

Fiscal Federalism and Monetary Unions

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The Question of Delegation

- How should policy choices be delegated between central and local fiscal authorities?
 - *“We should know over which matters several local tribunals are to have jurisdiction, and in which authority should be centralized.”*

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 - a **centralized** fiscal authority is better
 - because in the presence of fiscal externalities, a centralized regime is better at internalizing them
- Answer from micro literature on fiscal federalism [Oates (1972, 1999)]
 - a **decentralized** fiscal authority is better
 - because local authorities are better at tailoring policies to its citizens’ preferences

Our Approach to the Benefits of Centralization vs. Decentralization

- This paper: incorporate two key forces
 - **Information benefit of decentralization** in the spirit of fiscal federalism literature
 - central authority observes only noisy signal of local preferences
 - information problem prevents central authority to elicit them
 - **Externality benefit of centralization** in the spirit of the macro literature
 - central fiscal authority internalizes the inflationary cost of debt
- Dynamic model: captures how debt *dynamics* in union vary depending on fiscal regime

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 - central fiscal authority internalizes the inflationary cost of debt
- Dynamic model: captures how debt *dynamics* in union vary depending on fiscal regime
- **Main goal**: characterize when is it optimal to centralize fiscal authority
- Main result:
 - as the number of countries in the union expands, centralization becomes more desirable

Model Set-Up

- Incorporate strategic interactions (finite countries, I) and information friction to Aguiar et al (2015)
- Each region/country in the monetary union has a representative agent
- All countries are identical except for their preferences between public and private goods
 - we abstract from transfers across countries or any redistribution mechanism
- Compare two regimes: **local** vs. **central** fiscal authority (decentralized vs. centralized)
- Either local or central authority chooses nominal debt issued to foreign lenders
- Linear production function using labor: $y_{it} = \ell_{it}$ with $\ell_{it} \in [0, \bar{\ell}]$, where $\bar{\ell} > u'^{-1}(1) + \rho\psi$

Preferences and Information Structure

- The representative agent in each country
 - gets utility from private consumption, c , and public goods, g
 - linear disutility from working, and direct disutility from inflation, $\psi\pi$
- So, preferences in country i are given by

$$\mathbb{E} \int_0^{\infty} e^{-\rho t} [(1 - \theta_{it})u(c_{it}) + \theta_{it}h(g_{it}) - \ell_{it} - \psi\pi_t] dt$$

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- θ are iid shocks across countries
- **Local fiscal authority**: perfectly observes θ_i
- **Central fiscal authority**: observes noisy signal s_i about it
- Idea: local authority tries to communicate θ_i but this type of communication difficult

Foreign Lenders and Debt Dynamics

- Risk-neutral foreign lenders buy non-defaultable government bonds, b_{it} (in real units)
- Their real opportunity cost is ρ which equals the discount rate of consumers
- The law of motion of debt in country i is

$$\dot{b}_{it} = c_{it} + g_{it} + (i_t - \pi_t) b_{it} - \ell_{it}$$

where i_t is the nominal interest rate

- In equilibrium, the real interest rate is always opportunity cost ρ : $i_t - \pi_t = \rho$

Monetary Authority: How Does It Choose Inflation?

- The union-wide monetary authority maximizes utility of all countries in the union
- Given a vector of current debt in each country $\mathbf{b} = (b_1, \dots, b_I)$ and preferences θ , chooses inflation
- Assume that $\pi_t \in [0, \bar{\pi}]$. So, it solves

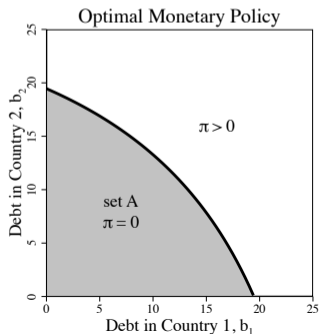
$$J(\mathbf{b}_0, \theta_0) = \max_{\{\pi_t\}} \frac{1}{I} \sum_i \mathbb{E}_0 \int_0^\infty e^{-\rho t} [(1 - \theta_{it})u(c_{it}) + \theta_{it}h(g_{it}) - \ell_{it} - \psi\pi_t] dt$$

$$\text{s.t.} \quad \dot{b}_{it} = c_{it} + g_{it} + (i_t - \pi_t)b_{it} - \ell_{it}$$

