

COUNTRY SOLIDARITY, PRIVATE SECTOR INVOLVEMENT, AND THE CONTAGION OF SOVEREIGN CRISES

Conference on “The Economics of Sovereign
Debt and Default”

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I. INTRODUCTION

Focus of international finance literature:

allocation of risk between debtor country and foreign creditors.

Neglected aspect of sovereign debt sustainability:

backing and bailouts by (deep-pocket?) friends.

Many interesting questions:

- implications for sustainability, for allocation between market and official sector borrowing
- solidarity area. European pattern puzzle: risk sharing between small number of countries (potentially facing correlated shocks).
- pattern of solidarity:
 - spontaneous (ex post; Southern Europe so far)
 - contractual (ex-ante; e.g. Eurobonds proposals).

Understanding these aspects suggests introducing potential official sector guarantors, applying to them the same logic (willingness, rather than ability, to pay) as to debtor country, where WTP is determined by spillovers:

stand by the distressed country if the latter's private debt is smaller than the collateral damage cost:

- *economic*: reduced trade, subsidiaries and banking exposures, run on other countries;
- *other*: empathy, European construction, distressed country's nuisance power.



A country's borrowing capacity depends not only on its own WTP (literature), but also on:

- ✓ collateral damage its default would inflict on other countries; Eurozone and the solidarity area puzzle
 - Large increase in financial integration (despite recent LTRO/running for home) and trade.
 - Establishment of monetary union was primarily a political project.

- ✓ latter's willingness to take on JL.

Two paradigms

(1) *One-way insurance*

Two parties with very asymmetric probabilities of encountering hardship.

International community/debtor country

Northern Europe/Southern Europe

(2) *Mutual insurance*

More symmetrical situation

Europe, IMF..., behind the veil of ignorance.

Main results

I first consider a *currency union* (debt monetization is not an option).

Laissez-faire is not efficient. The optimal institutional arrangement involves:

- ✓ Debt brakes
- ✓ Contractual solidarity?
 - *One-way insurance*: JL increases borrowing capacity and involves an ex-post transfer. JL does not emerge
 - *Two-way insurance* (behind veil of ignorance): JL creates a risk of contagion if none has deep pockets; it emerges provided that
 - country shocks are sufficiently independent
 - spillover costs are relatively large relative to default costs.

Second, I look at the possibility of an autonomous monetary policy and at its interaction with bailouts.

- ✓ Impact of a currency union
 - makes hard default more likely (debt monetization = “soft default”)
 - precludes/reduces PSI
 - bailouts denominated in foreign currency if no currency union.

Literature. Paper relates to a number of research strands

- Sanctions

[Sachs 1983, Krugman 1985, Eaton et al 1986, Dellas-Niepelt 2012 on official sector-market allocation...]

- One- and two-sided reputation

[Eaton-Gersovitz 1981, Bulow-Rogoff 1989a, Hellwig-Lorenzoni 2009; Cole-Kehoe 1995, Eaton 1996, Kletzer-Wright 2000, Wright 2002]

- Internal cost of default

[Gennaioli et al 2011, Mengus 2012; plus empirical work; Cole-Kehoe 1998 on tarnished reputation vis-à-vis third parties]

- International institution as LOLR [Corsetti et al 2006, ...]

- “Cross-pledging” in corporate finance literature (group lending)

- Demand for liquid assets, spreads and joint liability [Bolton-Jeanne 2011]

- PSI by trade beneficiaries [Bulow-Rogoff 1988]

My focus is on debt brakes, joint liability, contagion and debt monetization.

II. ONE-WAY INSURANCE

- ✓ Two periods, $t = 1, 2$.
- ✓ Three players
 - M (market)
 - P (principal/official sector)
 - A (agent/debtor country)
- ✓ Universal risk neutrality (hence bang-bang solutions). M and P have deep pockets and do not discount the future:

Borrowing & repayment

Date 1

Agent $\left\{ \begin{array}{l} \text{borrows } b = b_M + b_P \text{ against debt claims } d_M \text{ and } d_P, \\ \text{obtains } Rb \quad \text{where } R \text{ measures liquidity needs/} \\ \quad \text{investment opportunities} \end{array} \right.$

