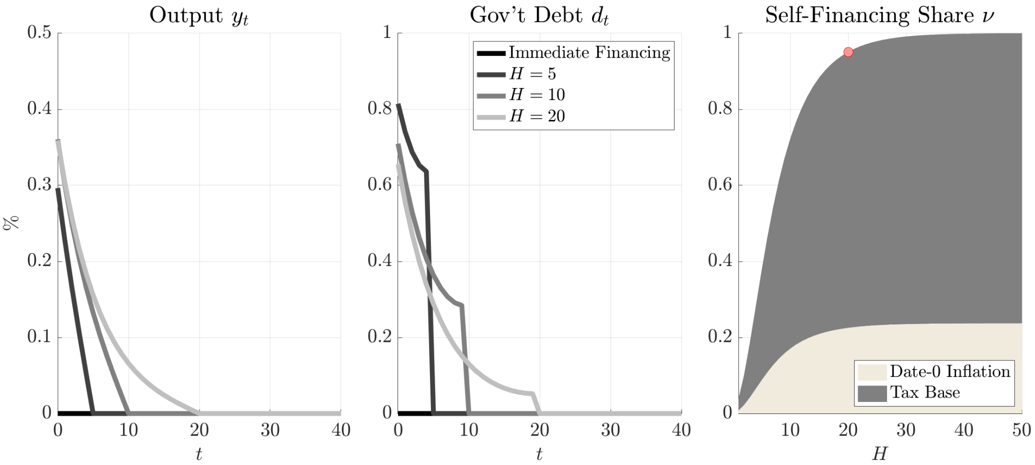

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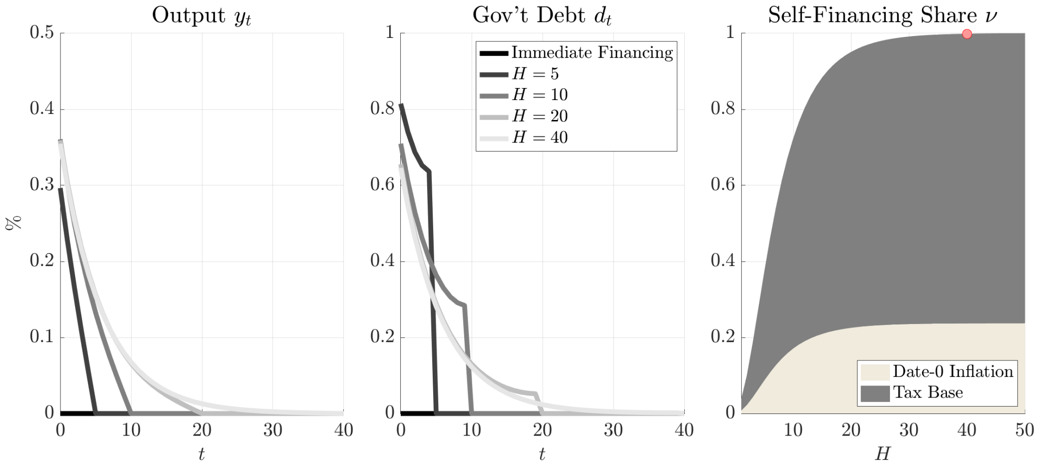

Economic intuition

- Background: self-financing in a **"static" Keynesian cross**
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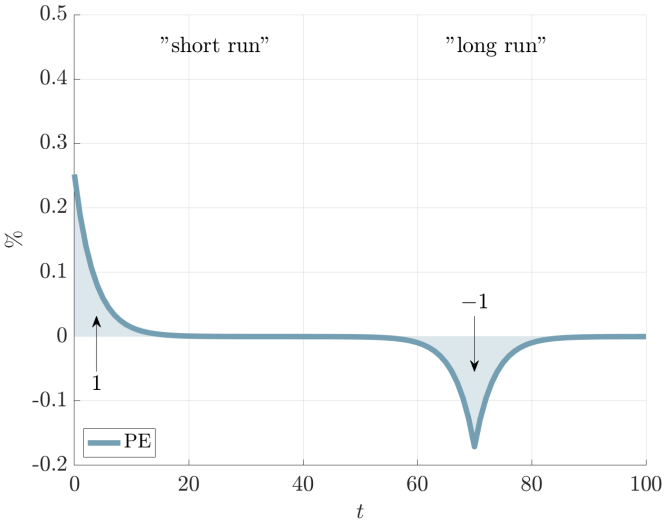