Intuition for $I = 2$ With No Information Problem: $\theta = 0$ and $g = 0$

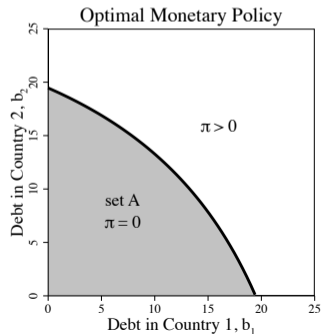
- The optimal inflation rule is of the following form

$$\pi(b_1, b_2) = \begin{cases} 0 & \text{if } (b_1, b_2) \in A \\ \bar{\pi} & \text{if } (b_1, b_2) \in A^C \end{cases}$$



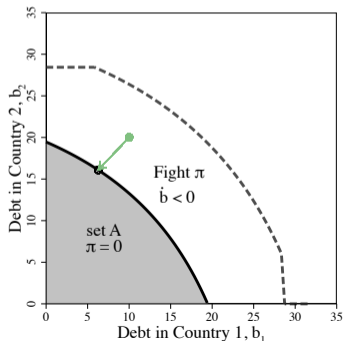
Intuition for $I = 2$: Three Regions Depending on Debt

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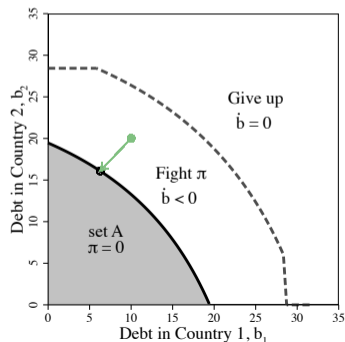
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1. *No inflation*: if $(b_1, b_2) \in A$, then set $\dot{b} = 0$
2. *Fight inflation*: if $(b_1, b_2) \in A^C$ but “not too far” from A
 - countries want to fight inflation by decreasing their debt levels: set $\dot{b} < 0$ until they reach set A



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 - countries give up fighting inflation: $\dot{b} = 0$
- **Key**: in a **centralized** regime *fight inflation* at higher debt levels than **decentralized**
 - and decrease debt faster

→ Next: formally show these results

The Problem of the Centralized Fiscal Authority

- Focus on the symmetric case for now: same initial debt in each country, $b_1 = \dots = b_I = b$
- Taking as given $i(b)$ and $\pi(b)$, the value of the centralized fiscal authority is

$$V^C(b) = \max_{c_t, \ell_t \in [0, \bar{\ell}]} \int_0^{\infty} e^{-\rho t} [u(c_t) - \ell_t - \psi \pi(b_t)] dt$$

$$\text{s.t.} \quad \dot{b}_t = c_t - \ell_t + \rho b_t \quad \text{for all } t$$

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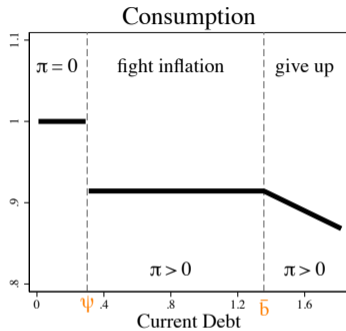
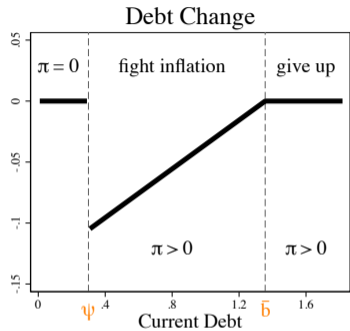
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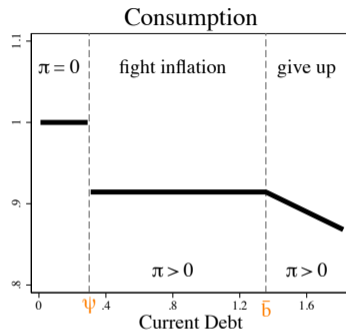
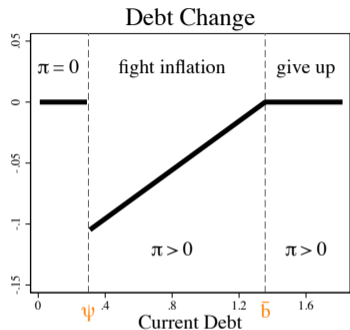
- Inflation rule from monetary authority problem is

$$\pi(b) = \begin{cases} 0 & \text{if } \psi \geq b \\ \bar{\pi} & \text{if } \psi < b \end{cases}$$

