The Fiscal Footprint of Macroprudential Policy

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Introduction

- Independence of monetary policy and fiscal dominance
  - → Fiscal footprint of looser policy: seignorage, inflating debt, lower debt rollover costs, raise tax revenues.
  - → Central bank independence.
  - → Sargent-Wallace fiscal dominance: inflation control sacrificed for fiscal revenue.

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- What about macroprudential policy?
  - → Characterize its fiscal footprint
  - → Independent macropru regulator and fiscal consequences
  - → Fiscal dominance over macropru.

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- What about macroprudential policy?
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  - → Independent macropru regulator and fiscal consequences
  - → Fiscal dominance over macropru.
- Policy debates
  - → Indian elections and RBI lending standard requirements
  - → Placing macropru regulator inside CB or Treasury
  - → Central bank independence with an FPC.

Literature

- Macropru as Pigouvian taxes (Farhi Werning, 2016, Bianchi Mendoza, 2018, Jeanne Korinek, 2014). But then lump-sum transfers.

- Macropru (LTV, DTI) in housing as redistribution from the old to the young (Svensson, 2019, Peydro, Tripathy, Rodriguez, 2019). But no tax revenues.

- Macropru affecting demand for government bonds (Lenel, Piazzesi, Schneider, 2019, Krishnamurthy and Vissing-Jorgensen, 2012).

- Macropru affecting incidence of fiscal and financial crisis (Balloch, 2017, Farhi, Tirole, 2019).

- Financial cycle drives fiscal cycle (Benetrix, Lane, 2011).

This paper: macropru affecting demand for government bonds (liquidity or capital requirements), and fiscal footprint (resources available to government).

1. Model of the bond market and the direct fiscal footprint

Households

- Two periods, initial price level is 1.

- Household chooses $\{c, c', b, d\}$ to maximize:

$$c + \ell(b) + \mathbb{E}(c') \quad \text{s.t.}$$
$$c + d + qb \leq \bar{b} \quad \text{and} \quad pc' \leq (1 + i^d)d + b\delta + z$$

- $\ell(.)$: liquidity benefits from holding safe bonds, increasing, concave.

- For consumer to be indifferent, with independent inflation default risks.

$$q = \ell'(.) + \frac{\mathbb{E}(\delta)}{1 + i^d}$$

Safety premium of government bonds.

Bond market

- Government issues amount B.

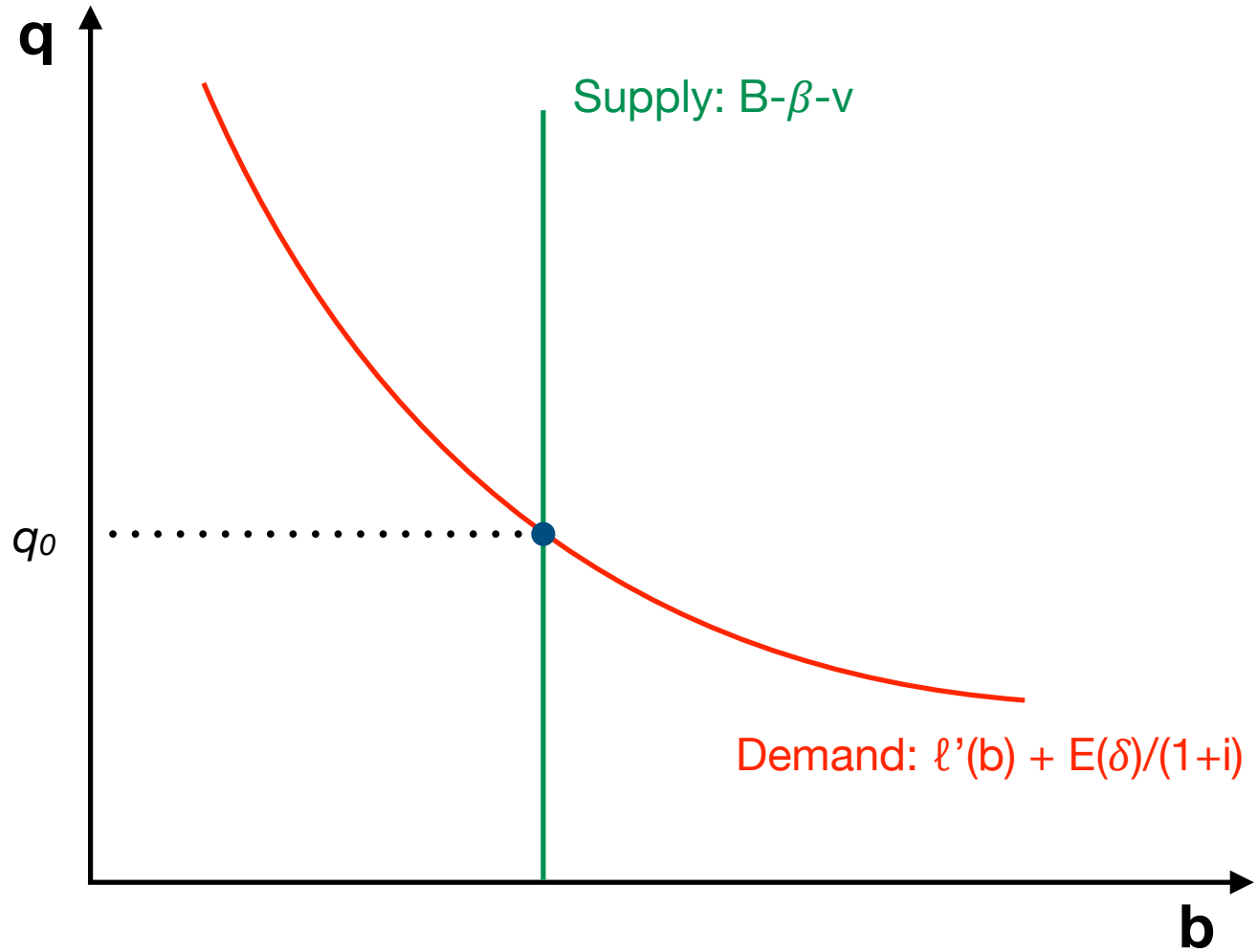
- Macropru policy: banks must hold at least β bonds. Since banks must pay i^d on deposits, will never choose to hold more than β.

