Insulation Impossible: Fiscal Spillovers in a Monetary Union

Russell Cooper*   Hubert Kempf**   Dan Peled***

*European University Institute and University of Texas at Austin

**Banque de France and Paris School of Economics

***University of Haifa

February 2010

Outline

Outline

Outline

Outline

Outline

Outline

1. **Motivation**

2. Model
   - Non-binding Reserve Requirement
   - Reserve Requirement Binds

3. Insulating Region 2 from Region 1 Fiscal Policy
   - Special Policies
   - Two General Results

4. Market Segmentation

5. Conclusion

Figure: Our World View

World View

- federations of regions (countries, states)
- regional fiscal policy: financing of transfers to regional agents
- central tax authority (Treasury)
- central monetary authority (CB)

Effects of Interdependence

- gain: trade and factor reallocation enhanced
- loss: policy spillovers
    - policy coordination
    - policy segmentation: insulation

World View

- federations of regions (countries, states)

- regional fiscal policy: financing of transfers to regional agents

- central tax authority (Treasury)

- central monetary authority (CB)

Effects of Interdependence

- gain: trade and factor reallocation enhanced

- loss: policy spillovers

    - policy coordination

    - policy segmentation: insulation
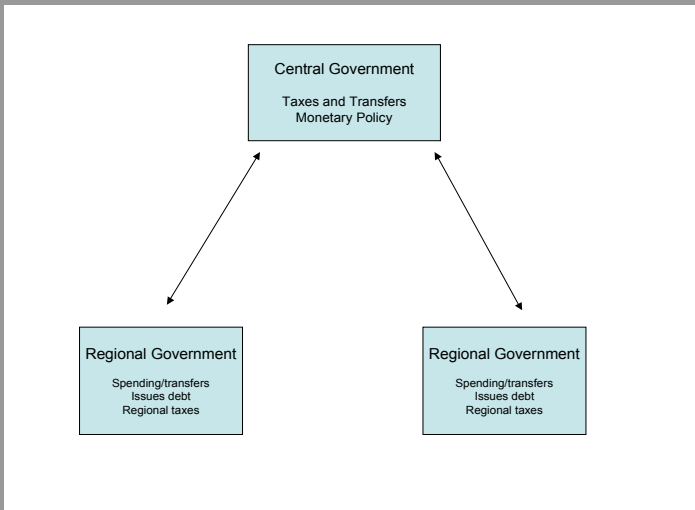
World View

- federations of regions (countries, states)
- regional fiscal policy: financing of transfers to regional agents
- central tax authority (Treasury)
- central monetary authority (CB)

Effects of Interdependence

- gain: trade and factor reallocation enhanced
- loss: policy spillovers
  - policy coordination
  - policy segmentation: insulation

Example: Who Pays Regional Debt Obligations?

- regional government want to spread obligations
- who will provide the bailout?
    - by Treasury (Cooper, Kempf and Peled, *IER*)
    - by CB

Rationale for CB Bailout

- "Weak CB" prints money to finance debt obligations of regional government (Cooper and Kempf, *REStud*)

- tax and consumption smoothing motivates CB bail-out (multiplicity)

- CB rules may accommodate bail-out by linking policy to endogenous variables

Example: Who Pays Regional Debt Obligations?

- regional government want to spread obligations
- who will provide the bailout?
    - by Treasury (Cooper, Kempf and Peled, *IER*)
    - by CB

Rationale for CB Bailout

- "Weak CB" prints money to finance debt obligations of regional government (Cooper and Kempf, *REStud*)
- tax and consumption smoothing motivates CB bail-out (multiplicity)
- CB rules may accommodate bail-out by linking policy to endogenous variables

Example: Who Pays Regional Debt Obligations?

- regional government want to spread obligations
- who will provide the bailout?
    - by Treasury (Cooper, Kempf and Peled, *IER*)
    - by CB

Rationale for CB Bailout

- "Weak CB" prints money to finance debt obligations of regional government (Cooper and Kempf, *REStud*)
- tax and consumption smoothing motivates CB bail-out (multiplicity)
- CB rules may accommodate bail-out by linking policy to endogenous variables

Example: Who Pays Regional Debt Obligations?

