On the optimal design of a Financial Stability Fund

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Three related themes

I. Risk-sharing and stabilization policies in normal times.

II. Dealing with severe crises (i.e. achieving resilience).

III. Resolving a debt crisis (e.g. the euro 'debt overhang').

I. Risk-sharing in the EMU

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- with **a fiscal union budget** and fiscal automatic stabilizers?
  (***% of non-smoothed GDP shocks***: 20% DE; 25% US; 70% EA(15; 1978-2010); (Furceri and Zdzienicka 2015); 83% EA(19; 1995-2015) (Lanati 2016))
- with private borrowing and risk-sharing within the *European Banking Union*?
- with public fiscal stabilization by relaxing even more the *Stability and Growth Pact*?
- or wait to "the medium term, as economic structures converge towards the best standards in Europe" (*Five Presidents' Report*, 2015)?

II. Dealing with severe crises

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- A crisis resolution mechanism?

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- A crisis resolution mechanism? The European Stability Mechanism

  > *If indispensable to safeguard the financial stability of the euro area as a whole and of its Member States, the ESM may provide stability support to an ESM Member subject to strict conditionality, appropriate to the financial assistance instrument chosen.*

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- by debt restructuring? (and further austerity?)
- by transforming sovereign debts into Eurobonds?
- by transforming short-term sovereign debt into long-term debt through the ESM?

  (the ESM is holding 50% of Greece's sovereign debt – it amounts to 88.5% of Greece GDP– as long-term, over 30 years, *unconditional* debt)

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- As a (constrained) optimal risk-sharing mechanism (I), which can also help with (II) and (III).
- **An EMU is a long-term self-enforcing partnership**.
- Long-term contracts can provide risk-sharing and enhance borrowing & lending and investment opportunities.
- Long-term *ex-post* conditional transfers, in contrast with unconditional debt contracts with *ex-ante* ('austerity programs') conditions.
- Normal-times-transfers 'build trust', in contrast with crisis-relief-transfers which tend to create 'stigma & resentment'.

A *Financial Stability Fund* as a Dynamic Mechanism Design problem

A well designed *Fund* must take into account 3 problems:

The redistribution problem: risk-sharing transfers should not become *ex-post* persistent, or permanent, transfers (Hayek's problem).

The moral hazard problem: the severity of shocks may depend on which policies and reforms are implemented.

The asymmetry problem: there may not be an *ex-ante* 'veil of ignorance' and countries may start with large (debt) liabilities.

The environment

One infinitely-lived risk-averse government with

- preferences: $U(c, n, e) \equiv u(c) + h(1 - n) - v(e)$ & β,
- technology: $y = \theta f(n)$
- and subject to productivity, θ & government expenditure G shocks;
- governmental effort, e, decreases the probability of high government expenditure realizations.

Two alternative borrowing & lending regimes

1. *Incomplete markets* with default (IMD) and a risk-free rate r: $1/(1+r) \geq \beta$.

   - countries smooth shocks, and borrow and lend, with long-term non-contingent debt;
   - there can be default (full, in our case);
   - default is costly and the country has no access to international financial markets, temporarily.

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2. *Financial Stability Fund* (Fund) as a risk-neutral agent with discount $1/(1+r) \geq \beta$.

   - a country could leave the Fund at any time, in which case is like a country who defaults in an IMD regime;
   - persistent transfers are limited by the amount of redistribution that is mutually accepted;
   - there are incentives for countries to apply policies which reduce risks.

Quantitative analysis to address questions like:

- How different would the evolution of an economy be with the Fund vis-a-vis using Debt with possible default?

  (e.g. How different would had been the Greek experience within a EA Fund?)

- How much would the borrower gain?

- How can very heterogeneous countries – say, in labour productivity – share risks, without incurring undesired permanent transfers?

- What is the maximum amount of a country's debt that the Fund can absorb?

Incomplete markets with default: Long-term Bond

Following Chaterjee and Eyigungor (2012), a long-term bond is parameterized by (δ, κ), where

- δ is the probability of continuing to pay out coupon in the current period.
- $(1-\delta)$ is the probability of maturing in the current period (i.e $\delta = 0$ is one-period debt)
- κ is the coupon rate (possibly $\kappa = 0$)

Given a constant discount rate r, and no default risk, the price of a unit bond equals to

$$\mathfrak{q} = \sum_{t=0}^{\infty}[(1-\delta)+\delta\kappa]\frac{\delta^t}{(1+r)^{t+1}} = \frac{(1-\delta)+\delta\kappa}{r+1-\delta}.$$

Incomplete markets with default

If a borrower does not default on her outstanding debt debt, $(-b)$, in state s the value of the 'debt contract' is:

$$V_n^b(b,\ s) = \max_{c,n,e,b'} \left\{ U(c,n,e) + \beta \mathrm{E}\left[V^b(b',\ s') \mid s, e \right] \right\}$$

$$\text{s.t.} \quad c + G + q(s,b,b')(b' - \delta b) \leq \theta f(n) + (1 - \delta + \delta\kappa)b,$$

where, taking into account that default can occur next period,

$$V^b(b,\ s) = max\{V_n^b(b,\ s), V^a(s)\}$$

Assumption: Effort e, is not observable/contractable by the market.

Implication: The bond price $q(s,b,b')$ may depend on the current level of debt as e does.

Incomplete markets with default (IMD)

- The value in autarky is given by

$$V^{a}(s) = \max_{n,e}\{u\left(\theta^{p}(\theta)f\left(n\right) - G\right) + h(1-n) - v(e)$$

$$+\beta \mathrm{E}\left[\left(1-\lambda\right)V^{a}(s') + \lambda V^{b}\left(0,\ s'\right) \mid s, e\right]\}$$

- There is a 'default penalty' modelled as a drop in productivity, from θ to θ^{p}.

- After default a government is in autarky, but can re-enter the financial (incomplete) market with probability λ; λ small.

Incomplete markets with default (IMD)

- The choice of default: $D(\,s, b) = 1$ if $V^a(\,s) > V_n^b(b,\ s)$ and 0 otherwise.
- The expected default rate: $d(s, b, b') = \mathrm{E}\left[D(s',\ b') \mid\ s, e^*(s, b)\right]$
- The price of new debt is:

$$q(s, b, b') = (1-\delta)\frac{1-d(s, b, b')}{1+r} + \delta\frac{\mathrm{E}\left[\left(1-D(s',\ b')\right)\left(\kappa + q(s',\ b', b''(s',\ b'))\right) \mid\ s, e^*(s, b)\right]}{1+r}$$

- The 'stationary' interest rate on debt is: $r^i(s, b, b') = \frac{(1-\delta)+\delta\kappa}{q(s,b,b')} - (1-\delta)$
- **The 'stationary positive spread' is:** $r^i\left(s, b, b'\right) - r \geq 0$

Incomplete markets accounting

- Primary surplus (we also call it transfers, τ, and primary deficit if negative)

$$q(s, b, b')(b' - \delta b) - (1 - \delta + \delta\kappa)b = \theta f\,(n) - (c + G)$$

The choice of effort

- Without default, in state $s = (\theta,\, G)$, the optimal effort is given by:

$$v'(e) = \zeta'(e)\beta \sum_{s'} \pi^{\theta}(\theta'|\theta) \left[\pi^{g}(G'|G) - \pi^{b}(G'|G)\right] V^{b}(b', s'),$$

where b' is the optimal choice of debt.

- With default $b' = 0$ and the optimal level of effort is given by

$$v'(e) = \zeta'(e)\beta \sum_{s'} \pi^{\theta}(\theta'|\theta) \left[\pi^{g}(G'|G) - \pi^{b}(G'|G)\right] \left[(1-\lambda)V^{a}(s') + \lambda V^{b}(0, s')\right].$$

The *Financial Stability Fund* as a long-term contract

- We use the theory of *Recursive Contracts* (Marcet & Marimon (2017)) to characterize the optimal long-term contract, which is subject to:

  intertemporal participation constraints to guarantee that none of the agents wants to quit when there are still joint gains to be shared;

  moral hazard constraints to guarantee that efforts to reduce risks are made.

