Debt sustainability and fiscal space in a heterogeneous Monetary Union: normal times vs the ZLB

Javier Andrés, Pablo Burriel and Wenyi Shen

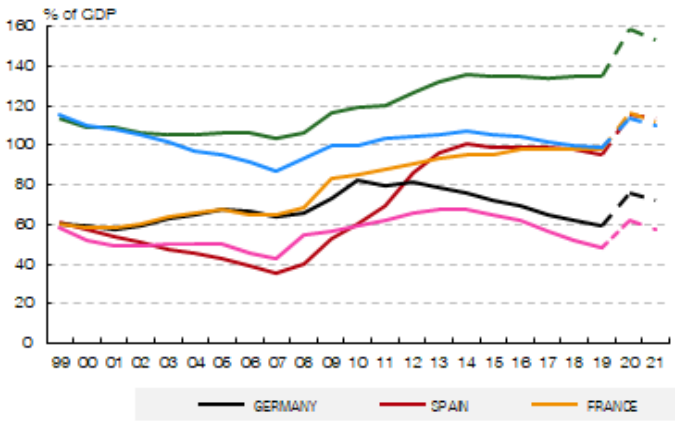
Universidad de Valencia, Banco de España and Oklahoma State University

CEMLA (online), 7-08-2020

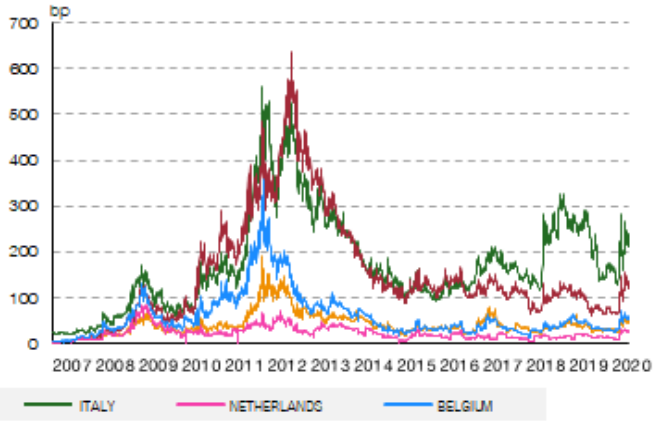
BANCO DE ESPAÑA
Eurosistema

Motivation

General gov debt



10-year bond spreads



High gov. debt/GDP in EMU members raise concerns about debt sustainability:

- Is debt sustainability different for a EMU member? Normal times vs ZLB
- Are there spillover effects on debt sustainability within EMU?
- Are effects of fiscal consolidation & coordination different within EMU?

BANCO DE ESPAÑA
Eurosistema

Structure of presentation

1. Introduction
2. Preview of results
3. Model
4. Fiscal limit
5. Long-run fiscal consolidation
6. Short-run discretionary fiscal policy
7. Conclusions

Literature

- **Standard Monetary union DSGEs** assessing policy effects do not account for default risks: Gali & Monacelli (2008), Ferrero (2009).
- **Debt sustainability** literature use DSGEs with exogenous risk premia: Mendoza and Oviedo (2004), Corsetti et al. (2013).
- **Sovereign default** literature internalize default cost but assume exogenous output: Eaton & Gersovitz (1981), Arellano (2008), Dovis (2019).
- **Default in EMU** is more likely the result of accidents, than strategic.

Preview of results

- **Normal times:** Risk channel matters significally when debt is $>$90%.
  - Makes long run consolidation to 60% costly, with spillovers to EMU.
  - Reduces significantly multiplier of discretionary fiscal policy.
  - Endogenous risk premium explains 40% of that reduction.

- **ZLB:** Risk channel becomes muted
  - Consolidation generates deflation expectations $\Rightarrow \uparrow$ real int. rate
  - Policy coordination favors expansion in EMU.

Model highlights

Two-country New Keynesian model (Benigno & Benigno (2005)), modified for:

1. Periphery's High debt is subject to default risk, Core with low debt.
2. Endogenous debt sustainability risk: distance to fiscal limit (Bi (2012))

Other characteristics:

- Total home bias in debt & gov spending.
- Distortionary taxes on income.
- Calibration: Periphery (Spain) & Core (Germany).

Main Mechanism:

1) RISKY PERIPHERY'S GOVERNMENT DEBT

- Periphery's government debt (b_{t-1}) is subject to default risk, with haircut δ ($= 0.3$ annually, Bi (2012)) and risky yield R_t

$$\delta_t = \begin{cases} 0 & \text{if} \quad b_{t-1} < \mathcal{B}(\mathcal{S}_t) \\ \delta & \text{if} \quad b_{t-1} \geq \mathcal{B}(\mathcal{S}_t) \end{cases}$$

where $\mathcal{B}(\mathcal{S}_t)$ is a random draw from fiscal limit distribution

Main Mechanism:

1) RISKY PERIPHERY'S GOVERNMENT DEBT

- Periphery's government debt (b_{t-1}) is subject to default risk, with haircut δ ($= 0.3$ annually, Bi (2012)) and risky yield R_t

$$\delta_t = \begin{cases} 0 & \text{if} \quad b_{t-1} < \mathcal{B}(\mathcal{S}_t) \\ \delta & \text{if} \quad b_{t-1} \geq \mathcal{B}(\mathcal{S}_t) \end{cases}$$

  where $\mathcal{B}(\mathcal{S}_t)$ is a random draw from fiscal limit distribution

- Periphery household's Euler eq includes risky yield & expected haircut:

$$\lambda_t = \beta E_t \frac{R_t(1-\delta_{t+1})\lambda_{t+1}}{\pi_{t+1}}$$

Main Mechanism:

1) RISKY PERIPHERY'S GOVERNMENT DEBT

- Periphery's government debt (b_{t-1}) is subject to default risk, with haircut δ ($= 0.3$ annually, Bi (2012)) and risky yield R_t

$$\delta_t = \begin{cases} 0 & \text{if} \quad b_{t-1} < \mathcal{B}(\mathcal{S}_t) \\ \delta & \text{if} \quad b_{t-1} \geq \mathcal{B}(\mathcal{S}_t) \end{cases}$$

  where $\mathcal{B}(\mathcal{S}_t)$ is a random draw from fiscal limit distribution

- Periphery household's Euler eq includes risky yield & expected haircut:

$$\lambda_t = \beta E_t \frac{R_t(1-\delta_{t+1})\lambda_{t+1}}{\pi_{t+1}}$$

- Core gov debt is NOT risky: $\delta_t^* = 0$, $R_t^* = R_t^{ECB}$

Main Mechanism:

2) PERIPHERY'S DEBT SUSTAINABILITY RISK = FISCAL LIMIT

Debt sustainability defined as distance to stochastic Fiscal Limit ($\mathcal{B}(\mathcal{S}_t)$)

- **Fiscal limit** is max debt that can be supported without default.
- Iterate on the gov. budget constraint, assuming no default & tax rate $= \tau^{\max} = 0.435$ (Spain's marginal rate)

$$\mathcal{B}(\mathcal{S}_t) = \beta_t^p \pi(\mathcal{S}_t) E_t \sum_{j=0}^{\infty} \beta^j \frac{\lambda(\mathcal{S}_{t+j})}{\lambda(\mathcal{S}_t)} \frac{\tau^{\max} y(\mathcal{S}_{t+j}) - g_{t+j}}{tot(\mathcal{S}_{t+j})^{1-\eta}}$$

where state of the economy $\mathcal{S}_t = \{g_t, g_t^*, tot_{t-1}\}$

BANCO DE ESPAÑA
Eurosistema

Main Mechanism:

2) PERIPHERY'S DEBT SUSTAINABILITY RISK = FISCAL LIMIT

$$\mathcal{B}(\mathcal{S}_t) = \beta_t^p \pi(\mathcal{S}_t) E_t \sum_{j=0}^{\infty} \beta^j \frac{\lambda(\mathcal{S}_{t+j})}{\lambda(\mathcal{S}_t)} \frac{\tau^{\max} y(\mathcal{S}_{t+j}) - g_{t+j}}{tot(\mathcal{S}_{t+j})^{1-\eta}}$$

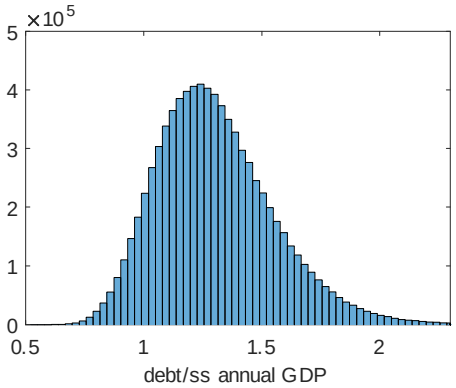
- Endogenous: depends on state of economy ($\mathcal{S}_t = \{g_t, g_t^*, tot_{t-1}\}$).
- Captures private sector's perception: HH's discount factor.
- β_t^p =stochastic political risk $\rightarrow$ brings risk premium closer to evidence (in 2018 Spain had debt/y=97% & spread$\approx$100bp).
- FL distribution simulated using Markov Chain Monte Carlo method.

BANCO DE ESPAÑA
Eurosistema

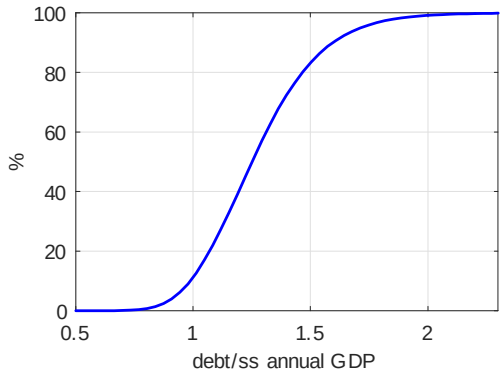
Periphery's Fiscal Limit:

DISTRIBUTION COMPUTED USING B(St)

Histogram



Cumulative density function (cdf)



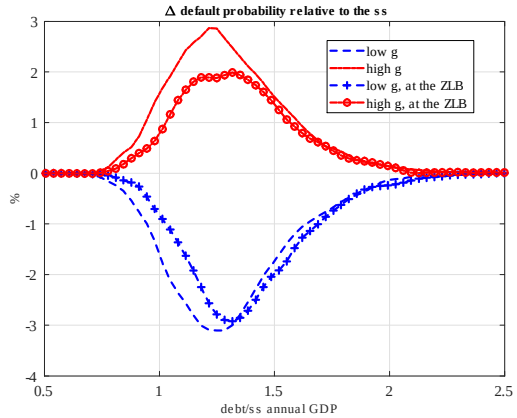
- FL approx symmetric with mean=125%, sd=24
- Prob of default = 0 for B/Y<80% & =1 for B/Y>200%
- Between 80-180%: ⇑B/Y → ⇑default Prob

BANCO DE ESPAÑA
Eurosistema

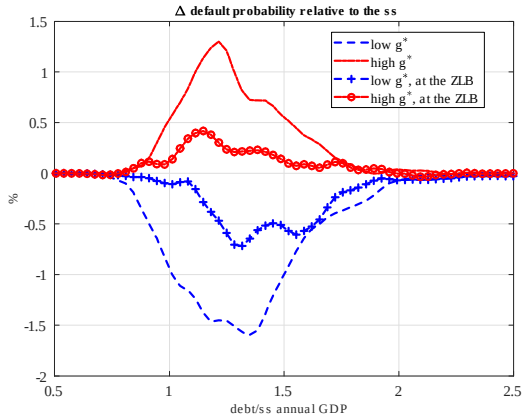
Periphery's FL MP or ZLB.

10% CHANGE IN g OR g*

10% Δ Periphery's g



10% Δ Core's g*



NORMAL MP: ⇑deficit, Y, $\pi \rightarrow$ ⇓FL (shift UP/LEFT)
MP channel weak: small ⇑ Y^{EA}, π^{EA} →small ⇑ R^{ECB} → ⇓FL
⇒ Both ⇓FL (shift UP/LEFT) → ⇑ default prob (3% B/Y=125%)

ZLB: NO MP channel ⇒ SMALLER effect of Δg, g* on FL

BANCO DE ESPAÑA
Eurosistema

Fiscal policy exercises.