Date 2

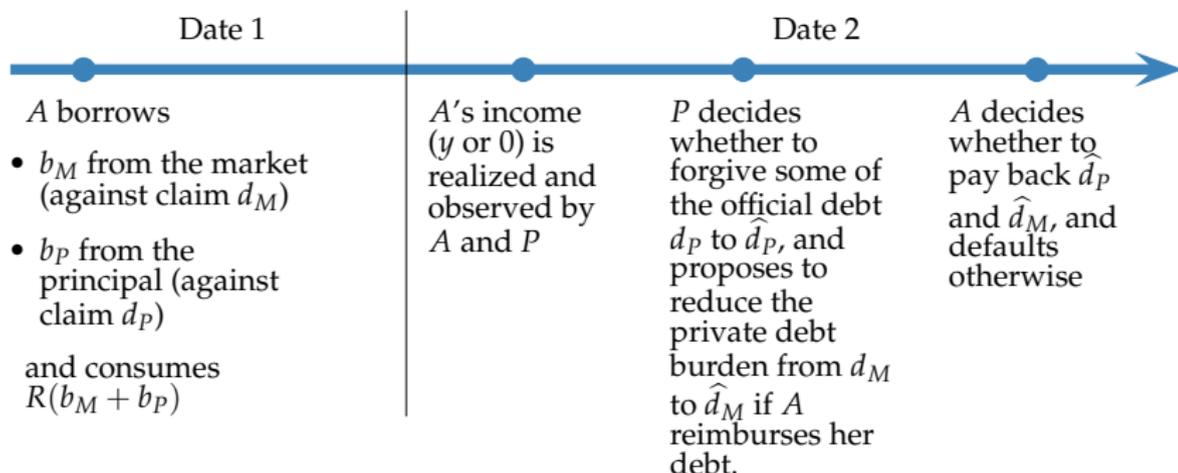
Agent learns income (beyond incompressible consumption)

$\left\{ \begin{array}{l} y \text{ with prob. } \alpha \text{ (Good state)} \\ 0 \text{ with prob. } 1 - \alpha \text{ (Bad state)} \end{array} \right.$

α is exogenous (easy to add *MH*: agent chooses α at date 1)

- ✓ Market does not observe income shock. Principal does, and forms a coalition with agent (similar insights if principal does not observe shock).

- ✓ *Debt forgiveness and bailout?* Principal can (a) forgive to $\hat{d}_P \leq d_P$ and (b) offer support conditional on private debt being repaid: $\hat{d}_M \leq d_M$.
- ✓ *Repayment decision:* Agent repays \hat{d}_P and \hat{d}_M or defaults.



Default costs

Agent's default cost: $\Phi_A < y$

Standard motivation: interruptions in trade patterns, denial of trade credit, seizure of assets & other retaliatory moves, internal cost of default, FDI interruptions, alliance shifts...

Collateral damage/spillover cost borne by the principal: $\phi_P \leq \Phi_A$
economic and political costs mentioned above.

Endogeneization of spillovers: see later.

Principal's own default cost: Φ_P

only if (a) takes on joint liability, (b) agent defaults, and (c) principal does not honor resulting liability.

Date-2 debt forgiveness and bailouts for legacy debts (d_M, d_P)

Agent:

Agent reimburses iff has income and $\hat{d} \equiv \hat{d}_M + \hat{d}_P \leq \Phi_A$.

Principal: (assuming no joint liability)

Bad state (no income):

Principal forgives: $\hat{d}_P = 0$. Furthermore

$$\left\{ \begin{array}{l} \text{if } d_M \leq \phi_P, \quad \text{bailout} \\ \text{if } d_M > \phi_P, \quad \text{default.} \end{array} \right.$$

Good state, when $d > \Phi_A$:

$$\left\{ \begin{array}{l} \text{if } d_M \leq \Phi_A + \phi_P, \quad \text{bailout} \\ \text{if } d_M > \Phi_A + \phi_P, \quad \text{default.} \end{array} \right.$$

Date 1: Laissez-faire (borrow from market only)

Optimum for agent (if borrows, i.e., $R \geq R_0$ for some $R_0 < 1$):

Low debt (no default): borrows $b_M = d_M = \phi_P$.

Agent reimburses $d_M = \phi_P$ in good state, is rescued in bad state.

High debt (default in bad state): debt $d_M = \Phi_A + \phi_P > b_M = \alpha(\Phi_A + \phi_P)$.