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- We 'price' these contracts as if agents where exchanging *state-contingent assets* subject to *e*ndogenous constraints; then histories are summarized by the asset holdings.

The *Financial Stability Fund* as a long-term contract

- As a planner's problem with initial weights $\mu_{b,0}$ and $\mu_{l,0}$ for the lender and the borrower,
- where $\mu_{l,0}/\mu_{b,0}$ guarantees the *ex-ante* zero profit condition for the lender.
- The outside value of the borrower is $V^a(s)$, as in the IMD economy.
- $Z \leq 0$ is the *ex-post* outside value of the lender.

The *Financial Stability Fund* as a long-term contract

$$\max_{\{c(s^t),n(s^t),e(s^t)\}} \mathrm{E}\left[\mu_{b,0}\sum_{t=0}^{\infty}\beta^t\left[U(c(s^t),\ n(s^t),e(s^t))\right] + \mu_{l,0}\sum_{t=0}^{\infty}\left(\frac{1}{1+r}\right)^t\tau(s^t)\mid s_0\right]$$

s.t.
$$\mathrm{E}\left[\sum_{r=t}^{\infty}\beta^{r-t}\left[U(c(s^r),\ n(s^r),\ e(s^r))\right]\mid s^t\right]\geq V^{af}(s_t),$$

$$v'(e(s^t)) = \beta\sum_{s^{t+1}|s^t}\frac{\partial\pi(s^{t+1}|s_t,\ e(s^t))}{\partial e(s^t)}V_b^f(s^{t+1}),$$

$$\mathrm{E}\left[\sum_{r=t}^{\infty}\left(\frac{1}{1+r}\right)^{r-t}\tau(s^r)\mid s^t\right]\geq Z,$$

and
$$\tau(s^t) = \theta(s^t)f\left(n(s^t)\right) - c(s^t) - G(s^t),\ \forall s^t, t\geq 0.$$

$$
\begin{aligned}
\text{SP} \min_{\{\gamma_{b,t},\gamma_{l,t}\,\xi_t\}} \max_{\{c_t,n_t,e_t\}} \mathrm{E} \Bigg[\sum_{t=0}^{\infty} \beta^t \big(\mu_{b,t} \left[U(c_t,\, n_t,\, e_t) \right] - \xi_t v'(e_t) \\
+ \gamma_{b,t} \Big[U(c_t,\, n_t,\, e_t) - V^{af}(s_t) \Big] \Big) \\
+ \sum_{t=0}^{\infty} \left(\frac{1}{1+r} \right)^t \left(\mu_{l,t+1} \left[\theta_t f(n_t) - G_t - c_t \right] - \gamma_{l,t} Z \right) \mid s_0 \Bigg]
\end{aligned}
$$

$\mu_{b,t+1} = \mu_{b,t} + \gamma_{b,t} + \xi_t \sum_{s^{t+1}|s^t} \frac{\partial\pi(s_{t+1}|s_t,\, e_t)/\partial e}{\pi(s_{t+1}|s_t,\, e_t)}$, with $\mu_{b,0}$ given, and

$\mu_{l,t+1} = \mu_{l,t} + \gamma_{l,t}$, with $\mu_{l,0}$ given.

Normalization and new co-state x

$$\eta \equiv \beta(1+r) \leq 1,$$

$$v_{i,t} = \gamma_{i,t}/\mu_{i,t}, i = b, l,$$

$$\varphi_t = \frac{\xi_t}{\mu_{b,t}} \sum_{s^{t+1}|s^t} \frac{\partial \pi(s_{t+1}|s_t, e_t)/\partial e}{\pi(s_{t+1}|s_t, e_t)},$$

$$x_0 = \mu_{b,0}/\mu_{l,0} \text{ and } x_{t+1} = \frac{1 + v_{b,t} + \varphi_{t+1}}{1 + v_{l,t}} \eta x_t$$

Resulting in policy functions $c(x, s), n(x, s), e(x, s)\tau(x, s)$ and $v_b(x, s), v_l(x, s), \varphi(x, s)$, satisfying

$$u'(c(x, s)) = \frac{1 + v_l(x, s)}{1 + v_b(x, s)} x \quad \text{and} \quad \frac{h'(1 - n(x, s))}{u'(c(x, s))} = \theta f'(n(x, s)).$$

The *Financial Stability Fund* as a long-term contract

The value function of the *Fund* contracting problem takes the form:

$$FV(x,s) = xV^{lf}(x,s) + V^{bf}(x,s); \text{ where,}$$

$$V^{bf}(x,s) = U(c(x,s),\, n(x,s)) + \beta \mathrm{E}\left[V^{bf}(x',s') \mid s\right]$$

and

$$V^{lf}(x,s) = \tau(x,s) + \frac{1}{1+r}\mathrm{E}\left[V^{lf}(x',s') \mid s\right]$$

Furthermore, $V^{bf}(x,s) \geq V^{af}(s)$, with equality if $v_b(x,s) > 0$ and, similarly, $V^{lf}(x,s) \geq Z$ with equality if $v_l(x,s) > 0$.

The *Financial Stability Fund* as a long-term contract

$$FV(x,s) = \mathrm{SP}\min_{\left\{v_b, v_l, \widetilde{\xi}\right\}} \max_{\{c,n,e\}} \left\{ x\left[(1+v_b)\, U(c,\ n,\ e) - v_b V^{af}(s) - \widetilde{\xi} v'(e)\right]\right.$$

$$\left. + \left[(1+v_l)\,(\theta f(n) - G - c) - v_l Z\right] + \frac{1+v_l}{1+r}\mathbb{E}\left[FV(x', s') \mid s\right]\right\}$$

where $x' = \dfrac{1+v_b+\varphi(G' \mid G, e)}{1+v_l}\eta x$ and $\varphi(G' \mid G, e) = \widetilde{\xi}\dfrac{\partial\pi(G'|G,e)/\partial e}{\pi(G'|G,e)}$.

‘Decentralizing’ the *Fund contract*

Following Alvarez and Jermann (2000), we can find competitive prices to value *Fund* contracts and compare them with *IMD* contracts.

The Fund contract as long term state-contingent assets

- S **securities** parameterized by (δ, κ, s), where (δ, κ) denote the common coupon and duration probability.
- (δ, κ, s) only pays coupon or the maturity value in state s.
- Agents hold a continuum of these portfolios

$$W^b(a,\ s) = \max_{(c,n,e,a'(s'))} \left\{ U(c,\ n,\ e) + \beta \mathbb{E}\left[W^b(a', s') \mid s \right] \right\}$$

$$\text{s.t. } c + \sum_{s'|s} q\left(s'|s\right)\left(a'(s') - \delta a(s)\right) \leq \theta(s) f(n) - G(s) + (1 - \delta + \delta\kappa)\, a(s)$$

$$a'(s') \geq A_b\left(s'\right)$$

The Fund as an economy with state-contingent assets

- $q\left(s'|s\right)$ is the price of a (δ, κ, s') asset in state s,
- $a_b'\left(s'\right)$ are the end-of-period asset (contingent claims) holdings,
- $A_b\left(s'\right)$ **is an endogenous borrowing limit**: $W^b(A_b\left(s\right), s) = V^a(s)$.

The Fund as an economy with state-contingent assets

The borrower's choice satisfies

$$q\left(s'|s\right) \geq \beta\pi\left(s'|s\right)\frac{u'\left(c\left(s'\right)\right)}{u'\left(c\left(s\right)\right)}(1-\delta+\delta\kappa)+\delta\beta\pi\left(s'|s\right)\frac{u'\left(c\left(s'\right)\right)}{u'\left(c\left(s\right)\right)}\sum_{s''|s'}q\left(s''|s'\right),$$

with equality if $a_b\left(s'\right) > A_b\left(s'\right)$, as well as the present-value budget constraint.

