Temptation and Monetary-Fiscal Policy Coordination

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Background

- In real world, monetary and fiscal policy are inextricably intertwined
  - interest rate decisions (MP) $\Longrightarrow$ govt. debt sustainability (FP)
  - taxes/govt. spending (FP) $\Longrightarrow$ AD $\Longrightarrow$ inflation, interest rates (MP)
- Yet, in baseline NK model, limited coordination is necessary to shield economy from non-fundamental fluctuations: a determinate REE emerges if either
  1. MP responds *actively* (more than 1-to-1) to inflation (Taylor principle) and FP *passively* stabilizes debt (**AM/PF Regime**); or
  2. Both MP and FP weakly respond to their respective targets, and inflation endogenously adjusts to put govt. debt on a sustainable trajectory (**PM/AF Regime**), according to the FTPL logic

Motivation

- This stark dichotomy (Leeper, JME '91) is driven by Ricardian equivalence
- In baseline NK, Ricardian equivalence is due to mainstream *behavioral* and *structural* assumptions
  - households' infinite planning horizon
  - constant rate discounted utility framework with stationary preferences (no preference reversals)
  - frictionless asset markets
  - rational expectations
  - (non-distortionary) lump-sum taxation
- Ricardian equivalence is fragile to reasonable *structural* amendments of baseline NK model

A Behavioral Approach

- We take a **behavioral approach**: Ricardian equivalence fails to hold in a NK model with households characterized by Gul and Pesendorfer (ECTA '01, '04) *temptation with self-control preferences*
- A large body of experimental and field research documents *preference reversal* in intertemporal choices: present-bias in consumption
- GP-preferences allow to reconcile this evidence with a model of dynamic consumption choice which preserves time consistency

A Behavioral Approach

- GP provide axioms where decision-maker's utility depends on *choice sets* (not just the choice made). In our context:
  - the representative agent is tempted by *hand-to-mouth* behavior: use entire financial wealth (e.g. government bonds) for immediate consumption;
  - resisting temptation involves cognitive effort (or self-control), and hence some disutility;
  - optimal behavior trades off the temptation for immediate satisfaction (temptation utility) with long-run optimal consumption smoothing (commitment utility).
- Gul-Pesendorfer (ECTA '01, '04), lay out baseline framework with *linear costs* in static and dynamic contexts
- Convincing experimental evidence on GP-preferences by Toussaert (ECTA '18, WP '19)

Our Paper

- We use this *behavioral NK* framework to
  1. study the coordination of monetary and fiscal policy for what concerns (local) determinacy of REE: does Leeper's dichotomy holds?
  2. assess the impact of temptation on
     1. the government spending multiplier for output in the *conventional* AM/PF regime: can we raise it above 1 without too much price rigidity?
     2. govt. bonds' wealth effects on inflation in the *fiscalist* PM/AF regime (not today)
     3. the transmission of a persistent shock to the inflation target in both of them (not today)

Related Literature

Applications to Macroeconomics

Positive and normative implications of GP-preferences in dynamic macroeconomic models

- Social security (Kumru and Thanopoulos, JPubE '11)
- Optimal capital taxation (Krusell et al., ECTA '10)
- Asset pricing (DeJong and Ripoll, JME '07; Airaudo, MD '21)
- Welfare cost of business cycle fluctuations (Huang et al., JMCB '15)
- Forward guidance puzzle (Airaudo, JET '20)
- Housing and hand-to-mouth behavior (Attanasio et al., NBER '21; Kovacs, IER '21)
- Optimal monetary policy (Airaudo et al., '23)

Preview of Results

In a GP-NK model

1. **Leeper's dichotomy fails: more MP-FP coordination needed**
2. **Equilibrium determinacy depends on the relative strength of policy feedbacks**
   How active MP should be depends on how aggressive is FP
3. Temptation reduces the risk of explosive debt dynamics in the AM/AF Regime
   $\Longrightarrow$ a determinate equilibrium arises if MP is not too active (a bounded Taylor Principle)
4. Temptation can induce equilibrium indeterminacy both in conventional AM/PF regime and the fiscalist PM/AF regime
   $\Longrightarrow$ a determinate equilibrium arises if MP is sufficiently active (a reinforced Taylor Principle)
5. **Temptation amplifies the quantitative impact of monetary and fiscal policy shocks** both in the AM/PF and PM/AF regime.