Agent chooses risky policy if R or α are “large enough”:

$$R(\underbrace{\alpha(\Phi_A + \phi_P) - \phi_P}_{\text{increase in borrowing if positive}}) \geq \underbrace{\Phi_A - \alpha\phi_P}_{\text{reduction in date-2 expected welfare}}$$

increase in borrowing if positive

reduction in date-2 expected welfare

or $R \geq R^*$ (where R^* may be $+\infty$)

$$U_P^* = \begin{cases} -\phi_P & \text{if } R \geq R^* \\ -(1 - \alpha)\phi_P & \text{if } R < R^* \end{cases}$$

Optimal contract with official sector

Intuitively, laissez-faire can be improved upon in one of two ways:

- risky borrowing strategy generates inefficient default
- safe borrowing strategy substantially constrains agent's access to funding.

Mechanism design: how can agent and principal reach a constrained efficient outcome? Suppose, say, that agent makes contract offer to principal.

At date 1, agent makes offer to principal. Mechanism design.

$$\text{Contract: } \begin{cases} b = b_M + b_P \\ d^\omega = d_M^\omega + d_P^\omega \end{cases} \quad (\text{actual payments})$$

$\omega \in \{G, B\}$. Note: d_P^ω can be negative (bailout).

Proposition (optimal contract)

When the agent contracts with the principal at date 1 and $R \geq 1$,
(i) an upper bound on the agent's utility is

$$\hat{U}_A = R(\alpha\Phi_A - U_P^*) + \alpha(y - \Phi_A);$$

Mechanism design approach. *Realized* values must satisfy:

$$\max \left\{ U_A = Rb + \alpha(y - d^G) + (1 - \alpha)(-d^B) \right\},$$

where

$$b = b_M + b_P,$$

P 's and M 's participation constraints are satisfied:

$$-b_P + \alpha d_P^G + (1 - \alpha)d_P^B \geq U_P^*$$

$$-b_M + \alpha d_M^G + (1 - \alpha)d_M^B \geq 0$$

and the incentive constraints are satisfied:

$$d^G \leq \Phi_A, \quad d^B \leq 0, \quad \text{and}$$

$$-d_P^\omega \leq \phi_P + \Phi_P \quad \text{for } \omega \in \{G, B\}.$$

Ignoring latter (principal IC) constraints,

$$U_A \leq R[\alpha d^G + (1 - \alpha)d^B - U_P^*] + \alpha(y - d^G) + (1 - \alpha)(-d^B).$$

Proposition (optimal contract)

The agent never defaults;

- ✓ the agent borrows $b_M = d_M^G = d_M^B = \phi_P$ from the market; the principal monitors this cap on market financing (debt brake) and spontaneously bails out the agent in the bad state of nature;
- ✓ the agent borrows $b_P = \alpha\Phi_A - \phi_P - U_P^*$ from the principal, repays the principal $d_P^G = \Phi_A - \phi_P$ in the good state of nature, and receives bailout money $-d_P^B = \phi_P$ in the bad state of nature from the principal to repay its private creditors.

✓ *Debt brake requirement*

Agent otherwise may overborrow from market (negative externality on P).

Seniority rule does not solve problem.

✓ *No need for JL*

JL would allow agent to borrow more, so total surplus would be higher; but the agent would have to borrow more to compensate the principal (utility is non-transferable).

[Joint liability, “Eurobonds”, also implement the optimal contract iff the principal is in a very weak bargaining position:

- $R \geq R^*$ (overleveraging is a credible threat)
- $\phi_P \geq (1 - \alpha)\Phi_A$

✓ *Ex-post moral hazard*

- Increasing, convex cost $g(\alpha)$; α non-observable.
- May make debt brake more stringent.

✓ *Ex-ante moral hazard*

- Date-0 choice affecting date-1 income, together with concave date-1 utility \implies akin to a choice of R (intensity of liquidity need).
- A low date-0 effort makes overleveraging more plausible and strengthens the agent's bargaining position.

III. CONTRACTUAL SOLIDARITY

- ✓ Symmetric two-country version (behind veil of ignorance).
Borrowing b_i yields Rb_i .
- ✓ Probability p_k that k countries have income y (with $\sum_0^2 p_k = 1$)
Arbitrary pattern of correlation.
- ✓ Default costs: $\begin{cases} \text{own cost} & \Phi \\ \text{collateral damage cost} & \phi < \Phi \end{cases}$

Let $\hat{\Phi} \equiv \Phi + \phi$ (upper bound on WTP).

