Who Is Afraid of Eurobonds?

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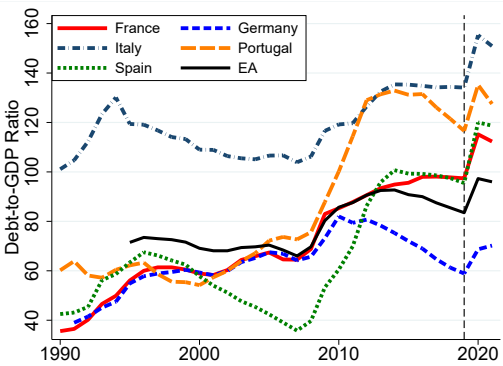
Where Does the Euro Area Stand?

- More countries in EA have now elevated government debt



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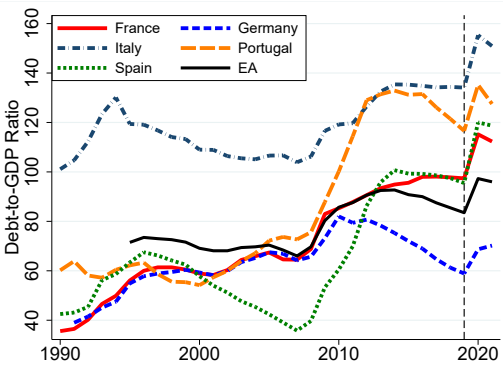
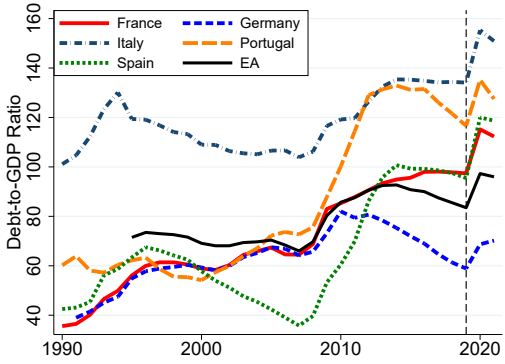
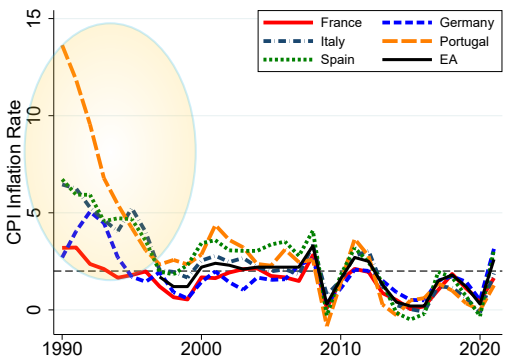
- Fiscal adjustments required by current fiscal framework pose serious challenge to macroeconomic stability of the EA



Where Does the Euro Area Stand?

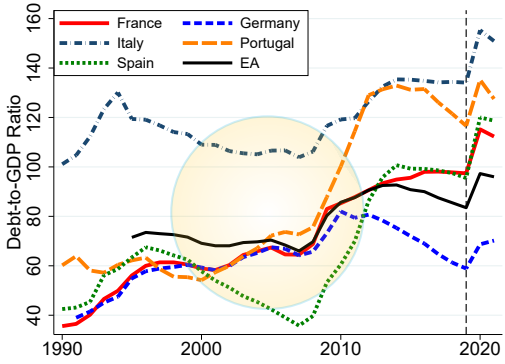
- In the 90s fiscal rules were introduced to get convergence across EA countries

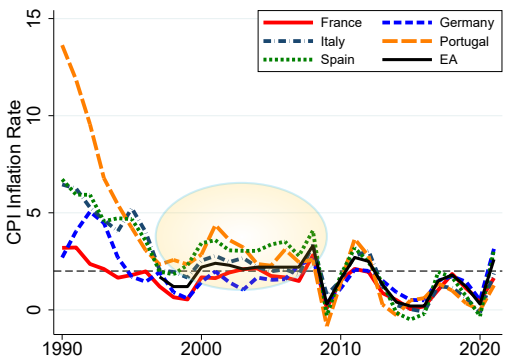




Where Does the Euro Area Stand?

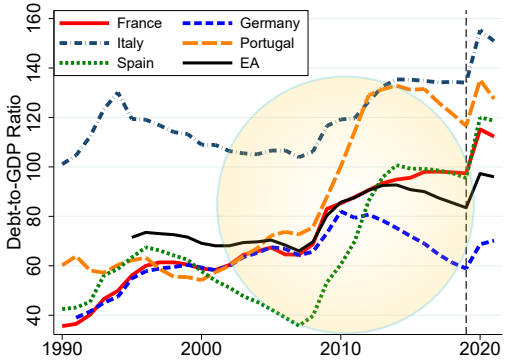
- The fiscal rules worked well in the 2000s...

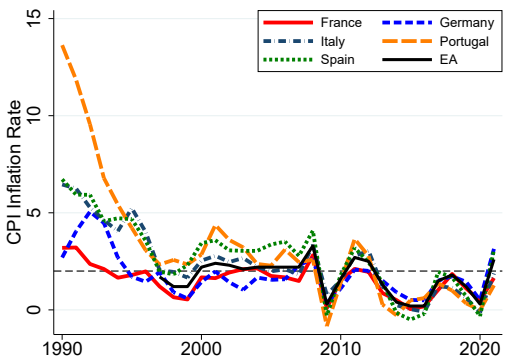




Where Does the Euro Area Stand?

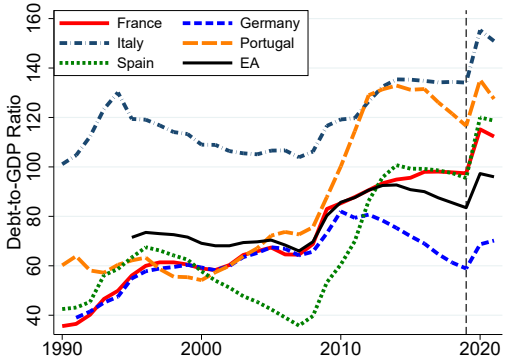
- ...but when Great Recession hit, debt accumulated tremendously

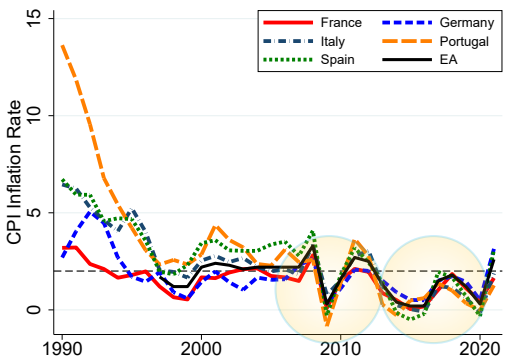




Where Does the Euro Area Stand?

