Fiscal moral hazard in a monetary union

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Motivation

Sovereign debt crisis in the euro area showed that in a monetary union it is important to provide incentives to member countries to pursue sound fiscal policy. The Stability and Growth Pact (SGP) was not enough to avoid the debt crisis: difficult to enforce. To prevent opportunistic behaviors, many advocate for tighter rules, that leave very little leeway for national policies (e.g., budget balance at constitutional level). When countries are heterogeneous, more flexibility allows to make better use of information and cope with asymmetric shocks. What is the optimal degree of flexibility to leave to national governments?
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- To prevent opportunistic behaviors, many advocate for tighter rules, that leave very little leeway for national policies (e.g., budget balance at constitutional level)
- When countries are heterogeneous, more flexibility allows to make better use of information and cope with asymmetric shocks
- What is the optimal degree of flexibility to leave to national governments?
What we do

We study how to optimally design debt rules when member governments can differ in how much they value current versus future consumption, and these preferences are private information. We develop a model of a monetary union along the lines of Chari and Kehoe (2007; CK hereafter), which shows that the fiscal authorities have an incentive to act in a non-cooperative way when the central bank takes their decisions as given. Augment CK with taste shocks affecting marginal utility of current consumption that are idiosyncratic and privately observed. We take a mechanism design approach: characterize the optimal incentive compatible allocations implemented by a social planner who wants to maximize the welfare of the entire monetary union, but cannot observe the shocks of member countries.
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- We take a mechanism design approach: characterize the optimal incentive compatible allocations implemented by a social planner who wants to maximize the welfare of the entire monetary union, but cannot observe the shocks of member countries.
For an external observer like a supranational authority it is typically difficult to disentangle if more debt in a country is due to a lack of effort of the government or to genuine political constraints. As argued in Wyplosz (2015), “Fiscal policy is an intensely political instrument and therefore a key prerogative of national governments. It lies at the heart of domestic politics, hence the information asymmetry.

Alternative interpretation is non contractibility of policy constraints: even if they are observed, it might be difficult for the supranational authority to enforce a policy conditional on them (as shown by the difficulties met by the SGP). A similar formulation of a sovereign government subject to a privately observed taste shock is found e.g. in Dovis (2012), Halac and Yared.
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Overview of results

The optimal degree of flexibility depends on how different preferences of governments can be. There is a trade-off between the benefit of giving national fiscal authorities flexibility to react to their own private information, and the temptation that these authorities have to free-ride on the other union members (Amador et al. 2006, Athey et al. 2005). If the heterogeneity is low, the importance of private information is so small compared to the severity of the free-rider problem that it is optimal to leave no flexibility at all. If the heterogeneity is high, it is optimal to let countries with a strong preference for current consumption run a higher debt. If the heterogeneity is very high, the first best is incentive compatible.
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Related literature

Interaction of fiscal and monetary policy in a monetary union

- Beetsma and Jensen (2005), Gali and Monacelli (2008), Ferrero (2009), and Farhi and Werning (2013)
- Rationale for debt ceilings: CK, Beetsma and Uhlig (1999)

We focus on private information friction

Private information in policy games

Optimal monetary policy: Athey et al. (2005), Sleet (2001)


Optimal macroprudential policy: Schroth (2016), Dogra (2016)

Interaction of fiscal and monetary policy without mechanism design: Beetsma and Bovenberg (2001), Sanguinetti and Tommasi (2004)

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Interaction with the possibility of self-fulfilling debt crises: Aguiar et al. (2013), (2015)

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- In period 0 price level given. In period 1, the monetary authority sets the monetary policy for the union (chooses the price level).
- In period 0 output is a constant given by $\omega$, common across countries.
- In period 1, output is given by $y(\pi)$, which depends on the common inflation rate $\pi = p_1/p_0$. 
The model

Chari and Kehoe (2007)

The budget constraints of the government in country $i$ are:

\[ p_0 c_i^0 = \omega + b_i \]

\[ p_1 c_i^1 = p_1 y(\pi) - x_i \]

The profit of a lender who agrees to accept a debt contract $(b_i, x_i)$ is given by:

\[ -b_i + \beta x_i \pi. \]

Fiscal authorities move before the central bank; this gives rise to a free-rider problem.
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We depart from CK along two dimensions

The welfare of country $i$’s representative consumer which country $i$’s government wants to maximize is given by:

$$\theta_i U(c_{i0}) + \beta U(c_{i1})$$

$\theta_i$ is an iid, mean 1 idiosyncratic taste shock realized at the beginning of period 0 which can take two values, $\theta_H$ with prob $P$ and $\theta_L$ with prob $1 - P$; if $\theta_H = \theta_L = 1$, back to CK.