Notation: In “state” k

$d_k \equiv$ average per-country repayment ($d_0 = 0$ obviously)

$x_k \equiv$ average number of defaults ($x_k \in [0, 2]$)

$\hat{\Phi}_k \equiv$ average per-country total cost of default(s)

example: $\hat{\Phi}_k = \hat{\Phi}$ if both countries default

Payoff: $\max \left\{ R \left[\sum_{k=0}^2 p_k d_k \right] - \sum_{k=0}^2 p_k (d_k + \hat{\Phi}_k) \right\}$

Assume $R > \frac{1 + p_0}{1 - p_0} \geq 1$. Then borrowing is optimal and

- no default when both are intact ($\hat{\Phi}_2 = 0$)
- full default when both are distressed ($\hat{\Phi}_0 = \hat{\Phi}$).

Furthermore, *binding constraints* are:

$$d_2 \leq d_1 + \frac{x_1}{2} \hat{\Phi}$$

and

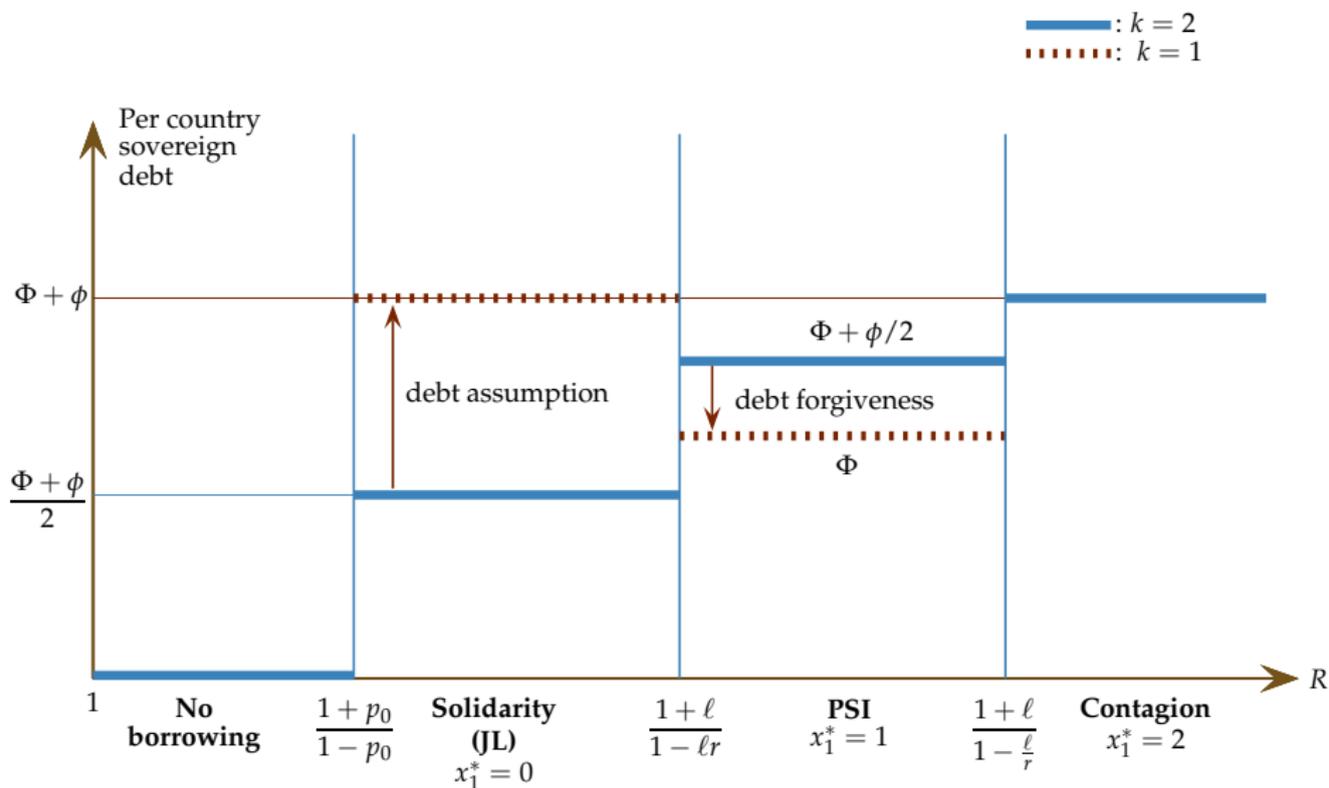
$$2d_1 + \hat{\Phi}_1^y \leq \hat{\Phi}$$

where cost to intact country when other is distressed is minimized conditional on number of defaults x_1 :

$$\hat{\Phi}_1^y = \begin{cases} x_1 \phi & \text{if } x_1 \leq 1 \\ \phi + (x_1 - 1)\Phi & \text{if } 1 \leq x_1 \leq 2. \end{cases}$$