The Model

- The backbone of our model economy is identical to the baseline New Keynesian model used for monetary policy analysis:
  - A continuum of identical infinitely-lived households who consume and save (demand side).
  - A continuum of sticky price monopolistically competitive good producing firms (supply side).
- Standard supply side: Calvo price setting problem with monopolistically competitive firms
- **Key innovation**: introduction of GP-preferences, as in Airaudo (JET '20).

The Household Problem

Household chooses commitment plan $a = \{c_t, h_t, b_t, m_t\}_{t=0}^{\infty}$ and temptation plan $\tilde{a} = \{\tilde{c}_t, \tilde{h}_t, \tilde{b}_t, \tilde{m}_t\}_{t=0}^{\infty}$ to solve a dynamic program:

$$\begin{aligned} \mathcal{U}_t &= \max_{a} \{u(c_t, h_t, m_t) + \nu(c_t, h_t, m_t) + \beta E_t \mathcal{U}_{t+1}\} \\ &\quad - \max_{\tilde{a}} \nu(\tilde{c}_t, \tilde{h}_t, \tilde{m}_t) \\ c_t + b_t + m_t &= R_{t-1}\frac{b_{t-1}}{\pi_t} + \frac{m_{t-1}}{\pi_t} + w_t h_t + d_t - \tau_t, \qquad m_t, b_t \geq 0 \end{aligned}$$

- **Self-control cost**: utility difference between most tempting option (consume all wealth, $\tilde{b}_t = 0$) and optimal long-run plan

$$SCC = \max_{\tilde{a}} \nu(\tilde{c}_t, \tilde{h}_t, \tilde{m}_t) - \nu(c_t, h_t, m_t) > 0$$

The Household Problem

- **Temptation parameter**: $\xi \geq 0$

$$\underbrace{u_t = (1-\psi)\ln x_t + \psi \ln m_t}_{\text{commit. utility}}, \qquad x_t \equiv c_t - \frac{h_t^{1+\chi}}{1+\chi}, \qquad \underbrace{v_t = \xi u_t}_{\text{tempt. utility}}$$

Paper allows for a more general x-m non-separable specification!

Generalized Euler Equation

- Household's problem gives a **Generalized Euler Equation**

$$x_t^{-1}(1+\xi) = \beta R_t E_t \left[\frac{x_{t+1}^{-1} + \xi(x_{t+1}^{-1} - \tilde{x}_{t+1}^{-1})}{\pi_{t+1}} \right] \quad (1)$$

$$\tilde{x}_t = (1-\psi)\left(x_t + m_t + \frac{b_t}{R_t} \right)$$

- Temptation introduces two key changes
  1. It affects the **consumption-saving trade-off**
     - MB of current consumption (LHS of (1)) accrued by factor $(1+\xi)$
     - MB of saving (RHS of (1)) augmented by (marginal) disutility cost of self-control, $\xi(x_{t+1}^{-1} - \tilde{x}_{t+1}^{-1}) > 0$ (as $\tilde{x}_{t+1} = x_{t+1} + b_{t+1} > x_{t+1}$)
  2. It introduces **negative real wealth effects** from bond holdings in Euler equation (Ricardian Equivalence breaks)
     - by increasing $\tilde{x}_{t+1}$, higher b_{t+1} lowers the future marginal costs of self-control
     - forward-looking households have an additional incentive to save

Rest of the Model

- Fiscal government faces standard budget:

$$\tau_t + \frac{b_t^T}{R_t} = \frac{b_{t-1}^T}{\pi_t} + g_t. \tag{2}$$

with fiscal feedback rule

$$\tau_t = \bar{\tau}\left(\frac{b_{t-1}^T}{\bar{b}}\right)^{\phi_b}, \qquad \phi_b \geq 0, \tag{3}$$

- The central bank follows a Taylor rule:

$$R_t = \bar{R}\left(\frac{\pi_t}{\pi_t^*}\right)^{\phi_\pi}, \qquad \phi_\pi \geq 0, \tag{4}$$