- regional government want to spread obligations
- who will provide the bailout?
    - by Treasury (Cooper, Kempf and Peled, *IER*)
    - by CB

Rationale for CB Bailout

- "Weak CB" prints money to finance debt obligations of regional government (Cooper and Kempf, *REStud*)
- tax and consumption smoothing motivates CB bail-out (multiplicity)
- CB rules may accommodate bail-out by linking policy to endogenous variables

Two perspectives on CB policy rules

- policy response: monetary policy may accommodate regional fiscal policy:

- (fiscal spillovers): monetary policy acts to offset (eliminate) fiscal policy effects on wages and interest rates

- both perspectives co-exist here
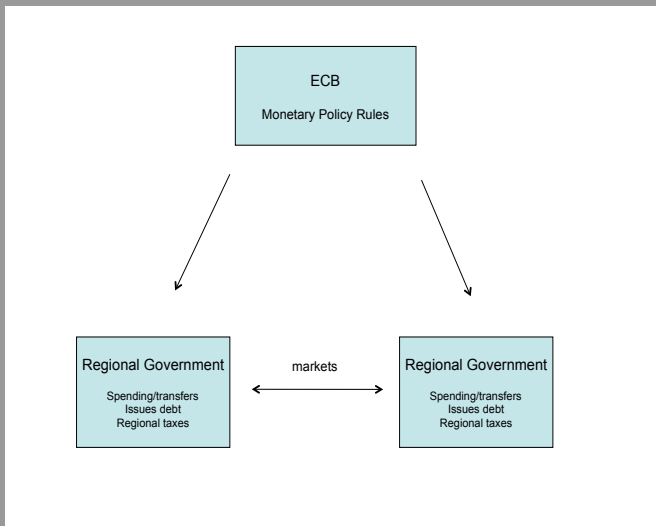
Figure: ECB

Questions

- how effective is CB policy in insulating one country from another?

  - how does CB policy influence fiscal spillovers across regions?
  - are there CB policies which will insulate one region from the fiscal policy of another?

Find

- Insulation Impossible

- CB influence through both interest rates and monetary transfers used to implement monetary policy

Questions

- how effective is CB policy in insulating one country from another?
  - how does CB policy influence fiscal spillovers across regions?
  - are there CB policies which will insulate one region from the fiscal policy of another?

Find

- Insulation Impossible

- CB influence through both interest rates and monetary transfers used to implement monetary policy

Questions

- how effective is CB policy in insulating one country from another?
  - how does CB policy influence fiscal spillovers across regions?
  - are there CB policies which will insulate one region from the fiscal policy of another?

Find

- Insulation Impossible

- CB influence through both interest rates and monetary transfers used to implement monetary policy

Study Using

- two-period, two-region Diamond OG model: money, capital and bonds

- interactions between regional government's fiscal policy and (CB)

- reserve requirements generate money demand

- focus on steady state monetary equilibria; potentially interesting dynamics

- integrated capital markets

- no crises *per se* but mechanisms are relevant during these periods as well.

- fiscal spillovers iff reserve requirements bind (non-Ricardian)
    - regional debt $\Rightarrow$ aggregate capital stock
    - aggregate capital $\Rightarrow$ real wages and interest rates
    - CB may be induced to respond

- CB rules

    - abstract feedback rule

    - fixed nominal money growth: no policy response

    - interest peg: policy response through inflation tax, insulation
      from interest rate part of fiscal spillover

- fiscal spillovers iff reserve requirements bind (non-Ricardian)
    - regional debt $\Rightarrow$ aggregate capital stock
    - aggregate capital $\Rightarrow$ real wages and interest rates
    - CB may be induced to respond
- CB rules
    - abstract feedback rule
    - fixed nominal money growth: no policy response
    - interest peg: policy response through inflation tax, insulation from interest rate part of fiscal spillover