- EA entered a phase of low inflation and ZLB episodes





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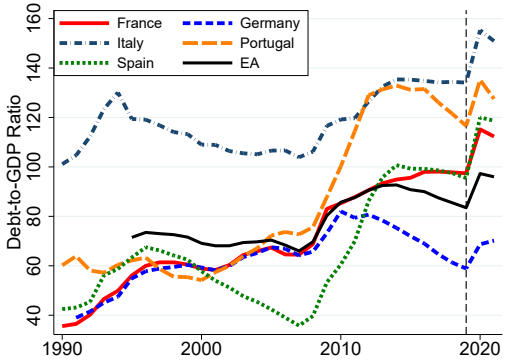
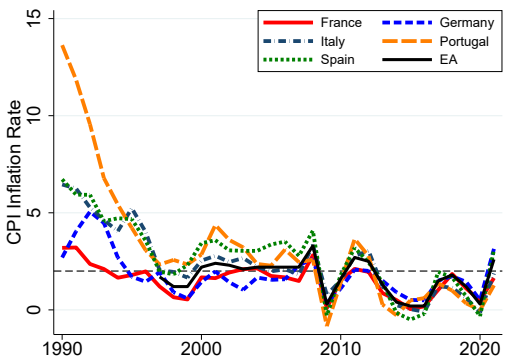
- EA had a sluggish recovery accompanied by high debt and low inflation





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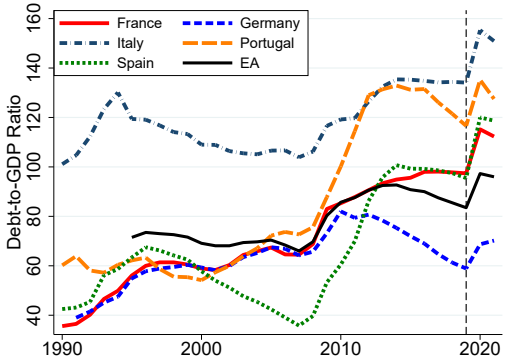
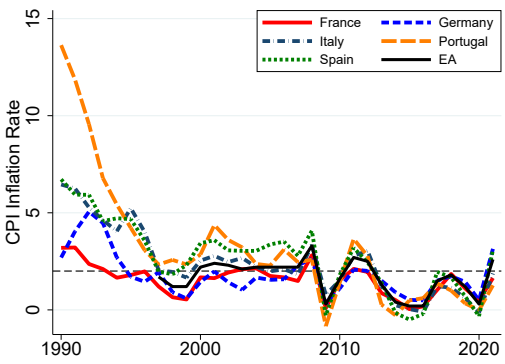
- Pandemic further curtailed the already constrained ability of EA policymakers to stabilize EA economy





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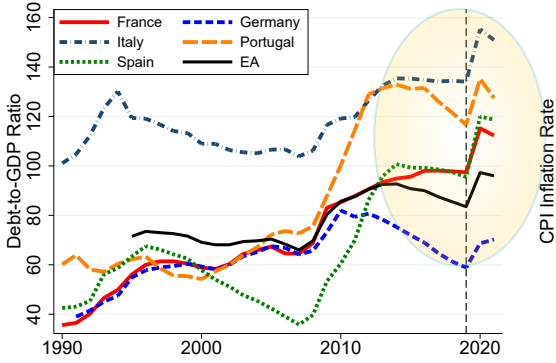
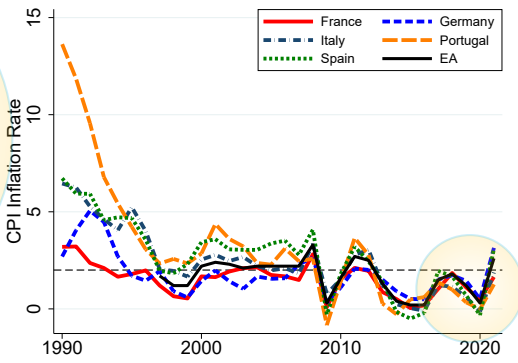
- Fiscal rules were temporarily suspended...





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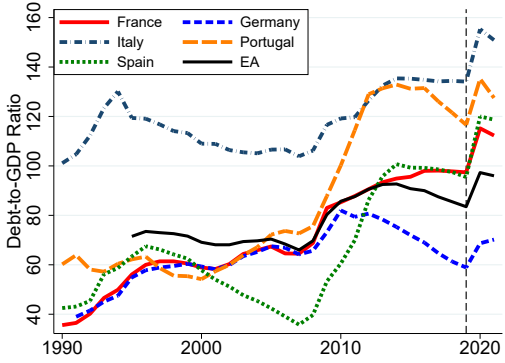
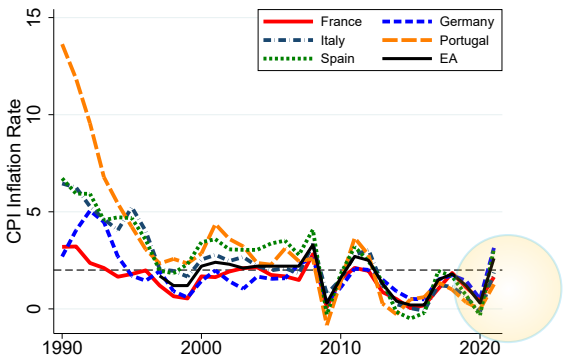
- ...and now inflation is growing





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  3. Decreases the risk of sparking spiral of inflation-recession-debt

Model Overview

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- Fiscal authorities use fiscal instruments: $\tau^L, \tau^K, \tau^C, G, Z$

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Fiscal Discipline

Fiscal authorities follow fiscal rules to stabilise their debts

+ National fiscal rules for $i \in \{IT, DE\}$

$$\hat{\tau}^J_{i,t} = \rho_J \hat{\tau}^J_{i,t-1} + (1-\rho_J)\gamma_{J_i}\hat{s}_{b_i,t-1},$$

$$\hat{g}_{i,t} = \rho_G \hat{g}_{i,t-1} - (1-\rho_G)\gamma_{G_i}\hat{s}_{b_i,t-1}$$

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$J \in \{C, L, K\}$ and $\hat{s}_{i,t} = \hat{b}_{i,t} - \hat{y}_{i,t}$ national debt-to-GDP ratio

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+ EA fiscal rules

$$\hat{\tau}^J_{EA,t} = \rho_J \hat{\tau}^J_{EA,t-1} + (1-\rho_J)\gamma_J \hat{s}_{bEA,t-1}$$

$$\hat{z}_{EA,t} = \rho_Z \hat{z}_{EA,t-1} - (1-\rho_Z)\gamma_Z \hat{s}_{bEA,t-1} - (1-\rho_Z)\gamma_{ZY}\hat{y}_{EA,t-1}$$

$J \in \{C, L, K\}$ and $\hat{s}_{bEA,t} = \hat{b}_{EA,t} - \hat{y}_{EA,t}$ is EA debt-to-GDP ratio

Fiscal Discipline

+ The EA monetary authority follows a Taylor rule

$$\hat{R}_t = \max\left\{-\ln R^*, \rho_r \hat{R}_{t-1} + (1-\rho_r)\left[\phi_\pi \hat{\pi}_{EA,t} + \phi_y \hat{y}_{EA,t}\right]\right\}$$

  where $\hat{\pi}_{EA,t} = \frac{1}{2}\hat{\pi}_{1,t} + \frac{1}{2}\hat{\pi}_{2,t}$ and $\hat{y}_{EA,t} = \frac{1}{2}\hat{y}_{1,t} + \frac{1}{2}\hat{y}_{2,t}$ are at EA level