1. Peripherys' long-run consolidation from B/Y=100 to 60%
2. Discretionary short-run fiscal policy (transitory Δg, g^*)

- Under two regimes for Monetary Policy:
  - Normal times
  - Zero lower bound

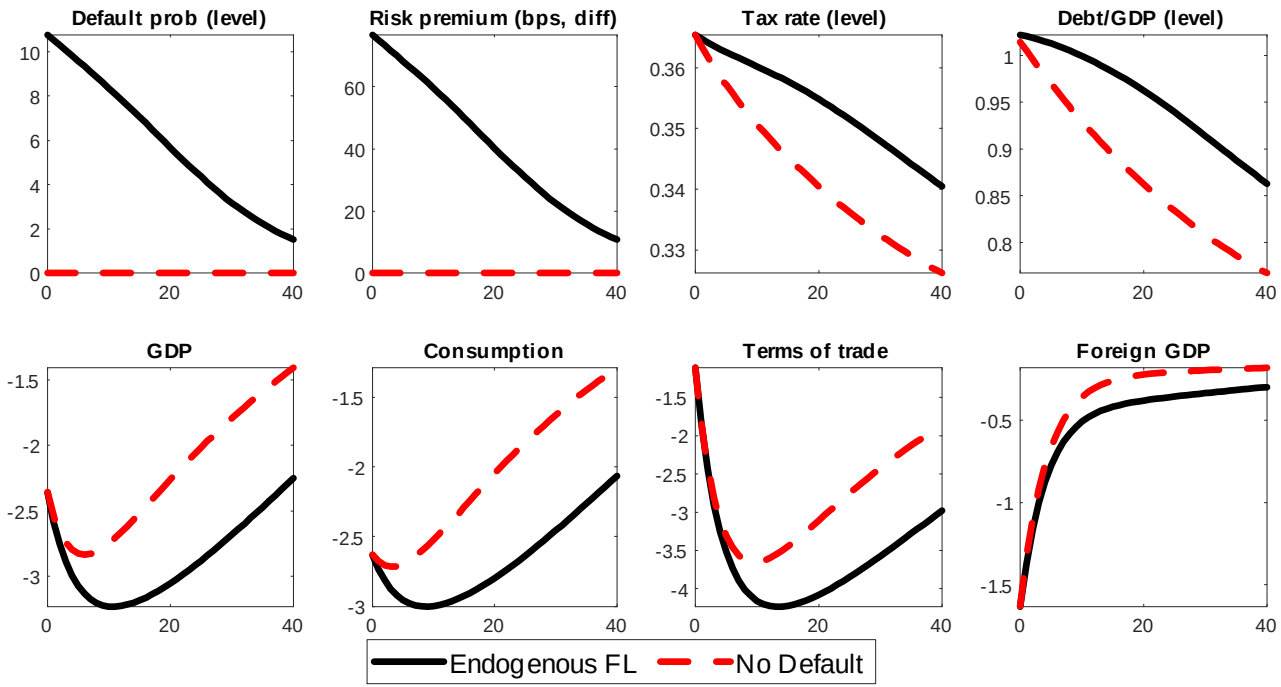
Policy scenario 1:

Peripherys' long-run consolidation from B/Y=100 to 60%

What we do: set Periphery's debt at 100% & let fiscal/monetary rules bring economy back to 60%

Periphery's long- run Consolidation:

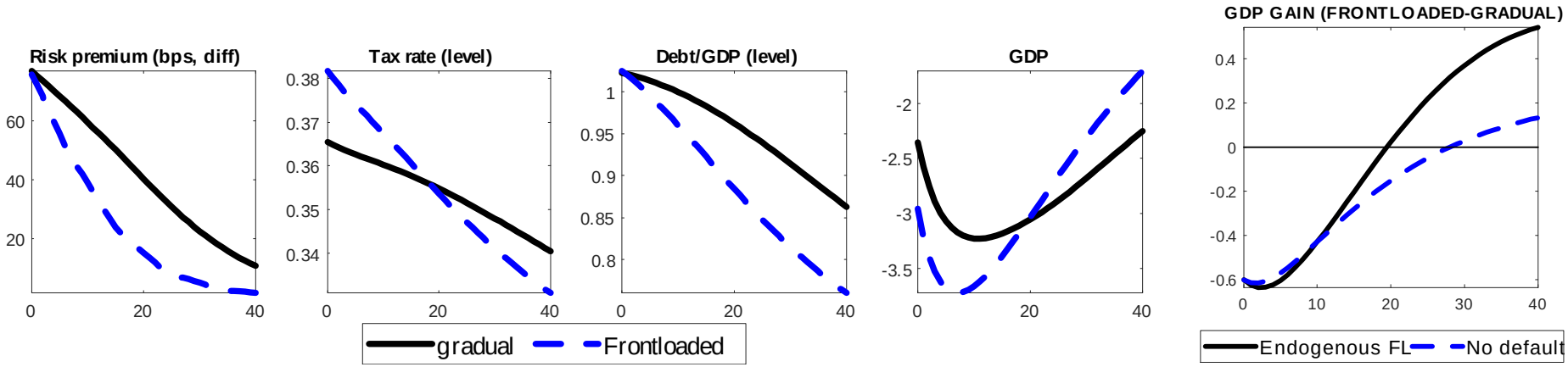
B/Y FROM 100 TO 60%



- High debt requires significant $\Uparrow$ tax, $\Downarrow B/Y$ slowly, with high risk premium
- Long and costly process ($\Downarrow$Y, C & L), spillover to Core ($\Downarrow$Y*).
- With NO default lower cost of financing.$\longrightarrow$ smaller Y loss

BANCO DE ESPAÑA Eurosistema

Periphery's Consolidation: Frontloaded?



- Frontloaded $\Downarrow$ risk premium & long-run cost.
- Initial greater $\Downarrow$Y due to flex wages: stronger $\Uparrow$tax$\rightarrow\Uparrow$W$\rightarrow\Uparrow R^{ECB}$
- GDP loss from frontloading is lower when FL is Endogenous.