Centralized Fiscal Authority: Characterization of Equilibrium



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→ Note: all the results in the centralized case are independent of I ; next, decentralized fiscal authority

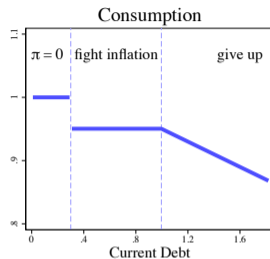
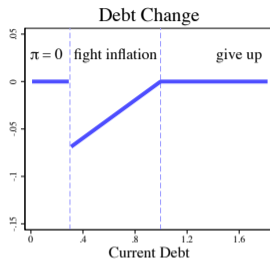
The Problem of the Local Fiscal Authority

- Each country's local fiscal authority chooses (c_i, ℓ_i) to maximize utility of their country
- **Strategic interaction**: inflation depends on what all other countries are doing
- Given $\pi(\mathbf{b}), i(\mathbf{b})$, and $\{c_j(\mathbf{b}), \ell(\mathbf{b})\}_{j \neq i}$, the local fiscal authority value is given by

$$V_i^D(\mathbf{b}_0) = \max_{c_{it}, \ell_{it} \in [0, \bar{\ell}]} \int_0^{\infty} e^{-\rho t} [u(c_{it}) - \ell_{it} - \psi \pi(\mathbf{b}_t)] dt$$

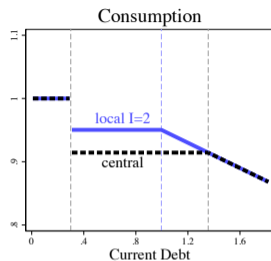
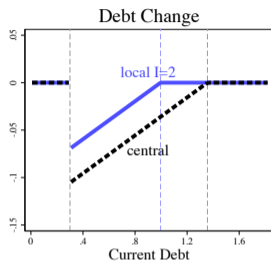
$$\begin{aligned} \text{s.t. } \dot{b}_{it} &= c_{it} + \rho b_{it} - \ell_{it} \\ \dot{b}_{jt} &= c_j(\mathbf{b}_t) + \rho b_{jt} - \ell_j(\mathbf{b}_t) \quad \forall j \neq i \end{aligned}$$

Local Fiscal Authority: Characterization of Equilibrium with $I = 2$



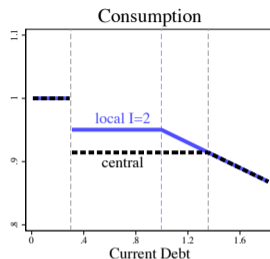
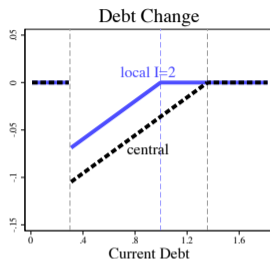
- Same qualitative form as in the centralized regime
- But both consumption level and area where countries fight inflation depend on no. of countries I
- Next, compare with the centralized regime

Compare Local and Central Fiscal Authority Equilibria with $I = 2$



1. *Zero inflation*: equilibrium same in both regimes
2. *Fight inflation*:
 - in both regimes, consumption is constant along the debt reduction path, but $\underline{c}^D(I) > \underline{c}^C$
 - debt decreases slower in the decentralized so takes longer to get zero inflation→ key fiscal externality: locals don't internalize the union-wide benefits of decreasing debt fast
3. *Give up fighting inflation*: for lower levels of debt under decentralized

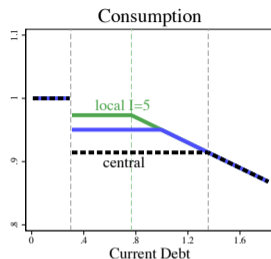
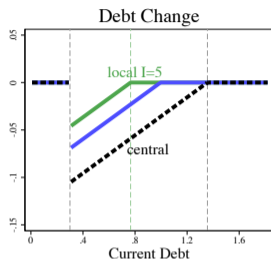
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What about **welfare**?

