

# Fiscal Rules, Bailouts, and Reputation in Federal Governments

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## Overview

- Local gov'ts over-borrow if expect bailout or transfer
  - Central gov't cannot commit to no-bailout/transfer clauses
  - Examples: Argentina, Brazil, German länders, EMU
  
- One proposed solution is to use fiscal rules
  - Defined as borrowing limits and punishments if these are violated
  - Example: Stability and Growth Pact

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  - Examples: Argentina, Brazil, German länders, EMU
- One proposed solution is to use fiscal rules
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  - Example: Stability and Growth Pact
- **Why can the central gov't commit to fiscal rules?**
  - But not to no-bailout clauses?

## This Paper

- Study efficacy of fiscal rules when the central gov't can't commit
  - No-bailout clauses
  - Enforcing fiscal rules
  
- Local gov'ts uncertain about the type of the central gov't
  - Commitment type: always enforces fiscal constitution
  - No-Commitment type: chooses policy sequentially
  
- Compare equilibrium outcomes with and without fiscal rules

## Fiscal Rules Can Incentivize Fiscal Indiscipline

When reputation is low (low probability of facing commitment type)

- Debt issued larger when constitution contains fiscal rules
- **Rules increase cost of maintaining good reputation**
  - With binding rules type of the central gov't is revealed earlier
  - Early revelation reduces cost of issuing debt for local gov'ts

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When reputation is high

- Debt issued smaller when constitution contains fiscal rules

## Equilibrium Fiscal Rules

- Why do we observe fiscal rules in equilibrium?
  - When reputation is low rules can be detrimental
- Outcome of a signaling game between two types of central gov't
- When reputation is low
  - Commitment type finds it optimal to set tight rules
  - No-commitment type initially mimics but not does not enforce
  - Rules are violated by local gov'ts
- Rationalize several examples when:
  - Tight fiscal rules arise when the reputation is low
  - Fiscal rules have been instituted but not enforced

## Related Literature

- Lack of commitment and bailouts:
  - Chari and Kehoe (2007, 2008), Cooper Kempf and Peled (2008), Rodden (2002)
- Repeated games with behavioral types
  - Kreps and Wilson (1982), Milgrom and Roberts (1982)
- Using fiscal rules to overcome commitment problem:
  - Beetsma and Uhlig (1999), Athey et al. (2005), Amador et al (2006), Halac and Yared (2014, 2017), Hatchondo, Martinez and Roch (2015), Alfaro and Kanczuk (2016), Azzimonti et al. (200x)
- Mechanism design
  - Halac and Yared (2018)
- Reputation:
  - Cole et al. (1995), Phelan (2006), D'Erasmus (2008)
- Uncertainty as commitment
  - Nosal and Ordonez (2013)



## Outline

- Model
- Fiscal rules promote indiscipline if reputation low
- Fiscal rules promote discipline if reputation high
- Supporting evidence
- Equilibrium fiscal constitution

**MODEL**

## Environment

- $t = 0, 1, 2$
- Small open economy composed of  $N$  regions,  $i \in \{1, \dots, N\}$
- Representative citizen has preferences over local public good

$$u^i = \sum_{t=0}^2 \beta^t u(G_{it}).$$

$u$  is increasing, concave, Inada,  $u \in C^1$ , and  $u(0)$  finite

- Two levels of government:
  - Local
  - Central

## Local Governments

- Benevolent
  - Maximizes utility of representative citizen in region
- Finance local public good provision with
  - Tax revenues:  $Y_{it} = Y$  for all  $i, t$ 
    - In paper we consider case with heterogeneity
  - Debt issued to foreign lenders (interest rate  $1/q$ )
  - Transfers from central government

## Central Government

- Benevolent
  - Maximizes  $\sum_{i=1}^N \frac{1}{N} u^i$
- Chooses
  - Transfers  $T_{it}$  such that  $\sum_i T_{it} = 0$
  - Enforcement of fiscal rule  $\sigma \in \{0, 1\}$
- Can be one of two types
  - Commitment type (C): follows policy in constitution
  - No-Commitment type (NC): chooses policy sequentially
- Prior probability of being the commitment type is  $\pi$

# Fiscal Constitution

Two Clauses:

- No bailout clause:  $T_{it} = 0$
- Fiscal rule:  $(\bar{b}, \psi)$ 
  - Debt limit:  $\bar{b}$
  - Punishment  $\psi$  if  $b_{i1} > \bar{b}$