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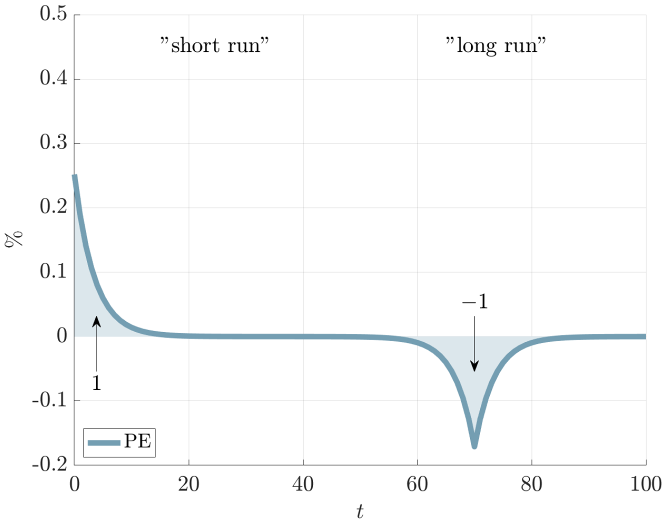

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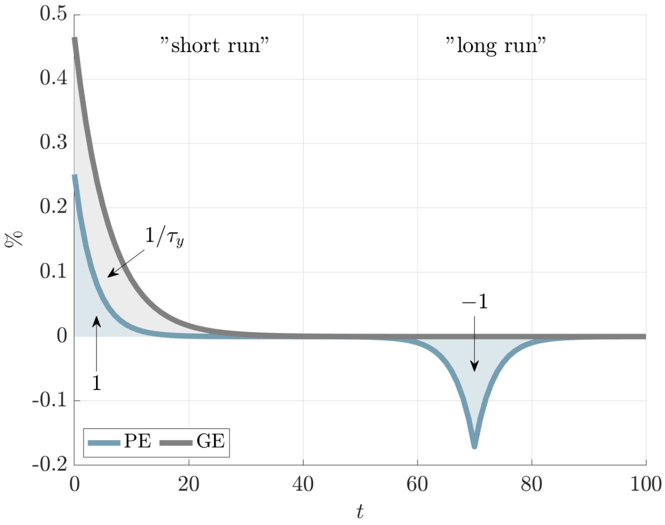

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With imperfectly rigid prices: boom partially leaks into **prices** instead of **quantities**.

Practical Relevance

Extensions & generality

1. **Policy** ▸ Details

   - Fiscal policy

     a) Tax adjustment: limit result unaffected if far-ahead adjustment is **distortionary**

     b) Form of stimulus: result applies with little change to **gov't purchases** instead of transfers

   - **Monetary response**: ρ_d in self-financing eq'm is increasing in ϕ. Full self-financing as long as ϕ is not too big (need $\phi < \bar{\phi}$, where $\bar{\phi} > 0$), otherwise partial self-financing.

2. **Economic environment** ▸ Details

   - **Demand relation**: need discounting—break Ricardian equivalence + front-load spending
     Second condition for example fails in spender-saver environment, but holds in OLG/BiU/HANK.

   - Rest of the economy: can change **NKPC**, add **wage rigidity**, allow for **investment**, ...