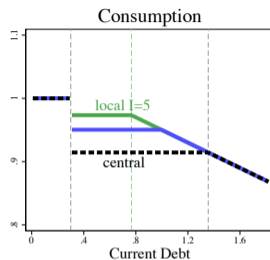
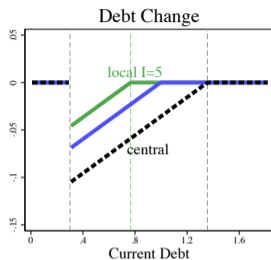
- When inflation is zero or both give up inflation: same allocations and welfare in two regimes
- In the area where centralized regime fights inflation:
 - flow utility is higher in decentralized because consumption is higher
 - but, overall welfare higher under **centralized** because it gets to $\pi = 0$ and faster

Compare Local and Central Fiscal Authority Equilibria with $I = 5$



- As the number of countries in the union I increase
 - don't fight inflation as hard: $\underline{c}^D(I)$ increases with I
 - so the rate at which debt decreases is slower: takes longer to reach the zero inflation area
 - give up fighting inflation for lower levels of debt
- fiscal externality becomes worse

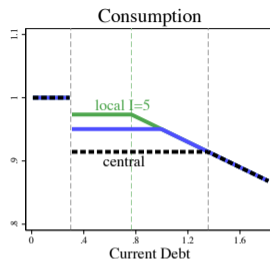
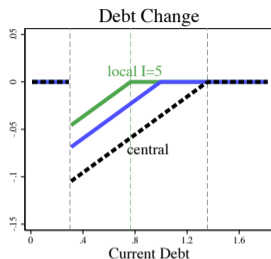
Compare Local and Central Fiscal Authority Equilibria with



Proposition: in the symmetric case $b_1 = \dots = b_I$

- i) if $b \leq \psi$ (no inflation) or $b \geq \bar{b}(I = 1)$ (giving up under centralized)
 - a decentralized regime is as good as a centralized one
- ii) if $b \in (\psi, \bar{b})$ (when fighting inflation), then a centralized regime is preferred
 - and the value of a decentralized regime decreases with I for $b \in (\psi, \bar{b}(I))$

Compare Local and Central Fiscal Authority Equilibria



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Let $J^C(\mathbf{b})$ and $J^D(\mathbf{b}, I)$ denote the ex-ante welfare under central and local regimes in this problem

Next: add an information disadvantage to the centralized regime

Add an Information Disadvantage to Central Fiscal Authority

- Go back to the general problem in which countries have heterogeneous preferences about g
- Preferences in each country i are given by

$$\mathbb{E} \int_0^{\infty} e^{-\rho t} [(1 - \theta_{it})u(c_{it}) + \theta_{it}h(g_{it}) - \ell_{it} - \psi\pi_t] dt$$

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- Information structure formally
 - let $\boldsymbol{\theta}_t \equiv (\theta_{1t}, \dots, \theta_{It})$ be a random variable in probability space $(\Omega, \mathcal{F}, \mathcal{P})$ and iid across i
 - **local** fiscal authority observes θ_{it} and its information structure is the filtration $\mathcal{F}_t^i = \sigma(\theta_{i\tau}, \tau \leq t)$
 - **central** authority only observes signals \mathbf{s}_t and info structure is filtration $\mathcal{F}_t^C = \sigma(\mathbf{s}_\tau, \tau \leq t)$

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- An example: let $\theta_{it} \in \{\theta_L, \theta_H\}$ with $0 < \theta_L < \theta_H < 1$
 - at a given Poisson rate λ , preference θ_{it} switches from θ_L to θ_H and vice versa
 - central fiscal authority learns value of current θ_{it} with Poisson rate ϕ

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 - central fiscal authority learns value of current θ_{it} with Poisson rate $\phi \rightarrow$ informativeness degree

A Separation Result With Log Utility

Two parts to this separation result

- Debt dynamics identical to the economy with only fiscal externalities
 - total consumption, $c + g$, does not vary with θ , only its composition
- Welfare is sum of welfare with only externality and a term that captures benefits of info structure

