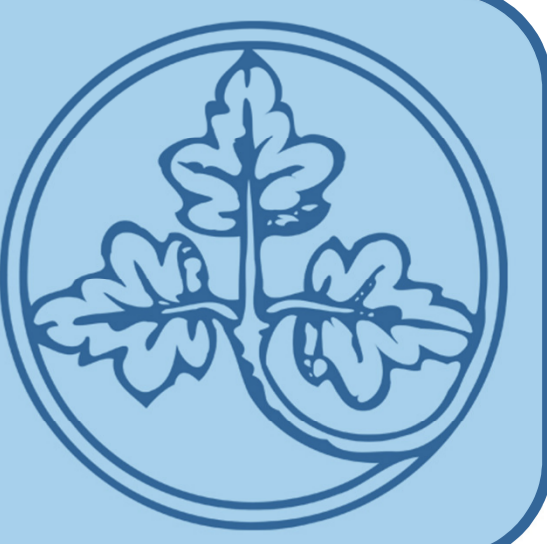




# SOVEREIGN DEFAULT, BANK RUNS, AND CONTAGION

Stephan Luck and Paul Schempp

University of Bonn and Max Planck Institute for Research on Collective Goods



## What we do:

- We analyze how self-fulfilling banking crises and sovereign defaults reinforce each other.
- Furthermore, we analyze international contagion.

## Results:

- A fiscally weak government cannot prevent bank runs.
- Self-fulfilling financial and sovereign debt crises occur as twins.
- National policies cannot prevent international contagion.
- If countries are financially interconnected, a banking union with a supranational deposit insurance scheme is beneficial for all participating countries.

## Motivation:

- 2007-09 financial crisis, European debt crisis, and the resulting policy debates
- Historical evidence by Reinhart and Rogoff (2009) on the link between banking crises and sovereign default.

## Model: Single Country

### Consumers:

- Two periods,  $t \in \{1,2\}$ , consumers with D&D preferences: impatient with probability  $\pi$ , wants to consume in  $t = 1$ , patient with prob.  $1 - \pi$ . Types are private information.
- Consumers own a demand deposit contract, either  $c_1^*$  in  $t = 1$  or  $c_2^*$  in  $t = 2$ .
- Mass of consumers withdrawing early:  $\omega$

### Banks:

- Banks own government bonds with total value of  $\alpha B$ , maturing in  $t = 2$ .
- Banks own  $I$  units of illiquid assets with after-tax return  $(1 - \tau)R$  in  $t = 2$ , liquidation at rate  $l$  is possible in  $t = 1$ .
- Liquidation fraction  $z$ , total liquidation return  $zI$

### Investors:

- Investors buy government bonds if return is non-negative.
- $\eta$ : mass of investors buying government bonds.

### Government:

- Outstanding debt  $B$ , maturing in  $t = 2$
- Two sources of tax revenue in  $t = 2$ : Exogenous tax revenue  $E$ , and taxation of banks:  $T(z) = E + \tau(1 - z)RI$
- Government repays whenever it is able to do so.

Parameters are chosen such that a “good” equilibrium exists.

## Mechanics

- “Rollover” of sovereign debt: banks sell government bonds to investors in order to satisfy withdrawing consumers.
- In case of high early withdrawal or rollover problems, banks have to liquidate a fraction of the illiquid projects:

$$z(\omega, \eta) = \min \left[ 1, \frac{[\omega c_1^* - \eta]^+}{I} \right].$$

- Late consumption decreases with withdrawal and increases with rollover:

$$c_2(z, \omega) = (1 - z) \frac{1 - \eta}{1 - \omega} c_2^*.$$

- Consumers withdraw early if potential late consumption is low:

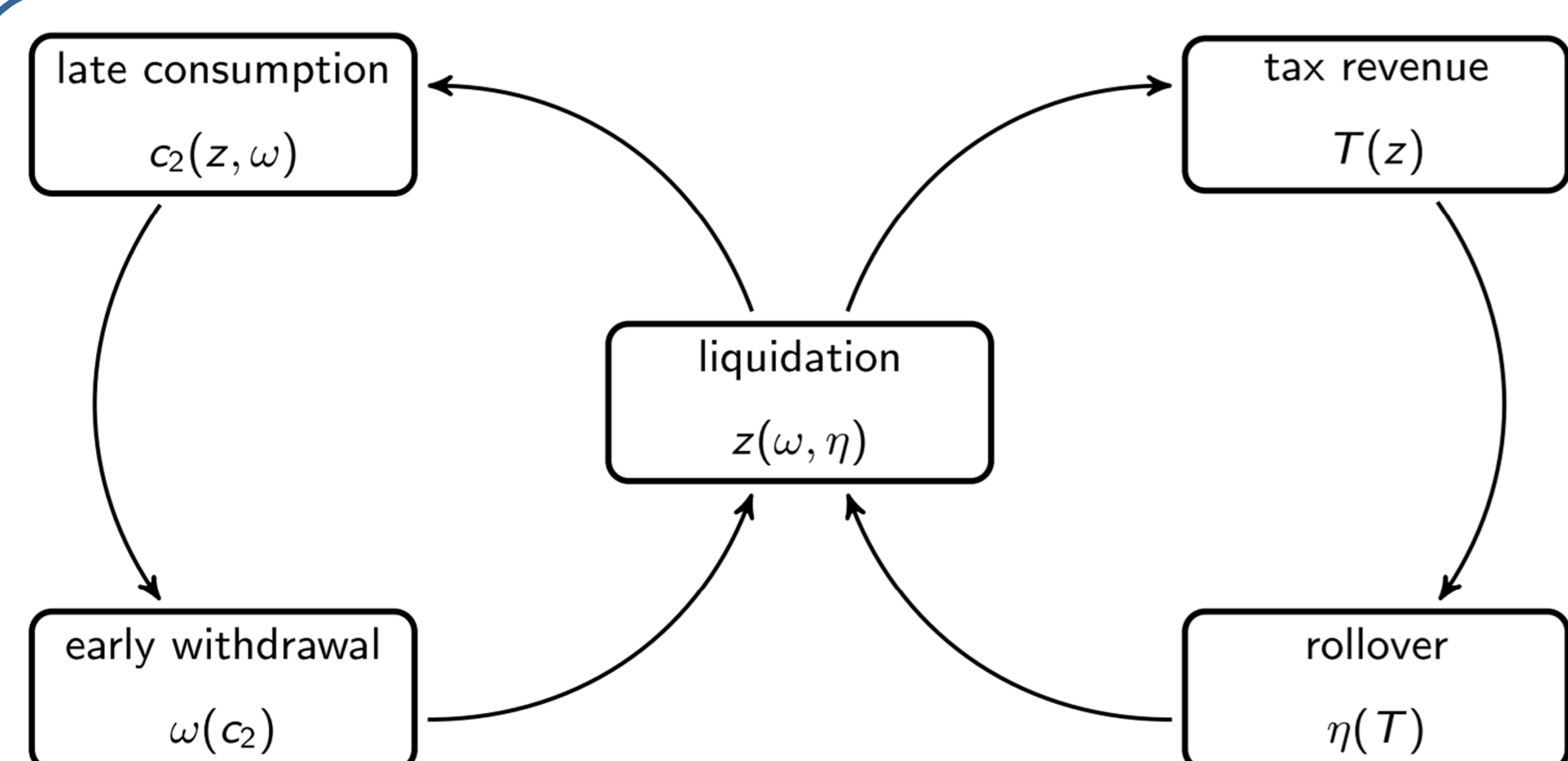
$$\omega_i^*(\omega, \eta) = \begin{cases} 0 & \text{if } c_2(z, \omega) \geq c_1^* \\ 1 & \text{if } c_2(z, \omega) < c_1^* \end{cases}$$

- Tax revenue decreases with liquidation:

$$T(z(\omega, \eta)) = E + \tau(1 - z(\omega, \eta))RI.$$

- Rollover works if tax revenue is sufficient:

$$\eta_i^*(\omega, \eta) = \begin{cases} 1 & \text{if } B \leq T(z(\omega, \eta)) \\ 0 & \text{if } B > T(z(\omega, \eta)) \end{cases}$$



**Proposition 1.** There exist two Nash equilibria in pure strategies.

“**Good**” equilibrium: No bank run, no liquidation, government is solvent, investors roll over gov. bonds.