Quantitative exploration

Environment: match evidence on dynamic (tail) MPCs + speed of fiscal adjustment

▸ Details, extensions, & alternative calibration strategies

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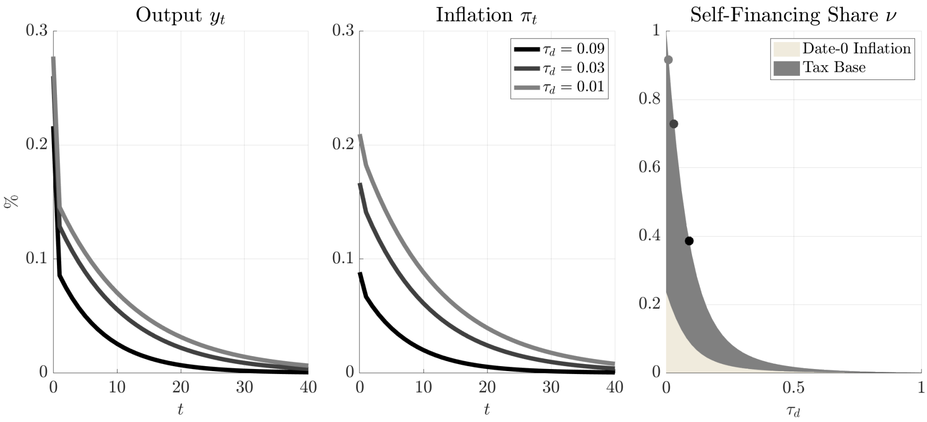

Takeaways

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- **Main result**: if **fiscal adjustment** is delayed, then financing will instead come from debt erosion & tax base boom—i.e., **self-financing**

- **Implications**

  a) **Theory**: grounded in a classical failure of Ricardian equivalence, robust to information perturbations, consistent with Taylor principle

  b) **Practice**: self-sustaining stimulus may be less implausible than commonly believed
  In particular if supply constraints are slack—get self-financing via output boom.

- **Future work**: (optimal) policy implications for fiscal-monetary interaction

Thank you!

Appendix

Aggregate demand

- **Consumption-savings problem**
  - **Preferences**

$$\mathbb{E}_t\left[\sum_{k=0}^{\infty}(\beta\omega)^k\left[u(C_{i,t+k})-v(L_{i,t+k})\right]\right]$$

  - **Budget constraint**

$$A_{i,t+1}=\underbrace{\frac{I_t}{\omega}}_{\text{annuity}}\left(A_{i,t}+P_t\cdot\left(\underbrace{W_tL_{i,t}+Q_{i,t}}_{Y_{i,t}}-C_{i,t}-T_{i,t}+S_i\right)\right)$$

    where S_i is a transfer to newborns that facilitates aggregation

- **Aggregate demand relation**

$$c_t=(1-\beta\omega)\left(d_t+\mathbb{E}_t\left[\sum_{k=0}^{\infty}(\beta\omega)^k\left(y_{t+k}-t_{t+k}\right)\right]\right)-\gamma\mathbb{E}_t\left[\sum_{k=0}^{\infty}(\beta\omega)^k r_{t+k}\right]$$

back

Aggregate supply

- **Unions** equalize post-tax wage and average consumption-labor MRS. This gives

$$(1-\tau_y)W_t = \frac{\chi \int_0^1 L_{i,t}^{\frac{1}{\varphi}} di}{\int_0^1 C_{i,t}^{-1/\sigma} di}$$

  Log-linearizing:

$$\frac{1}{\varphi}\ell_t = w_t - \frac{1}{\sigma}c_t$$

- Combining with optimal firm pricing decisions we get the **NKPC**:

$$\pi_t = \kappa y_t + \beta \mathbb{E}_t\left[\pi_{t+1}\right]$$

  - Note: no time-varying wedge since distortionary taxes τ_y are fixed

▸ back

Equilibrium characterization

- First step to eq'm characterization is a more concise representation of agg. demand
- Combining (1), (3), (4), (5), and output market-clearing, we get

$$y_t = \mathcal{F}_1 \cdot (d_t + \epsilon_t) + \mathcal{F}_2 \cdot \mathbb{E}_t \left[\sum_{k=0}^{\infty} (\beta\omega)^k \, y_{t+k} \right] \tag{6}$$

  - Here: $\mathcal{F}_1 \equiv \frac{(1-\beta\omega)(1-\omega)(1-\tau_d)}{1-\omega(1-\tau_d)}$ and $\mathcal{F}_2 = (1-\beta\omega)\left(1 - \frac{(1-\omega)\tau_y}{1-\omega(1-\tau_d)}\right)$
  - Note: $\mathcal{F}_1 = 0$ if $\omega = 1$—reflects lack of direct effect of deficit on consumer spending/ aggregate demand under Ricardian equivalence