It reduces to the blue part when $\delta = 0$, i.e. one-period assets, as Arrow securities:

The Fund contract as long term state-contingent assets

Similarly, for the the lender, who receives the coupon and maturity value

$$W^{l}(a,\ s) = \max_{\left(c,\, a'(s')\right)} \left\{ c + \frac{1}{1+r} \mathbb{E}\left[W^{l}(a', s') \mid s \right] \right\}$$

$$\text{s.t. } c + \sum_{s'|s} q\left(s'|s\right)\left(a'(s') - \delta a(s)\right) = \left(1 - \delta + \delta\kappa\right) a(s)$$

$$a'\left(s'\right) \geq A_{l}\left(s'\right); \quad W^{l}(A_{l}\left(s\right), s) = Z.$$

The Euler's equation, satisfied with equality if $a_l\left(s'\right) > A_l\left(s'\right)$, is:

$$q\left(s'|s\right) \geq \frac{1}{1+r}\pi\left(s'|s\right)\left(1 - \delta + \delta\kappa\right) + \frac{\delta}{1+r}\pi\left(s'|s\right)\sum_{s''|s'} q\left(s''|s'\right)$$

Asset prices

$$
\begin{aligned}
q\left(s'|s\right) &= \frac{1}{1+r}\pi\left(s'|s\right)\max\left\{\frac{u'\left(c\left(s'\right)\right)\eta}{u'\left(c\left(s\right)\right)}\left[\left(1-\delta+\delta\kappa\right)+\delta\sum_{s''|s'}q\left(s''|s'\right)\right],\right.\\
&\quad\left.\left[\left(1-\delta+\delta\kappa\right)+\delta\sum_{s''|s'}q\left(s''|s'\right)\right]\right\}\\
&= \frac{1}{1+r}\pi\left(s'|s\right)\left[\left(1-\delta+\delta\kappa\right)+\delta\sum_{s''|s'}q\left(s''|s'\right)\right]\max\left\{\frac{u'\left(c\left(s'\right)\right)\eta}{u'\left(c\left(s\right)\right)},1\right\}\\
&= \frac{1}{1+r}\pi\left(s'|s\right)\left[\left(1-\delta+\delta\kappa\right)+\delta q\left(s'\right)\right]\max\left\{\frac{u'\left(c\left(s'\right)\right)\eta}{u'\left(c\left(s\right)\right)},1\right\}
\end{aligned}
$$

Fund decentralization

$$q^*\left(s'|s\right) = \frac{1}{1+r}\pi\left(s'|s\right)\left[(1-\delta+\delta\kappa)+\delta q\left(s'\right)\right]\max\left\{\frac{1+v_l(x',s')}{(1+v_b(x',s'))}\frac{1}{1+\frac{\varphi(s'|x,s)}{1+v_b(x,s)}},1\right\}$$

- the ***price of a one-period bond*** $q^f(s) = \sum_{s'|s} q^*\left(s'|s\right)$,
- the implicit interest rate $r^f(s) = \frac{1-\delta+\delta k}{q^f(s)}$
- and the ***negative spread***: $r^f\left(s^t\right) - r \leq 0.$

Fund accounting

- Primary surplus (we also call it transfers or primary deficit if negative)

$$\sum_{s'|s} q^*\left(s'|s\right)\left(a_b'(s') - \delta a_b'(s)\right) - \left(1 - \delta + \delta k\right) a_b'(s) = c_l(s) = \tau^*(x, s).$$

The dual competitive economy

The values for the borrower and the lender have a recursive form

$$W^b(a_b, s) = U\left(c(a_b, s),\ n(a_b, s)\right) + \beta \mathrm{E}\left[W^b(a_b', s') \mid s\right]$$

and

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$$W^{l}(a_l, s) = \tau(a_l, s) + \frac{1}{1+r}\mathrm{E}\left[W^{l}(a_l', s') \mid s\right].$$

Mirror of

$$V^{bf}(x, s) = U(c(x, s),\ n(x, s)) + \beta \mathrm{E}\left[V^{bf}(x', s') \mid s\right]$$

and

$$V^{lf}(x, s) = \tau(x, s) + \frac{1}{1+r}\mathrm{E}\left[V^{lf}(x', s') \mid s\right]$$

with $a_l\left(s^t\right) = -a_b\left(s^t\right)$.

Calibration: functions and parameters

- Utility:
$$\log(c) + \gamma \frac{(1-n)^{1-\sigma} - 1}{1-\sigma}, \quad \text{with } \sigma = 0.69, \gamma = 1.4.$$
Production: $f(n) = n^{\alpha}$, with $\alpha = 0.566$.
- Borrower's discount factor $\beta = 0.945$, while $r = 2.48\%$.
- The probability of returning to the IMD market after default (quit) is $\lambda = 0.15$; default/quit penalty
$$\theta^p(\theta) = \begin{cases} \psi \mathbb{E}\theta, & \theta \geq \psi \mathbb{E}\theta \\ \theta, & \theta < \psi \mathbb{E}\theta \end{cases} \quad \text{with } \psi = 0.81.$$
- IMD long-term bond: $\delta = 0.814$, $\kappa = 8.3\%$.
- **Tight** limited enforcement constraint of the Fund: $Z = 0$!

A *PIIGS* calibration

- Annual data for PIIGS countries over 1980–2015, main source: AMECO.
- Construct labor productivity using aggregate working hours for each country; fit the productivity series with a panel Markov regime switching model; discretize the MS process into a 27-state Markov chain:

  Best state: $\theta_{27} \equiv e27$, . . ., worst state: $\theta_1 \equiv e1$
- Calibrate the G shock with a 3-state Markov chain, featuring persistent 'crisis' state:

  Best state: $G_3 \equiv g3$, . . ., worst state: $G_1 \equiv g1$
- Stochastic processes calibrated to the PIIGS countries up to the euro crisis.

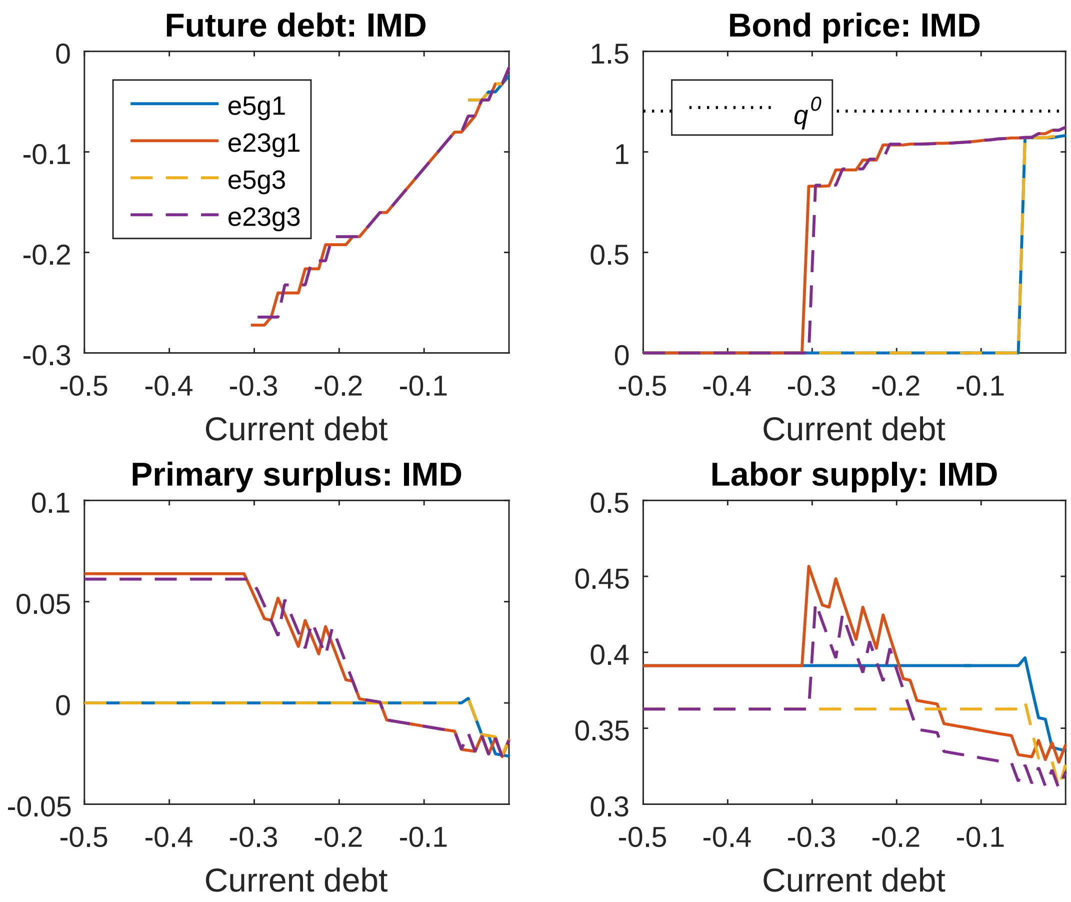
Model fit

1^{st} Moments	Data	Model (IMD)
Mean		
Debt to GDP ratio	77.29%	76.56%
Real bond spread	3.88%	3.76%
G to GDP ratio	20.18%	19.62%
Percentile: 1 & 99	$[13.48\%, 32.79\%]$	$[11.56\%, 33.02\%]$
Primary surplus to GDP ratio	-0.78%	1.30%
Fraction of working hours	36.74%	37.28%
Maturity	5.38	5.38