Local Equilibrium Dynamics

- We log-linearize equilibrium conditions around unique steady state (suff. cond. is $\xi < 2\beta - 1$)
- We obtain a 3-dimensional system

$$\hat{y}_t = \alpha E_t \hat{y}_{t+1} - \underbrace{\gamma_r \left(\hat{R}_t - E_t \hat{\pi}_{t+1}\right)}_{\text{real int. rate channel}} + \underbrace{\gamma_R E_t \hat{R}_{t+1}}_{\substack{\text{nom. int. rate channel} \\ \text{(temptation-driven)}}}$$

$$\underbrace{-\gamma_b E_t \left(\hat{b}_{t+1} - \hat{R}_{t+1}\right)}_{\substack{\text{govt. debt channel} \\ \text{(temptation-driven)}}}$$

$$\hat{\pi}_t = \tilde{\beta} E_t \hat{\pi}_{t+1} + \kappa \chi \hat{y}_t \quad \text{for} \quad \tilde{\beta} < \beta, \ \kappa \equiv \frac{(1-\theta)\left(1-\theta\tilde{\beta}\right)}{\theta}$$

$$\hat{b}_t - \hat{R}_t = \varphi_b \hat{b}_{t-1} - \bar{R}\hat{\pi}_t + g_b \bar{R}\hat{g}_t \quad \text{for} \quad \varphi_b \equiv \bar{R}\left(1 - \tau_b \phi_b\right)$$

- REMARK: for $\xi = 0 \Longrightarrow$ baseline NK model (with GHH utility): $\alpha = 1$ and $\gamma_R = \gamma_b = 0$; $\tilde{\beta} = \beta$

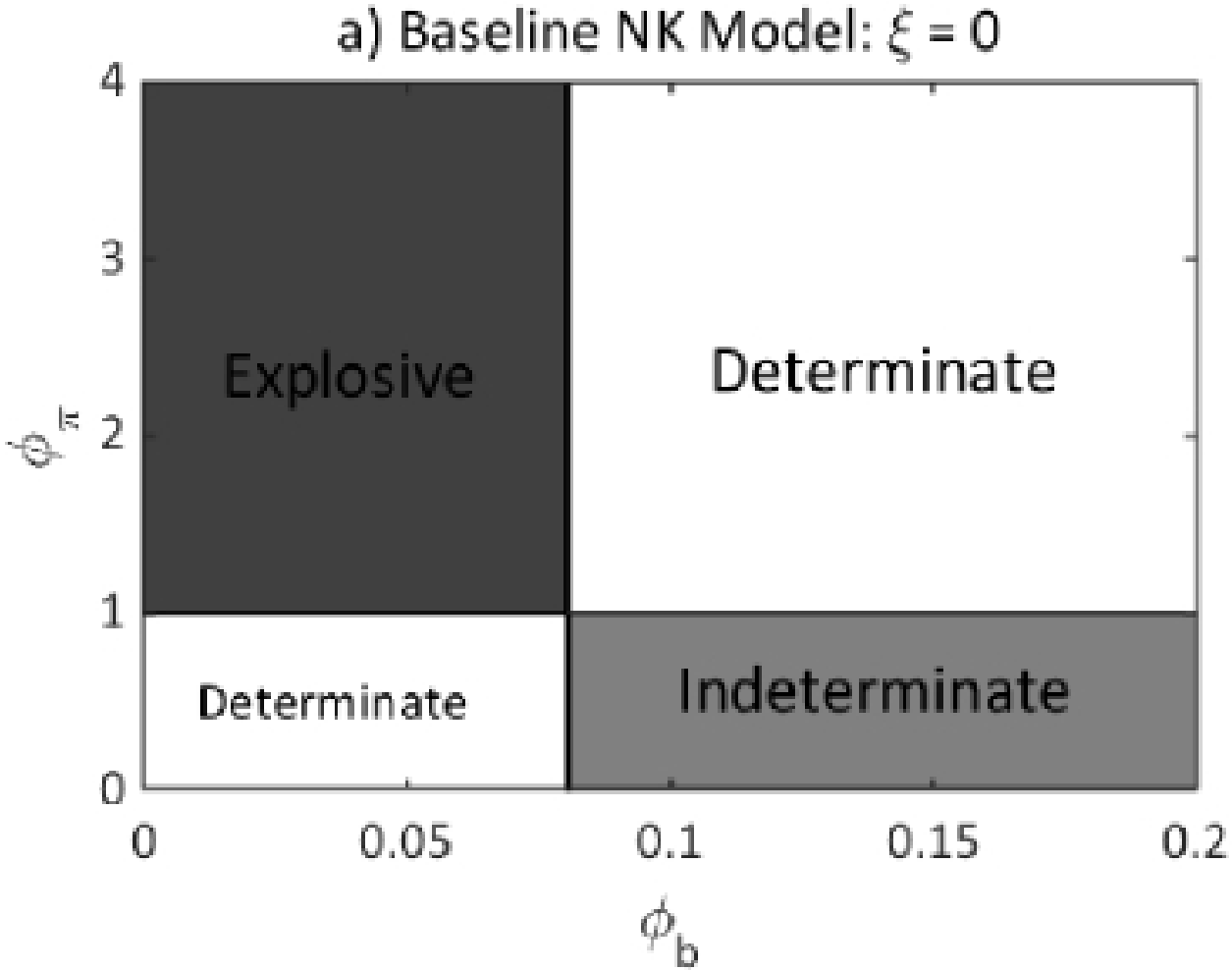
Equilibrium Determinacy without Temptation