- Central bank: receives deposits from banks, pays off i^v. With deposits, buys v bonds.

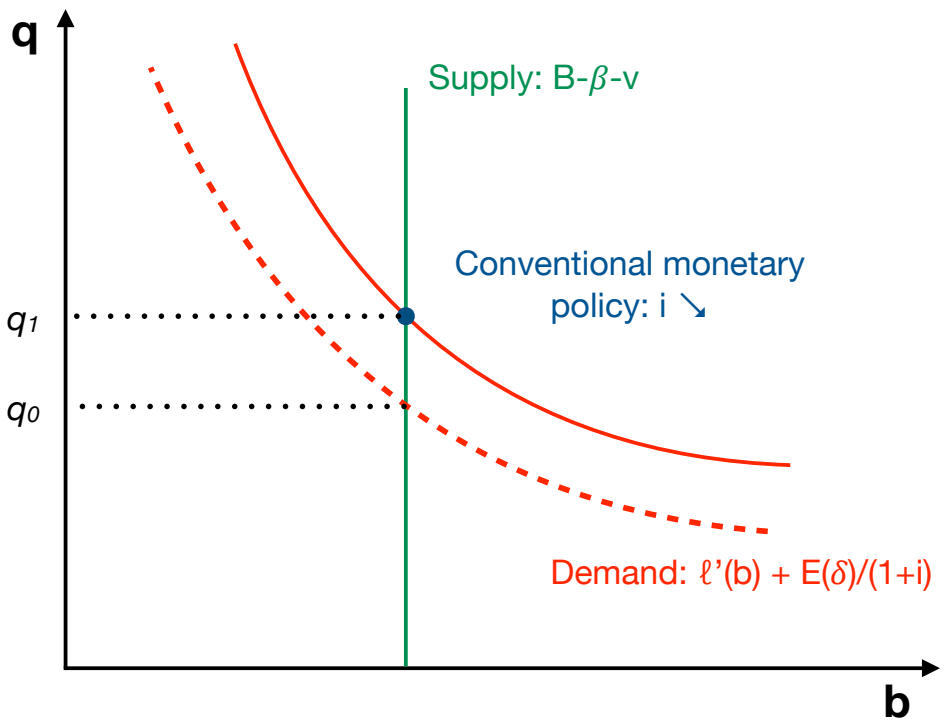
- Market clearing:

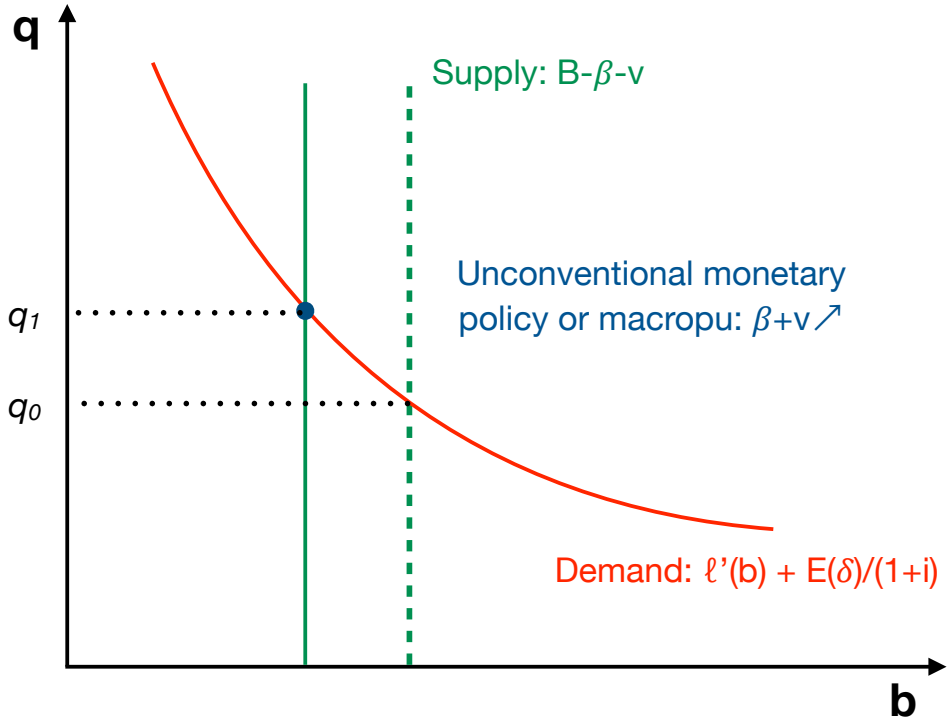
$$B = b + \beta + v$$

Supply and demand



Macropru and monetary policy





Government budget constraint

- Initial date, only sell bonds to roll over debt:

$$qB = \bar{B}$$

- In second date, fiscal surplus and dividends from central bank:

$$\delta B \leq ps + pd$$

- Intertemporal budget constraint gives:

$$s \geq \frac{\delta \bar{B}}{pq} - d \equiv \text{fiscal burden}$$

Definition

The direct fiscal footprint of a policy is the change in the fiscal burden of the fiscal authority holding default constant.

Macroprudential policy

Lemma

The direct fiscal footprint of expansionary macroprudential policy (higher β) is

$$-\left(\frac{\delta B}{q^2 p}\right)\left(\frac{\partial q}{\partial \beta}\right).$$

- It is higher the larger is the debt being paid.
- It is lower if default is higher.

Identical policies

Definition

A macropru policy (β), conventional monetary policy (i^d) and unconventional monetary policy (v) have identical price impact if they have the same effect on bond yields ($1/q$)

Differences from bond market:

- Conventional: no change in safety premium (ℓ'), no change in bond holdings by households, banks, or central bank (b, β, v).
- Unconventional monetary policy: increase safety premium, increase bond holdings by central bank.
- Macropru: increase safety premium, increase bond holdings by banks.

Monetary policy and the central bank

- Central bank balance sheet: receives reserves, buys government bonds. Rebates income every period to the fiscal authority:

$$pd = [\delta - (1 + i^v)q]\, v$$

- What is the premium between reserves and government bonds? Unclear in data since not same duration. Let $\mathcal{L}(v, b)$ be defined as:

$$\ell'(1 + i^v) = \mathcal{L}(.)$$

- Effect on price level: simply assume that raising rates lowers inflation:

$$\frac{\partial p}{\partial i^d} < 0$$

(Example: Taylor rule for inflation targeting central bank.)

Relative footprint

Lemma

A conventional monetary policy with the same price impact as a macroprudential policy exceeds its fiscal footprint by:

$$-\left(\frac{\delta B}{qp^2}\right)\left(\frac{\partial p}{\partial i^v}\right)\left(\frac{\partial q}{\partial i^v}\right)^{-1} < 0$$

Extra impact from inflation

Lemma

An unconventional monetary policy with the same price impact as a macroprudential policy exceeds its fiscal footprint by:

$$\mathcal{L} + \mathcal{L}'(.)v + \mathbb{E}(\delta) - \delta$$

Without default, relative premium between central bank debt vis-a-vis government debt (negligible, Wallace-Modigliani-Miller). With unexpected default, then unconventional policy leaves fewer bonds in private hands

2. Model of finance and investment and the indirect fiscal footprint

Firms and setting up production

- Bankers and entrepreneurs (each measure 1) return payoffs to household z in second period.

- Entrepreneurs have an idea for production that yields π in second period.

- Setting up a firm in first period costs κ. Bank captures the after-tax profit, which if k firms operate is:

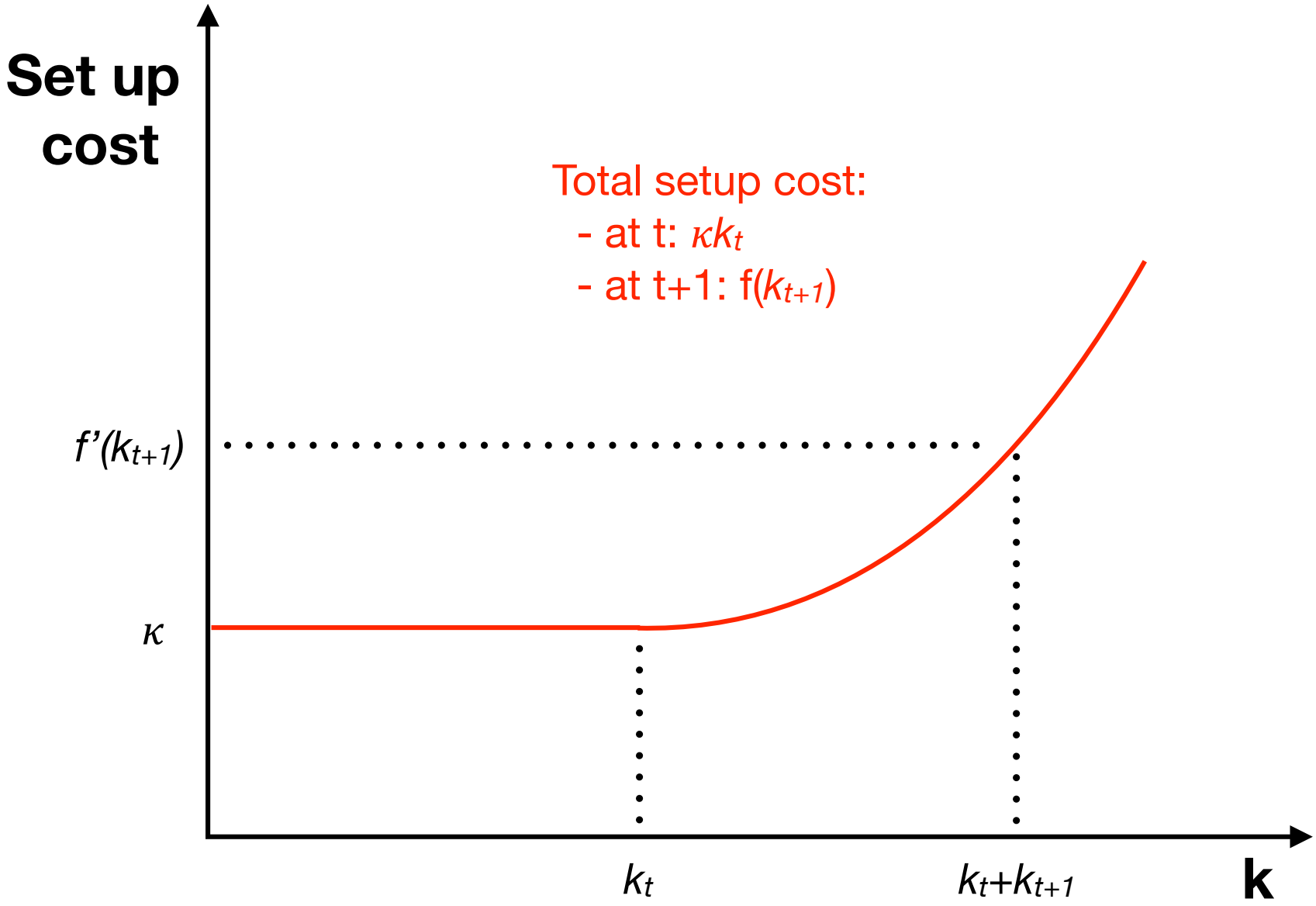
$$(1-\tau)(\pi-\kappa)k_t$$

- Setting up a firm in second period requires make-do investment. Cost is larger and convex in projects financed: $f(k')$, with $f'(0) \geq \kappa$ and $f''(.) > 0$. Profits from make-do investments are:

$$(1-\tau)(\pi k' - f(k'))$$

So optimal make-do investment is $f'(k*) = \pi$ as long as $k + k^* < 1$.

Marginal costs of investment



Banks

- All bankers have monitoring technology and net worth n.

- Only some bankers match with firms. Balance sheet in first period is:

$$\kappa k + qb^f = n + d$$

- Because they do not have monitoring technology, households can only capture share γ of loans from first period (but can capture all bonds). For bankers to honor their deposits, the incentive constraint is:

$$\underbrace{(1-\gamma)(1-\tau)(\pi-\kappa)k}_{\text{default, keep share of loans}} \leq \underbrace{(1-\tau)(\pi-\kappa)k_t + \delta b^f - (1+i^d)d}_{\text{pay deposits, keep bonds and loans}}$$

Financial markets

- Unmatched bankers cannot make loans to firms. But can make loans to other banks x next period, in order to set up make-do firms.

- Interbank loans must be collateralized with government bonds held by the borrower, with margin ξ:

$$(1-\xi)x \leq b^f \delta$$

- Total investment either with bank funds or with government bailout:

$$f(k') = x + T$$

Macro-prudential policy: benefits

Lemma

Banks hold as few bonds as they can $b^f = \beta$, and if the government has funds available it guarantees the optimal amount of make-do investment through a bailout: $T = \max\{0, f(k^*) - b^f \delta/(1-\xi)\}$

- Matched banks want to use all their funds as loans right away (since $f'(0) \geq \kappa$), and do not want to hold any bonds (since $\pi > i^d$). Formally, the derivative of bank's dividends with respect to bonds is:

$$\underbrace{1-(1+i^d)q}_{\leq 0 \text{ safety premium}} - \left(\frac{\ell'(1+i^d)}{1+i^d-\gamma(\pi-\kappa)}\right) \underbrace{(\pi-\kappa-1-i^d)}_{\geq 0 \text{ opportunity cost}} b \leq 0$$

- Without bond holdings, there would be no interbank loans, no make-do investment. Government bailout as ex post welfare higher with k^*, cannot commit not to do it.

Macro-prudential policy: costs

Lemma

Tighter macroprudential policy reduces investment since:

$$\kappa k = \underbrace{\left(\frac{1+i^d}{1+i^d-\gamma(\pi-\kappa)}\right)}_{\geq 1 \text{ leverage}} n - \underbrace{\left(\frac{\ell'(1+i^d)}{1+i^d-\gamma(\pi-\kappa)}\right)}_{\geq 0 \text{ leveraged safety premium}} b$$

- If banks invest in bonds, they make fewer loans in first period. Lowers investment k directly.
- Moreover, lower profitability, tighter incentive constraint, lowers deposits.

