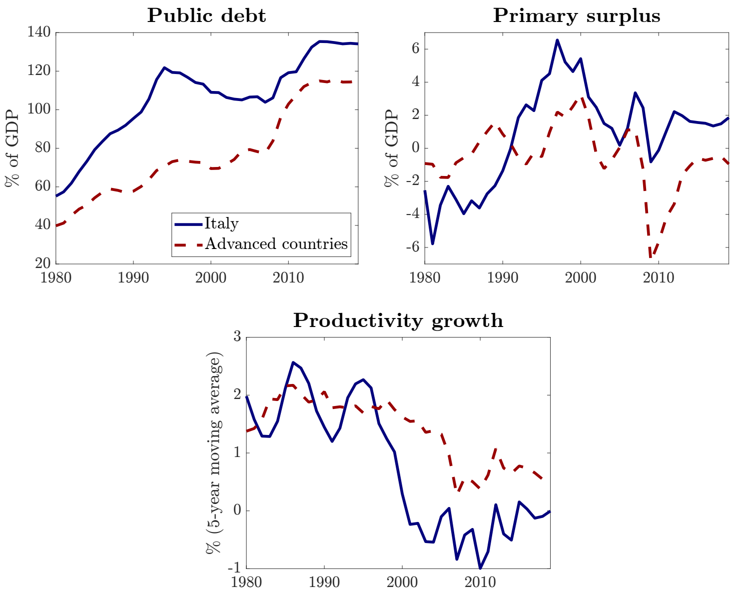
Fiscal Stagnation

Luca Fornaro and Martin Wolf

Motivation

- High public debt-to-GDP in most advanced economies
  - Heated debate about debt sustainability and macro implications
  - Often led on the premise that productivity growth does not depend on fiscal policy (Blanchard, 2023)
- Recent empirical evidence suggests that fiscal policy matters for productivity growth
  - Firms' investment responds to changes in taxes (Cloyne et al., 2024)
  - Public R&D strongly complementary with private investment (Antolin-Diaz and Surico, 2024; Fieldhouse and Mertens, 2023)

Italy: a case of fiscal stagnation?



This paper

- Endogenous growth model with public debt and fiscal policy
  - Growth driven by investment by profit-maximizing firms
  - Large primary surpluses generate fiscal distortions
- Key insight: two-way interaction between fiscal policy and growth
  - High surplus $\rightarrow$ high fiscal distortions $\rightarrow$ low growth
  - Low growth $\rightarrow$ high surplus $\rightarrow$ high fiscal distortions

Overview of results

- Two steady states may coexist
  - Fiscally sound: low surplus, low fiscal distortions, high growth
  - Fiscal stagnation: high surplus, high fiscal distortions, low growth
- Falling into fiscal stagnation
  - Hysteresis: temporary shocks may determine long-run outcomes
  - Animal spirits may play a role
- How to exit fiscal stagnation?
  - Big push/regime change
  - Austerity vs. pro-growth policies
  - Lack of credibility $\rightarrow$ excessive austerity

Outline

Baseline model

Model of vertical innovation (Aghion and Howitt, 1992), augmented with public debt and distortionary taxes

- Infinite-horizon closed economy
- Agents
  - Households (consume, buy government debt and work)
  - Firms (produce and invest)
  - Government (issues debt and sets taxes)
- Perfect foresight

Households

- Representative household with expected lifetime utility

$$\sum_{t=0}^{\infty} \beta^t \frac{C_t^{1-\gamma} - 1}{1-\gamma}$$

- Fixed labor supply normalized to 1, budget constraint

$$C_t + T_t + \frac{D_{t+1}}{R_t} = W_t + \Pi_t + D_t$$

- Euler equation

$$C_t^{\gamma} = \frac{C_{t+1}^{\gamma}}{\beta R_t} \rightarrow R_t = \left(\frac{C_{t+1}}{C_t}\right)^{\gamma} \frac{1}{\beta}$$