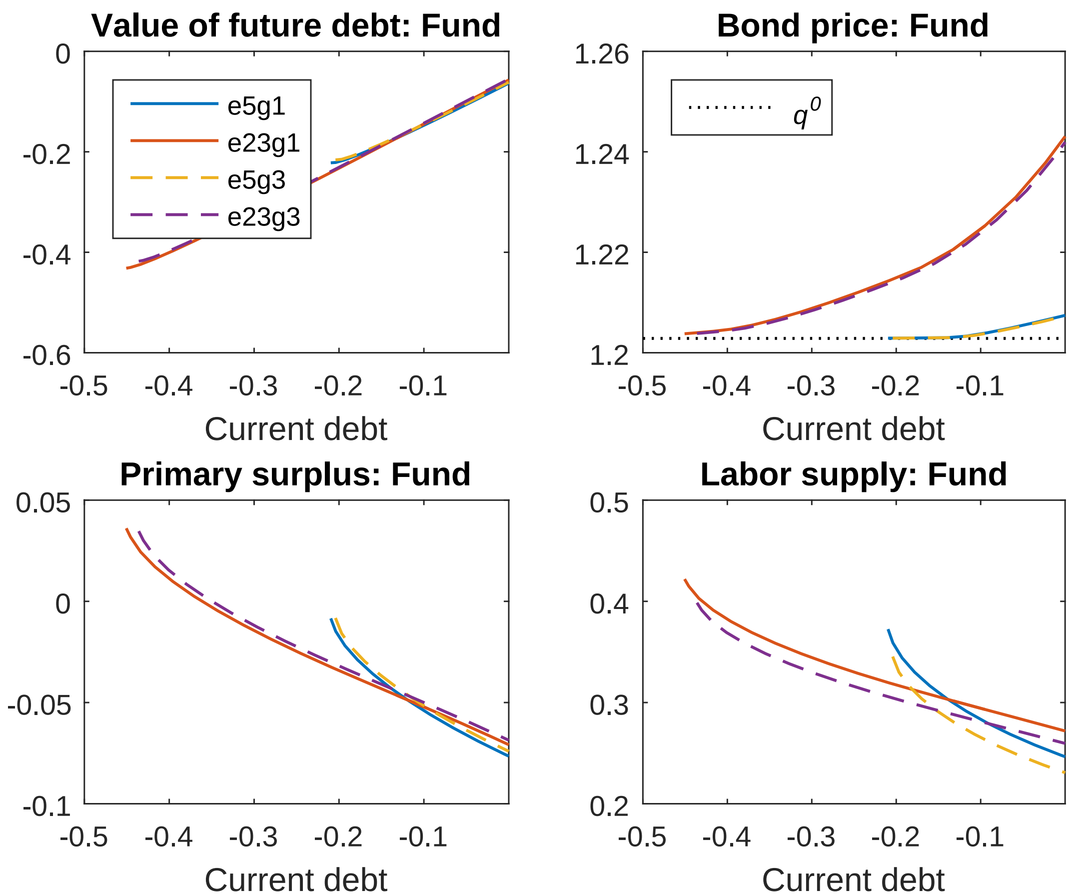
2^{nd}Moments	Data	Model (IMD)
Volatility		
$\sigma(C)/\sigma(Y)$	1.49	1.47
$\sigma(N)/\sigma(Y)$	0.92	0.69
$\sigma(G)/\sigma(Y)$	0.91	0.86
$\sigma(PS/Y)/\sigma(Y)$	0.65	0.80
σ(real spread)	1.53%	0.93%
Correlation		
$\rho(C, Y)$	0.88	0.76
$\rho(N, Y)$	0.67	-0.13
$\rho(PS/Y, Y)$	-0.29	0.11
$\rho(G, Y)$	0.35	0.07
ρ(real spread, Y)	-0.35	-0.29
$\rho(G_t, G_{t-1})$	0.94	0.94

Optimal policies

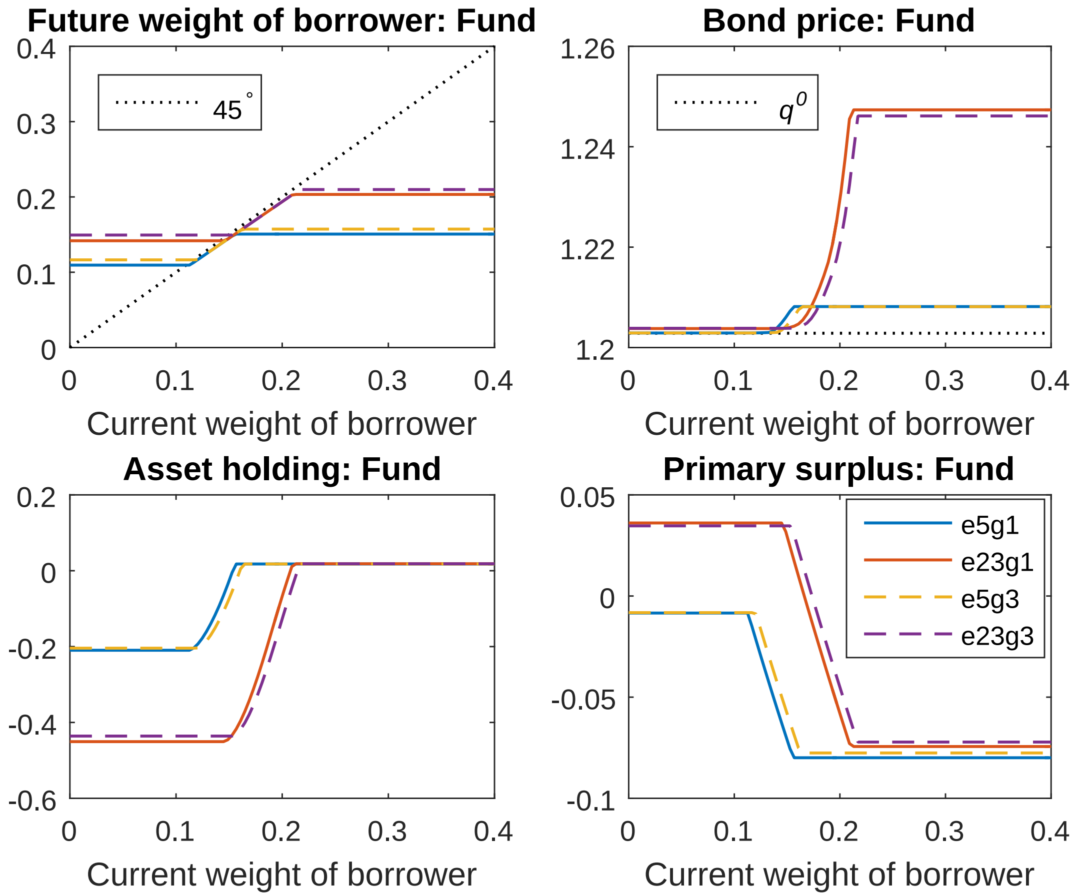
Optimal policies for incomplete markets with default