Outline

Overview

- Agents
    - Households
    - Firms
    - Intermediaries
    - Governments
- friction through reserve requirements
    - difference between return on household saving and government debt
    - Ricardian equivalence is lost
    - fiscal spillovers emerge
    - choice of CB policy matters

Households

- HH in region $i = 1, 2$ solves

$$max_s u(c_y^i) + v(c_o^i) \tag{1}$$

  where $c_y^i = \omega + g^i - \tau_y^i - s$ and $c_o^i = sR - \tau_o^i$.

- tax is τ_j^i, $i = 1, 2$ and $j = y, o$.

- deposit s^i in intermediaries, return of R

- do not demand money

- $u'(c_y^i) = Rv'(c_o^i)$

Firms

- CRS, perfect competition
- $\omega = f(k) - kf'(k)$
- $r = f'(k)$

Intermediaries

- reserve requirement of λ on deposits (S)

- $\frac{M}{p} = \lambda S$ and $b + k = (1-\lambda)S$

- Return on deposits linked to asset portfolio by:

$$R = r(k)(1-\lambda) + \frac{\lambda}{\pi} \tag{2}$$

- r is return on capital and bonds

- construct equilibria with $r > R$ when constraint binds as $\lambda > 0$

Regional Governments

- only region 1 is fiscally active
- transfer $g^1 > 0$ to young agents (broadly defined)
- financed by taxes τ_y^1 and τ_o^1
- Budget Constraint (steady state)
  - $g^1 = \tau_y^1 + B^1$
  - $rB^1 = \tau_o^1 + T^1$: one-period debt
  - $0 = \tau_o^2 + T^2$ in region 2
- $T^i = \frac{\phi^i \times T(k,b)}{\eta^i}$: real transfer from the CB to each agent in region i
- B^1 is per region 1 agent, b is per capita

CB

- monetary policy through transfers: $(T(k, b), \phi^1, \phi^2)$
- real transfers financed by printing money
- commit to $T(k, b)$, prior to fiscal policy of regional government
- transfers to regional governments implement policies
- special rules
  - $\sigma - rule$: fix the money growth rate
  - $R - rule$: peg an interest rate

Steady State

- $(T(k, b), \phi^1, \phi^2)$ and b given
- k determined in steady state equilibrium satisfying:
  - Household Euler Equations: $u'(c_y^i) = Rv'(c_o^i)$
  - Intermediary Zero Profits
  - factor demand: $r(k) = f'(k)$ and $\omega(k) = f(k) - kf'(k)$
  - Regional Government Budget Constraints
  - market clearing conditions

Benchmark: Non-binding Reserve Requirement

- all assets earn same return: $r = \frac{1}{\pi}$ so $R = r$

- Ricardian outcome: fiscal policy of Region 1 is irrelevant
  Proposition *If $T_b(k, b) \equiv 0$, then the steady state equilibrium is independent of b.*

- but the CB can create spillovers directly:
  Proposition *If $T_b(k, b) \neq 0$, then the steady state equilibrium depends upon b.*

Benchmark: Non-binding Reserve Requirement

- all assets earn same return: $r = \frac{1}{\pi}$ so $R = r$

- Ricardian outcome: fiscal policy of Region 1 is irrelevant
  Proposition *If* $T_b(k, b) \equiv 0$, *then the steady state equilibrium is independent of* b.

- but the CB can create spillovers directly:
  Proposition *If* $T_b(k, b) \neq 0$, *then the steady state equilibrium depends upon* b.