- Assume $\gamma < 1$: interest rate moves less than one-for-one with growth

Firms - final good production

- Large number of competitive firms producing according to

$$Y_t = (ZL_t)^{1-\alpha} \int_0^1 A_{j,t}^{1-\alpha} x_{j,t}^{\alpha} dj$$

- x_j is an intermediate input of productivity A_j
- Fixed number of intermediate inputs, quality growing over time
- Profit maximization implies the demand functions

$$(1-\alpha) Z^{1-\alpha} L_t^{-\alpha} \int_0^1 A_{j,t}^{1-\alpha} x_{j,t}^{\alpha} dj = W_t$$

$$\alpha (ZL_t)^{1-\alpha} A_{j,t}^{1-\alpha} x_{j,t}^{\alpha-1} = P_{j,t}$$

Firms - intermediate goods

- Each intermediate good j is produced by a monopolist
- One unit of final good is needed to manufacture one unit of intermediate good
  - Optimal price $P_{j,t} = 1/\alpha$
  - Equilibrium profits $\varpi A_{j,t}$
- Profits are taxed at rate τ_t^p by the government

Investment in innovation

- Firms may invest to increase their productivity

$$A_{j,t+1} = A_{j,t} + \chi I_{j,t}$$

- Assume rents from innovation last a single period

$$\max_{I_{j,t} \geq 0} \beta \frac{C_t^\gamma}{C_{t+1}^\gamma}(1 - \tau_{t+1}^p)\varpi A_{j,t+1} - I_{j,t}$$

- Optimal investment in innovation

$$\frac{1}{\chi} \geq \beta \frac{C_t^\gamma}{C_{t+1}^\gamma}(1 - \tau_{t+1}^p)\varpi$$

- Higher profit tax τ_{t+1}^p discourages innovation activities
  - Similar effects from cuts in public investments, public R&D or public services, hikes in labor taxes, cuts in investment subsidies,...

Aggregate production and market clearing

- GDP is given by

$$Y_t - \int_0^1 x_{j,t} dj = A_t \quad \text{where} \quad A_t \equiv \int_0^1 A_{j,t} dj$$

- Market clearing for final good

$$A_t = C_t + I_t$$

- Productivity growth

$$\frac{A_{t+1}}{A_t} \equiv g_{t+1} = 1 + \chi \frac{I_t}{A_t}$$

Fiscal policy

- Government's budget constraint

$$S_t + \frac{D_{t+1}}{R_t} = D_t$$

- Primary surplus

$$S_t = T_t + \tau_t^p \varpi A_t$$

- Upper bound on non-distortionary taxes

$$T_t \leq \bar{s} A_t$$

- Government minimizes use of distortionary taxation

$$\tau_t^p = \max\left\{0, \frac{S_t - \bar{s} A_t}{\varpi A_t}\right\}$$

Equilibrium

- **Growth equation**

$$g_{t+1} = \begin{cases} \frac{c_t}{c_{t+1}} \left(\beta\chi\varpi\right)^{1/\gamma} \equiv \bar{g}_{t+1} & \text{if } s_{t+1} \leq \bar{s} \\ \bar{g}_{t+1} \left(1 - \frac{s_{t+1}-\bar{s}}{\varpi}\right)^{1/\gamma} & \text{if } \bar{s} < s_{t+1} \leq \bar{s} + \varpi\left(1 - \bar{g}_{t+1}^{-\gamma}\right) \\ 1 & \text{if } \bar{s} + \varpi\left(1 - \bar{g}_{t+1}^{-\gamma}\right) < s_{t+1} \end{cases}$$

  - When s_{t+1} is low, growth is un-distorted because $\tau_{t+1}^{p} = 0$
  - Once $s_{t+1} \geq \bar{s}$, growth starts to decline in s_{t+1}
  - For very high s_{t+1}, distortions are so high that investment is zero

Equilibrium

- Growth equation

$$g_{t+1} = \begin{cases} \frac{c_t}{c_{t+1}} \left(\beta\chi\varpi\right)^{1/\gamma} \equiv \bar{g}_{t+1} & \text{if } s_{t+1} \leq \bar{s} \\ \bar{g}_{t+1} \left(1 - \frac{s_{t+1} - \bar{s}}{\varpi}\right)^{1/\gamma} & \text{if } \bar{s} < s_{t+1} \leq \bar{s} + \varpi \left(1 - \bar{g}_{t+1}^{-\gamma}\right) \\ 1 & \text{if } \bar{s} + \varpi \left(1 - \bar{g}_{t+1}^{-\gamma}\right) < s_{t+1} \end{cases}$$