## Timing and Actions

- At  $t = 0$ , local gov'ts choose  $G_{i0}$  and  $b_{i1}$  subject to

$$G_{i0} \leq Y_{i0} + qb_{i1}.$$

- At  $t = 1$ 
  - Central gov't chooses transfers  $\{T_{i1}\}$  and enforcement of fiscal rule  $\sigma \in \{0, 1\}$
  - Local gov'ts
    - Update their prior about central government type
    - Choose  $G_{i1}$  and  $b_{i2}$  subject to

$$G_{i1} + b_{i1} + \sigma\psi\mathbb{I}_{b_{i1} > \bar{b}_1} \leq Y_{i1} + T_{i1} + qb_{i2}.$$

- At  $t = 2$ 
  - Central gov't chooses transfers  $\{T_{i2}\}$
  - Local gov't consumes  $G_{i2} = Y_{i2} - b_{i2} + T_{i2}$

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Characterize perfect bayesian equilibrium (pure strategies)



# EQUILIBRIUM CHARACTERIZATION

## Period 2

- State:  $\mathbf{b}_2 = (b_{i2})$
- NC type will choose transfers to achieve *debt mutualization*.

$$G_{it} = Y - \frac{\sum_j b_{j2}}{N}.$$

- Value for local gov't

$$V_{i2}(\mathbf{b}_2) = u\left(Y - \frac{\sum_j b_{j2}}{N}\right).$$

- Commitment type will enforce constitution
  - Value for local gov't

$$V_{i2}^c(\mathbf{b}_2) = u(Y - b_{i2}).$$

## Period 1: Local Gov't

After central gov't has chosen transfers and fiscal rule enforcement

- State: posterior  $\pi'$  and obligations for local gov'ts

$$a_{i1} = b_{i1} - T_{i1} + \psi \mathbb{I}_{\{b_{i1} > \bar{b}_1 \text{ and central gov't enforces fiscal rule}\}}$$

- Local governments choose  $G_{i1}, b_{i2}$  to solve

$$V_{i1}(a_1, \pi') = \max_{G_{i1}, b_{i2}} u(G_{i1}) + \beta \pi V_{i2}^c(b_{i2}) + \beta(1 - \pi) V_{i2}(b_{i2}, b_{-i2})$$

subject to

$$G_{i1} + a_{i1} \leq Y_{i1} + qb_{i2}$$

taking as given strategy  $b_{-i2}(a_1, \pi')$

- Denote equilibrium outcome at this node by  $b_2(a_1, \pi')$

## Over-Borrowing in Period 1

- Equilibrium

$$qu'(G_{i1}) = \beta\pi u'(Y - b_{i2}) + \frac{\beta}{N} (1 - \pi) u' \left( Y - \frac{\sum_j b_{j2}}{N} \right)$$

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- Efficient

$$qu'(G_{i1}) = \beta u'(Y - b_{i2})$$

- If  $\pi < 1 \Rightarrow$  inefficient front-loading of public good consumption

$$qu'(G_{it}) < \beta u'(G_{it+1})$$

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**Over-borrowing more severe when reputation is low**

## If No Reputation, Timing of Transfers Irrelevant

If local gov'ts believe that central gov't is NC type for sure then

- Timing of transfers irrelevant
- Local gov'ts adjust borrowing anticipating transfers in period 2

### Lemma

*If  $\pi' = 0$ , the continuation values and public good provisions for the local governments are independent of transfers in period 1: for any  $\mathbf{a}_1, \mathbf{a}'_1$  such that  $\sum_i \frac{1}{N} \mathbf{a}_{i1} = \sum_i \frac{1}{N} \mathbf{a}'_{i1} \Rightarrow V_{i1}(\mathbf{a}_1, 0) = V_{i1}(\mathbf{a}'_1, 0)$ .*

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- Can drop  $T_1$  as decision for central gov't and state for local gov't
- NC decides whether to enforce the constitution or not



## Period 1: Central Gov't

- State  $\mathbf{b}_1 = (b_{i1})$  and prior  $\pi$
- Central gov't chooses whether to enforce constitution
  - Let  $\sigma(\pi, \mathbf{b}_1)$  be gov't strategy: 1 if enforce, 0 o/w