Proposition 3 (Leeper's Dichotomy)
Assume no temptation ($\xi = 0$) and flexible prices ($\theta \longrightarrow 0$)

- The REE is locally **determinate** for either
  - $0 \leq \phi_\pi < 1$ and $0 \leq \phi_b < \frac{\bar{R}-1}{\bar{R}\tau_b}$ (**PM/AF regime**); or
  - $\phi_\pi > 1$ and $\phi_b > \frac{\bar{R}-1}{\bar{R}\tau_b}$ (**AM/PF regime**).
- The REE is locally **indeterminate** for $0 \leq \phi_\pi < 1$ and $\phi_b > \frac{\bar{R}-1}{\bar{R}\tau_b}$ (**PM/PF regime**).
- There is **no stationary REE** (i.e., the equilibrium is explosive) for $\phi_\pi > 1$ and $0 \leq \phi_b < \frac{\bar{R}-1}{\bar{R}\tau_b}$ (**AM/AF regime**)

NOTE: same results for sticky prices, $\theta > 0$

Equilibrium Determinacy without Temptation



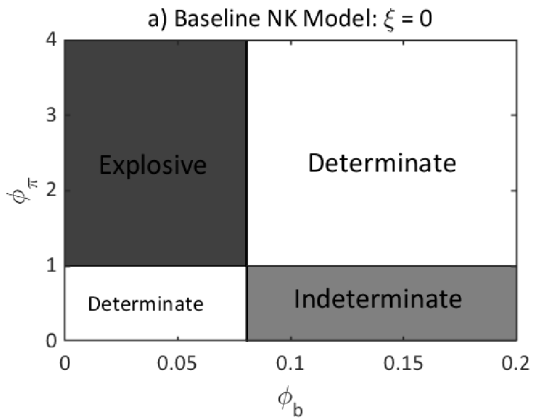
Equilibrium Determinacy with Temptation

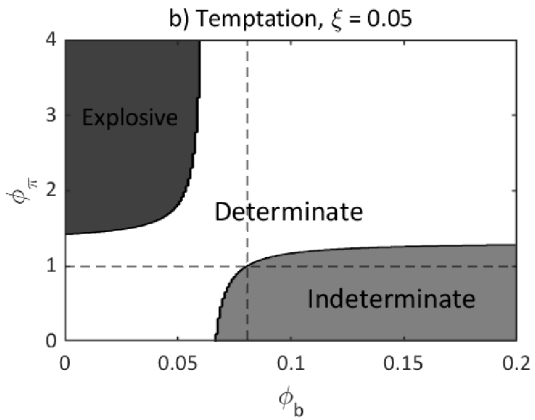
Key Results

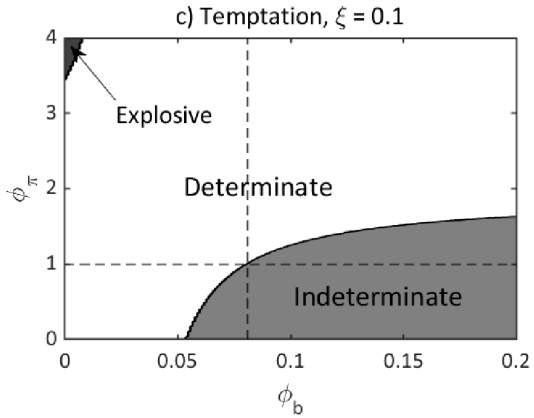
- Analytical results for the case of flex prices, robust numerical results for the case of sticky prices
- Leeper's dichotomy no longer applies
  1. A **determinate REE** is possible in the **AM/AF** regime if MP is not too active, $1 < \phi_\pi < \bar{\phi}_\pi$ (**bounded Taylor Principle**)
     $\Longrightarrow$ lower "risk" of explosive dynamics
  2. In the **AM/PF** regime, a **determinate REE** requires MP to be sufficiently active, $\phi_\pi > \bar{\phi}_\pi$ (**reinforced Taylor Principle**)
     $\Longrightarrow$ higher "risk" of indeterminate dynamics
- The bound $\bar{\phi}_\pi$ is strictly increasing in temptation ξ and the fiscal feedback ϕ_b
  $\Longrightarrow$ eq. outcome depend on relative strength of policy feedbacks