- **Fiscal equation**

$$s_t = d_t - d_{t+1} \frac{g_{t+1}}{R_t}$$

Equilibrium

- Growth equation

$$g_{t+1} = \begin{cases} \frac{c_t}{c_{t+1}} \left(\beta\chi\varpi\right)^{1/\gamma} \equiv \bar{g}_{t+1} & \text{if } s_{t+1} \leq \bar{s} \\ \bar{g}_{t+1} \left(1 - \frac{s_{t+1} - \bar{s}}{\varpi}\right)^{1/\gamma} & \text{if } \bar{s} < s_{t+1} \leq \bar{s} + \varpi \left(1 - \bar{g}_{t+1}^{-\gamma}\right) \\ 1 & \text{if } \bar{s} + \varpi \left(1 - \bar{g}_{t+1}^{-\gamma}\right) < s_{t+1} \end{cases}$$

- **Fiscal equation**

$$s_t = d_t - d_{t+1}\beta \left(\frac{c_t}{c_{t+1}}\right)^{\gamma} g_{t+1}^{1-\gamma}$$

Equilibrium

- Growth equation

$$g_{t+1} = \begin{cases} \frac{c_t}{c_{t+1}} (\beta\chi\varpi)^{1/\gamma} \equiv \bar{g}_{t+1} & \text{if } s_{t+1} \leq \bar{s} \\ \bar{g}_{t+1} \left(1 - \frac{s_{t+1} - \bar{s}}{\varpi}\right)^{1/\gamma} & \text{if } \bar{s} < s_{t+1} \leq \bar{s} + \varpi \left(1 - \bar{g}_{t+1}^{-\gamma}\right) \\ 1 & \text{if } \bar{s} + \varpi \left(1 - \bar{g}_{t+1}^{-\gamma}\right) < s_{t+1} \end{cases}$$

- Fiscal equation

$$s_t = d_t - d_{t+1}\beta \left(\frac{c_t}{c_{t+1}}\right)^{\gamma} g_{t+1}^{1-\gamma}$$

- Market clearing

$$1 = c_t + \frac{g_{t+1} - 1}{\chi}$$

- Equilibrium is a path for $\{g_{t+1}, c_t, d_{t+1}\}$ satisfying these equations for given fiscal policy $\{s_t\}$ and the initial condition d_0

Outline

1. Introduction
2. Baseline model
3. Falling into fiscal stagnation
4. Exiting fiscal stagnation

A constant debt policy

- Assume that government maintains debt-to-GDP constant

$$d_{t+1} = d$$

- Focus on steady states

$$g = \begin{cases} \bar{g} \equiv (\beta \chi \varpi)^{1/\gamma} & \text{if } s \leq \bar{s} \\ \bar{g}\left(1 - \frac{s-\bar{s}}{\varpi}\right)^{1/\gamma} & \text{if } \bar{s} < s \leq \bar{s} + \varpi\left(1 - \bar{g}^{-\gamma}\right) \\ 1 & \text{if } \bar{s} + \varpi\left(1 - \bar{g}^{-\gamma}\right) < s \end{cases} \tag{GG}$$

$$s = d\left(1 - \beta g^{1-\gamma}\right) \tag{FF}$$

Fiscally sound steady state

- No fiscal distortions $\rightarrow$ high growth ($g = \bar{g}$)

$$s = d\left(1 - \beta \bar{g}^{1-\gamma}\right) \leq \bar{s}$$

- So a fiscally sound steady state exists if

$$d \leq \frac{\bar{s}}{1 - \beta \bar{g}^{1-\gamma}}$$

- Assume that this condition holds from now on

Fiscal stagnation

- Imagine that taxes are so high that $g = 1$

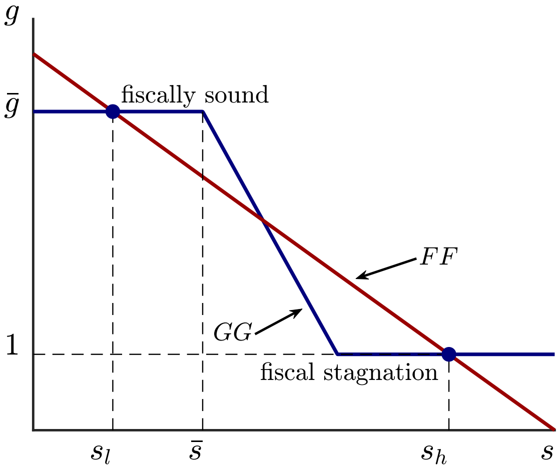
$$s = d\,(1-\beta) \geq \bar{s} + \varpi\left(1 - \bar{g}^{-\gamma}\right)$$