- Posterior

$$\pi'(\pi, \zeta; \sigma) = \begin{cases} \frac{\pi}{\pi + (1-\pi)\sigma} & \text{if } \zeta = 1 \\ 0 & \text{if } \zeta = 0 \end{cases}$$

where  $\zeta = 1$  if constitution enforced and  $\zeta = 0$  otherwise

- Enforcing constitution has
  - Costs: Dispersion in local public good provision
  - Benefits: Less over-borrowing due to maintained reputation

## Period 0

- State in period 0: prior  $\pi$
- Local government chooses public good and debt to solve

$$\begin{aligned} V_{i0}(\pi) = & \max_{G_{i0}, b_{i1}} u(G_{i0}) + \\ & + \sigma \beta V_{i1} \left( b_{i1} + \psi \mathbb{I}_{b_{i1} > \bar{b}_1}, b_{-i1} + \psi \mathbb{I}_{b_{-i1} > \bar{b}_1}, \pi \right) \\ & + (1 - \sigma) \beta \left[ \pi V_{i1} \left( b_{i1} + \psi \mathbb{I}_{b_{i1} > \bar{b}_1}, b_{-i1} + \psi \mathbb{I}_{b_{-i1} > \bar{b}_1}, 1 \right) \right. \\ & \left. + (1 - \pi) V_{i1} (b_{i1}, b_{-i1}, 0) \right] \end{aligned}$$

subject to

$$G_{i0} \leq Y_{i1} + qb_{i1}$$

- Taking as given the strategy  $b_{-i1} = b_{-i1}(\pi)$
- $\sigma = \sigma(\pi, b_{i1}, b_{-i1})$ : local gov'ts internalize effect of debt issuance on enforcement by central gov't

**IF REPUTATION LOW:  
FISCAL RULES PROMOTE FISCAL INDISCIPLINE**

## Binding Fiscal Rules

Fiscal rules are *binding* if the debt limits are lower than the equilibrium debt levels without fiscal rules

## Low Reputation

If reputation ( $\pi$ ) is low enough,  $\beta \leq \bar{\beta}$ , and  $N$  large enough, then

- Without fiscal rules: unique equilibrium where
  - NC type enforces fiscal constitution in period 1 (no transfers)
  - Central gov't type is not revealed in period 1 (late revelation)
- With binding fiscal rules: unique equilibrium where
  - Fiscal rule is violated by local gov'ts
  - NC type does not enforce fiscal constitution in period 1
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- Debt issued is larger with fiscal rules
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In period 1 central gov't decides whether to enforce constitution

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- Costs: Dispersion in local public good provision
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- Benefits: Less over-borrowing due to maintained reputation
  - Euler equation without bailout,  $\pi' = \pi$

$$u'(Y - b_{i1} + qb_{i2})q = \beta\pi u'(Y - b_{i2}) + \frac{\beta}{N}(1 - \pi)u'\left(Y - \frac{\sum_j b_{j2}}{N}\right)$$

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**No Rules  $\Rightarrow$  Late revelation of central gov't type**

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  - Enforce penalty  $\psi$  on local gov't that violates the rule

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Costs outweigh benefits if  $\beta$  small enough

**Rules increase costs of maintaining good reputation**

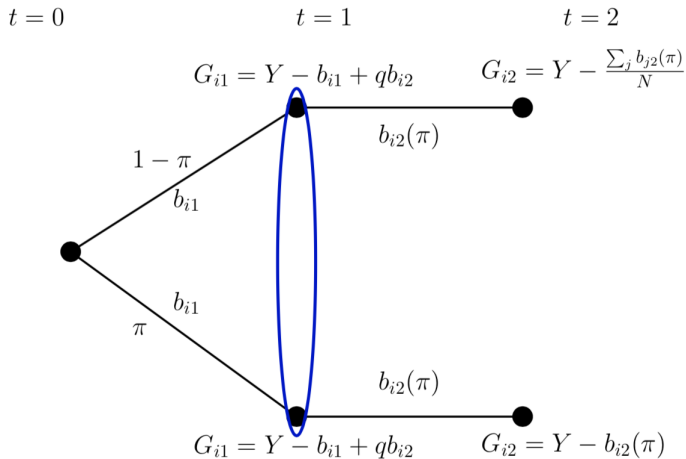
▶ Optimal to violate

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## Late Revelation and Debt Issuance