+ The Taylor principle is satisfied; i.e., $\phi_\pi > 1$

+ ZLB: sequence of anticipated shocks to unconstrained Taylor rule

Emergency Budget

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Emergency Budget

+ EA fiscal rules ($J \in \{K, L, C\}$)

$$\hat{\tau}^J_{EA,t} = \rho_J \hat{\tau}^J_{EA,t-1} + (1-\rho_J)\left[\gamma_J \hat{s}^P_{EA,t-1} + \gamma^A_J \underbrace{\left(\hat{s}_{EA,t-1} - \hat{s}^P_{EA,t-1}\right)}_{\text{new Eurobonds}}\right]$$

$$\hat{z}_{EA,t} = \rho_Z \hat{z}_{EA,t-1} - (1-\rho_Z)\left\{\left[\gamma_Z \hat{s}^P_{EA,t-1} + \gamma^A_Z \underbrace{\left(\hat{s}_{EA,t-1} - \hat{s}^P_{EA,t-1}\right)}_{\text{new Eurobonds}}\right] + \gamma_{ZY}\hat{y}_{EA,t-1}\right\}$$

where $\gamma_J \geq \beta^{-1} - 1 \geq \gamma^A_J = 0$

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$\hat{s}^P_{EA,t-1}$ is Eurobonds to output ratio IF no symmetric recessionary shock

Emergency Budget

+ EA monetary authority tolerates increase in inflation to stabilise amount of Eurobonds due to EA symmetric recession

$$\hat{R}_t = \max\left\{ -\ln R_*, \rho_R \hat{R}_{t-1} + (1-\rho_R)\left[\phi_\pi \hat{\pi}^P_{EA,t} + \phi^P_\pi \underbrace{\left(\hat{\pi}_t - \hat{\pi}^P_{EA,t}\right)}_{\substack{\text{inflation} \\ \text{to stabilise Eurobonds}}} + \phi_y \hat{y}_{EA,t} \right] \right\}$$

with $\phi_\pi > 1 > \phi^P_\pi = 0$

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with $\phi_\pi > 1 > \phi^P_\pi = 0$

+ How do we pin $\hat{s}^P_{EA,t}$ and $\hat{\pi}^P_{EA,t}$ down?

Emergency Budget

We construct a **counterfactual economy** where:

+ Symmetric recessionary shocks are shut down
+ The ZLB never binds
+ Policymakers follow Fiscal Discipline

Our Exercise

+ Recession induced through one standard deviation risk-premium shock
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  - Volatility: Match output volatility over 1999Q1-2019Q4

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  - Country 1 (Italy): annual debt-to-GDP 134.8%
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+ Compare:
  1. **Fiscal discipline**
  2. **Emergency budget**

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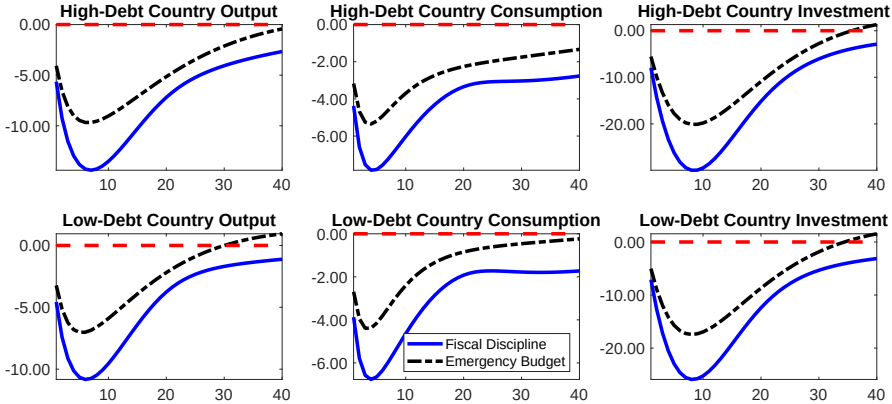
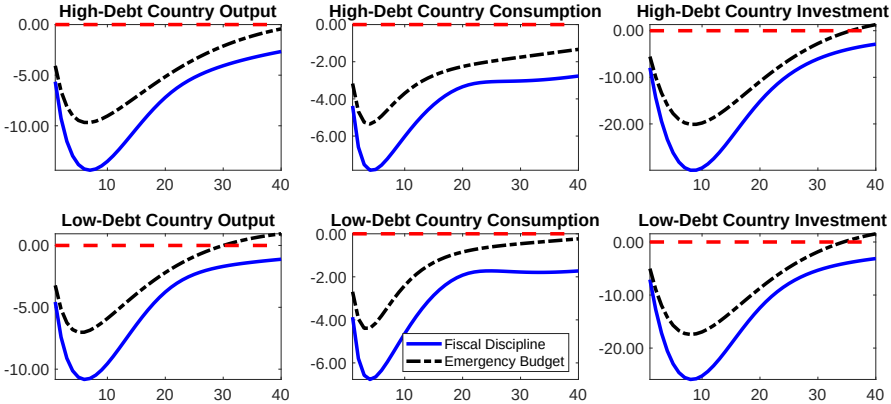
Facing a Recession

- Fiscal discipline in response to shock costly for both countries



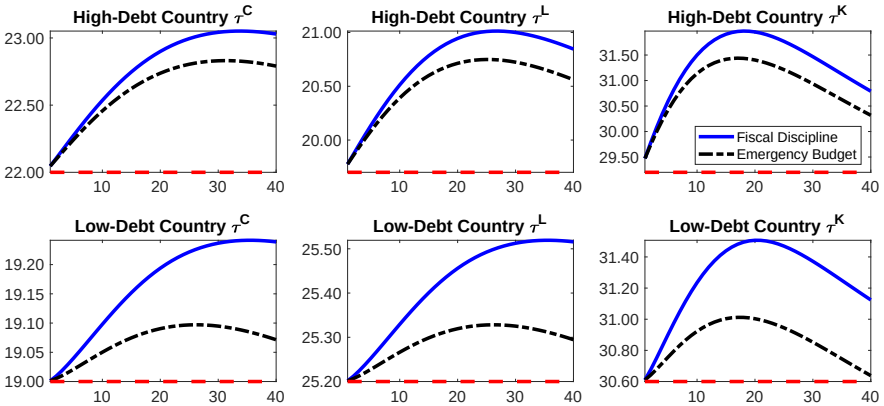
Facing a Recession

- Using EA emergency budget mitigates recession in both countries



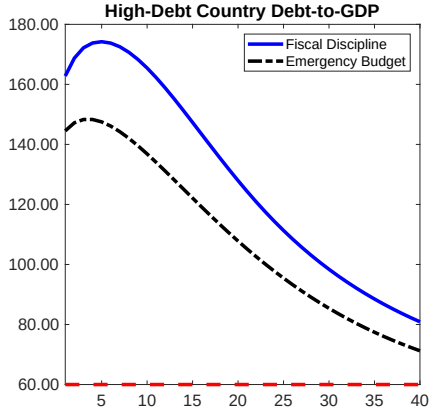
Facing a Recession

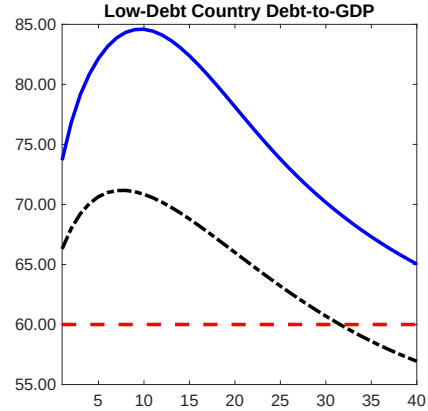
- Less fiscal adjustment is needed at national level under emergency budget