BANCO DE ESPAÑA
Eurosistema

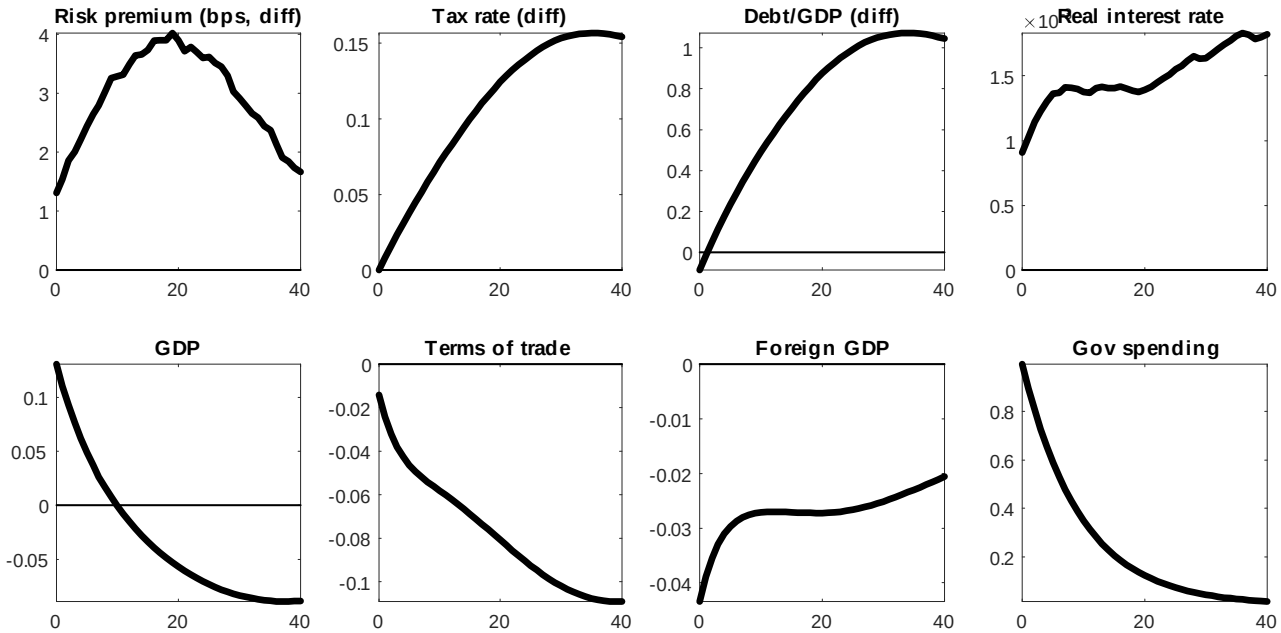
Policy scenario 2:

Discretionary short-run fiscal policy (transitory Δg, g^*)

Monetary Policy in **normal times regime**

IRFs show marginal effects with respect to long-run consolidation.

Discretionary fiscal policy: 1% rise in g

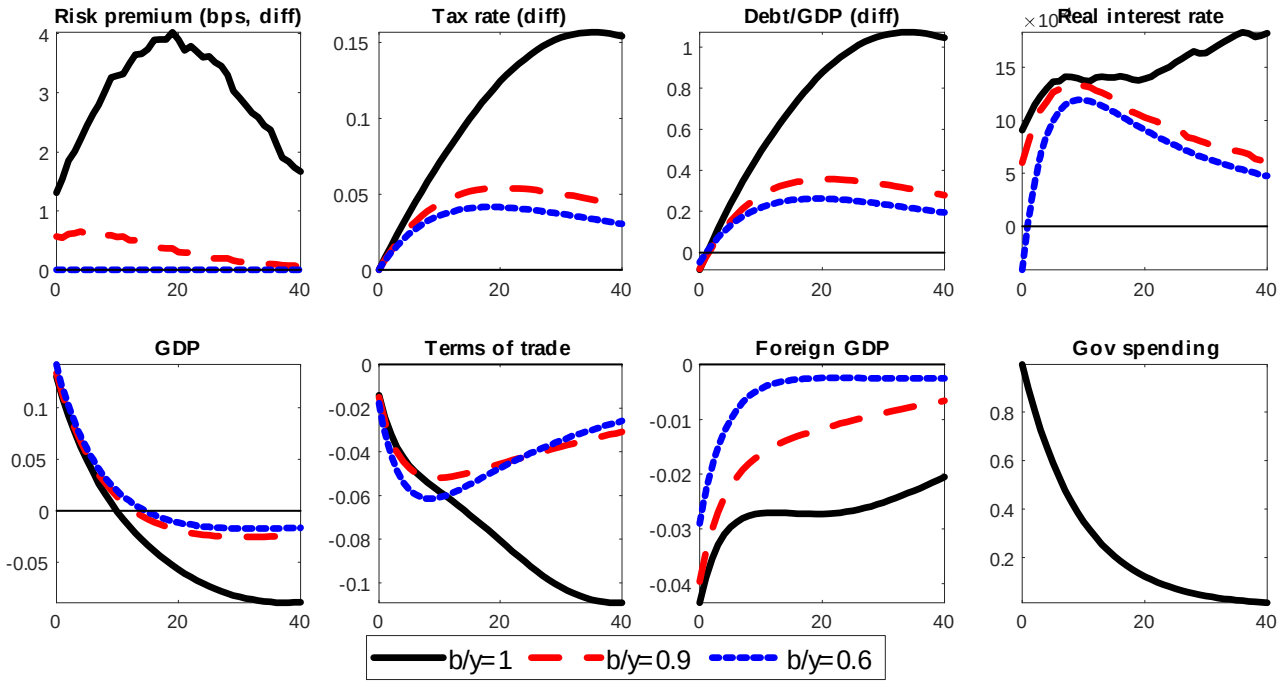


- With high debt, ⇑g→⇓FL, ⇑risk premium→ ⇑R/π
- Initial rise in Y, but falls after 10q
- MP channel weak: ⇑ π^{EA} →small ⇑ R^{ECB} → ⇓FL