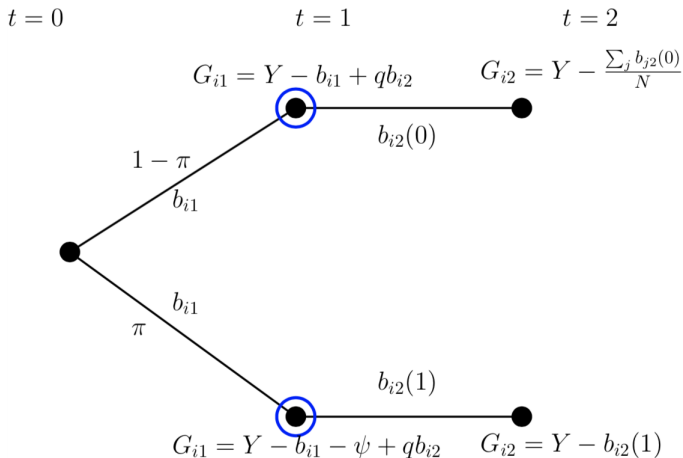


Debt issued in period 1 not contingent on gov't type



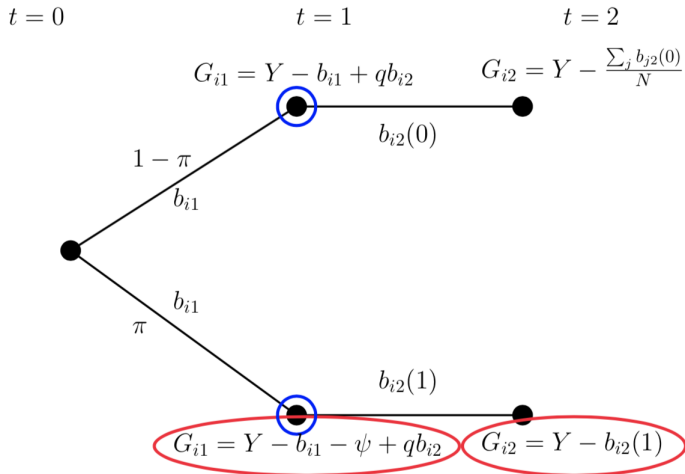


## Early Revelation and Debt Issuance



Debt issued in period 1 contingent on gov't type

## Early Revelation and Debt Issuance



If face C type: can spread adjustment across periods 1 and 2  
 $\Rightarrow$  lowers cost of servicing debt issued in period 0 ▶ sketch

**IF REPUTATION HIGH:  
FISCAL RULES PROMOTE FISCAL DISCIPLINE**

## High Reputation

Suppose that

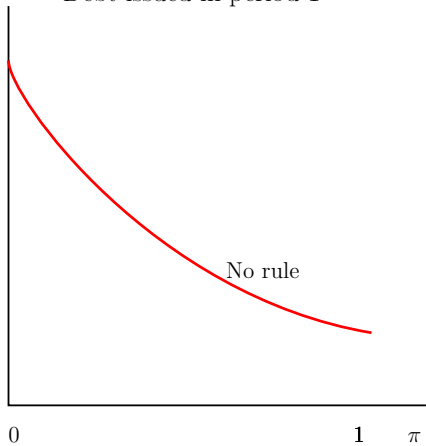
$$u(Y_{i0} + q\bar{b}) + \beta V_{i1}(\bar{b}, \pi) \geq \max_{b_i > \bar{b}} u(Y_{i0} + qb_i) + \beta V_{i1}(b_i + \psi, \bar{b}_{-i}, \pi)$$

Then if reputation ( $\pi$ ) is high enough

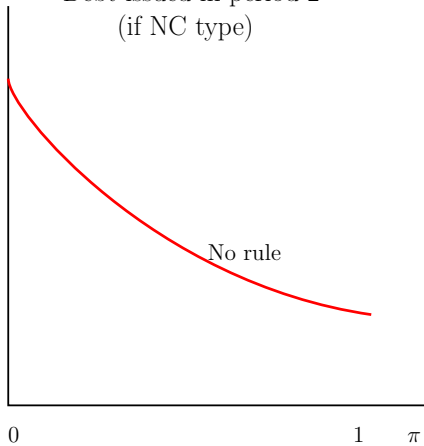
- Without rules: unique equilibrium where
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  - Central gov't type is not revealed in period 1 (late revelation)
- With binding rules: unique equilibrium where
  - Fiscal rule is obeyed by local gov'ts
  - Central gov't type is not revealed in period 1 (early revelation)
- Debt issued is smaller with binding rules
  - Local gov'ts obey the rule not to pay penalty (enforced with high probability off-path)