- Equilibrium: (2), (6) and law of motion for government debt

back

Equilibrium characterization

- We will look for **bounded equilibria** in the sense of Blanchard-Kahn
  - Note: in our case—with $\omega < 1$ and $\tau_y > 0$—this is enough to rule out sunspot solutions. Recover same eq'm through limit $\phi \to 0^+$.
- The unique bounded eq'm takes a particularly simple form:

$$y_t = \chi(d_t + \varepsilon_t), \quad \mathbb{E}_t [d_{t+1}] = \rho_d(d_t + \varepsilon_t)$$

where $\chi > 0$ (deficits trigger boom) and $0 < \rho_d < 1$ (debt goes back to steady state).

back

General monetary policy

- **Intuition**: $\phi < 0$ accelerates the Keynesian cross, $\phi > 0$ delays it

Proposition

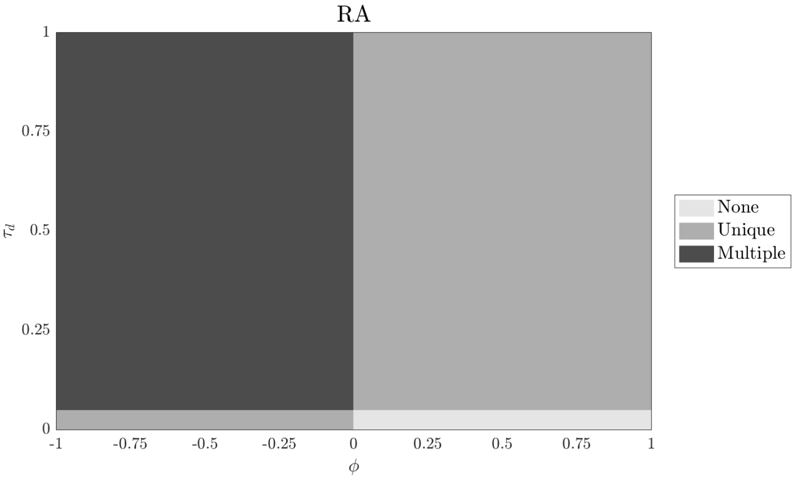
There exists a $\bar{\phi} > 0$ such that:

1. *An equilibrium with full self-financing exists if and only if $\phi < \bar{\phi}$.*
2. *The persistence of $\rho_d(\phi)$ of gov't debt (and output) in the equilibrium with full self-financing is increasing in ϕ, with $\rho_d(0) \in (0, 1)$ and $\rho_d(\bar{\phi}) = 1$.*

- What happens if $\phi > \bar{\phi}$? If fiscal financing is too delayed then no bounded eq'm exists. For such a monetary policy **fiscal adjustment** needs to be *fast enough*.

back

General monetary policy: determinacy regions



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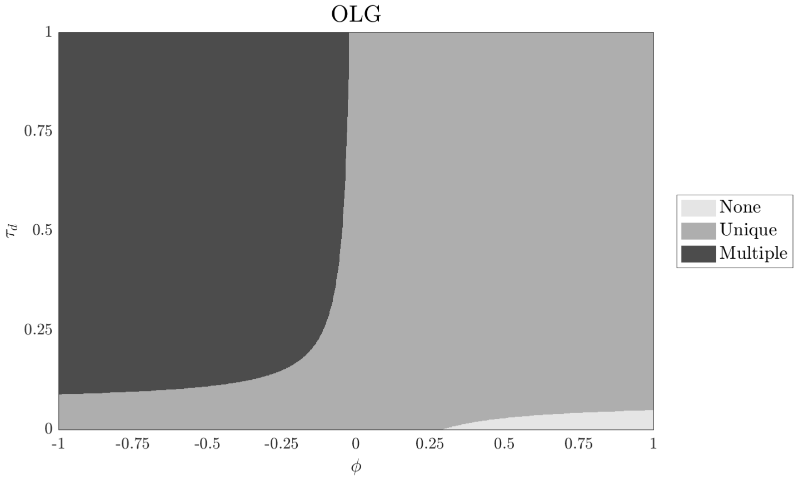