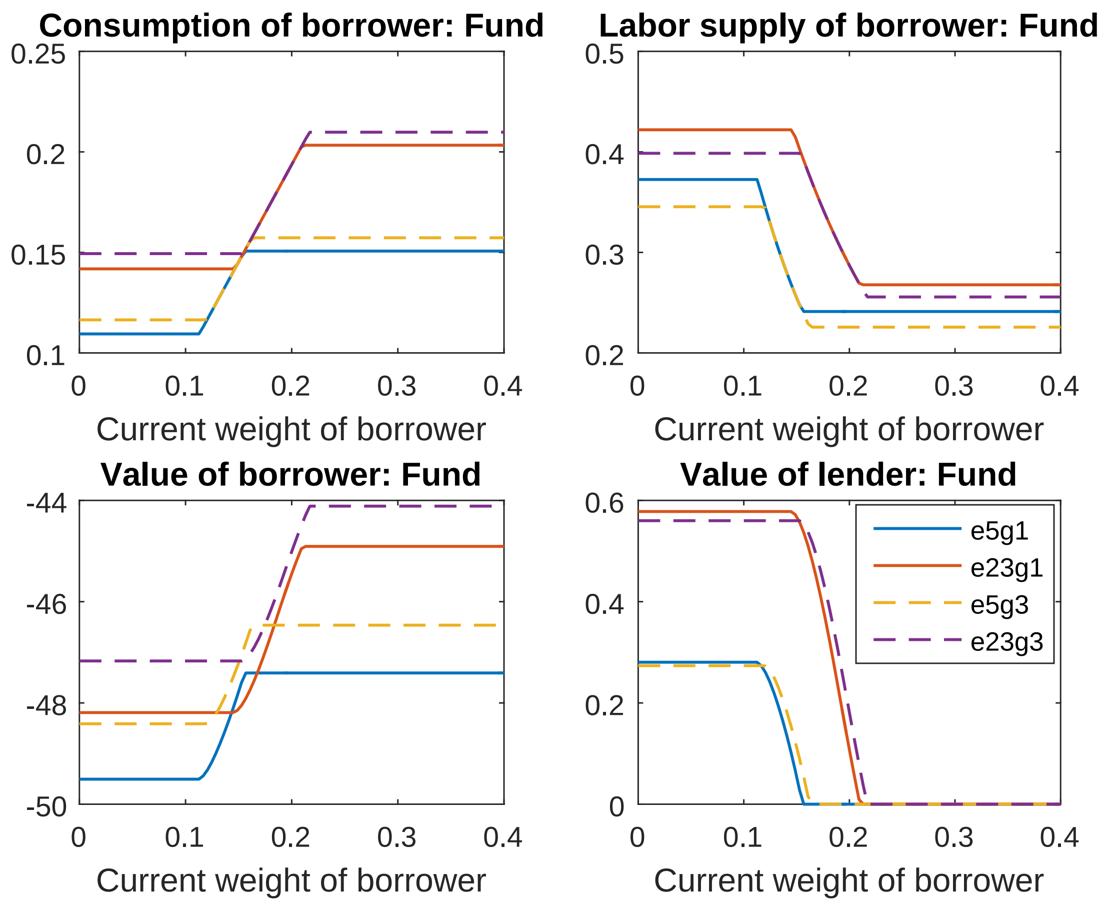
Optimal policies for the fund (in assets)