**RECAP**

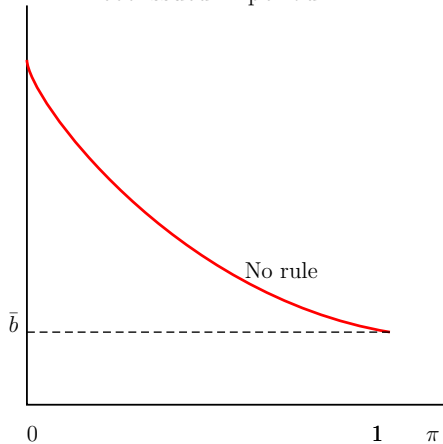
Debt issued in period 1



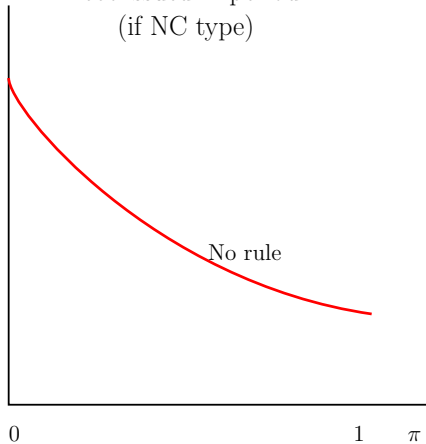
Debt issued in period 2  
(if NC type)

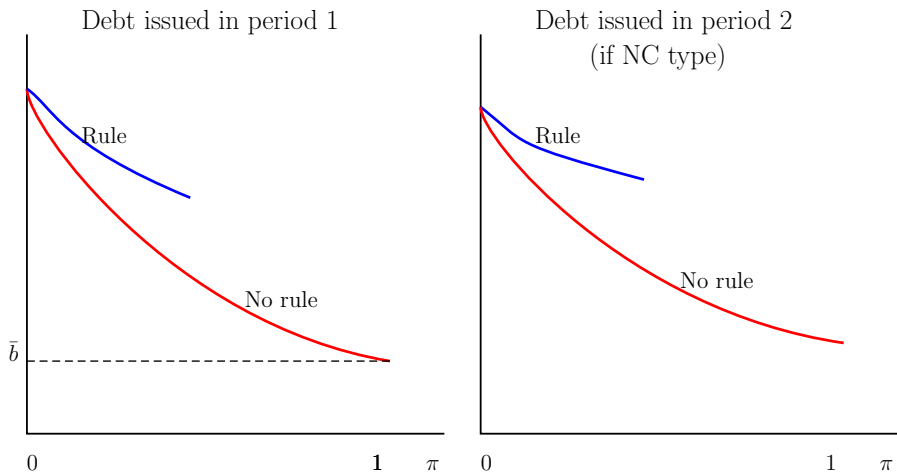


Debt issued in period 1



Debt issued in period 2  
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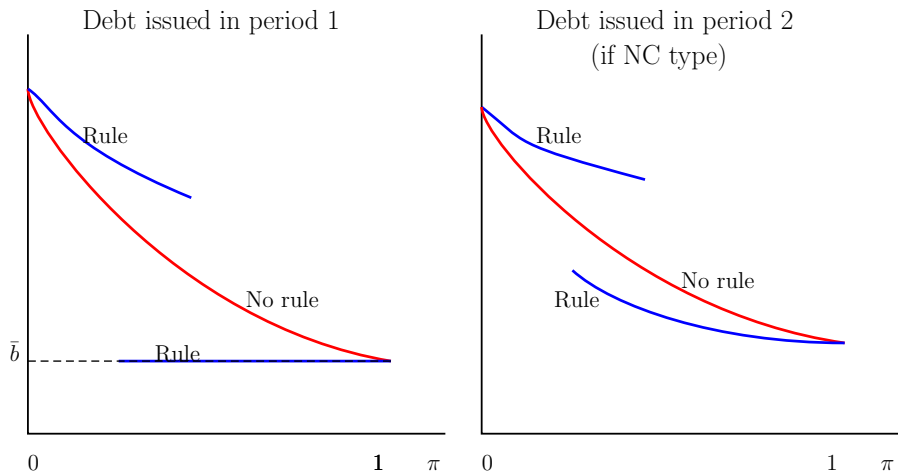