Facing a Recession

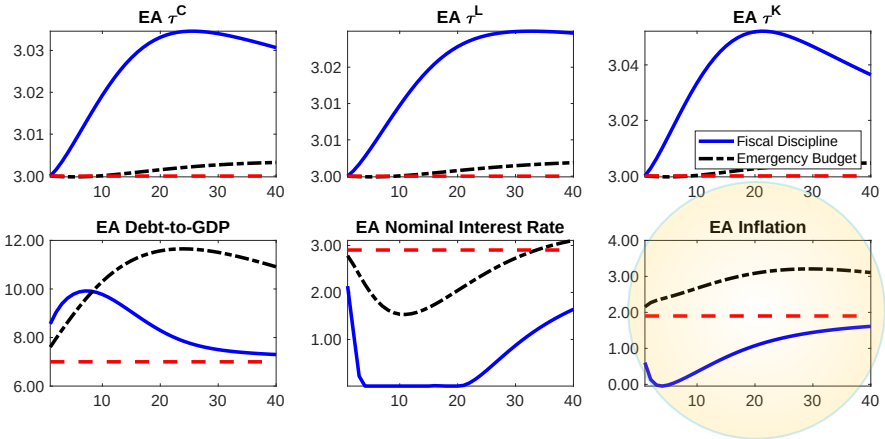
- EA emergency budget lowers national debt-to-GDP





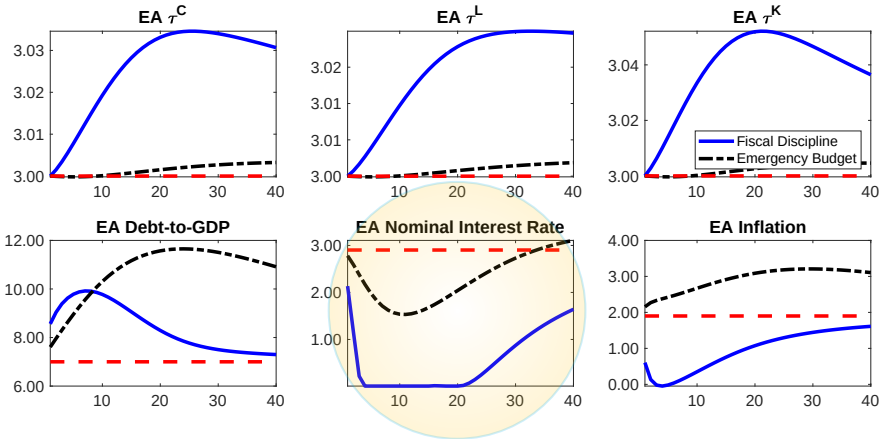
Facing a Recession

- Moderate increase in inflation → controlled reflation of the economy



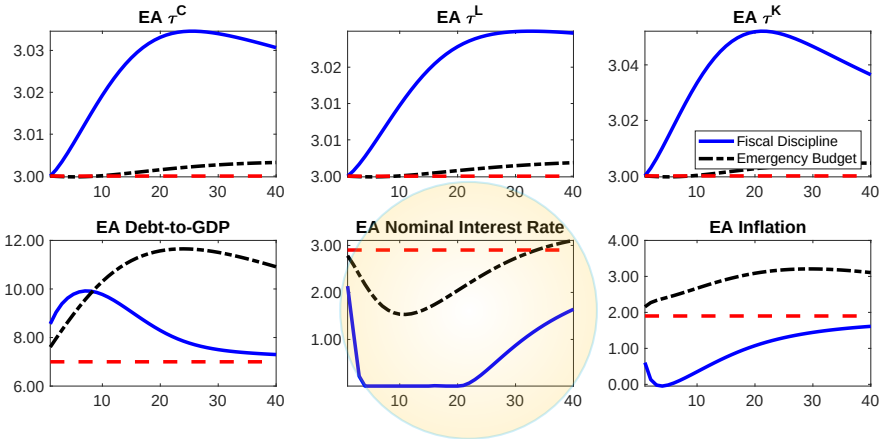
Facing a Recession

- Higher nominal rates lower the risk of hitting the ZLB $\rightarrow$ frequency of ZLB falls



Facing a Recession

- Central bank can even escape the ZLB



Emergency Budget, Real Activity, and Inflation

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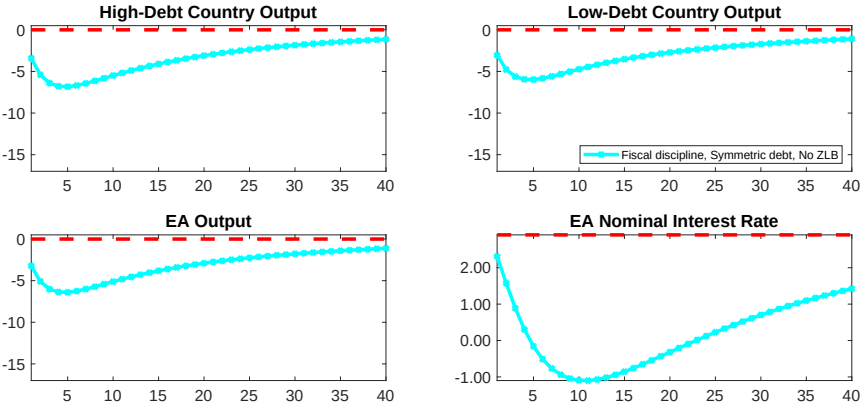
  - Fiscal discipline still maintained at national level

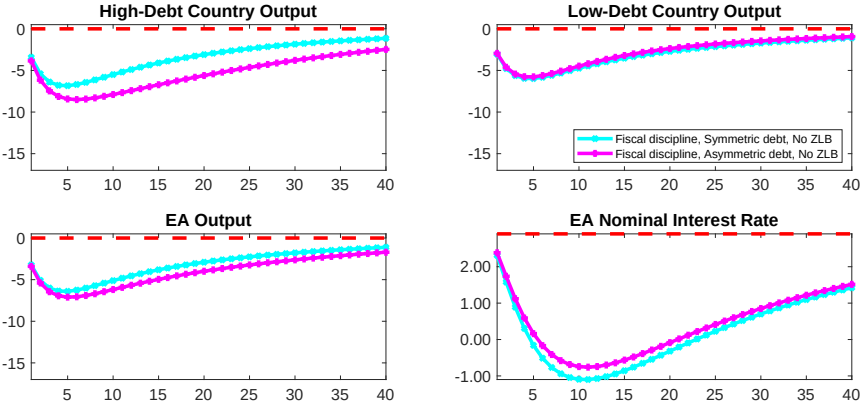
Why Does the EA Need Monetary and Fiscal Coordination?

- When monetary policy unconstrained, it is effective stabilisation tool



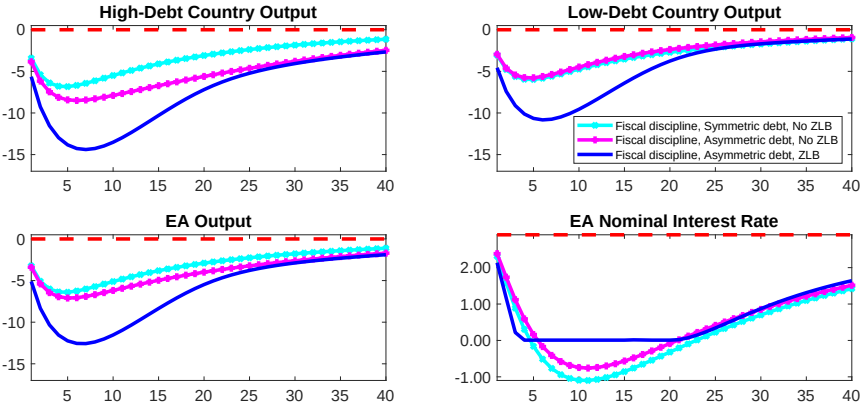
Why Does the EA Need Monetary and Fiscal Coordination?