A Separation Result With Log Utility

Proposition: The ex-ante welfare in an economy with heterogeneous preferences for g given by θ_t is

$$\begin{aligned}\tilde{J}^C(\mathbf{b}, \boldsymbol{\theta}) &= J^C(\mathbf{b}) + f(\boldsymbol{\theta} | \mathcal{F}^C) \\ \tilde{J}^D(\mathbf{b}, \boldsymbol{\theta}, I) &= J^D(\mathbf{b}, I) + f(\boldsymbol{\theta} | \cap_i \mathcal{F}^i),\end{aligned}$$

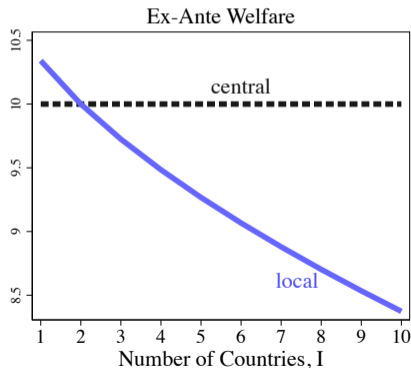
with $\hat{\theta}_{i,t} \equiv \mathbb{E}[\theta_{i,t} | \mathcal{F}_t]$, $\mathcal{F} = (\mathcal{F}_t)$, and

$$f(\boldsymbol{\theta} | \mathcal{F}) \equiv \frac{1}{I} \sum_i \mathbb{E}_{\boldsymbol{\theta}} \int_0^{\infty} e^{-\rho t} \left[\hat{\theta}_{i,t} \log \hat{\theta}_{i,t} + (1 - \hat{\theta}_{i,t}) \log(1 - \hat{\theta}_{i,t}) \right] dt,$$

where $J^C(\mathbf{b})$ and $J^D(\mathbf{b}, I)$ are the value functions from the economy with only externalities

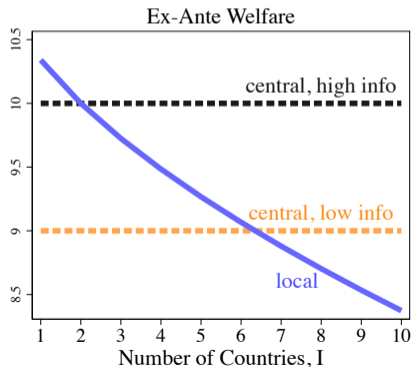
A Cutoff Rule Result

- There exists a cutoff in the number of countries $I(b; \mathcal{F}^C)$ s.t.
 - if I is small **decentralization** is preferred because of the info advantage
 - if I is large **centralization** is preferred because the externality becomes worse



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 - if I is small **decentralization** is preferred because of the info advantage
 - if I is large **centralization** is preferred because the externality becomes worse
 - as information becomes worse, centralized welfare decreases, so cutoff increases



A Cutoff Rule Result

Proposition: Suppose that $(b_{i0}, \theta_{i0}) = (b, \theta)$ for all i and $\cap_i \mathcal{F}^i$ is strictly more informative than \mathcal{F}^C .

i) if $b \leq \psi$ (*no inflation*) or $b \geq \bar{b}(I = 1)$ (*give up* under centralized)

- then a decentralized regime is always preferred

ii) if $b \in (\psi, \bar{b})$, then a centralized regime is preferred if and only if $I > I(b; \mathcal{F}^C)$.

iii) the cutoff $I(\mathbf{b}; \mathcal{F}^C)$ decreases in the informativeness of \mathcal{F}^C : if $\mathcal{F}^C \subset \tilde{\mathcal{F}}^C$, then $I(\mathbf{b}; \mathcal{F}^C) \leq I(\mathbf{b}; \tilde{\mathcal{F}}^C)$

Conclusion

- Show how insights from fiscal federalism change principles of delegation from existing macro lit.
 - optimal delegation does not just depend on whether externalities exist or not
 - instead it depends on the trade-off between externalities and natural advantage of local authorities
- Implications for design of monetary union
 - key new idea: *centralization optimal only if monetary union sufficiently large*
 - analysis has implications for fiscal adjustment and enlargement policies