Optimal policies for the fund: Pareto weights and assets

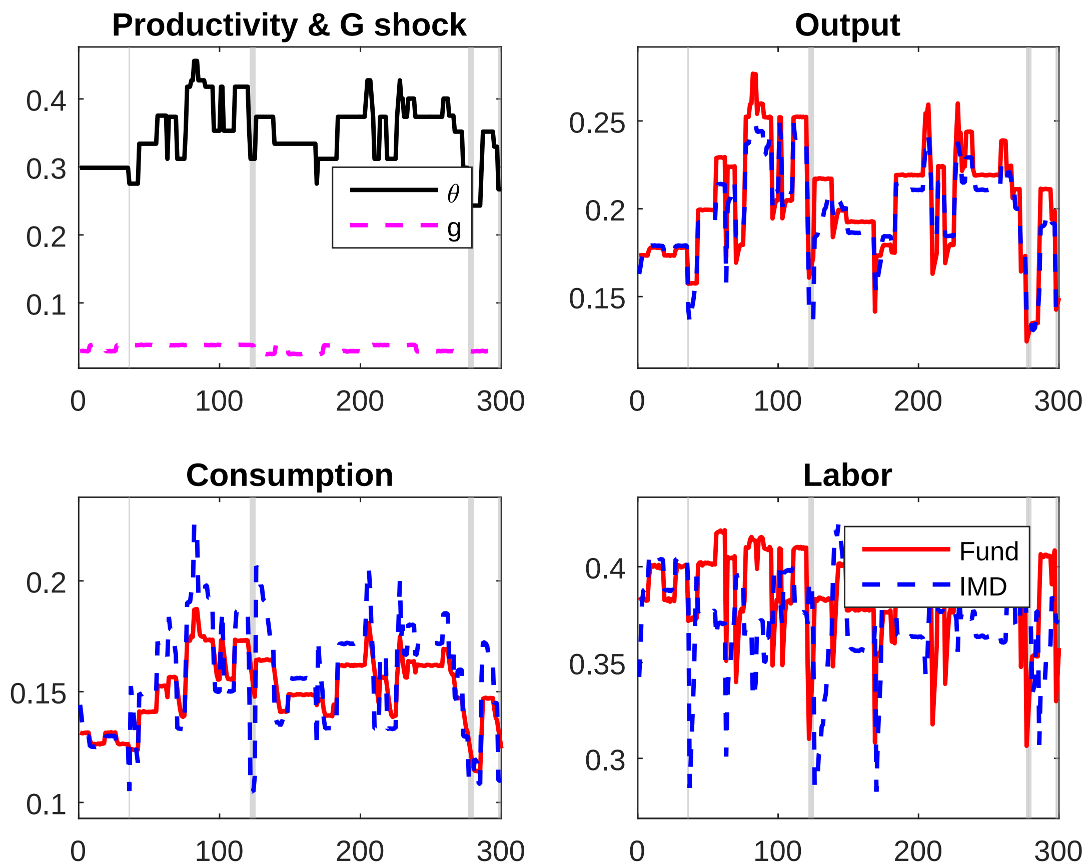


Optimal policies for the fund: allocations and values

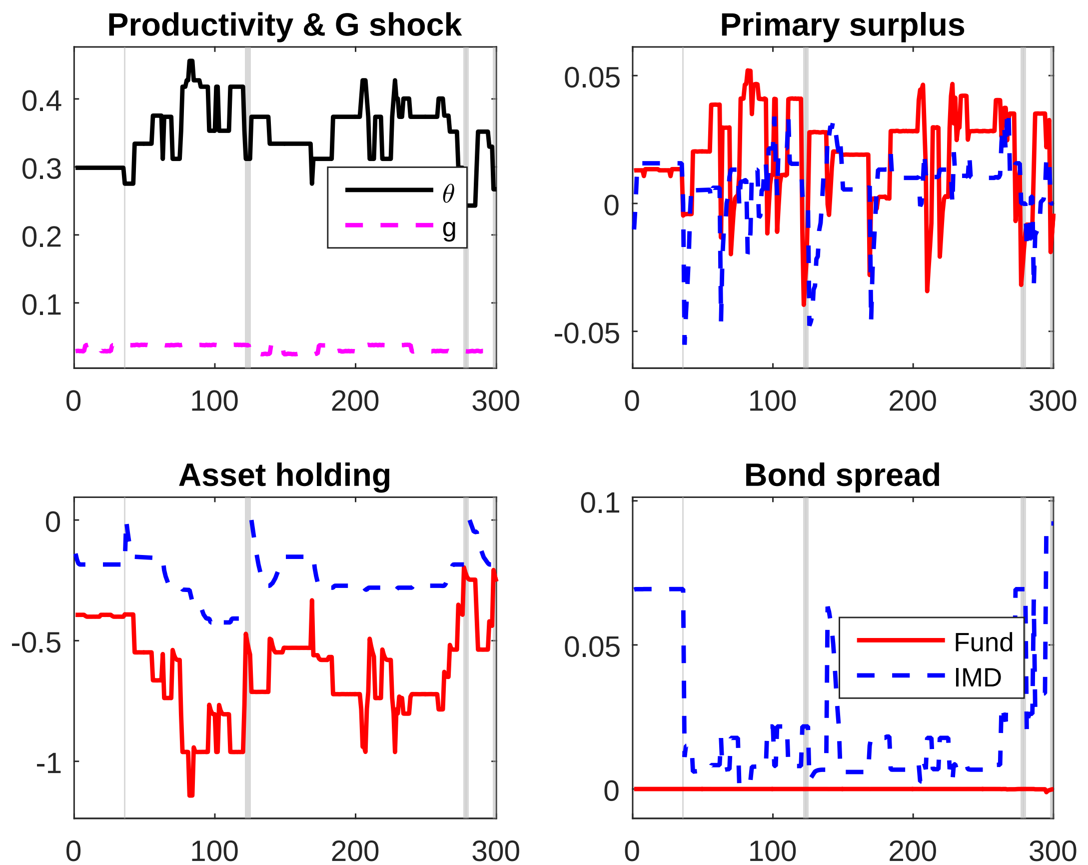


Comparing the economies in normal times

IMD vs. Fund Business Cycle Paths: shocks and allocations



IMD vs. Fund Business Cycle Paths: shocks and assets

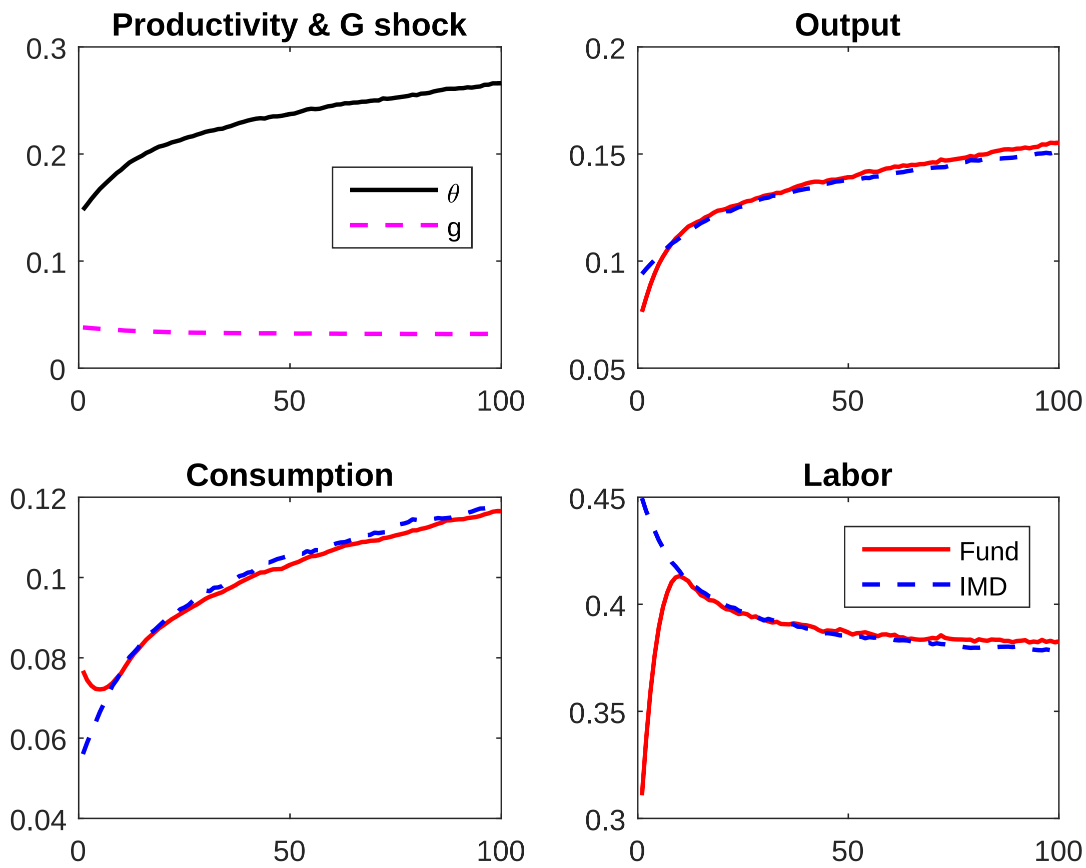


Contrasting paths...

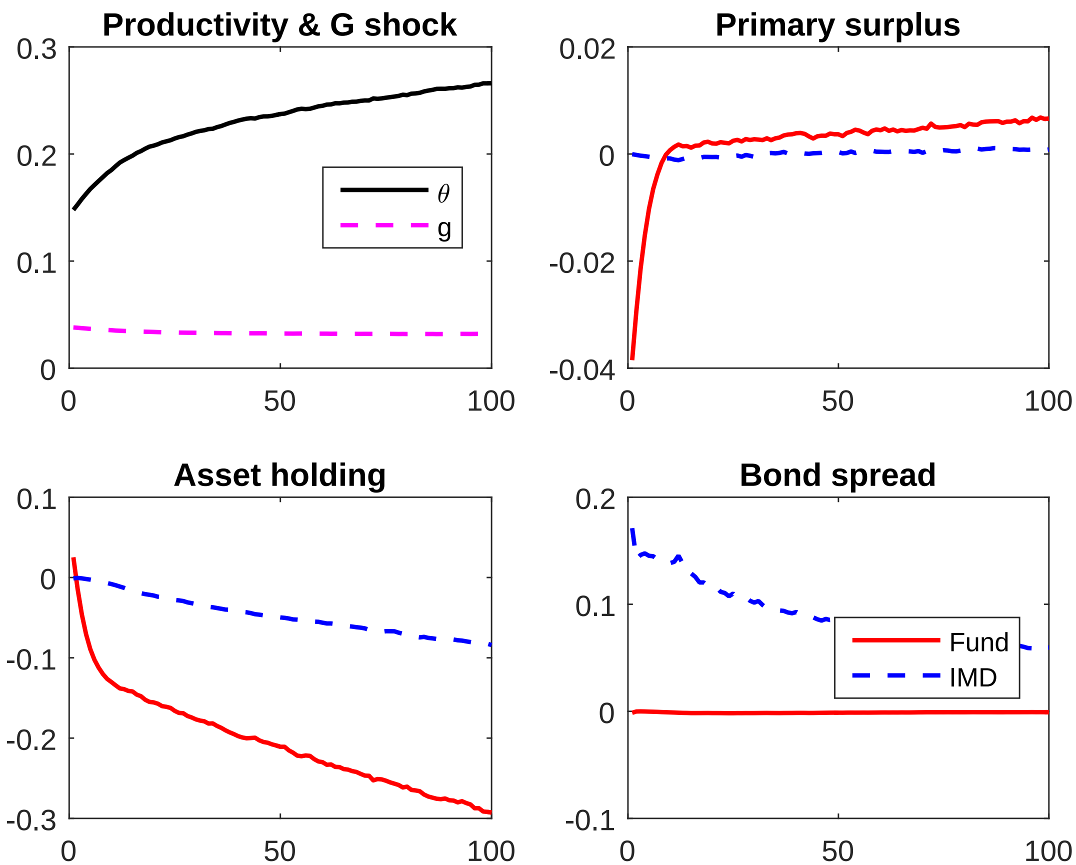
- Repeated defaults [in grey] in the IMD economy, no quits with the Fund.
- Positive spreads 'anticipating' default when debt is relatively high, and just a small episode (at the end) of negative spreads.
- Default episodes mostly driven by productivity shocks: productivity drops + (relatively) large debt levels.
- Larger amount of 'borrowing' with the Fund.
- Primary surpluses tend to be *pro-cyclical* in the IMD economy (as they often have been), *counter-cyclical* with the Fund (as they should be).
- Smoother consumption and, correspondingly, more volatile asset holdings and primary deficits with the Fund.