- Large national debt matters somewhat for recovery under fiscal discipline



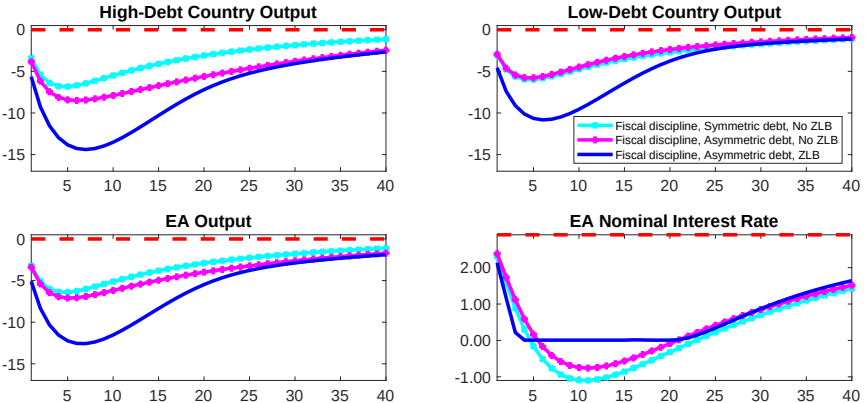
Why Does the EA Need Monetary and Fiscal Coordination?

- If ZLB binds, lack of stabilisation tools for high-debt countries under fiscal discipline



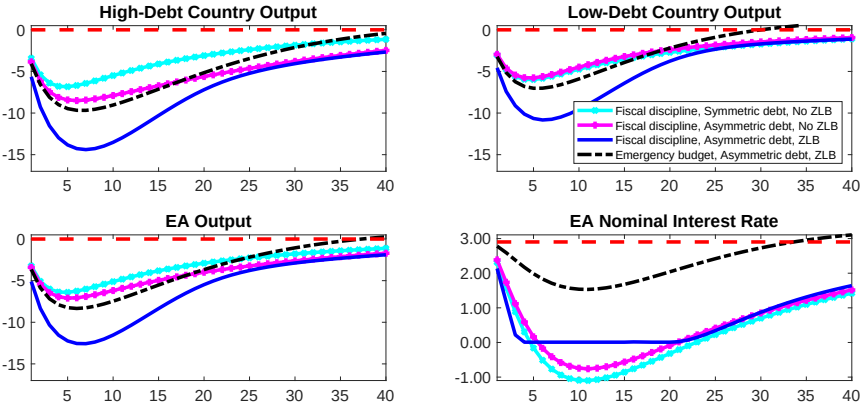
Why Does the EA Need Monetary and Fiscal Coordination?

- Very costly, also for low-debt countries because EA heavily integrated



Why Does the EA Need Monetary and Fiscal Coordination?

- Scope for Eurobonds as stabilisation tool if ZLB binds and large national debt



Welfare Implications

Volatilities	Fiscal Discipline	Emergency Budget
Euro Area Output	16.797	11.707
Euro Area Inflation	0.617	0.427
High-Debt Country Output	18.103	12.273
High-Debt Country Inflation	0.640	0.426
Low-Debt Country Output	15.516	11.147
Low-Debt Country Inflation	0.640	0.426
ZLB Frequency	0.210	0.089

Table: Volatilities of Output and Inflation for 1000 simulations of 40 periods under *Fiscal Discipline* and *Emergency Budget*.

What if the High-Debt Country Abandons Fiscal Discipline?

Lack of stabilization tools in high-debt country leads the national government of this country to refuse to comply with the fiscal rules

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The transition matrix Q of these three policy regimes is the following:

$$Q = \begin{pmatrix} p^{MM} & (1 - p^{FC} - p^{FF}) & 0 \\ (1 - p^{MM} - p^{MC}) & p^{FF} & 1 - p^{CC} \\ p^{MC} & p^{FC} & p^{CC} \end{pmatrix}$$

What if the High-Debt Country Abandons Fiscal Discipline?

+ Period of conflict between high-debt country fiscal authority and monetary authority

Parameter	Description	Fiscal Discipline	Emergency Budget	Conflict
ϕ_π	Monetary response to π_{EA}	1.89	0.9	1.89
$\gamma_{J,IT}$	Fiscal response for IT	0.11	0.11	0.001
$\gamma_{J,DE}$	Fiscal response for DE	0.11	0.11	0.11
$\gamma_{J,EA}$	Fiscal response for EA	0.11	0.001	0.11

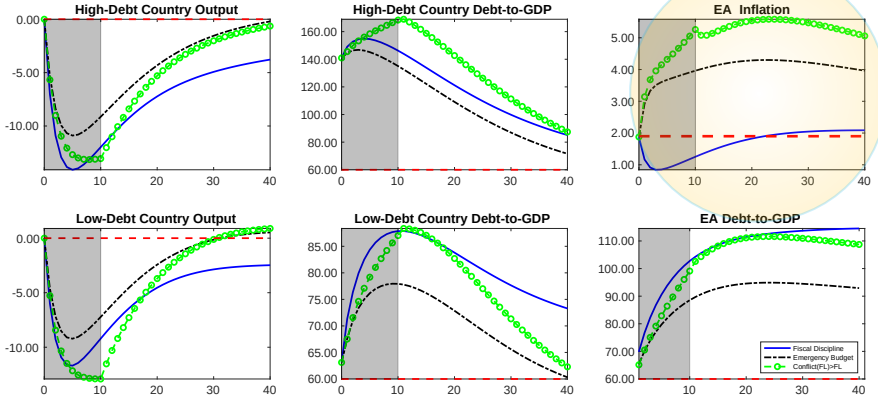
Table: Parameters of monetary and fiscal rules under *Fiscal Discipline*, *Emergency Budget*, *Conflict*.

+ $J \in \{C, L, K, G, Z\}$
+ $\phi_\pi = 1.89$ as estimated in Coenen, Straub, & Trabandt (2013)
+ $\gamma_J = 0.11$, IT debt-to-GDP to bring IT debt back to SS in 15 years under fiscal discipline
+ Transition probabilities across regimes as in Bianchi & Melosi (2019)

▸ matrix

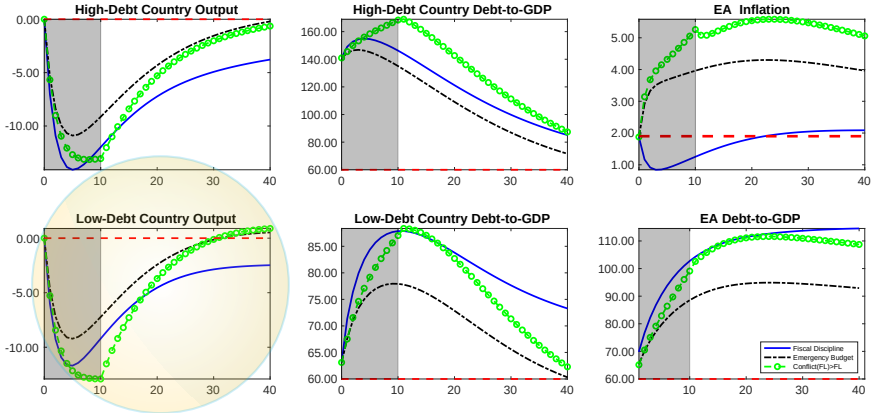
What if the High-Debt Country Abandons Fiscal Discipline?