$\theta_i$ is a reduced-form term that captures the political costs of sticking to fiscal discipline in country $i$, and these costs might be heterogeneous across countries.

There is private information: $\theta_i$ is observed only by government $i$. 

Santoro (Banca d’Italia)
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Mechanism design problem

Direct revelation game. The monetary union authorities specify rules for:

- Fiscal policy as a function of the national governments' reports on their private information about the realization of $\theta$.
- Monetary policy as a function of national debt contracts.

Given the specified policy rules, the timing of the induced game is the following.

At the beginning of period 0, governments choose simultaneously a strategy for reporting their private information.

$\theta_i$ is realized and observed by governments, reports are issued, and debt contracts are offered to international lenders according to the fiscal policy rules.

Lenders decide whether to accept the contracts.

In period 1, the central bank sets the common inflation rate $\pi$ as a function of the repayments $x_i$ in the contracts according to the monetary policy rule.
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- Lenders decide whether to accept the contracts
- In period 1 the central bank sets the common inflation rate $\pi$ as a function of the repayments $x_i$ in the contracts according to the monetary policy rule
Mechanism design problem

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An equilibrium of this direct revelation game is:

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- a reporting strategy for each country
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such that, for each $i$, the welfare of country $i$ cannot be raised by deviating to any other reporting strategy, and the international lenders accept the resulting debt contracts
Remarks

In order to focus on the consequences of the distortion introduced by private information, we make the following assumptions:

▶ Fiscal policy moves before monetary policy, as in CK: this gives rise to a free-rider problem.
▶ National debt contracts are perfectly enforceable: we rule out sovereign default.
▶ National debt contracts are chosen to maximize the welfare of the monetary union as a whole, instead of the single countries: we rule out issues of non-cooperation among governments.

WLOG, we restrict the choice set to the incentive compatible policy rules: fiscal and monetary policy rules that induce a direct revelation game for which truthtelling is part of an equilibrium.

\[
\begin{align*}
\theta_i & U(\omega + \beta x_i(\theta_i, \theta_{-i})) + \beta U(y(\pi(x(\theta_i, \theta_{-i})))) - x_i(\theta_i, \theta_{-i}) \pi(x(\theta_i, \theta_{-i})) \\
& \geq \theta_i U(\omega + \beta x_i(\theta_{-i} \theta_{-i})) + \beta U(y(\pi(x(\theta_{-i}, \theta_{-i})))) - x_{-i}(\theta_{-i}, \theta_{-i}) \pi(x(\theta_{-i}, \theta_{-i}))
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- In order to focus on the consequences of the distortion introduced by private information, we make the following assumptions
  - fiscal policy moves before monetary policy, as in CK: this gives rise to a free-rider problem
  - national debt contracts are perfectly enforceable: we rule out sovereign default
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- WLOG, we restrict the choice set to the incentive compatible policy rules: fiscal and monetary policy rules that induce a direct revelation game for which truthtelling is part of an equilibrium
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- WLOG, we restrict the choice set to the incentive compatible policy rules: fiscal and monetary policy rules that induce a direct revelation game for which truthtelling is part of an equilibrium