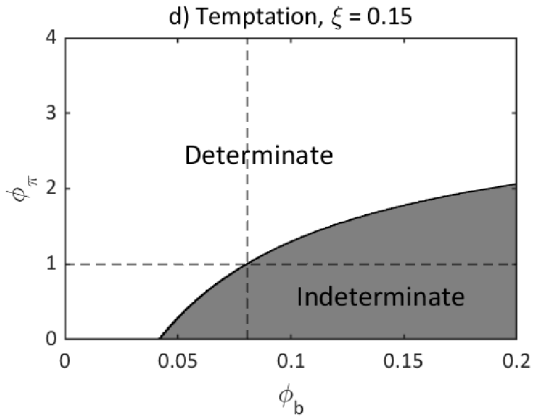
Equilibrium Determinacy with Temptation

Numerical Results for Baseline Calibration









Equilibrium Determinacy with Temptation

Intuition for Determinacy in the AM/AF Region

- What does MP-FP coordination require? In a nutshell
  1. If govt. is fiscally irresponsible, inflation should take care of debt dynamics (FTPL)
  2. If govt. is fiscally responsible, central bank should threat to "blow economy away"
     $\Longrightarrow$ inflation diverges in expectations unless it starts at target
- In the **AM/AF regime**, $\varphi_b > 1$: $\hat{b}_t$ will explode unless $\hat{\pi}_t$ "free to jump" to guarantee fiscal solvency
- Under flex prices, modified Fisher equation holds:

$$\hat{R}_t = E_t\hat{\pi}_{t+1} + \underbrace{\gamma_\pi E_t\hat{\pi}_{t+1}}_{\text{due to wealth effect of temptation}}$$

$$\gamma_\pi \geq 0 \quad \text{for} \quad \xi \geq 0$$

Equilibrium Determinacy with Temptation

Intuition for Determinacy in the AM/AF Region

- Inflation dynamics given by

$$\phi_\pi \hat{\pi}_t = (1+\gamma_\pi)\, E_t \hat{\pi}_{t+1}, \qquad \text{where} \qquad \phi_\pi > 1$$

- If $\xi = 0$ (baseline NK) $\Longrightarrow \gamma_\pi = 0$
  $\Longrightarrow E_t \hat{\pi}_{t+1} = \phi_\pi \hat{\pi}_t > \hat{\pi}_t$: explosive inflation unless it starts at target, $\hat{\pi}_t = 0$
  $\Longrightarrow$ inflation cannot guarantee fiscal solvency at the same time
  $\Longrightarrow$ debt explosive, no stable REE!
- If $\xi > 0 \Longrightarrow \gamma_\pi > 0$

$$E_t \hat{\pi}_{t+1} = \frac{\phi_\pi}{1+\gamma_\pi} \hat{\pi}_t < \hat{\pi}_t \qquad \text{for} \qquad \underbrace{\phi_\pi < 1+\gamma_\pi}_{\text{bounded TP}}$$