Comparing the economies in times of crisis

IMD vs. Fund: combined shock impulse-responses: allocations



IMD vs. Fund: combined shock impulse-responses: assets



Contrasting a severe crisis...

- With an unexpected 'one-period' worst (θ, G) shock the Fund clearly dominates:
  - With a relatively large asset position (implicit insurance) the country can afford higher consumption with lower labor at the beginning (recall that the borrower is relatively more impatient),
  - even if at first there is a drop of output (larger than in the IMD economy) and later the asset position becomes negative (debt).
- In contrast, there is a a severe crisis and large spreads in the **IMD** economy!

Contrasting *debt contracts* and *Fund contracts*

- Efficiency, calls for smooth consumption decay (impatience), and labour responding monotonically to productivity.

- The *Fund* achieves these to the extent that *limited enforcement constraints* allow (e.g. they set a lower bound on consumption decay).

- IMD is less efficient; in particular, when borrowers are close to their borrowing/default constraints.

- Fund contracts are able to exploit better the existing asset trading possibilities (e.g. more borrowing with the Fund than with IMD).

Contrasting *debt contracts* and *Fund contracts*

- Persistent crisis and bad shocks exacerbate the differences between debt contracts and fund contracts.

- With the same underlying shocks, **recessions** are likely to be more severe with *incomplete markets*.

- With the same underlying shocks, there can be frequent episodes of **positive spreads and defaults** in the IMD economy, while harmless **negative spreads and no quits** with the Fund.

Welfare gains and absorbing capacity

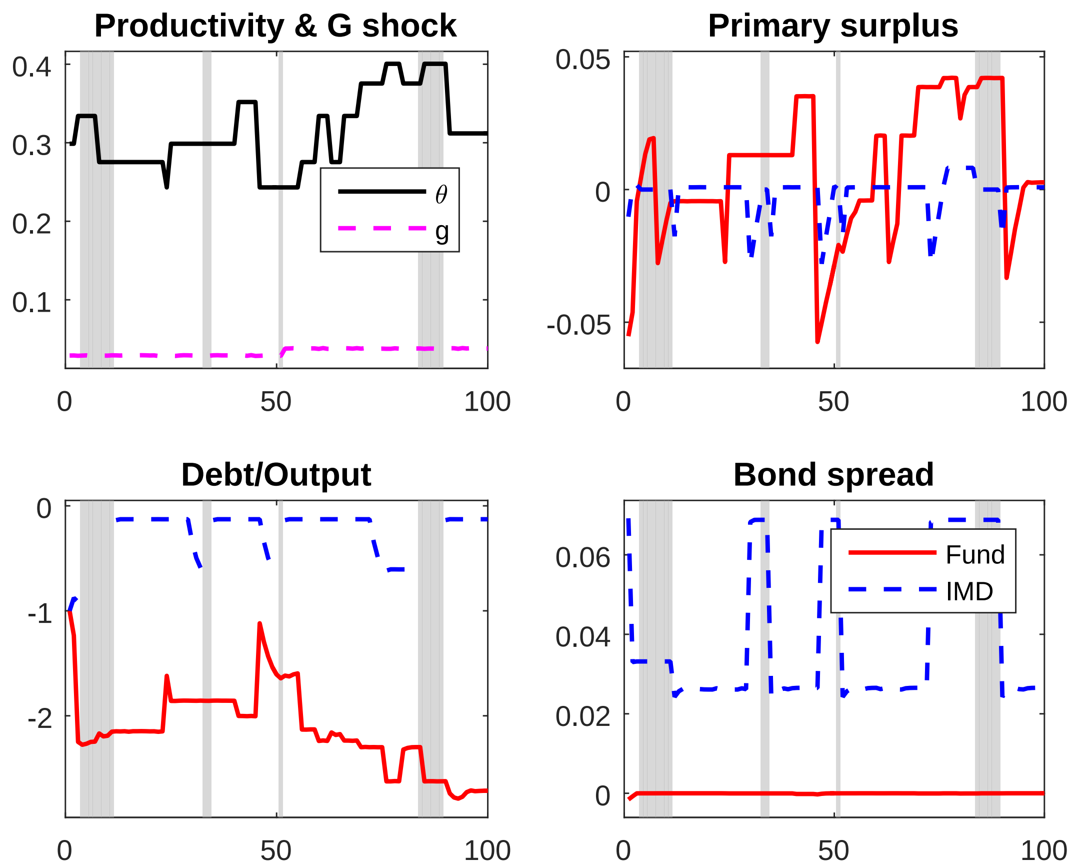
Welfare gains and absorbing capacity

Shocks (θ, G_c)	Welfare Gain	$(b'/y)_{\max}$: M	$(b'/y)_{\max}$: F
$(\theta_l, G_h) = (0.148, 0.038)$	8.90	1.71	97.42
$(\theta_m, G_h) = (0.299, 0.038)$	7.03	107.55	187.16
$(\theta_h, G_h) = (0.456, 0.038)$	4.68	217.43	336.77
$(\theta_l, G_l) = (0.148, 0.025)$	7.87	1.84	101.89
$(\theta_m, G_l) = (0.299, 0.025)$	6.56	111.40	187.93
$(\theta_h, G_l) = (0.456, 0.025)$	4.46	217.80	334.47
Average	**6.53**		

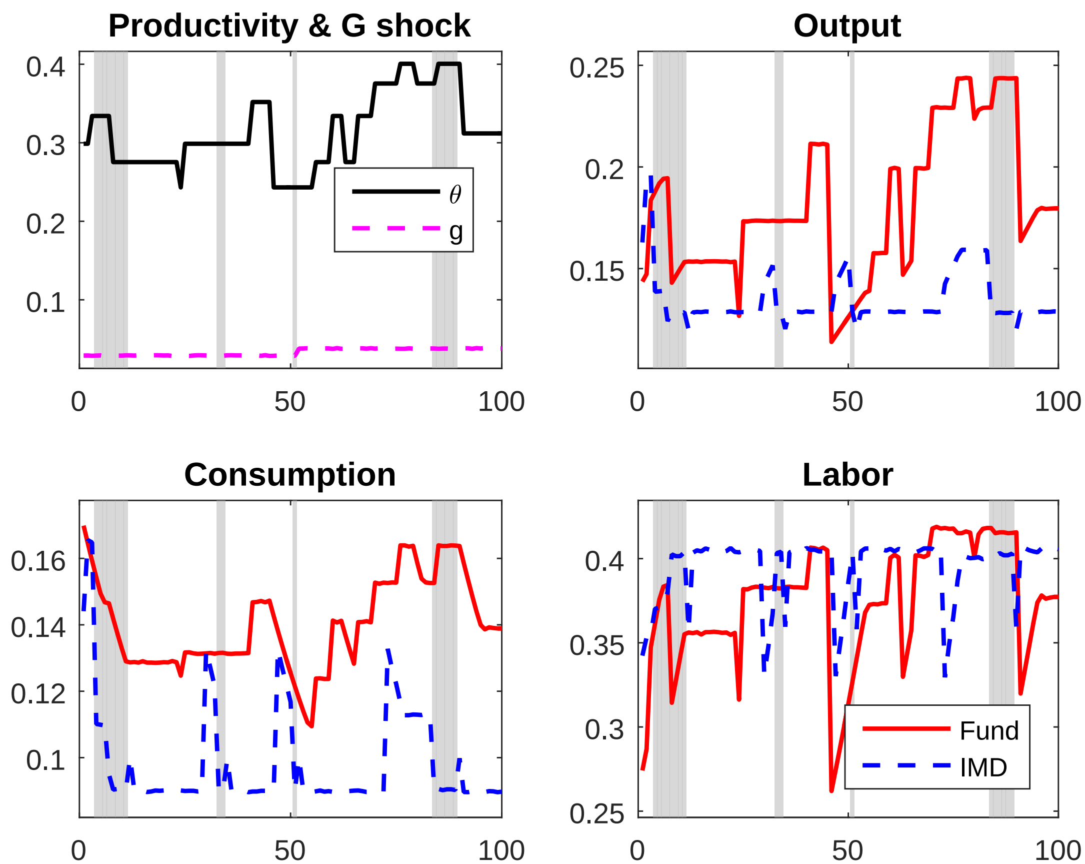
- Welfare gains are expressed in consumption equivalent terms at $b = 0$ (%).
- b^{max} is the maximum level of country indebtedness expressed as the percentage of GDP in a given financial environment (Markets or Fund).