\[
\begin{align*}
\theta_i U \left( \omega + \beta \frac{x_i(\theta_i, \theta_{-i})}{\pi(\bar{x}(\theta_i, \theta_{-i}))} \right) + \beta U \left( y(\pi(\bar{x}(\theta_i, \theta_{-i}))) - \frac{x_i(\theta_i, \theta_{-i})}{\pi(\bar{x}(\theta_i, \theta_{-i}))} \right) \\
\theta_i U \left( \omega + \beta \frac{x_i(\theta_i^c, \theta_{-i})}{\pi(\bar{x}(\theta_i^c, \theta_{-i}))} \right) + \beta U \left( y(\pi(\bar{x}(\theta_i^c, \theta_{-i}))) - \frac{x_i(\theta_i^c, \theta_{-i})}{\pi(\bar{x}(\theta_i^c, \theta_{-i}))} \right)
\end{align*}
\]
Solution
We solve the model backwards. Hence, we start from the problem of monetary policy in period 1, taking into account the debt contracts \((b_i, x_i)\) offered by the governments.
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We solve the model backwards. Hence, we start from the problem of monetary policy in period 1, taking into account the debt contracts \((b_i, x_i)\) offered by the governments. It sets an inflation rate that solves the control problem:

\[
\max_{\pi \in [1, \infty)} \frac{1}{2} \left\{ U(y(\pi) - x_1/\pi) + U(y(\pi) - x_2/\pi) \right\}
\]

(1)

Lemma \(\pi(x_1, x_2)\) exists for any \((x_1, x_2)\), is smaller than \(\pi^*\), and is implicitly defined by the FOC:

\[
U'(y(\pi) - x_1\pi)(y'(\pi) + x_1\pi^2) + U'(y(\pi) - x_2\pi)(y'(\pi) + x_2\pi^2) = 0
\]

\(\pi(x_1, x_2)\) belongs to C2.

Let \(x_i \geq x_i - i\); then \(\pi(x_1, x_2)\) is increasing in \(x_i\).

\(x_i \pi(x)\) is increasing in \(x_i\) for any \(i\).
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\[
\max_{\pi \in [1, \infty)} \frac{1}{2} \left\{ U \left( y(\pi) - \frac{x_1}{\pi} \right) + U \left( y(\pi) - \frac{x_2}{\pi} \right) \right\}
\]

(1)

Lemma

\(\pi(x_1, x_2)\) exists for any \((x_1, x_2)\), is smaller than \(\pi^*\), and is implicitly defined by the FOC:

\[
U' \left( y(\pi) - \frac{x_1}{\pi} \right) \left( y'(\pi) + \frac{x_1}{\pi^2} \right) + U' \left( y(\pi) - \frac{x_2}{\pi} \right) \left( y'(\pi) + \frac{x_2}{\pi^2} \right) = 0
\]

\(\pi(x_1, x_2)\) belongs to \(C^2\).

Let \(x_i \geq x_{-i}\); then \(\pi(x_1, x_2)\) is increasing in \(x_i\).

\(\frac{x_i}{\pi(x)}\) is increasing in \(x_i\) for any \(i\).
The next step is to characterize the fiscal policy of the national governments. To do so we solve for the debt contracts that maximize the welfare of the monetary union subject to the constraints that:
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- truth-telling for the governments is incentive compatible
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- inflation is equal to \( \pi (x_1, x_2) \) derived previously
- truth-telling for the governments is incentive compatible

First of all, we characterize two benchmarks
Solution: first best (FB)
FB maximizes expected welfare of the monetary union when the realizations of $\theta_i$ are common knowledge.
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FB maximizes expected welfare of the monetary union when the realizations of $\theta_i$ are common knowledge. It solves the problem

$$
\max_{x(\theta_1, \theta_2) \in \mathbb{R}^4_+ \times \mathbb{R}^4_+} \{ \theta_1 U(\omega + \beta x_1(\theta_1, \theta_2)) \pi(x(\theta_1, \theta_2)) + \beta U(y(\pi(x(\theta_1, \theta_2)))) - x_1(\theta_1, \theta_2) \pi(x(\theta_1, \theta_2)) + \theta_2 U(\omega + \beta x_2(\theta_1, \theta_2)) \pi(x(\theta_1, \theta_2)) + \beta U(y(\pi(x(\theta_1, \theta_2)))) - x_2(\theta_1, \theta_2) \pi(x(\theta_1, \theta_2)) \}.
$$
Solution: first best (FB)