- This fiscal stagnation steady state exists if

$$d \geq \frac{\bar{s} + \varpi\,(1 - \bar{g}^{-\gamma})}{1-\beta}$$

- Both steady states may coexist → intertemporal Laffer curve
  - Higher primary surplus lowers debt/GDP ($\uparrow s_t \downarrow d_{t+1}$)
  - But lower growth increases future debt/GDP ($\uparrow s_{t+1} \downarrow g_{t+1} \uparrow d_{t+1}$)

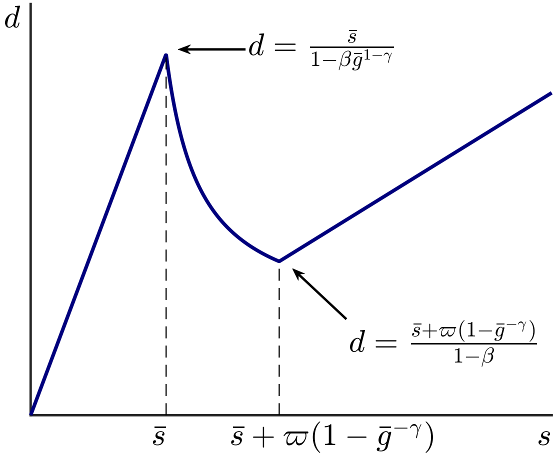
Multiple steady states with constant debt



The role of animal spirits

- Equilibrium is determined by expectations and animal spirits
  - Suppose that agents anticipate high future fiscal distortions
  - Investment and productivity growth drop
  - Government has to increase primary surplus to stabilize debt/GDP
  - Expectations of high fiscal distortions become self-fulfilling
- Fundamentals determine whether fiscal stagnation is possible
  - High interest rates (low β), weak growth fundamentals (low $\bar{g}$), and high sensitivity of government budget to growth (low γ) expose the economy to the risk of self-fulfilling stagnation

A Laffer curve interpretation



Gradual fiscal adjustment

- Fiscal policy given by
$$s_t = -\delta + \phi d_t$$
- Debt-to-GDP in the fiscally sound steady state
$$\frac{\delta}{\bar{g}^{1-\gamma}\beta + \phi - 1}$$
- Debt-to-GDP in a fiscal stagnation steady state with no growth
$$\frac{\delta}{\beta + \phi - 1}$$
- Both steady states are possible for intermediate values of ϕ

Transitional dynamics

- Using the approximation $c_t \approx 1$, debt dynamics given by

$$d_{t+1} = \frac{(d_t - s_t)R_t}{g_{t+1}}$$

Transitional dynamics

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Transitional dynamics

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$$d_{t+1} = \frac{\delta + (1-\phi) d_t}{\beta g_{t+1}^{1-\gamma}}$$

$$g_{t+1} = \begin{cases} \bar{g} & \text{if } d_{t+1} \le \frac{\delta + \bar{s}}{\phi} \\ \bar{g}\left(1 - \frac{\phi d_{t+1} - \delta - \bar{s}}{\varpi}\right)^{1/\gamma} & \text{if } \frac{\delta + \bar{s}}{\phi} < d_{t+1} \le \frac{\delta + \bar{s} + \varpi\left(1 - \bar{g}^{-\gamma}\right)}{\phi} \\ 1 & \text{if } \frac{\delta + \bar{s} + \varpi\left(1 - \bar{g}^{-\gamma}\right)}{\phi} < d_{t+1} \end{cases}$$

Transitional dynamics

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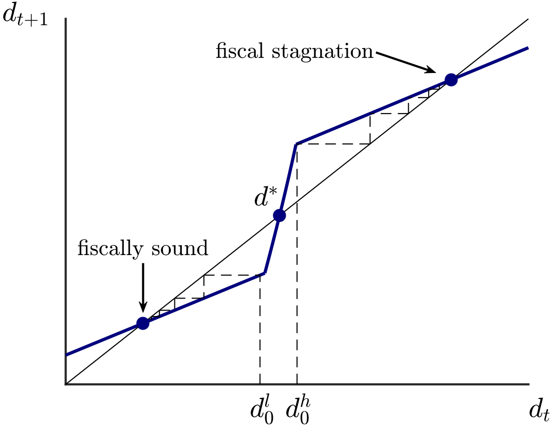
$$g_{t+1} = \begin{cases} \bar{g} & \text{if } d_{t+1} \leq \frac{\delta+\bar{s}}{\phi} \\ \bar{g}\left(1 - \frac{\phi d_{t+1} - \delta - \bar{s}}{\varpi}\right)^{1/\gamma} & \text{if } \frac{\delta+\bar{s}}{\phi} < d_{t+1} \leq \frac{\delta+\bar{s}+\varpi\left(1-\bar{g}^{-\gamma}\right)}{\phi} \\ 1 & \text{if } \frac{\delta+\bar{s}+\varpi\left(1-\bar{g}^{-\gamma}\right)}{\phi} < d_{t+1} \end{cases}$$