Comparing economies starting with high debt (100% Debt/GDP)

IMD vs. Fund in highly indebted economy: debts and spreads



IMD vs. Fund in highly indebted economy: allocations

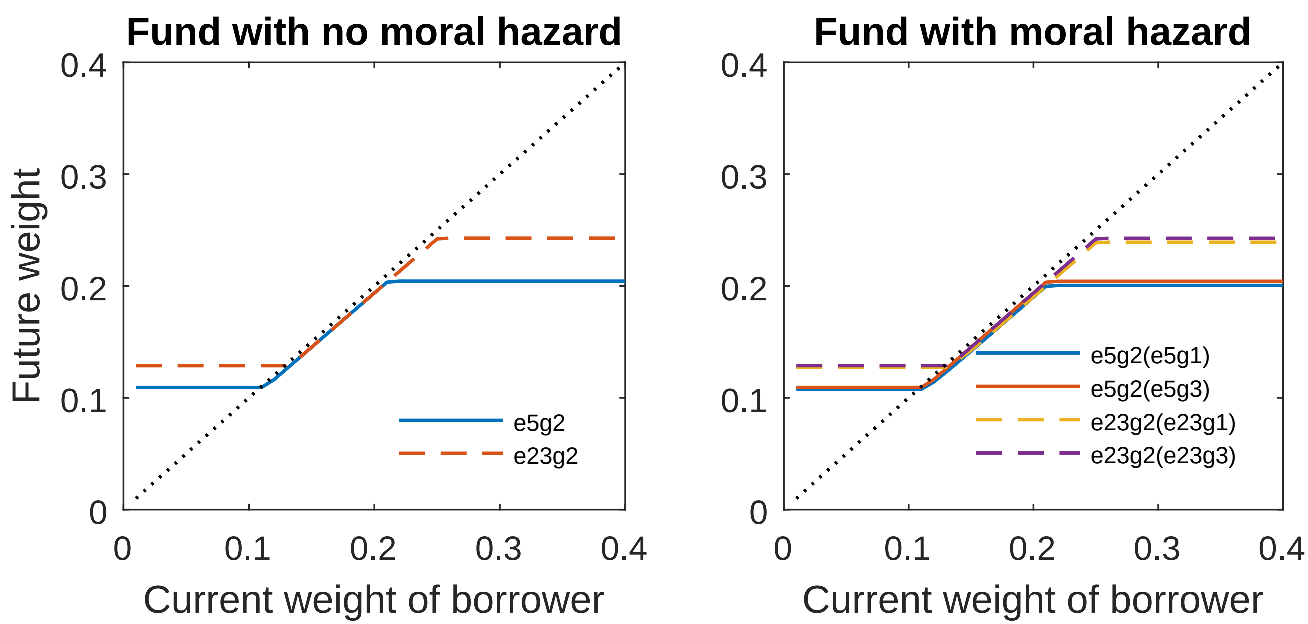


Contrasting paths of highly indebted countries...

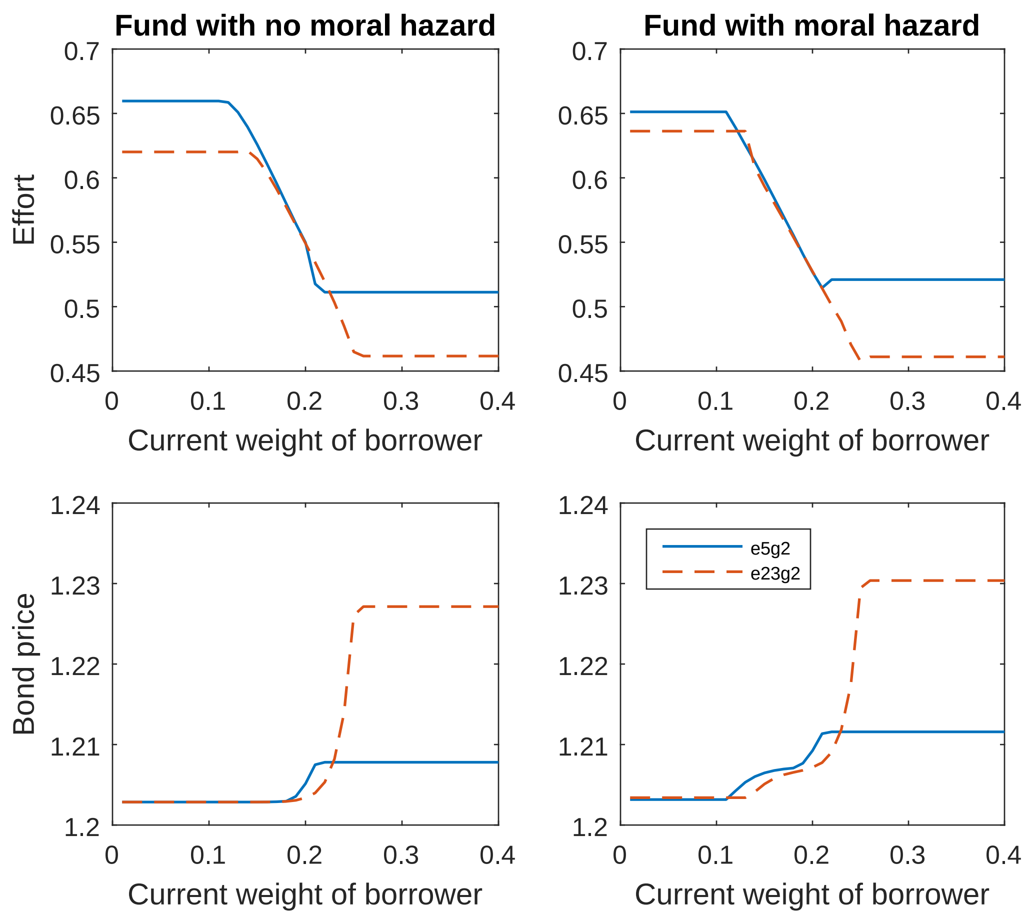
- The debt overhang problem is resolved with **default** in the IMD economy and, in fact, *there is no debt overhang problem*, and **no quits** with the Fund.
- There are Positive spreads 'anticipating' default when debt is relatively high in the IMD economy, and there is a small episode of negative spreads at the beginning with the Fund.
- Larger amount of 'borrowing' with the Fund.

Accounting for **moral hazard** problems

Fund Pareto weight policies with observable and non-observable effort



Fund Effort and bond price policies: observable vs. non-observable effort



Summary

Even with very limited redistribution, the Fund can improve efficiency significantly, with respect to debt financing.

I. The Fund can provide the risk-sharing that it is achieved by taxes & transfers in federal systems.

II. Costly default events may be prevented and severe crises are less likely and/or better handled.

III. The Fund is able to absorb significantly more debt than the markets.

The Fund requires commitment in normal times to avoid time-inconsistency in difficult times. It can also account for **moral hazard** problems without great distortions.

Next Steps

- To simplify the conditionality to help the implementability of the Fund.
- To assess the welfare cost of moral hazard and check whether the market or the fund provide better incentives for prudent policies.
- To show that the Fund can be implemented with *heterogeneous partners* $\Longrightarrow$ there is no need to wait 'for economic structures to converge' in order to implement a 'a mechanism of fiscal stabilisation for the euro area as a whole'.
- To contrast the Fund with the current ESM eligibility & conditionality, and with other proposals of 'EA risk-sharing mechanisms' and of 'debt overhang resolution'.
- To address the question: can a market for fund contracts be developed?

There is no future for the EMU, it will involve too much redistribution!

Using dynamic mechanism design, there should be a future for the EMU!

ADEMU

A Dynamic Economic and Monetary Union

THANKS!