For low reputation:

- More debt with fiscal rules
- Fiscal rule is violated





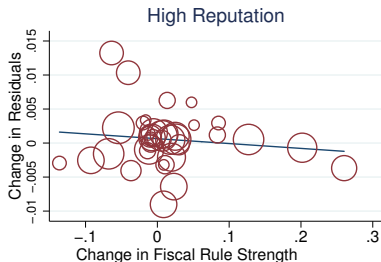
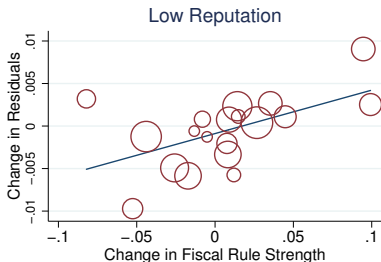
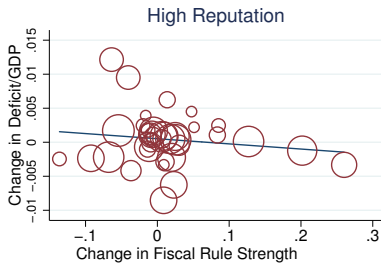
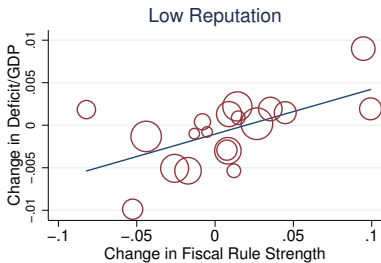
For high reputation:

- Less debt with fiscal rules
- Fiscal rule is not violated

## The $N = \infty$ case

- All local governments are infinitesimal
- An equilibrium with enforcement exists for all  $\pi$ 
  - Enforcement costs zero if measure zero local government deviates
- An equilibrium with non-enforcement exists for  $\pi$  small
- For  $\pi$  close to zero enforcement equilibrium is *fragile*
  - Unique non-enforcement equilibrium for  $N$  finite

# How do Deficits Respond to Tighter Rules in Practice?



# EQUILIBRIUM FISCAL RULES

## Equilibrium Fiscal Rules

- Why do we observe rules in equilibrium if reputation is low?

## Equilibrium Fiscal Rules

- Why do we observe rules in equilibrium if reputation is low?
- Outcome of a signaling game between two types of government
  - Both types announce constitution before period 0
  - NC type chooses whether to enforce in period 1
- For  $\pi \approx 0$ ,  $\beta < \underline{\beta}$ , unique equilibrium constitution with no rules
- For  $\pi \approx 0$ ,  $\beta \in [\underline{\beta}, \bar{\beta}]$ , unique equilibrium constitution with rules
  - **Rules are violated and not enforced**
  - **Early resolution of uncertainty**

## Equilibrium Fiscal Rules

- For  $\pi$  low and  $\beta < \bar{\beta}$  no-commitment type does not enforce rule
- For  $\pi$  low and  $\beta > \underline{\beta}$  commitment type values separation
  - Reputation jumps to 1 in period 1
  - No over-borrowing from period 1 to period 2
- For  $\beta \in [\underline{\beta}, \bar{\beta}]$  unique equilibrium with rules and no-enforcement

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  - No over-borrowing from period 1 to period 2
- For  $\beta \in [\underline{\beta}, \bar{\beta}]$  unique equilibrium with rules and no-enforcement
- **Rationalizes why we often observe central gov'ts with low reputation setting up tough fiscal rules**



# Fiscal Rules in Practice

- Previous results account for
  - Episodes where fiscal rules instituted but not enforced
  - Fiscal rules being instituted by gov'ts with low reputation
- Two examples
  1. Eurozone
  2. Brazil

## Stability and Growth Pact in the Eurozone

- In 2003 FR and DE violate SGP but sanctions not imposed
  - Power to discipline fiscal policy weakened
- In 2009 European debt crisis and bailout of Greece
  - Reputation and credibility of central authorities low
- Introduce “Six-Pack,” “Fiscal Compact” to strengthen fiscal rules
- Provisions violated by Spain and Portugal without sanctions

“My perception is that the European Commission has basically given up on enforcing the rules of the Stability and Growth Pact.”