Indirect fiscal footprint

- Ignore monetary policy: zero inflation $i^d = 0$, no reserves $v = 0$.
- Primary surplus now:

$$s = \underbrace{\tau[(\pi - \kappa)k + \pi k' - f(k')]}_{\text{tax revenues}} - \underbrace{T}_{\text{bailouts}} - \underbrace{g}_{\text{exogenous spending}}$$

- Assume there is a maximum $\tau < \bar{\tau} < 1$. Riots otherwise.
- Useful result: assume that $\bar{\tau}$ is small enough that $\partial s / \partial \tau > 0$.

Definition

The indirect fiscal footprint of a policy is the effect it has on the fiscal deficit keeping tax rates fixed. A policy with a positive footprint requires higher taxes to generate the same fiscal surplus.

Macropru's indirect fiscal footprint

Proposition

The indirect fiscal impact of macroprudential policy can be positive or negative, as it is the sum of the effect on repressing lending:

$$-\frac{\partial \tau(\pi-\kappa)k}{\beta} = \tau(\pi-\kappa)\left(\frac{\ell'(1+i^d)}{1+i^d-\gamma(\pi-\kappa)(1-\tau)}\right)$$
$$\geq 0 \quad \textit{Positive footprint}$$

and the effect on avoiding bailouts, or lowering their costs:

$$\frac{\partial T}{\beta} = \frac{\partial}{\beta}\left(\min\left\{0, f(k^*) - \frac{\beta\delta}{1-\xi}\right\}\right)$$
$$= -\delta/(1-\xi) \;\; \textit{if} \;\; \beta < \bar{\beta} \;\; , \textit{and zero otherwise}$$
$$\leq 0 \quad \textit{Negative footprint}$$

3. Independent macroprudential policy: fiscal interactions

Policy tools and crises

- Macropru regulator chooses β in first period. Moves first, dominant.
- Fiscal authority chooses τ in the second period. Will set τ to avoid default unless it hits $\bar{\tau}$.

Definition

A fiscal crisis is a time when $\delta < 1$. It happens when debt is so high that not enough tax revenues can be collected to pay for it:

$$B > q\left[(\pi - \kappa)\bar{\tau}k(\bar{\tau}, \beta) + \bar{\tau}(\pi k' - f(k')) - T(\beta) - g\right]$$

Definition

A financial crisis is a time when $T > 0$. It happens when macropru was lax:

$$\beta < \bar{\beta} \equiv (1 - \xi)f(k^*)/\delta$$

First case: quiet times

Proposition

If there is no fiscal or financial crisis, then tighter macropru (higher β) leads taxes to rise (higher τ) if the crowding-out of lending is larger than the price impact, which happens if the elasticity of the safety premium is small enough:

$$\frac{1}{\kappa k} \times \frac{1+i^d}{1+i^d-\gamma(\pi-\kappa)} > \left(-\frac{\ell''(.)}{b\ell'(.)}\right) \times \frac{b}{q}$$

A present biased politician wants too tight macropru:

- Direct fiscal footprint on bond prices is negative. Lets policymaker in first period roll over debt more easily.
- Indirect fiscal footprint on tax collection is positive. Forces policymaker in second period to raise taxes.

Second case: fiscal crisis

Proposition

If there is no financial crisis, but $\tau = \bar{\tau}$, then tighter macropru (higher β) makes the fiscal crisis more severe (lower δ) if the price impact is smaller than the crowding-out of lending, as in the previous proposition.

Unpleasant macroprudential arithmetics:

- Say fiscal authority commits to low taxes, makes fiscal crisis likely
- If the regulator wants to avoid a fiscal crisis, it must use macropru's fiscal footprint.
- If the crowding-out effect exceeds the price impact effect, regulator will loosen macropru to raise activity.

Third case: financial crisis

Proposition

If there is a financial crisis but no fiscal crisis, then tighter macropru (higher β) leads taxes to rise (higher τ) if the crowding-out of lending exceeds the price impact plus the lowering of the bailout size:

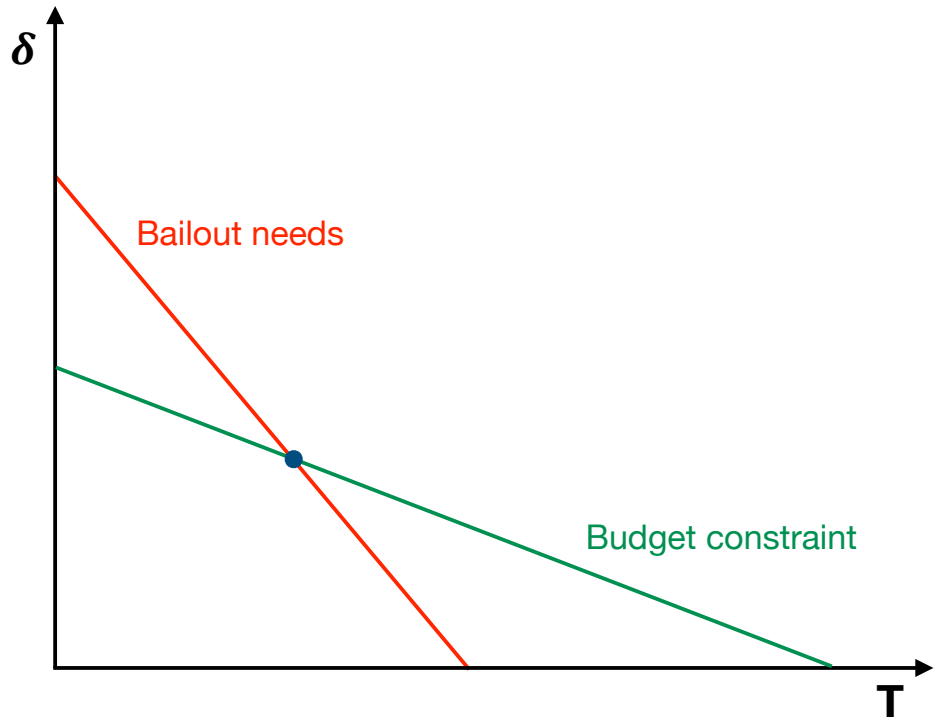
$$\frac{1}{\kappa k} \times \frac{1+i^d}{1+i^d-\gamma(\pi-\kappa)} > \frac{1}{q\ell'(.)}\left(-\ell''(.)+\frac{1}{(1-\xi)\tau k}\right)$$

Current consensus:

- Tighter macropru now lowers the fiscal cost of the bailout.
- $\partial\tau/\partial\beta$ is unambiguously lower than before because of this extra effect.
- Stronger desire for tighter macropru.

Fourth case: Twin crises

Government budget constraint: higher bailout, more default
Financing of make-do investment: more default, less collateral, higher bailout

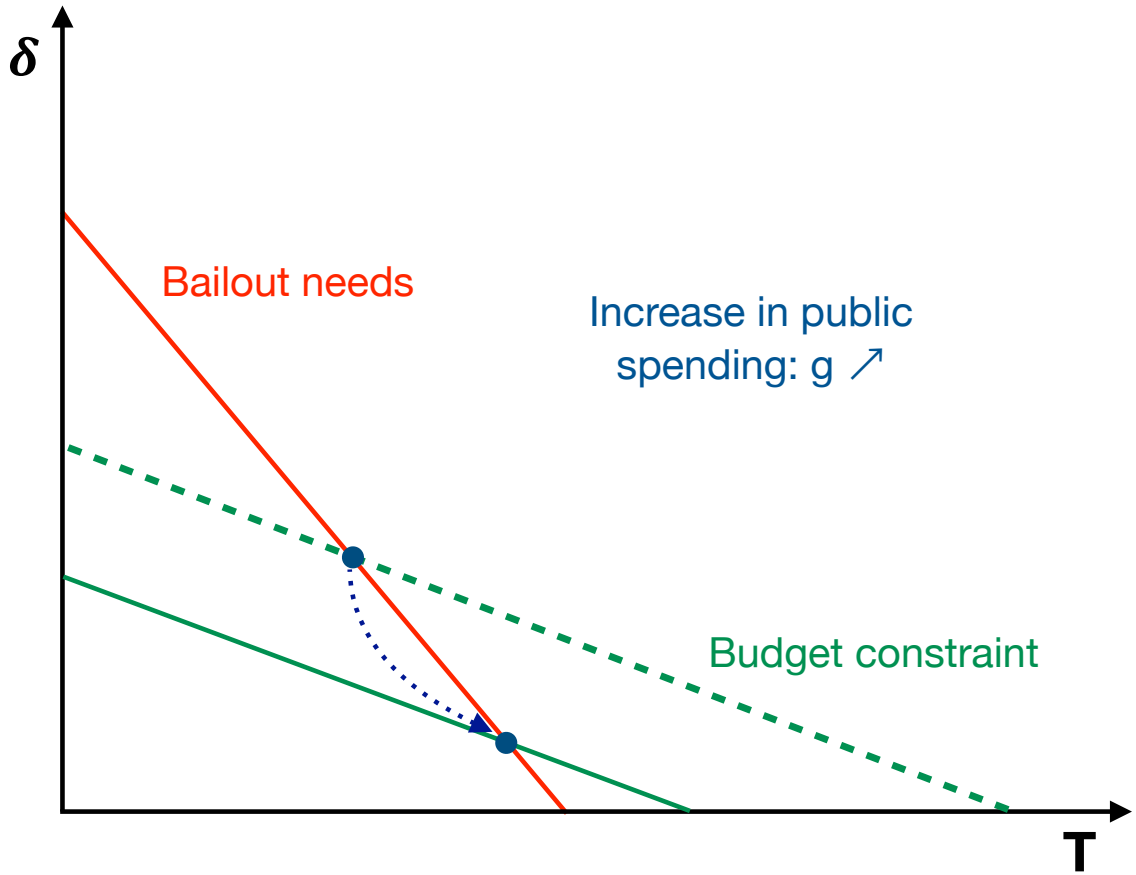


Proposition

If there is a twin crisis, tighter macropru (higher β) worsens default (lower δ) if the crowding-out of lending exceeds the price impact plus the lowering of the bailout size, as in the previous proposition.