▸ back

Distortionary fiscal financing

- **Environment**
  - **Fiscal adjustment** now instead through distortionary tax adjustments. Specifically:

$$\tau_{y,t} = \tau_y + \tau_{d,t}(D_t - D^{ss})$$

  - Only effect is to change (2) to

$$\pi_t = \kappa y_t + \beta \mathbb{E}_t [\pi_{t+1}] + \zeta_t d_t$$

- **Self-financing result**
  - Easy to see: exactly the same limiting self-financing eq'm as before
  - Why? tax adjustment not necessary, so distortionary vs non-distortionary is irrelevant

back

General aggregate demand relation

- Consider the following generalized AD relation:

$$c_t = M_d d_t + M_y \left(y_t - t_t + \delta \mathbb{E}_t \left[\sum_{k=0}^{\infty} (\beta\omega)^k (y_{t+k} - t_{t+k}) \right] \right)$$

- A self-financing eq'm then exists under the following two assumptions:

1. **Discounting**

$$\omega < 1$$

   Transfer today and taxes in the future redistribute from future generations to the present. Deficit directly shows up in AD representation.

2. **Fast boom**

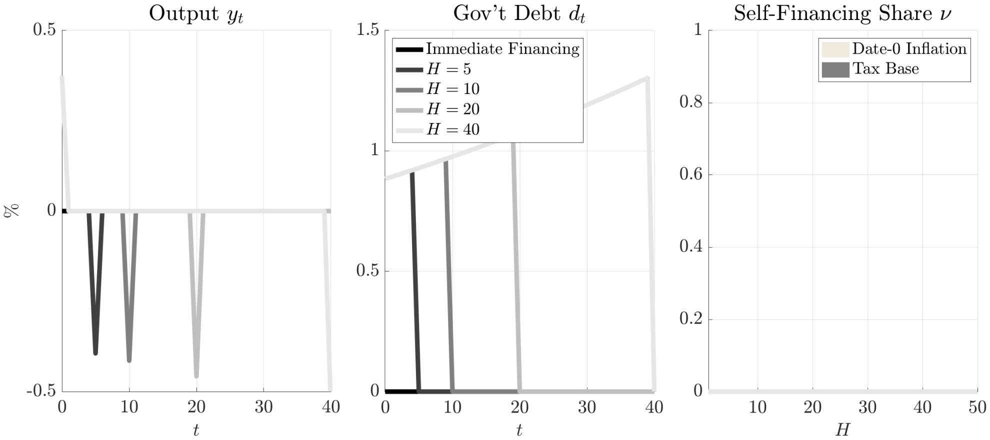
$$M_d + \frac{1-\beta}{\tau_y}(1-\tau_y) M_y \left(1 + \delta \frac{\beta\omega}{1-\beta\omega} \right) > \frac{1-\beta}{\tau_y}$$

   Self-financing boom is front-loaded enough to deliver $\rho_d < 1$.