“**Crisis**” equilibrium:

$E < B$  Sovereign default and bank run.

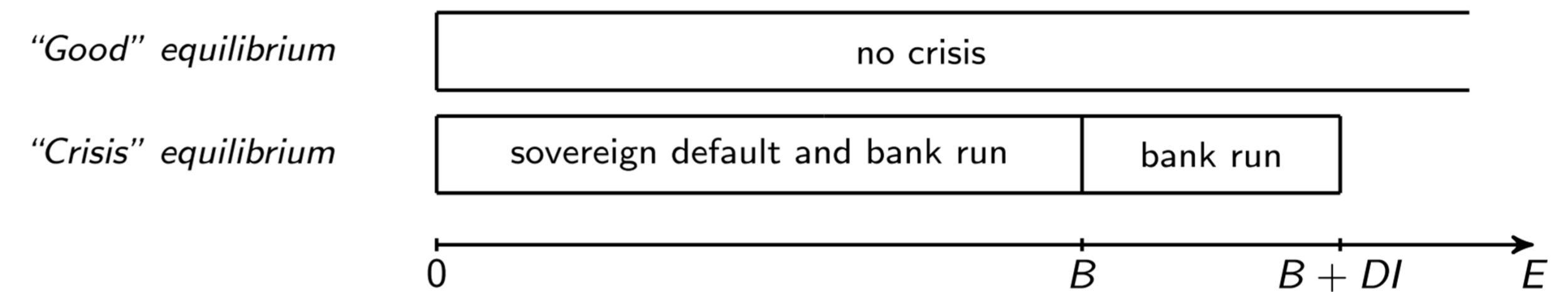
$E \geq B$  Bank run, but no sovereign default: Government is solvent even in case of a bank run.

## Deposit Insurance

- Government provides a deposit insurance which guarantees a payoff of  $c_1^*$  to each consumer.
- (Potential) cost of a deposit insurance:  $DI = (1 - \pi)c_1^* - I$

**Proposition 2.** By providing a deposit insurance scheme, the government can eliminate the crisis equilibrium iff  $E \geq B + DI$ .

## Existence of equilibria under a deposit insurance scheme



## Two Country Case

- Two countries, home  $H$  and foreign  $F$
- Setup as before, but home country is fiscally more stable than foreign country:  $E^H > E^F$
- Cross-holding of government bonds: Domestic banks hold bonds of the domestic government (fraction  $\lambda$ ), and of the foreign government (fraction  $1 - \lambda$ )
- Default of the foreign government has real consequences for domestic banks.
- Cost of deposit insurance increases,  $\widetilde{DI} > DI$ .
- Deposit can actually become costly in equilibrium.

**Proposition 3.** In case of a sovereign default in the foreign country, the following happens in the home country:

$E^H < B$  Sovereign default and bank run

$E^H \in [B, B + \widetilde{DI}]$  Bank run without sovereign default

$E^H > B + \widetilde{DI}$  No bank run, no sovereign default, but costly deposit insurance: Because the deposit insurance scheme becomes costly.

Which supranational policy instruments can help to eliminate fragility? We are looking for policies that benefit both countries.

**Proposition 4.** Assume  $E^H + E^F \geq 2(B + DI)$  and  $E^H > E^F$ .

$E^F > B + DI$  Political autarky is Pareto-efficient, no need for a union.

$E^F \in [\widetilde{E}, B + DI]$  A banking union is required for Pareto efficiency, but a fiscal union is not necessary.

$E^F < \widetilde{E}$  A banking union is Pareto-efficient only if it is complemented with a fiscal union.

## Policy Implications: European Banking Union

- Current regulation and policy focusses on
  - Single Supervisory Mechanism (SSM) and
  - Single Resolution Mechanism (SRM)
- A supranational Deposit Guarantee Scheme (DGS) seems politically infeasible and is currently off the table.
- A national DGS might be insufficient in an internationally interconnected financial system. A supranational DGS might be necessary to stabilize the financial system and to prevent contagion. The supranational DGS benefits all participating countries, even ex post.
- International connections between banks create similar problems.
- The current bank regulation considers sovereign debt to be “risk free”. However, the reinforcing nature of sovereign debt and banking crises implies that government bonds in the hands of banks constitute a severe systemic risk.