- Debt dynamics shaped by two effects

$$\frac{\partial d_{t+1}}{\partial d_t} = \underbrace{\frac{1-\phi}{g_{t+1}^{1-\gamma}\beta}}_{\text{direct effect}} \left(1 + \underbrace{(1-\gamma)\frac{d_{t+1}}{g_{t+1}}\frac{\partial g_{t+1}}{\partial d_{t+1}}}_{\text{growth effect}}\right)^{-1}$$

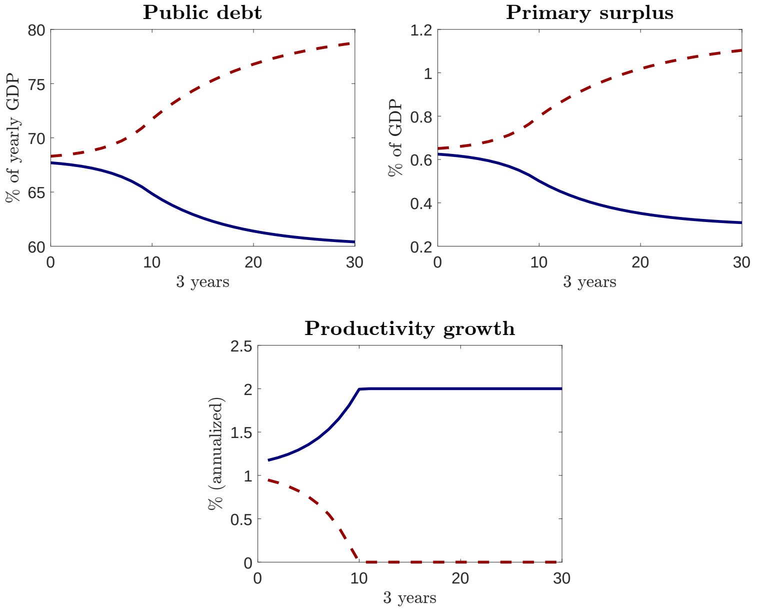
- Strength of growth effect crucial for dynamics

Moderate growth effect ($\gamma > \frac{\bar{s}+\delta+\varpi(1-\bar{g}^{-\gamma})}{\varpi+\bar{s}+\delta}$)

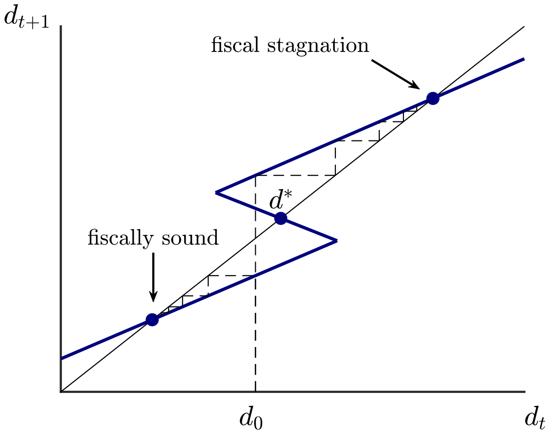


- Hysteresis: initial conditions determine long-run outcomes

Fiscal hysteresis



Strong growth effect ($\gamma < \frac{\bar{s}+\delta}{\varpi+\bar{s}+\delta}$)



- For intermediate values of initial debt expectations matter

Outline of the talk

1. Introduction
2. Baseline model
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4. Exiting fiscal stagnation

Exiting fiscal stagnation

- Exiting fiscal stagnation requires a big push to reduce public debt

$$d_{t+1} = \frac{d_t - s_t}{\beta g_{t+1}^{1-\gamma}}$$

- Two strategies available
  - Austerity: $\uparrow s_t$
  - Pro-growth policies: $\downarrow s_{t+1}$ to $\uparrow g_{t+1}$
- Ability to commit is crucial to employ pro-growth policies