▸ back

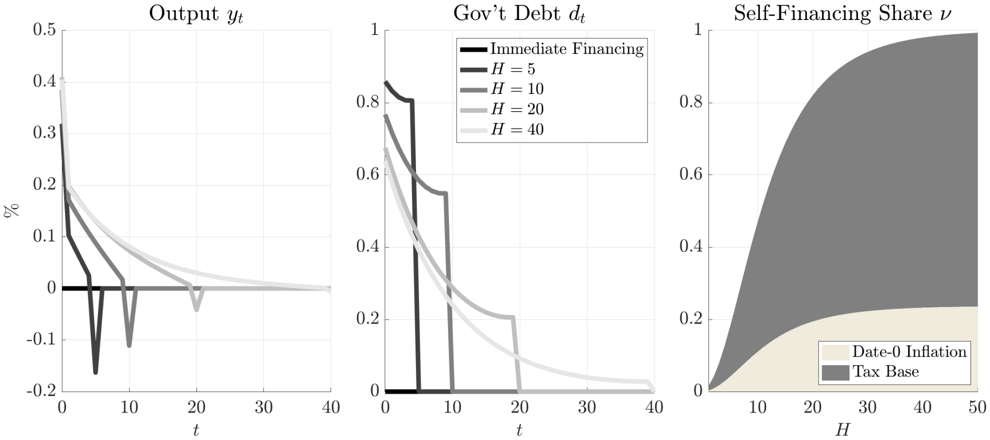
The importance of discounting

spender-saver model



The importance of discounting

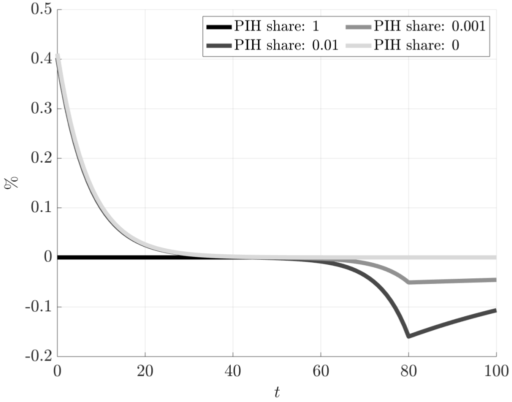
hybrid spender-OLG model



Self-financing with partial discounting

equilibrium selection matters if there's a margin μ of PIH households

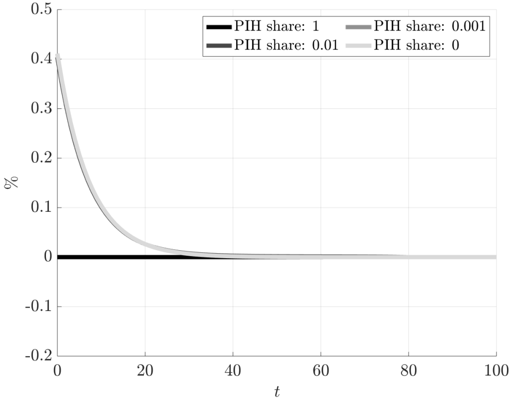
Variant I: $\phi \to 0^+$. Then $\nu = 0$ if $\mu > 0$ (i.e., discontinuity in μ). Get (very) persistent, delayed bust.



Self-financing with partial discounting

equilibrium selection matters if there's a margin μ of PIH households

Variant II: return economy to $y_t = 0$ after H. Then ν is continuous in μ, with $\lim_{\mu \to 0} \nu = \nu_{OLG}$.



Adding investment

- **Environment**
  - **Households**: receive labor income plus dividends e_t. Pay taxes τ_y on both.
  - **Production**: standard DSGE production block. Key twist: no tax payments anywhere.
- **Self-financing result**
  - For rigid prices exactly the same self-financing eq'm as before. Why? Keynesian cross & gov't budget both have c_t rather than y_t in them, so same pair of equations as before
  - Partially sticky prices: more complicated mapping from $\{c_t\}_{t=0}^{\infty}$ back to π_0, so fixed point is more complicated, but can still show that self-financing eq'm exists

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Quantitative model

- Identical to baseline model, but with richer **aggregate demand block**
  - Hybrid spender-OLG environment: fraction μ is hand-to-mouth, remainder $1 - \mu$ is OLG as in our baseline model
  - Why? allows us to disentangle *level* impact MPC from *slope* of dynamic MPC profile (ω), consistent with empirical evidence
- **Calibration strategy**
  1. **Demand block**: match evidence on MPC level & slope from microeconomic data on consumer spending behavior Johnson-Parker-Souleles, Fagereng-Holm-Natvik
  2. **Fiscal adjustment speed**: empirical evidence on debt dynamics from (i) VARs, (ii) estimated structural GE models, & (iii) direct estimation of fiscal adjustment rules