Binding Reserve Requirement: General $T(k, b)$

- $r > R$

- **Proposition** [Non-neutrality] *For $T(k, b) \equiv 0$, the steady state equilibrium is dependent on b.*

- variations in b influence k and hence factor prices and thus welfare in other region
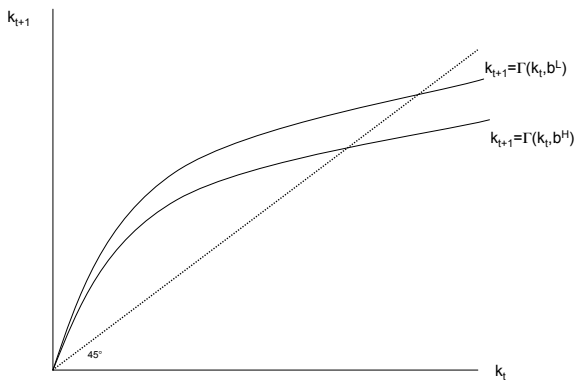
- Characterize the Spillovers with more structure

Binding Reserve Requirement: General $T(k, b)$

- $r > R$
- **Proposition** [Non-neutrality] *For $T(k, b) \equiv 0$, the steady state equilibrium is dependent on b.*

- variations in b influence k and hence factor prices and thus welfare in other region
- Characterize the Spillovers with more structure

Leading Case

k_{t+1}

$k_{t+1}=\Gamma(k_t,b^L)$

$k_{t+1}=\Gamma(k_t,b^H)$

45°

k_t

Local Stability of the steady state and crowding out with $b^H > b^L$.

Characterizing the Spillovers

- Capital dynamics are given by:

$$k_{t+1} = (1 - \lambda) \sum_i \eta^i s^i(\omega(k_t), R(k_{t+1}, b), \tau_y^i, \tau_o^i(k_{t+1}, b)) - b.$$

  - $s^i(\omega, R, \tau_y^i, \tau_o^i)$ is the savings function for a region i agent given factor prices and taxes.
  - $\tau_o^1(k, b) = \frac{rb}{\eta^1} - T^1(k, b), \qquad \tau_o^2(k, b) = -T^2(k, b).$

- Local dynamics are governed by:

$$\frac{dk_{t+1}}{dk_t} = \frac{(1 - \lambda) \sum_i \eta^i s_\omega^i \omega'(k_t)}{1 - (1 - \lambda)[\sum_i \eta^i (s_R^i R_k(k_{t+1}, b) + s_{\tau_o}^i \frac{\partial \tau_o^i(k_{t+1}, b)}{\partial k})]}.$$

Crowding Out

- response of k to region 1 debt per capita, b

$$\frac{dk}{db} = \frac{-[1 - (1-\lambda)\sum_i \eta^i \left(s^i_{\tau_y} \frac{d\tau^i_y}{db} + s^i_{\tau_o} \frac{d\tau^i_o}{db} + s^i_R R_b(k,b) \right)]}{1 - (1-\lambda)[\sum_i \eta^i s^i_R R_k(k,b) + s^i_\omega \omega'(k) + s^i_{\tau_o} \frac{\partial \tau^i_o(k,b)}{\partial k})]}.$$

- **Proposition**[crowding out] If $\frac{dk_{t+1}}{dk_t} \in (0,1)$ at the steady state and $T_b(k,b) \geq 0$, then $\frac{dk}{db} < 0$.

- Region 2 agents not insulated from region 1 fiscal policy

Outline

CB Policy

- here we see spillovers and crowding out

- how does the choice of $T(k, b)$ influence these spillovers

- answer

  - through some illuminating special cases
  - in general

Fiscal Spillovers and a $\sigma - rule$

- Transfers proportional to money stock

$$T(k, b) = \lambda S \frac{(\sigma - 1)}{\sigma} = \frac{\lambda(k + b)}{(1 - \lambda)}\tilde{\sigma} \qquad (3)$$

where $\tilde{\sigma} \equiv \frac{\sigma - 1}{\sigma}$

- **Corollary** *Under a $\sigma - rule$ with $\tilde{\sigma} \geq 0$, an increase in b leads to a reduction in the capital stock, an increase in the real interest rate and a reduction in the real wage.*

- crowding out effect

- real transfers are influenced by b.

- region 2 agents affected by b.