BANCO DE ESPAÑA
Eurosistema

Discretionary fiscal policy: 1% rise in g

THE NON-LINEAR EFFECT OF THE DEBT LEVEL

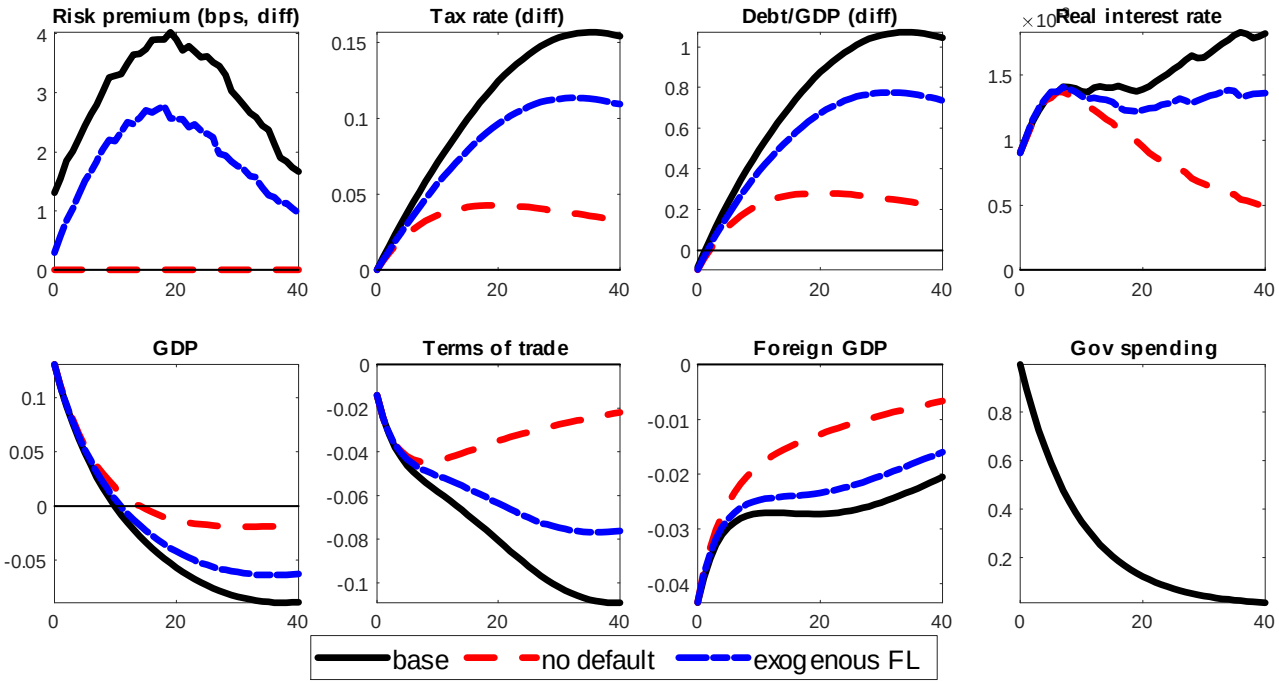


- Risk premium channel becomes relevant for debt>90%
- Below 90% periphery is closer to low-debt Core

BANCO DE ESPAÑA
Eurosistema

Discretionary fiscal policy: 1% rise in g

EFFECT OF ENDOGENEIZING THE FISCAL LIMIT



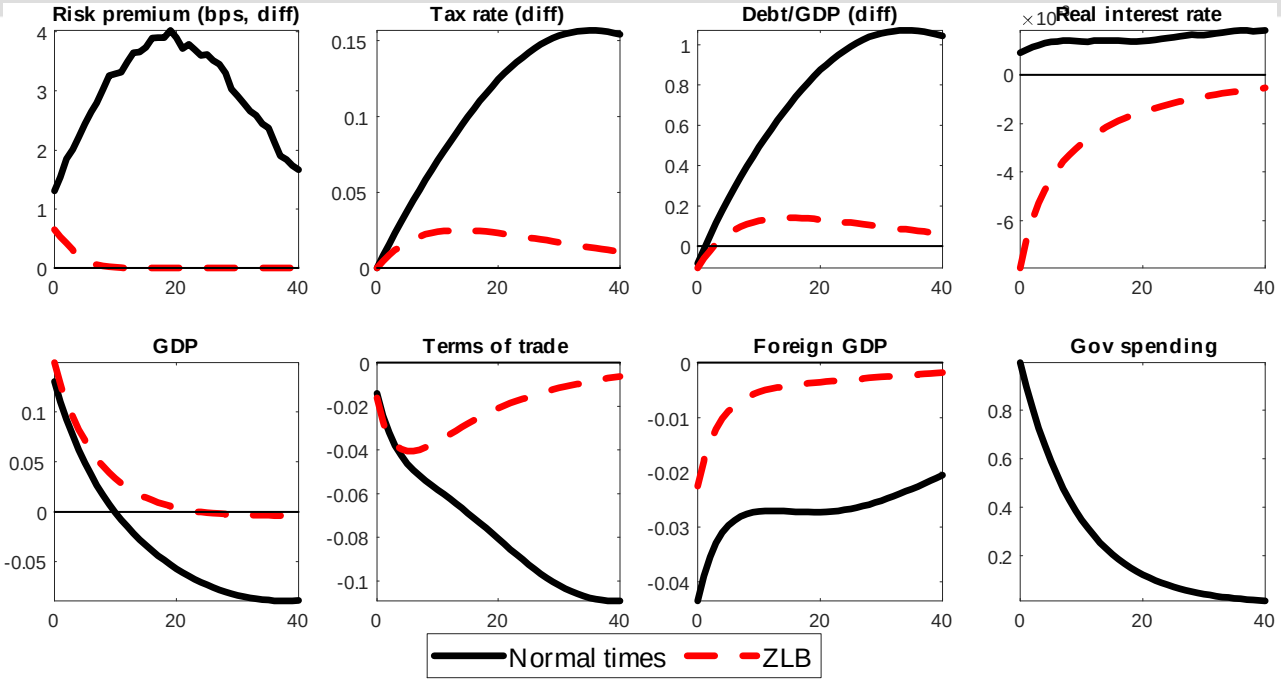
- When FL is Exogenous RP does not jump⇑, rises only as ⇑debt
- When debt is not risky, RP is constant, Y doesn't fall.

Policy scenario 2:

Discretionary short-run fiscal policy (transitory Δg, g^*)

Monetary Policy in **Zero Lower Bound regime**

ZLB, Discretionary FP: 1% rise in g



Under ZLB the RP channel is muted:

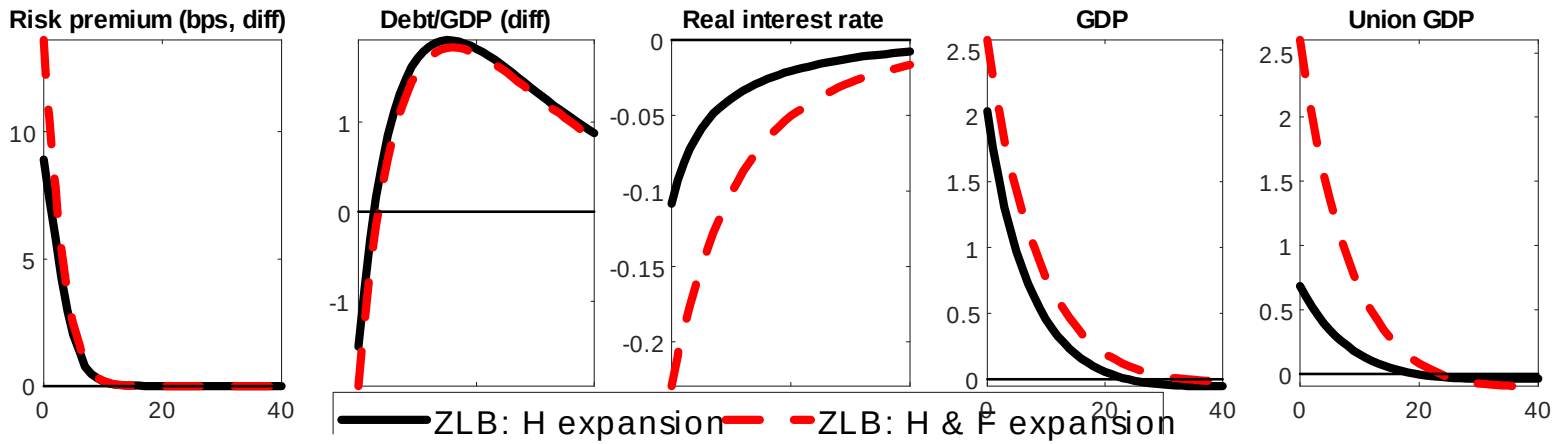
- $\Uparrow$g $\longrightarrow$ $\Downarrow$FL $\longrightarrow$ $\Uparrow$ RP $\longrightarrow$ initially $\Uparrow$ Y, inf
- ZLB $\longrightarrow$ constant R, $\Uparrow$inf $\longrightarrow$ $\Downarrow$ $\frac{R}{P}$ $\longrightarrow$ $\Uparrow$FL $\longrightarrow$ $\Downarrow$ RP

$\Longrightarrow$ <u>net effect</u> $\longrightarrow$constant RP $\longrightarrow$ multiplier $\approx$ No default case

BANCO DE ESPAÑA
Eurosistema

ZLB: Fiscal coordination

JOINT EXPANSION EMU EXPANSION IS BEST POLICY



At ZLB $\longrightarrow$ NO MP channel $\longrightarrow$ RP constant $\longrightarrow$ best is $\Uparrow g^*, g$.

Discretionary FP: Multipliers

Multiplier PV(DY)/PV(DG)	Periphery			Spillover to Core			Euro area		
models	0	1 yr	10 yr	0	1 yr	10 yr	0	1 yr	10 yr
No default	0.71	0.66	0.24	-0.18	-0.17	-0.25	0.14	0.13	-0.08
Exogenous FL	0.71	0.66	-0.24	-0.18	-0.18	-0.37	0.14	0.12	-0.32
Endogenous FL	**0.71**	**0.65**	**-0.50**	**-0.18**	**-0.18**	**-0.42**	**0.14**	**0.12**	**-0.45**
Endogenous FL, ZLB	0.82	0.77	0.56	-0.09	-0.08	-0.09	0.23	0.22	0.17

- Risk premium reduces multiplier by 76bp, 29bp due to endo FL
- Spillover to EMU reduces multiplier by 35bp, 13bp due to endo FL.
- ZLB kills RP channel $\rightarrow$ multiplier $\approx$ No default case

BANCO DE ESPAÑA
Eurosistema

Conclusions:

- **Normal times:** Risk channel matters significally when debt is >90%.
  - Makes long run consolidation to 60% costly, with spillovers to EMU.
  - Reduces significantly multiplier of discretionary fiscal policy.
  - Endogenous risk premium explains 40% of that reduction.

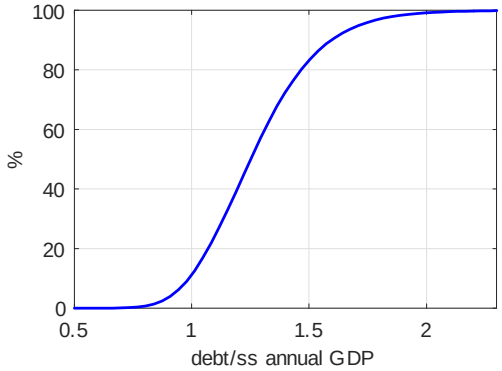
  - **ZLB:** Risk channel becomes muted
  - Consolidation generates deflation expectations $\Rightarrow \uparrow$ real int. rate
  - Policy coordination favors expansion in EMU.

Further work

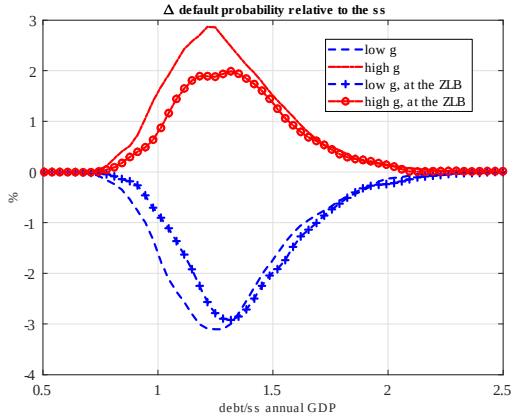
- Calibrate impact of Covid-crisis on Fiscal limit
- Effect of productive government spending
- Effect of structural reforms.

Further work: Impact of Covid on FL

Cumulative density function (cdf)



10% Δ Periphery's g

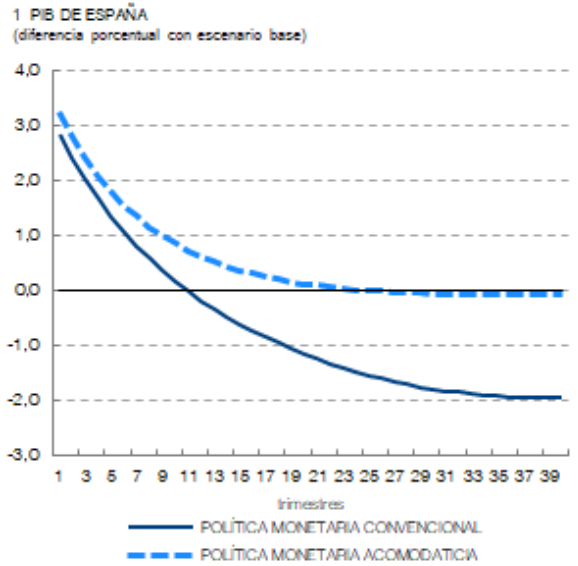


According to pre-crisis FL (movement along the curve). The increase in public debt (ES: 95%->120%) augments prob of default by 30bp
But the increase in gov spending (by 4% of GDP) also shifts FL to the LHS. Increasing prob of default for all debt levels.