- Mounting inflationary pressure in the EA



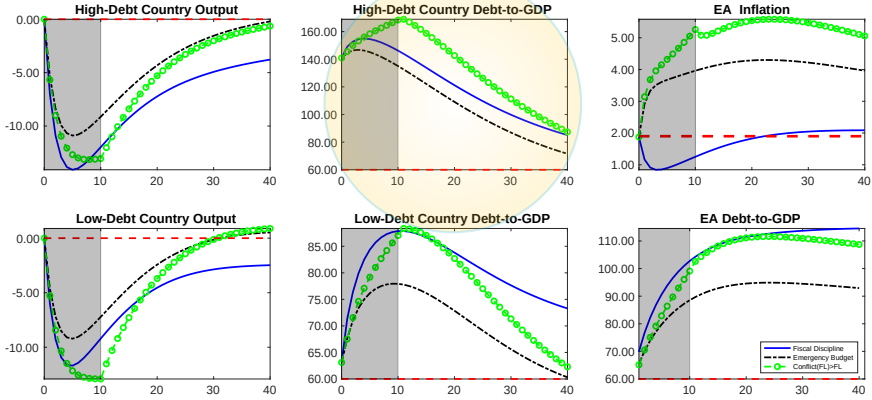
What if the High-Debt Country Abandons Fiscal Discipline?

- Monetary response worsens recession in low-debt country



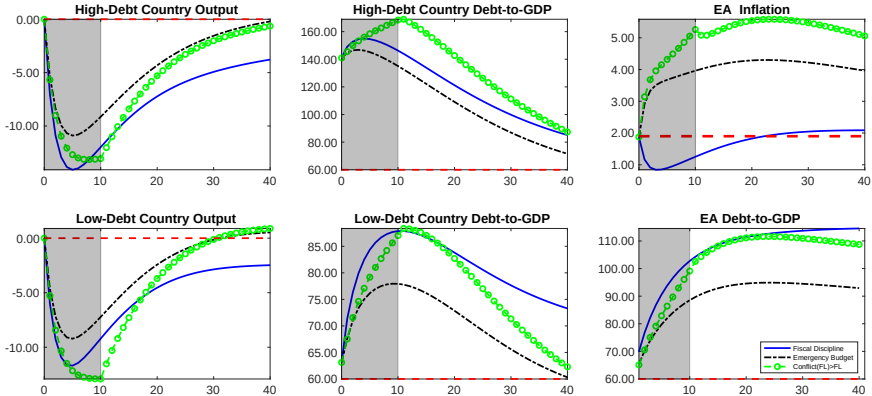
What if the High-Debt Country Abandons Fiscal Discipline?

- Monetary tightening further increases debt-to-GDP in high-debt country



What if the High-Debt Country Abandons Fiscal Discipline?

- Spiral of growing inflation, deeper recession, and debt accumulation



A New Monetary and Fiscal Framework for the EA?

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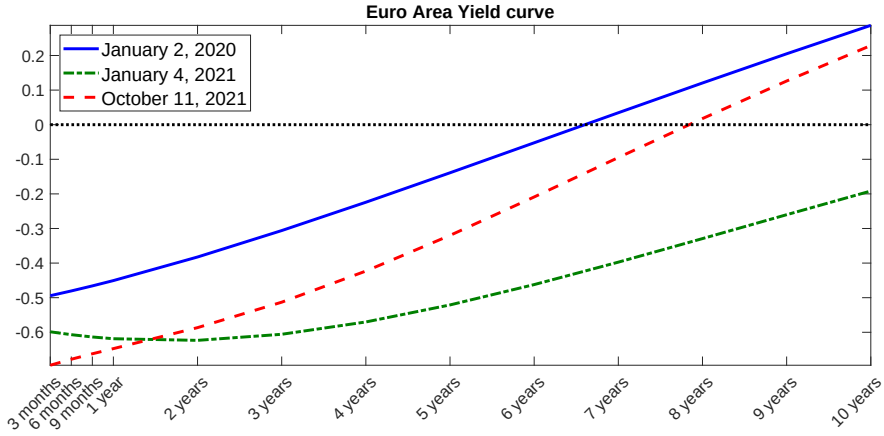
  2. Lowers high-debt country incentive to deviate from fiscal discipline and generate spirals of inflation-recession-debt accumulation

Appendix

Where Does the Euro Area Stand?



- Low and flat term structure considerably constrains monetary policy
- Limited space for the ECB to stabilize the EA economy in recession

Literature

+ Monetary and fiscal policy in currency unions (CU)
  - Beetsma and Jensen (2005), Galí and Monacelli (2008), Ferrero (2009), Nakamura and Steinsson (2014), Farhi and Werning (2017)

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This paper: Monetary-fiscal coordination in CU with Eurobonds

Back

A TANK Model of a Two-country Monetary Union

- Households:
- Final goods firms:
- Intermediate goods firms:
- Labor packers:

A TANK Model of a Two-country Monetary Union

- Households:
  - + savers and hand-to-mouth
  - + value public consumption as a complement to private consumption
  - + if savers, wage setters subject to a Calvo lottery
  - + if savers, invest in physical capital and rent a share to domestic firms
  - + if savers, buy their national debt, Eurobonds, and have access to state-contingent securities

▸ preferences

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- Final goods firms:
  - combine domestic and imported good with CES aggregator
  - sell this good to domestic households

  ▸ final goods

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- Intermediate goods firms:
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  - + price setters subject to a Calvo lottery
  - + sell goods to domestic and foreign final goods firms

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  ▸ interm. goods

- Labor packers:
  - + assemble differentiated labor input supplied by households
  - + sell homogeneous labor to domestic firms in competitive market

  ▸ labor packers

Policy Authorities

- National governments
- EA fiscal authority
- EA monetary authority

back

Policy Authorities

- National governments
  - + issue national debts with a maturity structure to domestic savers
  - + levy distortionary taxes on domestic households
  - + purchase goods and transfer resources to domestic households

$$P_t^B B_t + \tau_t^K R_t^K K_t + \tau_t^L W_t L_t + \tau_t^C P_t^C C_t = (1 + \rho P_t^B) B_{t-1} + P_t^C G_t + P_t^C Z_t$$

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  - + transfers resources to home and foreign country's households

$$P_t^{B,EA} B_t^{EA} + \tau_t^{EA,K}(R_t^K K_t + R_t^K K_t^*) + \tau_t^{EA,L}(W_t L_t + W_t^* L_t^*)$$
$$+\tau_t^{EA,C}(P_t^C C_t + P_t^{C*} C_t^*) = (1 + \rho_{EA} P_t^{B,EA}) B_{t-1}^{EA} + P_t^C Z_t + P_t^{C*} Z_t^*$$

- EA monetary authority

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$$\begin{aligned} P_t^{B,EA} B_t^{EA} + \tau_t^{EA,K} (R_t^K K_t + R_t^K K_t^*) + \tau_t^{EA,L} (W_t L_t + W_t^* L_t^*) \\ + \tau_t^{EA,C} (P_t^C C_t + P_t^{C*} C_t^*) = (1 + \rho_{EA} P_t^{B,EA}) B_{t-1}^{EA} + P_t^C Z_t + P_t^{C*} Z_t^* \end{aligned}$$