Optimal contract

Let $\ell \equiv \frac{p_1}{p_2}$ (likelihood ratio) and $r \equiv \frac{\phi}{\Phi}$ (spillover-default cost ratio)



IV. ENDOGENOUS SPILLOVERS

- ✓ Spillover costs are in part endogenous
 - Mengus (2012), Gennaioli et al (2011): Part of ϕ depends on country's banks' investment in other country.
 - Unilateral incentive to reduce exposure so as to strengthen one's position?
 - Collective incentive (behind veil of ignorance)?
- ✓ We here focus on choice of spillovers by principal (in fact, both the principal and the agent impact spillovers)
 - Some spillovers cannot be controlled by country: ϕ_0
 - Others can be controlled: $z_i \in [0, 1] = \text{exposure}$

$$\phi_i = \phi_0 + z_i(\phi - \phi_0)$$

[example: investment in other country's debt.]

(1) *One-way insurance*

- Intuition: should choose $z_P = 0$ (i.e., $\phi_P = \phi_0$) so as to contain soft-budget-constraint exposure.
- Broadly correct, but may choose $z_P > 0$ in order to incentivize agent to choose the safe policy.

[P 's welfare is same as under laissez-faire, so consider laissez-faire. Condition for choice of safe policy:

$$(\alpha R - 1)\Phi_A \leq [(1 - \alpha)R - \alpha] \phi_P.$$

Bailout in good (α) or bad ($1 - \alpha$) state?]

- ## (2) *Two-way insurance*: In solidarity region (no default), countries jointly decide to maximize their cross exposure: $\phi_i = \phi$.

V. DEBT MONETIZATION

- How does the possibility of soft default affect the probability of hard default?
- How does it alter bailout decisions?

Assumptions

- *Own currency:*
 - chooses fraction $\theta \in [0, 1]$ repaid in real terms ($1 - \theta =$ debasement rate). A la Calvo/Barro-Gordon.
 - cost $C(\theta) = -\log \theta$ for country.
- *Currency union:* $\theta \equiv 1$
 - indeed the case if median country voter has low debt/GDP.

Minor changes

- (1) Outcome y^G (prob. α) or y^B (prob. $1 - \alpha$), with

$$y^G > y^B > 0$$

(implies possibility of monetization in both states)

- (2) Risk aversion at date 2: $u(c) = \log c$.

(risk aversion implies state-contingent monetization).

SOFT/HARD DEFAULT DECISION

When income y and nominal debt d :

Currency union

$$\max \left\{ u(y - d), \quad u(y) - \Phi_A \right\}$$

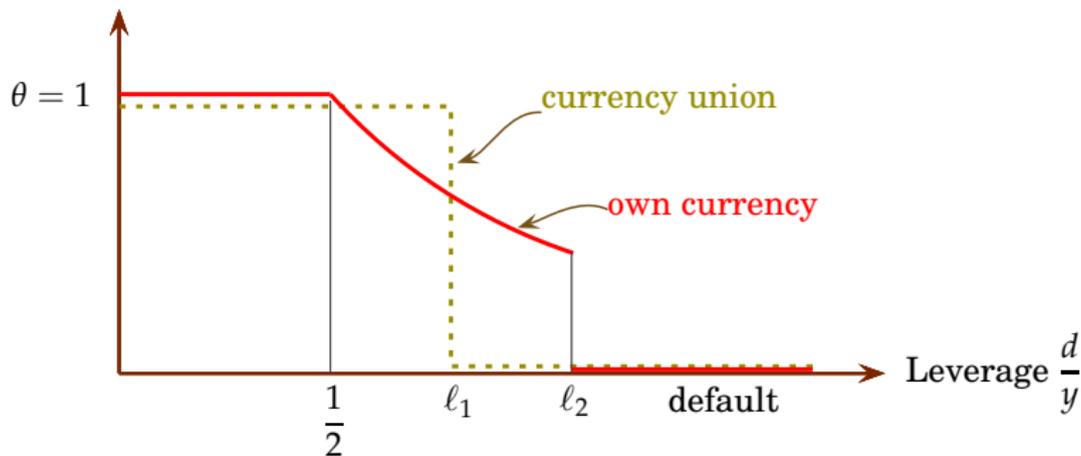
⇒ hard default if $d > l_1 y$ where $l_1 \equiv 1 - e^{-\Phi_A}$