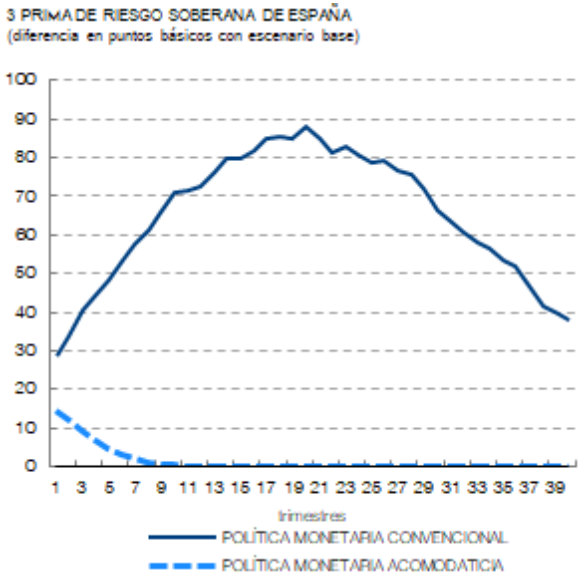
BANCO DE ESPAÑA
Eurosistema

Further work: Impact of Covid on FL

Spain's GDP



Sovereign risk premium

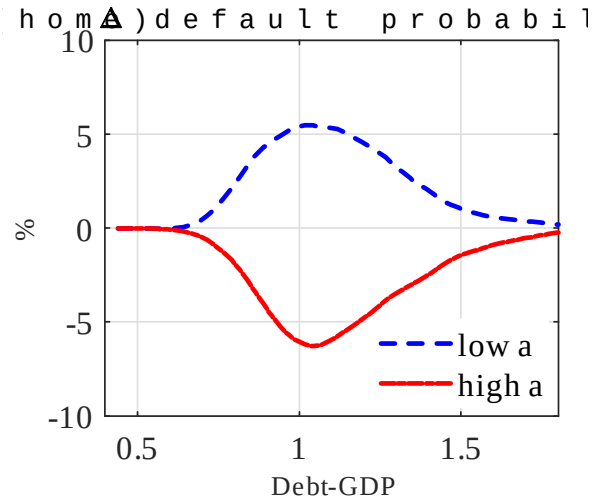


An increase of g by 4% of GDP increases risk premium by 100bp under a Taylor rule, but leaves it unchanged under the ZLB

BANCO DE ESPAÑA
Eurosistema

Further work: Gov Productive spending

Impact of change in prod

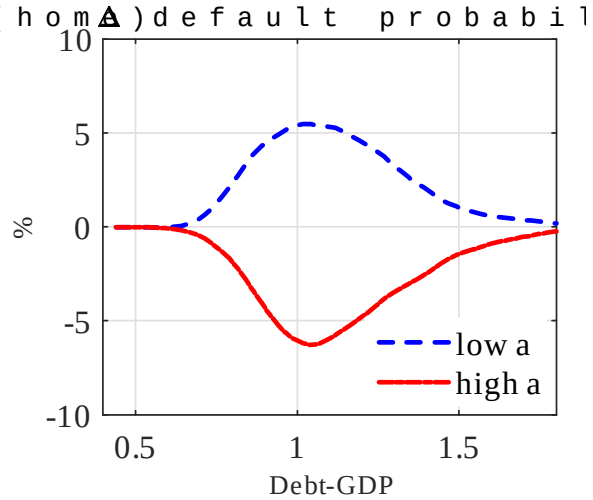


- If part of G is productive, $y = Af(G)L$, an increase in G augments productivity, increasing y and FL.
- EU plans to finance national governments investments may help high debt countries.

BANCO DE ESPAÑA
Eurosistema

Further work: Structural reforms

Impact of change in prod



Structural reforms help fiscal sustainability in 2 ways:

- Increase productivity A in $y = Af(G)L$, increasing y and FL.
- fiscal reforms may push up the max tax rate and increase FL

$$\mathcal{B}(\mathcal{S}_t) = \beta_t^p \pi(\mathcal{S}_t) E_t \sum_{j=0}^{\infty} \beta^j \frac{\lambda(\mathcal{S}_{t+j})}{\lambda(\mathcal{S}_t)} \frac{\tau^{\max} y(\mathcal{S}_{t+j}) - g_{t+j}}{tot(\mathcal{S}_{t+j})^{1-\eta}}$$

BANCO DE ESPAÑA
Eurosistema

Conclusions:

- **Normal times:** Risk channel matters significally when debt is >90%.
  - Makes long run consolidation to 60% costly, with spillovers to EMU.
  - Reduces significantly multiplier of discretionary fiscal policy.
  - Endogenous risk premium explains 40% of that reduction.

  - **ZLB:** Risk channel becomes muted
  - Consolidation generates deflation expectations $\Rightarrow \uparrow$ real int. rate
  - Policy coordination favors expansion in EMU.

THANK YOU FOR YOUR ATTENTION

BANCO DE ESPAÑA
Eurosistema

Calibration:

Periphery = Spain, Core = Germany

parameters	values	
β	0.99	the discount factor
θ	11	elasticity of substitution
ψ	116.5	Rotemberg adjustment parameter
α_π	2.5	Taylor rule parameter to inflation
γ_b	0.3	tax response parameter to changes in debt
b/y	0.6	steady state debt to output ratio (home)
b^*/b^*	0.6	steady state debt to output ratio (foreign)
g/y	0.183	steady state gov spending to output ratio (home)
g^*/y^*	0.187	steady state gov spending to output ratio (foreign)
τ	0.3005	steady state income tax rate (home)
τ^*	0.3425	steady state income tax rate (foreign)
a, a^*	1	steady state technology
ρ^g, ρ^{g*}	0.9	AR(1) coefficient in government spending rules
σ_g, σ_{g*}	0.01	standard deviation of government spending shock
s	0.36	share of home country
η	0.63	home country bias in home goods
η^*	0.37	foreign country bias in home goods
δ	0.07	quarterly haircut on debt if default occurs

Standard Fiscal/Monetary Policy:

- **Fiscal policy rule** in each country:

$$\tau_t = \tau + \gamma_b(b_{t-1} - 0.6)$$

- **Monetary policy**

$$R_t^{ECB} = \begin{cases} R^{ECB} + \alpha_\pi(\pi_{MU,t} - \pi_{MU}) & \text{if } s_t^R = 1 \\ 1 & \text{if } s_t^R = 2 \end{cases}$$