  $\Longrightarrow$ continuum of $\hat{\pi}_t \neq 0$ yielding convergence to SS
  $\Longrightarrow$ $\hat{\pi}_t$ pinned down by fiscal sustainability requirement
  $\Longrightarrow$ unique and stable REE

Equilibrium Determinacy with Temptation

Intuition for Determinacy in the AM/PF Region

- Similar logic but reversed
- Govt. is always fiscal responsible: $\varphi_b \in (0,1)$, hence stable $\hat{b}_t$ $\Longrightarrow$ determinacy requires unstable inflation dynamics

$$\phi_\pi \hat{\pi}_t = (1+\gamma_\pi)\, E_t \hat{\pi}_{t+1} \qquad \text{for} \qquad \phi_\pi > 1$$

- Always the case in baseline NK since $\gamma_\pi = 0$
- With temptation:

$$E_t \hat{\pi}_{t+1} = \frac{\phi_\pi}{1+\gamma_\pi} \hat{\pi}_t > \hat{\pi}_t \qquad \text{for} \qquad \underbrace{\phi_\pi > 1+\gamma_\pi}_{\text{reinforced TP}}$$

Government Spending Multiplier

Definition

- In a determinate REE, the MSV solution is

$$\hat{y}_t = \Upsilon_{y,b}\hat{b}_{t-1} + \Upsilon_{y,g}\hat{g}_t + \Upsilon_{y,\pi}\hat{\pi}^*_t \quad (5)$$

$$\hat{\pi}_t = \Upsilon_{\pi,b}\hat{b}_{t-1} + \Upsilon_{\pi,g}\hat{g}_t + \Upsilon_{\pi,\pi}\hat{\pi}^*_t \quad (6)$$

- Government spending multiplier is defined as in Christiano et al. (JPE, '11)

$$FM \equiv \frac{\partial y_t}{\partial g_t} = \frac{\bar{y}}{\bar{g}}\frac{\partial \hat{y}_t}{\partial \hat{g}_t} = \frac{\Upsilon_{y,g}}{g_y} \quad (7)$$