— Jens Weidmann, governor of the Bundesbank

## Brazil

- Fiscal behavior of the states major source of instability
  - Resulted in sub-national debt crises in 1989, 1993, and 1997
- Large bailout in 1997 by the federal government
  - Reputation and credibility of central authorities low
- Subsequently gov't approves the Fiscal Responsibility Law
  - Fiscal rules and sanctions for noncompliance

## Conclusion

- Fiscal rules are often imposed to promote fiscal discipline
- If cannot commit, fiscal rules detrimental when reputation low
  - Incentivize over-borrowing
  - Increase costs for central gov't to maintain good reputation
- Arise in equilibrium when reputation low even if detrimental
- Rationalize several historical examples when:
  - Fiscal rules have been instituted but not enforced
  - Tight fiscal rules arise when the reputation is low

**ADDITIONAL SLIDES**

## Sketch of Proof

Consider the case without fiscal rules (no transfers in period 1)

- Period 0 Euler equation

$$\begin{aligned} qu'(G_{i0}) &= \beta u'(Y - \mathbf{b}_{i1} + q\mathbf{b}_{i2}(\mathbf{b}_1, \pi)) \\ &\quad + \frac{\beta^2}{N} (1 - \pi) u'(Y - \mathbf{b}_{i2}(\mathbf{b}_1, \pi)) (N - 1) \frac{\partial \mathbf{b}_{-i2}(\mathbf{b}_1, \pi)}{\partial \mathbf{b}_{i1}} \end{aligned}$$

- Period 1 Euler equation

$$\begin{aligned} qu'(Y - \mathbf{b}_{i1} + q\mathbf{b}_{i2}(\mathbf{b}_1, \pi)) &= \beta \pi u'(Y - \mathbf{b}_{i2}(\mathbf{b}_1, \pi)) \\ &\quad + \frac{\beta(1 - \pi)}{N} u'(Y - \mathbf{b}_{i2}(\mathbf{b}_1, \pi)) \end{aligned}$$

- Substitute period 1 Euler into period 0 Euler

## Sketch of Proof

- Without rules,  $b_{i1}$  must equate  $qu'(Y + qb_{i1})$  to

$$\begin{aligned} & \frac{\beta^2}{q} \pi u'(Y - \mathbf{b}_{i2}(b_1, \pi)) + \frac{\beta^2}{Nq} (1 - \pi) u'(Y - \mathbf{b}_{i2}(b_1, \pi)) \\ & + \frac{\beta^2}{N} (1 - \pi) u'(Y - \mathbf{b}_{i2}(b_1, \pi)) (N - 1) \frac{\partial \mathbf{b}_{-i2}(b_1, \pi)}{\partial b_{i1}} \end{aligned}$$

## Sketch of Proof

- Without rules,  $\mathbf{b}_{i1}$  must equate  $q\mathbf{u}'(Y + q\mathbf{b}_{i1})$  to

$$\begin{aligned} & \frac{\beta^2}{q} \pi \mathbf{u}'(Y - \mathbf{b}_{i2}(\mathbf{b}_1, \pi)) + \frac{\beta^2}{Nq} (1 - \pi) \mathbf{u}'(Y - \mathbf{b}_{i2}(\mathbf{b}_1, \pi)) \\ & \quad + \frac{\beta^2}{N} (1 - \pi) \mathbf{u}'(Y - \mathbf{b}_{i2}(\mathbf{b}_1, \pi)) (N - 1) \frac{\partial \mathbf{b}_{-i2}(\mathbf{b}_1, \pi)}{\partial \mathbf{b}_{i1}} \end{aligned}$$

- With rules,  $\mathbf{b}_{i1}$  must equate  $q\mathbf{u}'(Y + q\mathbf{b}_{i1})$  to

$$\begin{aligned} & \frac{\beta^2}{q} \pi \mathbf{u}'(Y - \mathbf{b}_{i2}(\mathbf{b}_1 + \psi, \mathbf{1})) + \frac{\beta^2}{Nq} (1 - \pi) \mathbf{u}'(Y - \mathbf{b}_{i2}(\mathbf{b}_1, \mathbf{0})) \\ & \quad + \frac{\beta^2}{N} (1 - \pi) \mathbf{u}'(Y - \mathbf{b}_{i2}(\mathbf{b}_1, \mathbf{0})) (N - 1) \frac{\partial \mathbf{b}_{-i2}(\mathbf{b}_1^b, \mathbf{0})}{\partial \mathbf{b}_{i1}} \end{aligned}$$