FB maximizes expected welfare of the monetary union when the realizations of $\theta_i$ are common knowledge. It solves the problem

$$
\max_{\bar{x}(\theta_1, \theta_2) \in \mathbb{R}_+^4 \times \mathbb{R}_+^4} \frac{1}{2} \left\{ \theta_1 U \left( \omega + \beta \frac{x_1(\theta_1, \theta_2)}{\pi(\bar{x}(\theta_1, \theta_2))} \right) + \theta_2 U \left( \omega + \beta \frac{x_2(\theta_1, \theta_2)}{\pi(\bar{x}(\theta_1, \theta_2))} \right) + \beta U \left( y(\pi(\bar{x}(\theta_1, \theta_2))) - \frac{x_1(\theta_1, \theta_2)}{\pi(\bar{x}(\theta_1, \theta_2))} \right) + \beta U \left( y(\pi(\bar{x}(\theta_1, \theta_2))) - \frac{x_2(\theta_1, \theta_2)}{\pi(\bar{x}(\theta_1, \theta_2))} \right) \right\}
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$$\max_{\bar{x}(\theta_1, \theta_2) \in \mathbb{R}_+^4 \times \mathbb{R}_+^4} \frac{1}{2} \left\{ \theta_1 U \left( \omega + \beta \frac{x_1(\theta_1, \theta_2)}{\pi(\bar{x}(\theta_1, \theta_2))} \right) ight.$$ 

$$+ \beta U \left( y \left( \pi \left( \bar{x}(\theta_1, \theta_2) \right) \right) - \frac{x_1(\theta_1, \theta_2)}{\pi(\bar{x}(\theta_1, \theta_2))} \right) +$$

$$\theta_2 U \left( \omega + \beta \frac{x_2(\theta_1, \theta_2)}{\pi(\bar{x}(\theta_1, \theta_2))} \right) + \beta U \left( y \left( \pi \left( \bar{x}(\theta_1, \theta_2) \right) \right) - \frac{x_2(\theta_1, \theta_2)}{\pi(\bar{x}(\theta_1, \theta_2))} \right) \right\}$$

Lemma

(i) there exists a solution to the problem; the correspondence $\bar{x}^{FB}(\theta_i, \theta_{-i})$ is non-empty, compact valued and upper hemi-continuous (u.h.c).

(ii) For any $\theta_{-i}$, $x_i^{FB}(\theta^H, \theta_{-i}) \geq x_i^{FB}(\theta^L, \theta_{-i})$

(iii) For any $\theta_i$, $x_i^{FB}(\theta_i, \theta^H) \geq x_i^{FB}(\theta_i, \theta^L)$
Solution: common rule (CR)

CR maximizes expected welfare of the monetary union when fiscal policy rules cannot depend on the private information (independent of the report on $\theta$, equal across countries).
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CR maximizes expected welfare of the monetary union when fiscal policy rules cannot depend on the private information (independent of the report on $\theta$, equal across countries). It solves the problem

\[
\max_{x} \{ E(\theta) U(\omega + \beta x \pi(x)) + \beta U(y(\pi(x)) - x \pi(x)) \}
\]

Lemma

CR is a non-empty, compact set.

\[\pi(x_{CR}) - 2x_{CR} \frac{\partial \pi}{\partial x}(x_{CR}) \pi^2(x_{CR}) > 0\]
Solution: common rule (CR)

CR maximizes expected welfare of the monetary union when fiscal policy rules cannot depend on the private information (independent of the report on $\theta$, equal across countries). It solves the problem

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Lemma

- $\bar{x}^{CR}$ is a non-empty, compact set.

$$\frac{\pi(x^{CR}) - 2x^{CR} \frac{\partial \pi}{\partial x} (x^{CR})}{\pi^2 (x^{CR})} > 0$$
Solution: constrained efficient equilibrium (CE)