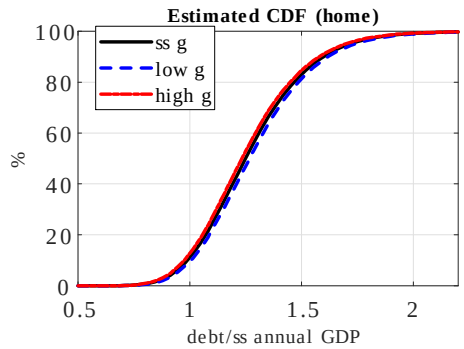
MP regime evolves exogenously according to $\begin{pmatrix} p_1 & 1-p_1 \\ 1-p_2 & p_2 \end{pmatrix}$

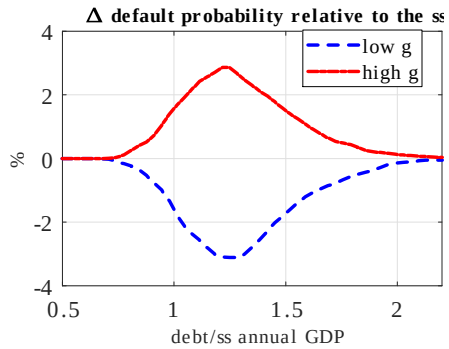
prob to stay in regime p_1=.99, p_2=.65.

BANCO DE ESPAÑA
Eurosistema

Periphery's Fiscal Limit:

10% CHANGE IN PERIPHERY'S GOV. EXPENDITURE g





10% ⇑g:

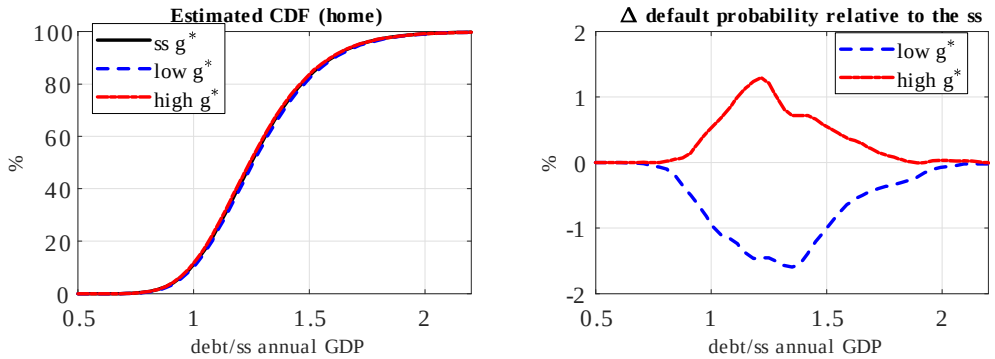
- ⇑deficit, Y, $\pi \longrightarrow$ ⇓FL (shift UP/LEFT)
- MP channel weak: small ⇑ Y^{EA}, π^{EA} →small ⇑ $R^{ECB} \longrightarrow$ ⇓FL

$\Rightarrow$ Both ⇓FL (shift UP/LEFT) $\longrightarrow$ ⇑ default prob (3% B/Y=125%)

BANCO DE ESPAÑA
Eurosistema

Periphery's Fiscal Limit:

10% CHANGE IN CORE'S GOV. EXPENDITURE g*



10% $\Uparrow$**g*** $\longrightarrow$ $\Uparrow$deficit*, Y^*, π^* $\longrightarrow$ spillover to Periphery due to:

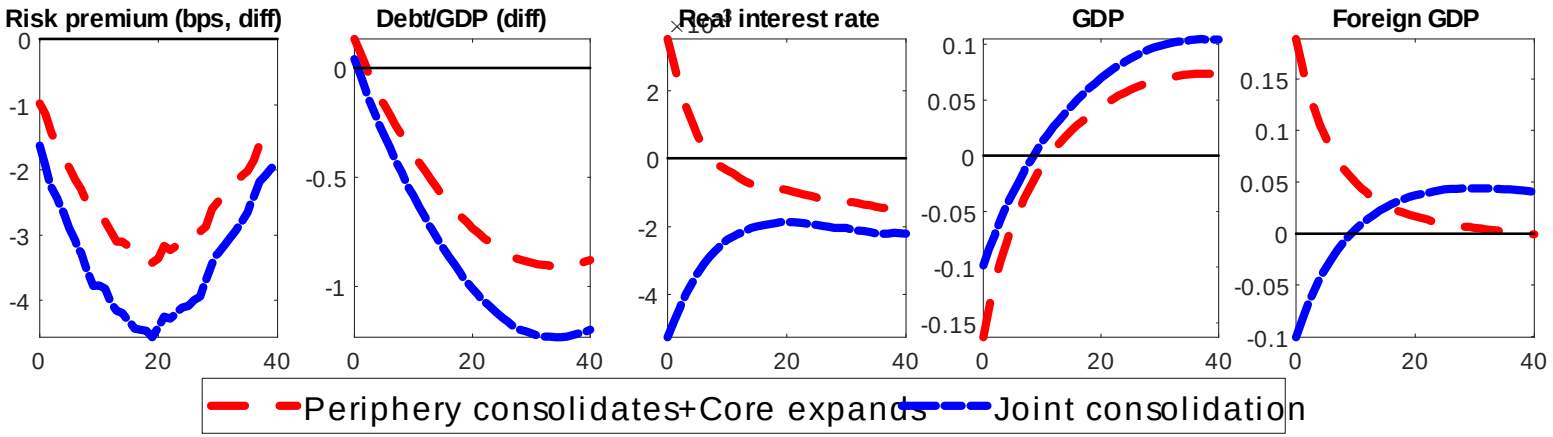
- MP channel: $\Uparrow R^{ECB} \longrightarrow \Uparrow$ financing costs of debt $\longrightarrow \Downarrow$ FL
- Trade channel: $\Uparrow M^*{=}X \longrightarrow \Uparrow$ FL (shift DOWN/RIGHT)

$\Rightarrow$ Net effect $\Downarrow$FL (shift UP/LEFT) $\longrightarrow \Uparrow$default prob (1.5% B/Y=125%)
Spillover is 50% of own effect (3% vs 1.5%).

BANCO DE ESPAÑA
Eurosistema

Fiscal coordination in EMU:

JOINT CONSOLIDATION IS BEST POLICY



- $\Uparrow$g* $\longrightarrow$ strong MP channel: $\Uparrow R^{ECB} >$ Trade channel
- Thus, best coordination policy is joint consolidation.