- EA monetary authority
  - + sets the interest rate of one-period risk-free bonds $R_t = \frac{1}{E_t Q_{t,t+1}}$

back

Final Goods Firms

+ Final good produced combining C_t^H and C_t^F with technology

$$Q_t^C = \left[(1-\nu_c)^{\frac{1}{\mu_c}} C_t^{H\,\frac{\mu_c-1}{\mu_c}} + \nu_c^{\frac{1}{\mu_c}} C_t^{F\,\frac{\mu_c-1}{\mu_c}} \right]^{\frac{\mu_c}{\mu_c-1}}$$

ν_c degree of openness & μ_c elasticity of sub. between H & F goods

- Demand for H and F intermediate goods i and i^* by final consumption good firm:

$$C_t^H(i) = \left[\int_0^1 C_t^H(i)^{\frac{1}{1+\eta_p}} \right]^{1+\eta_p} \quad C_t^F(i) = \left[\int_0^1 C_t^F(i^*)^{\frac{1}{1+\eta_{p,x}}} \right]^{1+\eta_{p,x}}$$

$\eta_p, \eta_{p,x} > 0$ related to the intratemporal elasticities of sub. between the differentiated outputs supplied by the H and F intermediate firms

- Demand for H and F good bundles by final consumption good firm:

$$C_t^H = (1-\nu_C) \left(\frac{P_t^H}{P_t^C} \right)^{-\mu_C} Q_t^C \quad C_t^F = \nu_C \left(\frac{P_t^F}{P_t^C} \right)^{-\mu_C} Q_t^C$$

back

price indices

Intermediate Goods Firms

+ Intermediate goods firms

  - Continuum of monopolistically competitive firms
  - Use technology: $Y_t(i) = K_t(i)^{\alpha}(A_t L_t(i))^{1-\alpha} - A_t\Omega$
  - Calvo-price setters
  - Price indexation: $p_t^H(i) = (\pi_{t-1}^H)^{\chi_P}(\pi^H)^{1-\chi_P} P_{t-1}^H(i)$
  - Face perfectly competitive factor markets for capital and labor

back

Wages

- Both savers and non-savers supply differentiated labor service
- Labor packer produces composite labor $L_t = \left[\int_0^1 L_t(l)^{\frac{1}{1+\eta_w}} dl\right]^{1+\eta_w}$
- Profit maximisation yields labor demand $L_t(l) = L_t \left(\frac{W_t(l)}{W_t}\right)^{-\frac{1+\eta_w}{\eta_w}}$
- Wage set optimally by savers with prob ω_w
- Wage indexation $W_t(l) = W_{t-1}(l)(\Pi_{t-1} e^{\gamma})^{\chi_w} (\Pi e^{\gamma})^{1-\chi_w}$

back

Households' Preferences

+ Savers
+ Hand-to-mouth

Same preferences

$$\mathcal{U}_t = \left((\ln C_t^*(j) - \tilde{C}_{t-1}^*) - \frac{L_t(j)^{1+\xi}}{1+\xi} \right),$$

where $C_t^*(j) \equiv C_t(j) + \alpha_G G_t$

back

Households' Budget Constraints

- The nominal flow budget constraint for hand-to-mouth $j \in [0, \mu]$

$$P_t^C(1+\tau_t^C+\tau_t^{EA,C})C_t^N(j) = (1-\tau_t^L-\tau_t^{EA,L})\int_0^1 W_t(l)L_t^N(j,l)dl + P_t^C Z_t^N(j)$$

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- The nominal flow budget constraint for saver $j \in (\mu, 1]$

$$P_t^C(1+\tau_t^C+\tau_t^{EA,C})C_t^S(j) + P_t^I I_t(j) + \underbrace{E_t(\frac{Q_{t,t+1}B_{s,t+1}}{\epsilon_t^{rp}})}_{\textbf{AD securities}} + \underbrace{P_t^B B_t(j)}_{\textbf{national bond}} + \underbrace{P_t^{B,EA}B_t^{EA}(j)}_{\textbf{Eurobond}}$$

$$= B_{s,t}(j) + (1+\rho P_t^B)B_{t-1}(j) + (1+\rho P_t^{B,EA})B_{t-1}^{EA}(j)$$

$$+(1-\tau_t^L-\tau_t^{EA,L})\int_0^1 W_t(l)L_t^S(j,l)dl$$

$$+(1-\tau_t^K-\tau_t^{EA,K})R_t^K v_t(j)\bar{K}_{t-1}^S(j) - \psi(v_t)\bar{K}_{t-1}^S + P_t^C Z_t^S(j) + D_t(j)$$

back

Price Indices

$$P_t^C = \left[(1-\nu_c){P_t^H}^{1-\mu_c} + \nu_c {P_t^F}^{1-\mu_c}\right]^{\frac{1}{1-\mu_c}}$$

$$P_t^{C^*} = \left[\nu_c {P_t^{H^*}}^{1-\mu_c} + (1-\nu_c){P_t^{F^*}}^{1-\mu_c}\right]^{\frac{1}{1-\mu_c}}$$

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Calibration

National fiscal parameters:

+ Steady state and persistence of tax rates: EC, DG Taxation and Customs Union

Calibration

National fiscal parameters:

+ Steady state and persistence of tax rates: EC, DG Taxation and Customs Union
+ Steady-state and persistence of G and Z: Eurostat

Calibration

National fiscal parameters:

- + Steady state and persistence of tax rates: EC, DG Taxation and Customs Union
- + Steady-state and persistence of G and Z: Eurostat
- + Steady-state national debt-to-GDP: 60%

Calibration

National fiscal parameters:

- Steady state and persistence of tax rates: EC, DG Taxation and Customs Union
- Steady-state and persistence of G and Z: Eurostat
- Steady-state national debt-to-GDP: 60%
- Debt response for fiscal instruments: high-country debt-to-GDP back to steady-state in 15 years

Calibration

National fiscal parameters:

- Steady state and persistence of tax rates: EC, DG Taxation and Customs Union
- Steady-state and persistence of G and Z: Eurostat
- Steady-state national debt-to-GDP: 60%
- Debt response for fiscal instruments: high-country debt-to-GDP back to steady-state in 15 years

EA fiscal parameters:

- Steady-state of tax rates: 3%

Calibration

National fiscal parameters:

- Steady state and persistence of tax rates: EC, DG Taxation and Customs Union
- Steady-state and persistence of G and Z: Eurostat
- Steady-state national debt-to-GDP: 60%
- Debt response for fiscal instruments: high-country debt-to-GDP back to steady-state in 15 years

EA fiscal parameters:

- Steady-state of tax rates: 3%
- Steady-state of Z: Eurostat

Calibration

National fiscal parameters:

- Steady state and persistence of tax rates: EC, DG Taxation and Customs Union
- Steady-state and persistence of G and Z: Eurostat
- Steady-state national debt-to-GDP: 60%
- Debt response for fiscal instruments: high-country debt-to-GDP back to steady-state in 15 years

EA fiscal parameters:

- Steady-state of tax rates: 3%
- Steady-state of Z: Eurostat
- Steady-state EA debt-to-GDP: 7%