Fiscal Spillovers and a $R - rule$

- fix $R = r(k)(1 - \lambda) + \frac{\lambda}{\sigma}$

- **Corollary** *Under a $R - rule$ pegging R, if $\tilde{\sigma} \geq 0$, an increase in b leads to a reduction in the capital stock and an increase in the rate of inflation.*

- crowding out increases R

- CB inflates to peg it.

- Region 2 agents are insulated from both R and inflation tax:
  $u'(\omega(k) - s^2) = Rv'(s^2R)$

- wages depend on k

Insulation Impossible

- Can the CB neutralize the effects of region 1 debt on region 2 agents?

  Proposition: *There do not exist $T^i(k, b)$ transfer functions, for $i = 1, 2$, such that the steady state equilibrium levels of consumption of region 2 agents, (c_y^2, c_o^2), are independent of b.*

- Are the equilibrium levels of consumption and k independent of b?

  Proposition: *There do not exist $T^i(k, b)$ transfer functions, for $i = 1, 2$, such that the steady state equilibrium levels of consumption for agents in regions $i = 1, 2$ and the capital stock are independent of b.*

Insulation Impossible

- Can the CB neutralize the effects of region 1 debt on region 2 agents?

  Proposition: *There do not exist $T^i(k, b)$ transfer functions, for $i = 1, 2$, such that the steady state equilibrium levels of consumption of region 2 agents, (c_y^2, c_o^2), are independent of b.*

- Are the equilibrium levels of consumption and k independent of b?

  Proposition: *There do not exist $T^i(k, b)$ transfer functions, for $i = 1, 2$, such that the steady state equilibrium levels of consumption for agents in regions $i = 1, 2$ and the capital stock are independent of b.*

Insulation Impossible

- Can the CB neutralize the effects of region 1 debt on region 2 agents?

  Proposition: *There do not exist $T^i(k, b)$ transfer functions, for $i = 1, 2$, such that the steady state equilibrium levels of consumption of region 2 agents, (c_y^2, c_o^2), are independent of b.*

- Are the equilibrium levels of consumption and k independent of b?

  Proposition: *There do not exist $T^i(k, b)$ transfer functions, for $i = 1, 2$, such that the steady state equilibrium levels of consumption for agents in regions $i = 1, 2$ and the capital stock are independent of b.*

Insulation Impossible

- Can the CB neutralize the effects of region 1 debt on region 2 agents?

  Proposition: *There do not exist $T^i(k, b)$ transfer functions, for $i = 1, 2$, such that the steady state equilibrium levels of consumption of region 2 agents, (c_y^2, c_o^2), are independent of b.*

- Are the equilibrium levels of consumption and k independent of b?

  Proposition: *There do not exist $T^i(k, b)$ transfer functions, for $i = 1, 2$, such that the steady state equilibrium levels of consumption for agents in regions $i = 1, 2$ and the capital stock are independent of b.*

Outline

Financial Market Segmentation

- understand robustness of insulation to portfolio

- Region 1 agents have access to intermediaries

- Region 2 agents only hold money: $u'(\omega(k) - s^2) = \frac{1}{\pi}v'(\frac{s^2}{\pi})$

- Find:

  - $\sigma - rule$: limits fiscal spillovers across regions to wages.
    Return for region 2 agents is fixed with money growth rate.
  - $R - rule$: CB response leads to inflation tax on region 2 agents

Outline

CB policy matters

- can influence impact of spillovers from regional fiscal policy
- policy rules may partially insulate region 2 agents from inflation tax
- key is portfolio return relative to peg

To Do

- optimal CB policy and optimal choice of regional debt b
- other special CB rules
- are fiscal restrictions useful?
- OMOs vs money transfers

CB policy matters

- can influence impact of spillovers from regional fiscal policy

- policy rules may partially insulate region 2 agents from inflation tax

- key is portfolio return relative to peg

To Do

- optimal CB policy and optimal choice of regional debt b

- other special CB rules

- are fiscal restrictions useful?

- OMOs vs money transfers