CE maximizes expected welfare of the monetary union under private information and subject to the constraint that truth-telling for the governments is incentive compatible.
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CE maximizes expected welfare of the monetary union under private information and subject to the constraint that truth-telling for the governments is incentive compatible. It solves the problem (2) subject to the IC constraints
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\[
\begin{align*}
\theta_i U \left( \omega + \beta \frac{x_i(\theta_i, \theta_{-i})}{\pi(\bar{X}(\theta_i, \theta_{-i}))} \right) + \beta U \left( y \left( \pi \left( \bar{X}(\theta_i, \theta_{-i}) \right) \right) - \frac{x_i(\theta_i, \theta_{-i})}{\pi(\bar{X}(\theta_i, \theta_{-i}))} \right) & \geq \\
\theta_i U \left( \omega + \beta \frac{x_i(\theta^c_i, \theta_{-i})}{\pi(\bar{X}(\theta^c_i, \theta_{-i}))} \right) + \beta U \left( y \left( \pi \left( \bar{X}(\theta^c_i, \theta_{-i}) \right) \right) - \frac{x_i(\theta^c_i, \theta_{-i})}{\pi(\bar{X}(\theta^c_i, \theta_{-i}))} \right)
\end{align*}
\]
Solution: constrained efficient equilibrium (CE)

We characterize CE as a function of the ex-ante heterogeneity of the two countries. WLOG, we consider only $\theta^L$, since the other can be backed out from the definition of the expected value.
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Lower $\theta^L$ means more heterogeneity.
Solution: constrained efficient equilibrium (CE)

We characterize CE as a function of the ex-ante heterogeneity of the two countries. WLOG, we consider only $\theta^L$, since the other can be backed out from the definition of the expected value. Lower $\theta^L$ means more heterogeneity.

**Proposition**

There exists a value $\theta^{CR} \in (0, 1)$ such that, if $\theta^L < \theta^{CR}$, the CE equilibrium is such that for any $\theta_{-i}$, $x_i^{CE}(\theta^H, \theta_{-i}) \geq x_i^{CE}(\theta^L, \theta_{-i})$. 

Santoro (Banca d’Italia)
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**Proposition**

There exists a value $\tilde{\theta}^{CR} \in (\theta^{CR}, 1)$ such that, if $\theta^L \geq \tilde{\theta}^{CR}$, the CR equilibrium is constrained efficient.
Solution: constrained efficient equilibrium (CE)

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**Proposition**

There exists a value $\theta^{CR} \in (0, 1)$ such that, if $\theta^L < \theta^{CR}$, the CE equilibrium is such that for any $\theta_{-i}$, $x^i_{CE} (\theta^H, \theta_{-i}) \geq x^i_{CE} (\theta^L, \theta_{-i})$.

**Proposition**

There exists a value $\tilde{\theta}^{CR} \in (\theta^{CR}, 1)$ such that, if $\theta^L \geq \tilde{\theta}^{CR}$, the CR equilibrium is constrained efficient.

**Proposition**

There exists a value $\theta^{FB} \in (0, \theta^{CR}]$ such that, if $\theta^L < \theta^{FB}$, any FB equilibrium is incentive compatible.
Intuition

Result depends on the trade-off between flexibility and incentives to tell the truth.

On the one hand, under full information the optimal debt depends on the taste shocks, so that in the private information model it is desirable to let CE depend on the reported values of these shocks.

On the other hand, because of the free-rider problem the planner has to provide incentives to induce governments to tell the truth.

Higher heterogeneity implies that for the planner flexibility to country-specific shocks is more valuable. The free-rider problem is less severe, since the individually optimal debt levels get more and more different, making less costly for the planner to provide incentives for truth-telling.
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Conclusions and future research

Design of the optimal policy mix in a monetary union when country-specific shocks are private information of national governments and the central bank cannot commit to its future policies.

The optimal mechanism trades off the desire to limit this form of moral hazard with the need to leave some flexibility to respond to country-specific shocks.

The optimal degree of flexibility depends on how much heterogeneous countries can be.

An important limitation of our analysis is the use of a two-period model. This modeling assumption does not allow us to examine how incentives to misreport are linked to the inherited debt and how they can be counteracted with future penalties.

Another limitation is the absence of aggregate shocks. Limited role for monetary policy.
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- Examine how incentives to misreport are linked to the inherited debt and how they can be counteracted with future penalties.
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