Government Spending Multiplier

Quantitative Results

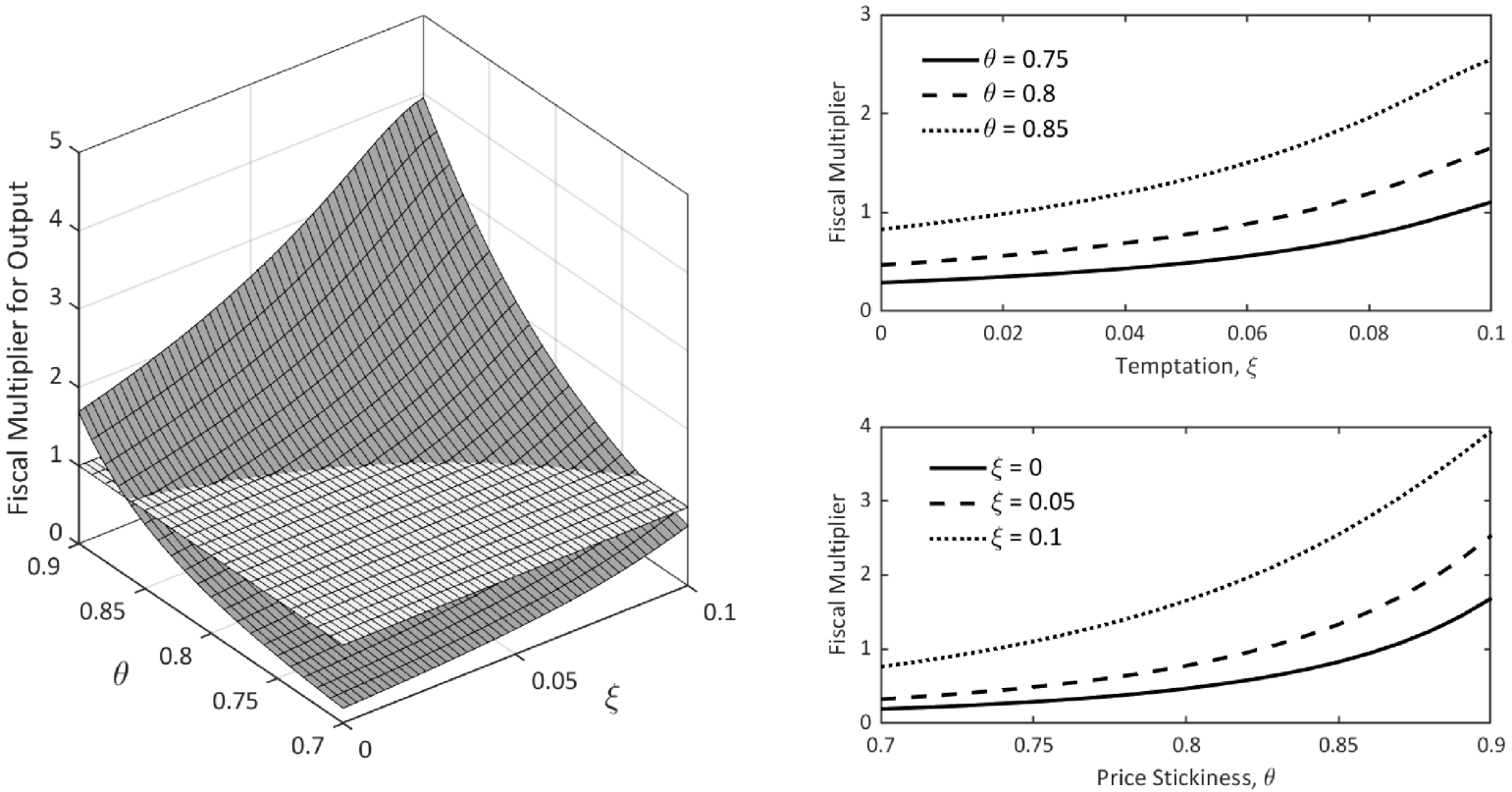


Figure: Fiscal multiplier for output: temptation and price stickiness.

Government Spending Multiplier

Intuition: Baseline Model

- Hard to get multiplier larger than 1 in baseline NK with standard preferences
- We need consumption to increase following higher g_t, but not easy since
  1. negative wealth effect of expected future taxes on consumption
  2. negative wealth effect of consumptionn on labor supply

  $\Longrightarrow$ small increase in labor income
- GHH utility helps: no wealth effect on labor supply
  $\Longrightarrow$ larger increase in wages hence labor income, lower consumption
- Still not enough to increase consumption unless high price rigidity assumed
  Stickier prices make labor demand shift by more (hence higher wages)

Government Spending Multiplier

Intuition: NK with Temptation

- Household seeks to smooth also the cognitive costs of self-control
- Higher wages $\Longrightarrow$ more tempting to act like HTM
  (higher temptation consumption, $\tilde{c}_t$)
- Households increase commitment consumption c_t to smooth *current* costs of SC (lower myopic-self disutility from resisting to temptation)
  $\Longrightarrow$ lower savings
- *Future* costs of SC drop too: future tempting option less appealing
  $\Longrightarrow$ additional incentive to save weakens
  $\Longrightarrow$ further incentive to consume more today

Conclusions

- The introduction of GP *temptation-with-self-control* preferences in baseline NK model breaks Leeper's AM/PF vs PM/AF dichotomy
- Equilibrium determinacy requires closer coordination btw monetary and fiscal policy
- In particular
  1. lower risk of non-existence of stable REE in the AM/AF regime: *bounded Taylor principle* yields determinacy
  2. risk of indeterminacy in the AM/PF regime: *reinforced Taylor principle* is necessary
- Temptation also amplifies the transmission of both fiscal (government spending) and monetary (inflation target) shocks