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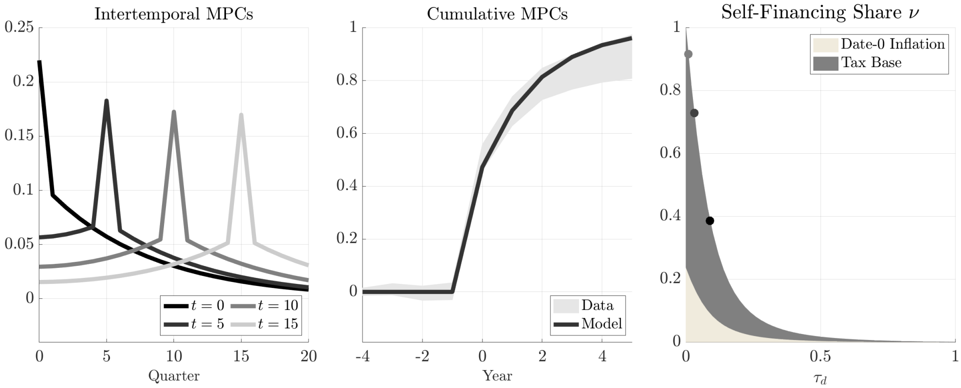
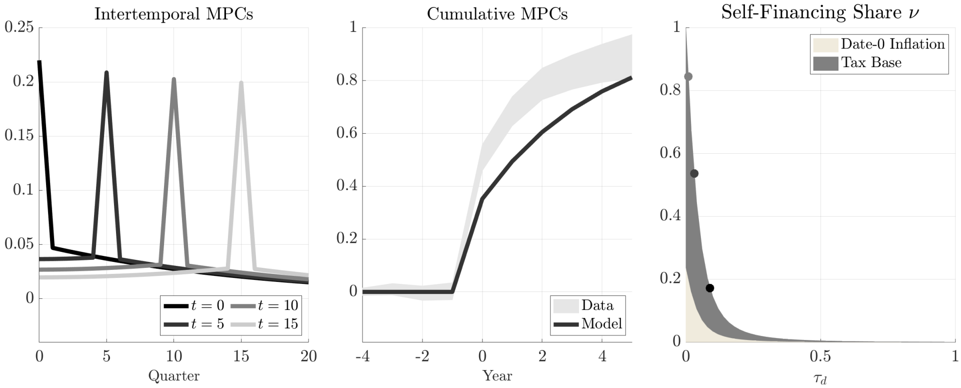
Three calibration strategies

Baseline: match impact and short-run MPCs, then extrapolate



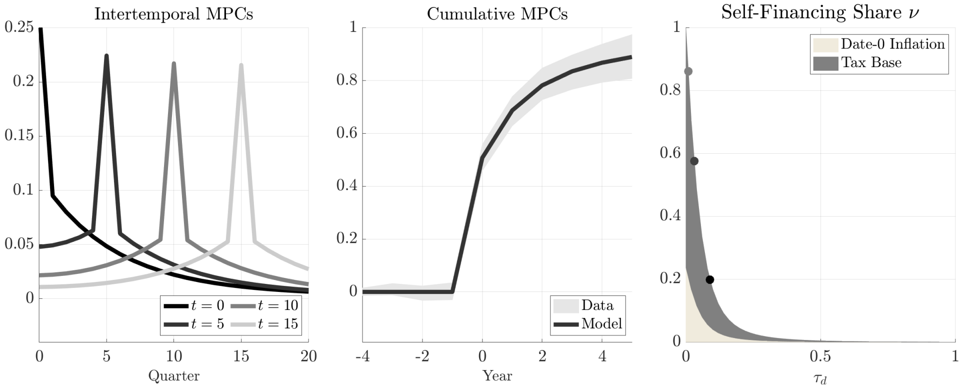
Three calibration strategies

Variant I: match lower bound of six-year cumulative spending share



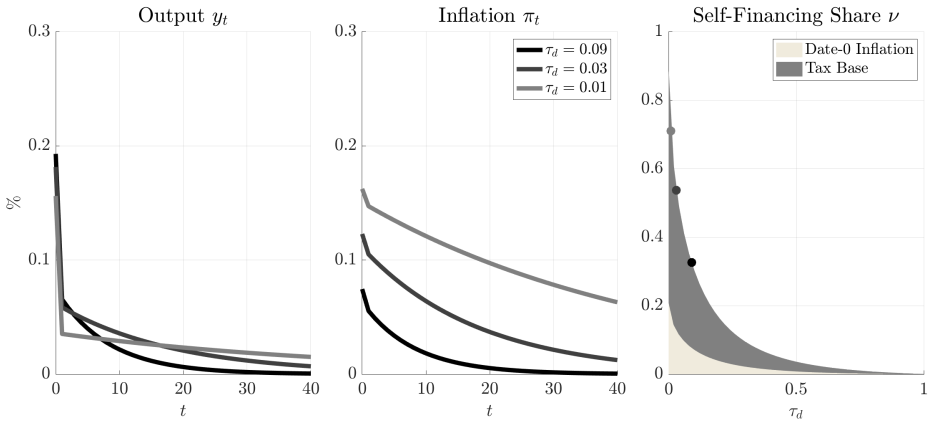
Three calibration strategies

Variant II: two-type OLG + spender model to match cumulative MPC time profile



Further experiments

Environment: baseline + behavioral friction [strong cognitive discounting]