The diabolic loop

Higher public spending (g rises) worsens default, lowers collateral, raises bailout needs, worsens default...



Higher macropru makes the diabolic loop multiplier stronger.

4. Fiscal dominance over macroprudential policy

Uncertainty and the single-minded regulator

- Shock to costs of production: $f(.) = f(\omega, k)$ where $\partial f(.)/\partial\omega > 0$ and $\partial^2 f(.)/\partial\omega\partial k > 0$. A higher ω means higher financing needs and less tax revenue from make-do firms. ω is a random variable with bounded support. Source of financial crisis.

- Shock to fiscal revenues g with bounded support. Source of fiscal crisis.

- Macropru goal: minimize financial crisis T.

Fiscal dominance

- Macropru regulator will choose β high enough so that at worst possible ω, there is no financial crisis.

- If crowding out effect exceeds price impact effect, this will either cause fiscal crisis or lead to very high taxes.

- Limits on macropru: If fiscal authority wants to prevent a fiscal crisis above all, it wants to set an ex ante upper limit on β. If the expected g is higher, the lower this limit is.

Financial meltdown

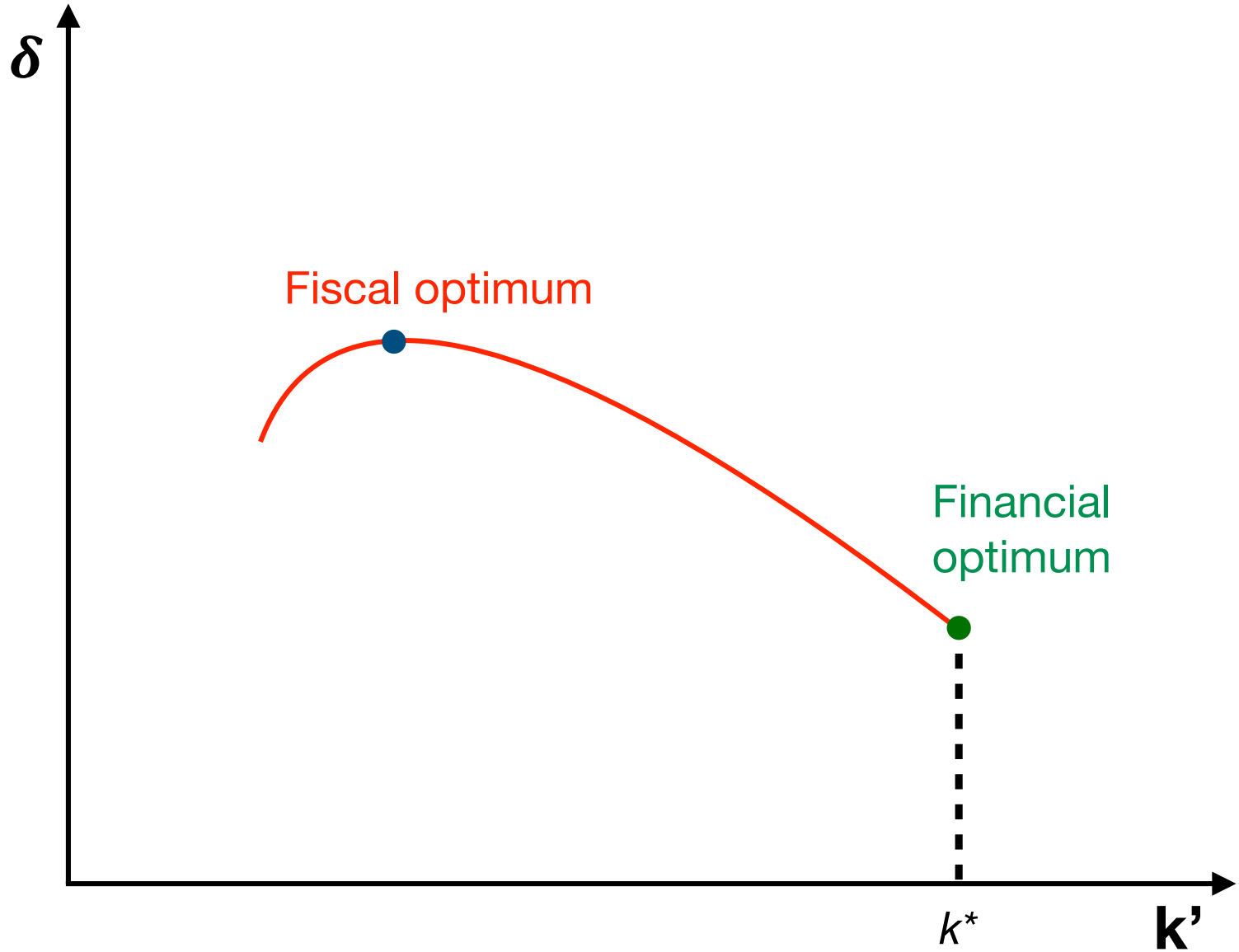
- Imagine twin crises, *and* that $k' < k^*$ because government does not have funds for full bailout (or can commit not to use them).