Own currency

$$\max \left\{ \max_{\{\theta \leq 1\}} \{ u(y - \theta d) - C(\theta) \}, \quad u(y) - \Phi_A \right\}$$

- ⇒
- θ weakly decreasing in d/y
 - hard default if $d > l_2 y$
(with $l_2 \equiv e^{-\Phi_A}/4 > l_1$)

Fraction θ of debt repaid (in real terms)



- Currency union dominates if no income uncertainty (commitment).
- Ability to monetize by contrast may be beneficial if income is random (insurance).

BAILOUT AND DEBT MONETIZATION

Assumption

Let $d_P = P$'s financial exposure to A .

$$\phi_P = \begin{cases} \phi_0 + d_P & \text{if hard default} \\ (1 - \theta)d_P & \text{if soft default} \end{cases}$$

(1) Currency union

P bailouts A iff

$$d_M - \ell_1 y \leq \phi_0$$

(debt d_P is wiped out anyway and thus irrelevant)

(2) *Own currency*

- Lemma (leakage effect/no support as long as no hard default):
P does not want to bring support in order to reduce debasement.
- But if hard default in absence of support, *P* may want to rescue *A*.
- Some automatic PSI under soft default! Hence *P* more willing to rescue for a given revenue shortfall/overindebtedness.
- Support may be in
 - domestic currency
 - hard currency.

Proposition (bailouts and debt monetization)

For given country debt d and income y , the principal bails the agent out if and only if

$d_M - \ell_1 y \leq \phi_0$ under a currency union,

$d_M - \ell_2 y \leq 2\ell_2 \phi_0$ under own currency, and support denominated in the agent's currency,

$\left[\sqrt{\frac{d_M}{\ell_2 y}} - 1 \right] y \leq \phi_0$ under own currency and support denominated in the principal's currency,

where $\ell_2 > \ell_1$ and $2\ell_2 > 1$. Thus,

(i) The principal intervenes for lower levels of debt under a currency union as soft default is then not an option.

(ii) Due to (involuntary) private sector involvement under an own currency and soft default, the principal is willing to rescue for larger shortfalls of required income $\ell_i y$ relative to market debt d_M .

(iii) When the agent has his own currency, the principal elects to bring support in the principal's rather than the agent's currency, so as to increase the magnitude of private sector involvement:

$$s^* = \left[\sqrt{\frac{d_M}{\ell_2 y}} - 1 \right] y < \hat{s} = \frac{1}{2} \left[\frac{d_M}{\ell_2 y} - 1 \right] y$$

VI. SUMMARY AND APPLICATIONS

Summary

- (1) *Collateral damage is collateral*
 - Bailouts driven by fear of externalities.
 - We have provided formal content to notion that a country's debt capacity depends on spillovers associated with its default.
- (2) *Joint liability requires being behind veil of ignorance*
 - Joint liability increases total surplus, creates domino effects
 - Risky countries cannot compensate safe ones for accepting joint liability (would have to borrow more: compensation in funny money).
- (3) *Endogenous spillovers.*

(4) *Debt monetization*

- a currency union generates more hard default by precluding soft default,
- debt monetization generates automatic PSI,
- optimal to denominate support in foreign currency.

Many possible *extensions*, including:

- ✓ Extended solidarity (inner/outer solidarity area, Eurozone/ international community)
- ✓ Asymmetric information about spillovers and posturing.
- ✓ Fiscal unions (correlate income realizations, some JL).

BACKUP

No-principal benchmark

If agent decides to borrow:

$$d_M = \Phi_A \text{ (maximal credible reimbursement)}$$

and so

$$b_M = \alpha \Phi_A$$

$$\Rightarrow U_A = R(\alpha \Phi_A) + \alpha(y - \Phi_A) - (1 - \alpha)\Phi_A$$

Absence of borrowing yields αy .

Borrows iff $\alpha R > 1$

Then defaults in Bad state.

From here on, reintroduce P .