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Calibration I

Parameter	Description	Value	Target/Source
Preferences			
β	Discount factor	0.999	Annual SS real rate of 1.35%
ξ	Inverse Frisch elasticity	2	Coenen et al. (2013)
θ	Habit in formation	0.59	Coenen et al. (2013)
α^G	Substitutability of private vs. gov. consumption	-0.24	Leeper et al. (2017)
Frictions and technology			
μ	Share of hand-to-mouth households	0.11	Leeper et al. (2017)
α	Elasticity in production function	0.33	SS share of labour income in total output of 70%
δ	Capital depreciation rate	0.025	Implies annual depreciation of 10%
s	Investment adjustment cost	5.56	Coenen et al. (2013)
ψ	Capital utilization cost	0.16	Leeper et al. (2013)
ω_p	Price Calvo parameter	0.93	Coenen et al. (2013)
ω_w	Wage Calvo parameter	0.78	Coenen et al. (2013)
χ_p	Price indexation	0.38	Coenen et al. (2013)
χ_w	Wage indexation	0.54	Coenen et al. (2013)
η_p	Price markup	0.163	Leeper et al. (2013)
η_w	Wage markup	0.286	Leeper et al. (2013)
$\nu_{C,IT}$	Degree of openness for IT	0.205	Albonico et al. (2019)
$\nu_{C,DE}$	Degree of openness for DE	0.261	Albonico et al. (2019)
$\mu_{C,IT}$	Elasticity of sub. between IT & DE	1.130	Albonico et al. (2019)
$\mu_{C,DE}$	Elasticity of sub. between DE & IT	1.300	Albonico et al. (2019)

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Calibration II

Parameter	Description	Value	Target/Source
Monetary authority			
ϕ_π	Interest rate response to EA inflation	1.89	Coenen et al. (2013)
ϕ_y	Interest rate response to EA output	0.16	Coenen et al. (2013)
ρ_r	Interest rate smoothing	0.88	Coenen et al. (2013)
Risk Premium Shock			
ρ	Persistence of shock	0.96	Match average EABCN peak-to-trough
σ	Volatility of shock	0.011	Match output volatility over 1999Q1-2019Q4

Table: Calibrated values for model parameters and steady-state targets.

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Calibration III

Parameter	Description	Value	Target/Source
Steady-state calibration targets			
$s_{b,IT}$	Quarterly debt-to-GDP in IT	2.4	Annualized 60%, Maastricht Treaty parameter
$s_{b,DE}$	Quarterly debt-to-GDP in DE	2.4	Annualized 60%, Maastricht Treaty parameter
$s_{b,EA}$	Quarterly debt-to-GDP in EA	0.28	Annualized 7%
$s_{gc,IT}$	Gov. expenditure-to-GDP ratio IT	0.187	Quarterly average in 2019, Eurostat
$s_{gc,DE}$	Gov. expenditure-to-GDP ratio DE	0.205	Quarterly average in 2019, Eurostat
τ^L_{IT}	Steady-state tax rate on labor IT	19.7%	EC, DG Taxation and Customs Union, 2018
τ^L_{DE}	Steady-state tax rate on labor DE	25.2%	EC, DG Taxation and Customs Union, 2018
τ^L_{EA}	Steady-state tax rate on labor EA	3%	
τ^K_{IT}	Steady-state tax rate on capital IT	29.2%	EC, DG Taxation and Customs Union, 2018
τ^K_{DE}	Steady-state tax rate on capital DE	30.6%	EC, DG Taxation and Customs Union, 2018
τ^K_{EA}	Steady-state tax rate on capital EA	3%	
τ^C_{IT}	Steady-state tax rate on cons. IT	22%	EC, DG Taxation and Customs Union, 2018
τ^C_{DE}	Steady-state tax rate on cons. DE	19%	EC, DG Taxation and Customs Union, 2018
τ^C_{EA}	Steady-state tax rate on cons. EA	3%	
Debt maturities			
ρ_{IT}	Debt maturity decay rate IT	0.963	Target yearly average maturity of 6.87 in 2019
ρ_{DE}	Debt maturity decay rate DE	0.964	Target yearly average maturity of of 5.94 in 2010
ρ_{EA}	Debt maturity decay rate EA	0.958	Target yearly average maturity of 6.6 in 2010

Table: Calibrated values for model parameters and steady-state targets. Back

Calibration IV

Parameter	Description	Value	Target/Source
Fiscal authorities			
ρ^L_{IT}	Persistence of τ^L in IT	0.735	Estimated 2004-2020, EC, DG Taxation & Customs Union
ρ^L_{DE}	Persistence of τ^L in DE	0.735	Estimated 2004-2020, EC, DG Taxation & Customs Union
ρ^L_{EA}	Persistence of τ^L in EA	0.726	Estimated 2004-2020, EC, DG Taxation & Customs Union
ρ^K_{IT}	Persistence of τ^K in IT	0.606	Estimated 2006-2018, EC, DG Taxation & Customs Union
ρ^K_{DE}	Persistence of τ^K in DE	0.662	Estimated 2006-2018, EC, DG Taxation & Customs Union
ρ^K_{EA}	Persistence of τ^K in EA	0.502	Estimated 2006-2018, EC, DG Taxation & Customs Union
ρ^C_{IT}	Persistence of τ^C in IT	0.884	Estimated 2000-2020, EC, DG Taxation & Customs Union
ρ^C_{DE}	Persistence of τ^C in DE	0.833	Estimated 2000-2020, EC, DG Taxation & Customs Union
ρ^C_{EA}	Persistence of τ^C in EA	0.895	Estimated 2000-2020, EC, DG Taxation & Customs Union
ρ^G_{IT}	Persistence of G in IT	0.659	Estimated over 2007-2019, Eurostat
ρ^G_{DE}	Persistence of G in DE	0.365	Estimated over 2007-2019, Eurostat
ρ^Z_{IT}	Persistence of transfers rule	0.785	Estimated over 1996-2019, Eurostat
ρ^Z_{DE}	Persistence of transfers rule	0.636	Estimated over 2002-2019, Eurostat
ρ^Z_{EA}	Persistence of transfers rule	0.880	Estimated over 2002-2019, Eurostat
γ^G	Debt response for G	0.11	IT debt-to-GDP to SS in 15 years
γ^Z	Debt response for transfers	0.11	IT debt-to-GDP to SS in 15 years
γ^L	Debt response for τ^L	0.11	IT debt-to-GDP to SS in 15 years
γ^K	Debt response, for τ^K	0.11	IT debt-to-GDP to SS in 15 years
γ^C	Debt response for τ^C	0.11	IT debt-to-GDP to SS in 15 years
ϕ_Y	Automatic stabilizers	0.11	IT debt-to-GDP to SS in 15 years

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Table: Calibrated values for model parameters and steady-state targets.

Calibration V

Transition matrix Q between the four regimes is the following:

$$Q = \begin{pmatrix} p^{MM} & (1 - p^{FC} - p^{FF}) & 0 \\ (1 - p^{MM} - p^{MC}) & p^{FF} & 1 - p^{CC} \\ p^{MC} & p^{FC} & p^{CC} \end{pmatrix}$$

Transition probabilities:

- $p^{MM} = 0.9995$,
- $p^{FF} = 0.9995$,
- $p^{CC} = 0.9$.
- $p^{MC} = p^{FC} = 0$

The conflict is assumed to last 10 quarters

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EU Fiscal Governance

- Maastricht Treaty (1992): establishes fiscal rules
  - 60% debt-to-GDP and 3% deficit limit
  - No bail-out clause and no debt monetization
- Stability and Growth Pact (1997): adds more rigidity
  - Budget position close to balance or in surplus over medium term
  - Excessive deficit procedure if rules are violated
- Reform of Pact (2005): aims to reduce pro-cyclical bias of fiscal rules
  - Rules in cyclically adjusted terms with a medium term objective
- Fiscal compact (2012): reforms the Stability and Growth Pact
  - Establishes a minimum limit for the structural deficit
  - Introduces debt brake
- Stability and Growth Pact suspended by EU on March 23, 2020 until at least 2023