A 'two-periods' optimal policy problem

- We consider a 'two-periods' optimal policy problem
  - From $t = 1$ on, economy enters a steady state with constant s, d, g

$$s = d\left(1 - \beta g^{1-\gamma}\right)$$

- Discretion: government sets s_t after private sector chooses g_t
  - For some values of d, multiple steady states are possible
- We model private agents' expectations by assuming that
  - If $d \leq \bar{d}$ the economy enters the fiscally sound steady state
  - If $d > \bar{d}$ the economy enters the fiscal stagnation steady state

Optimal fiscal policy under discretion

- In $t = 0$, taking g_1, c_0, R_0 and $\bar{d}$ as given, government solves

$$\max_{0 \leq s_0 \leq s^{max}} \frac{c_0^{1-\gamma}}{1-\gamma} + g_1^{1-\gamma} \beta V(d)$$

$$\text{s.t.} \qquad d = \frac{R_0}{\beta g_1}\left(d_0 - s_0\right)$$

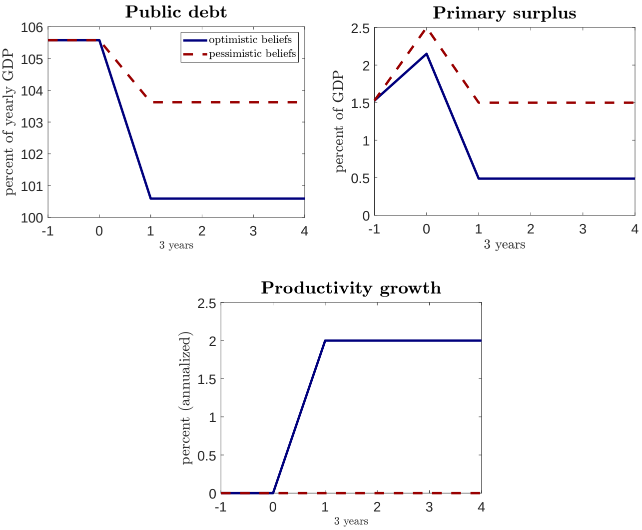
$$V(d) = \begin{cases} \frac{\left(1 - \frac{\bar{g}-1}{\chi}\right)^{1-\gamma}}{(1-\gamma)(1-\beta\bar{g}^{1-\gamma})} & \text{if } d \leq \bar{d} \\ \frac{1}{(1-\gamma)(1-\beta)} & \text{if } d > \bar{d} \end{cases}$$

- Optimal to rely on austerity until $\bar{d}$ is reached

$$s_0 = \min\left(d_0 - \bar{d}\beta g_1^{1-\gamma}, s^{max}\right)$$

- Lowering debt is valuable because it reduces future fiscal distortions

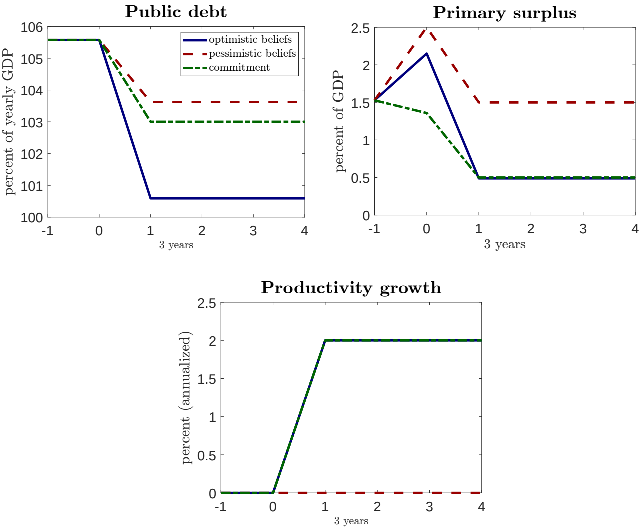
Optimal fiscal policy under discretion



On the gains from commitment

- Suppose government can commit to a path of s_t in period $t = 0$
  - Equilibrium multiplicity ruled out $\bar{d} = \frac{\bar{s}}{1-\beta\bar{g}^{1-\gamma}}$
  - Pro-growth policies reduce the fiscal austerity needed to exit stagnation
- Time-consistency problem
  - Ex-ante: government promises that it will take measures to boost return to investment
  - Ex-post: temptation to default on these promises
- Important role for expectations and government credibility

Gains from credibility



Conclusion

- We study public debt sustainability in an economy with endogenous productivity growth
- Two steady states may coexist
  1. Fiscally sound steady state
  2. Fiscal stagnation steady state
- Shocks to fundamentals and expectations determine long-run outcomes
- Government's ability to commit determines fiscal adjustment needed to exit stagnation