## Sketch of Proof

- Without rules,  $b_{i1}$  must equate  $qu'(Y + qb_{i1})$  to

$$\frac{\beta^2}{q} \pi u'(Y - \mathbf{b}_{i2}(\mathbf{b}_1, \pi)) + \frac{\beta^2}{Nq} (1 - \pi) u'(Y - \mathbf{b}_{i2}(\mathbf{b}_1, \pi)) \\ + \frac{\beta^2}{N} (1 - \pi) u'(Y - \mathbf{b}_{i2}(\mathbf{b}_1, \pi)) (N - 1) \frac{\partial \mathbf{b}_{-i2}(\mathbf{b}_1, \pi)}{\partial b_{i1}}$$

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With rules  $b_2$  contingent on type of gov't

## Taking limits as $N \rightarrow \infty$

- Without rules,  $\mathbf{b}_{i1}$  solves

$$q\mathbf{u}'(Y + q\mathbf{b}_{i1}) = \frac{\beta^2}{q}\pi\mathbf{u}'(Y - \mathbf{b}_{i2}(\mathbf{b}_1, \pi))$$

- With rules,  $\mathbf{b}_{i1}$  solves

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For  $\pi$  small enough

$$\mathbf{b}_{i2}(\mathbf{b}_1 + \psi, \mathbf{1}) < \mathbf{b}_{i2}(\mathbf{b}_1, \pi)$$

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For  $\pi$  small enough

$$\mathbf{b}_{i2}(\mathbf{b}_1 + \psi, 1) < \mathbf{b}_{i2}(\mathbf{b}_1, \pi)$$

**Early resolution of uncertainty reduces cost of issuing debt**  
 $\Rightarrow$  **More debt when constitution has fiscal rules**

## Even w/ Heterogeneity: No Rules $\Rightarrow$ Late Revelation

Heterogeneity in  $Y_{i0} \Rightarrow$  debt distribution in 1 not degenerate

Central gov't in period 1 chooses whether to make transfers

For  $\pi \approx 0$ :

- Costs: Dispersion in local public good provision
  - Second order
    - Local gov'ts almost certain to receive transfer in period 2
    - So adjust their borrowing to keep period 1 consumption constant

$$qu'(G_{i1}) = \beta\pi u'(Y - b_{i2}) + \frac{\beta}{N} (1 - \pi) u'\left(Y - \frac{\sum_j b_{j2}}{N}\right)$$

so for  $\pi \rightarrow 0 \Rightarrow G_{i1} = G_1$  for all  $i$

- Benefits: Less over-borrowing due to maintained reputation
  - First order
- So for low levels of reputation optimal to enforce constitution

## Optimal To Violate Fiscal Rule

If NC type doesn't enforce the penalty in period 1 and  $\pi$  small  
 $\Rightarrow$  Optimal for local governments to violate the rule

- If other  $N - 1$  local gov'ts violate the rule,  $\mathbf{b}_{-i1} = \mathbf{b}_1 > \bar{\mathbf{b}}$
- If gov't  $i$  deviates and issues  $\mathbf{b}_{i1} = \bar{\mathbf{b}}$  its payoff is

$$V^{\text{dev}} = u(Y + q\bar{\mathbf{b}}) + \beta\pi V_1(\bar{\mathbf{b}}, \mathbf{b}_{-i,1} + \psi, 1) + \beta(1 - \pi)V_1\left(\frac{N-1}{N}\mathbf{b}_1 + \frac{\bar{\mathbf{b}}}{N}, 0\right)$$

- If it issues  $\mathbf{b}_{i1} = \mathbf{b}_1 > \bar{\mathbf{b}}$  its payoff is

$$V = u(Y + q\mathbf{b}_1) + \beta\pi V_1(\mathbf{b}_1 + \psi, 1) + \beta(1 - \pi)V_1(\mathbf{b}_1, 0)$$

- If  $\pi$  small  $\Rightarrow V > V^{\text{dev}} \Rightarrow$  optimal to violate the rule