- Adjusted goal of macropru regulator: higher k' reduce financial meltdown

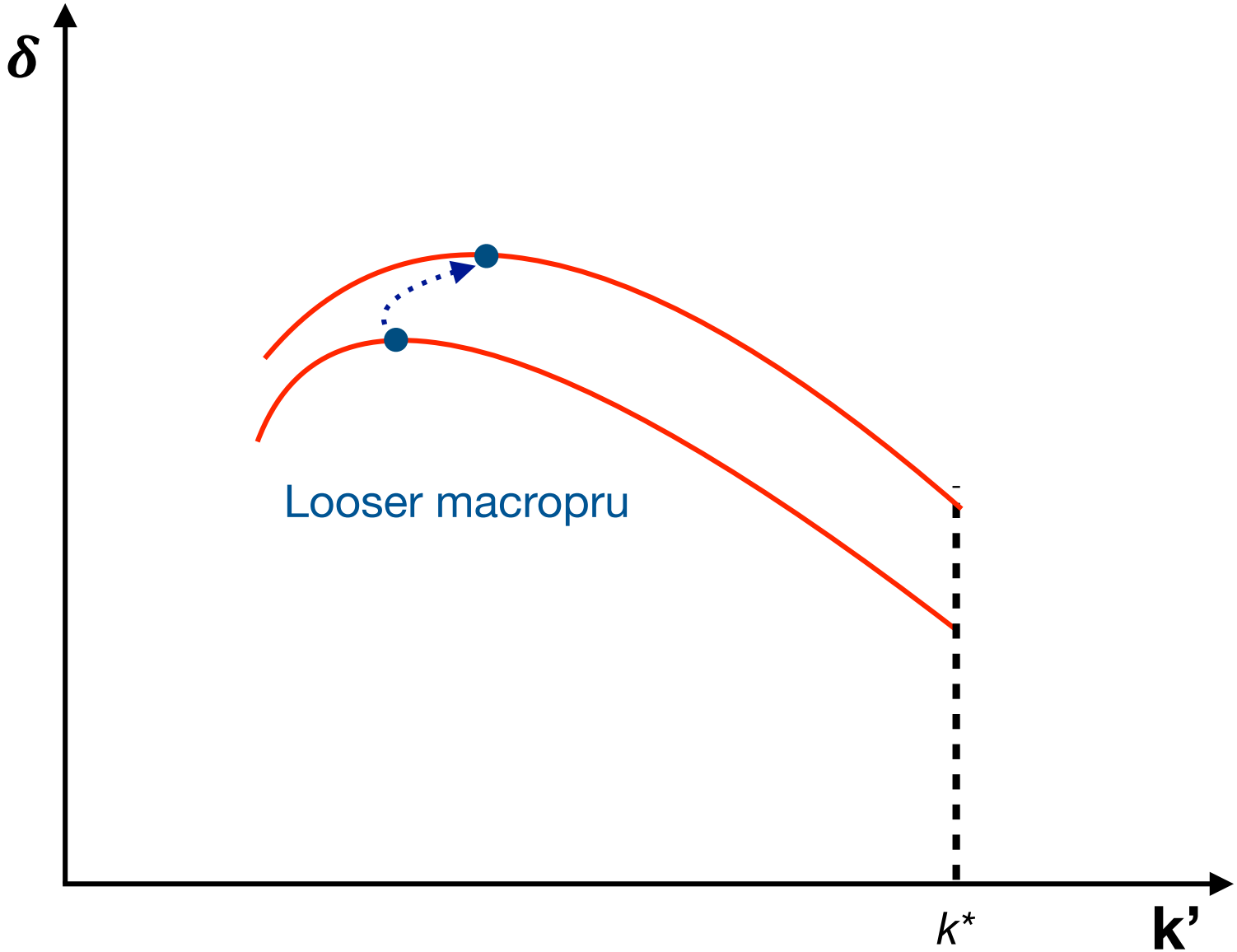
- New power of fiscal authority: chooses the crisis mix (k', δ).

- Exert dominance through that choice.

The crises frontier



Fiscal policy dominance



5. Conclusion

Conclusion

- The fiscal footprint of tighter macro-prudential policy:
  - → Makes rolling over debt cheaper
  - → Lowers lending, real activity, and tax collections in the future
  - → Lowers bailout costs, or likelihood.

- Comparison with monetary policies: macro has a lower fiscal footprint

- Independent macropru regulator:
  - → Precent biased politician wants tighter macropru
  - → Unpleasant macropru arithmetics in a fiscal crisis
  - → If fiscal abundance, financial risk, tight macropru is unchallenged
  - → Worsens diabolic loop

- Fiscal dominance: through upper bound on regulatory overreach, and by threatening to prioritize fiscal goals over bailing out financial system.