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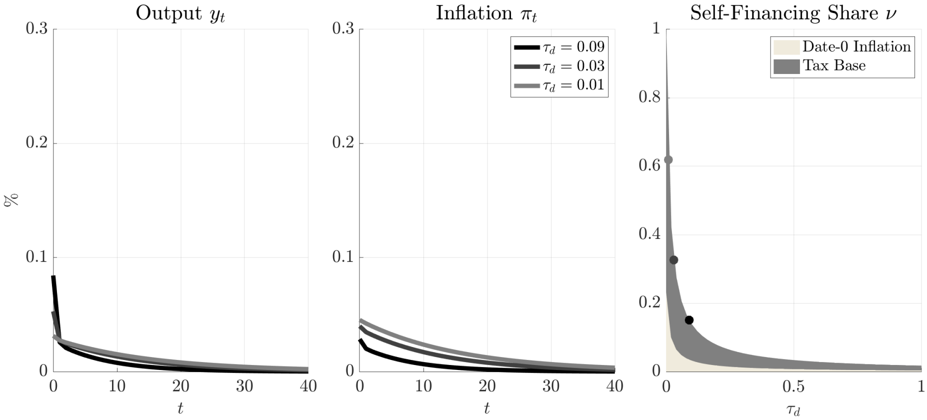
Further experiments

Environment: baseline + long-term debt + aggressive monetary policy ($\phi = 0.5$)



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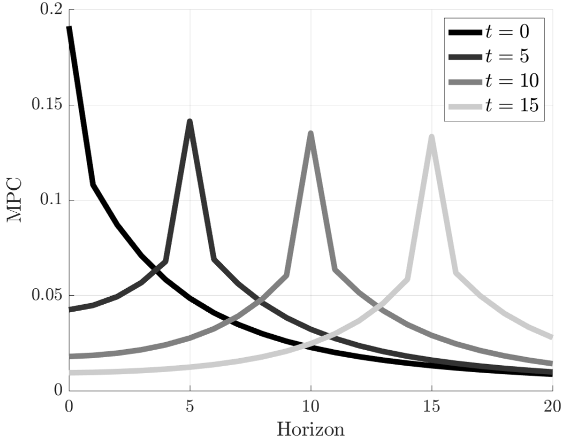
Further experiments

Environment: HANK model [similar to Wolf (2022)]



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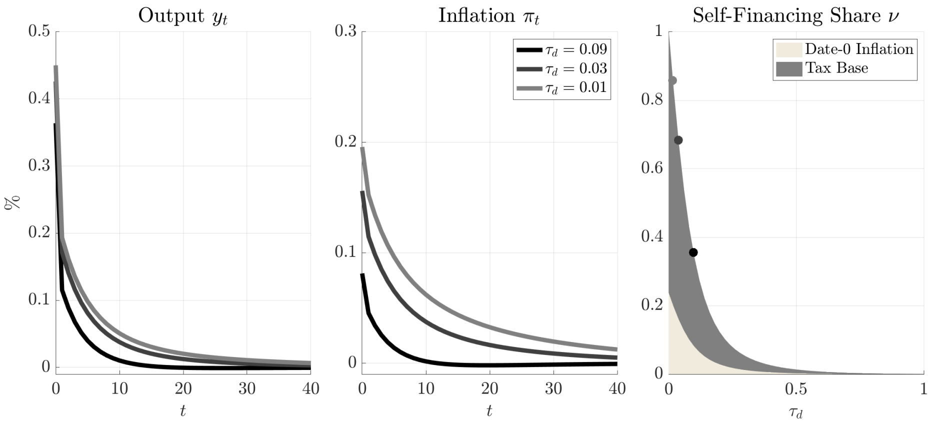
Further experiments

Environment: HANK model [similar to Wolf (2022)]



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