

Who Is Afraid of Eurobonds?

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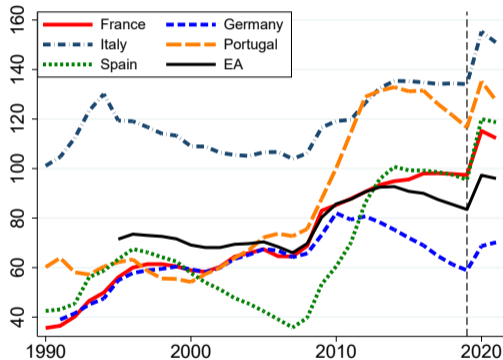
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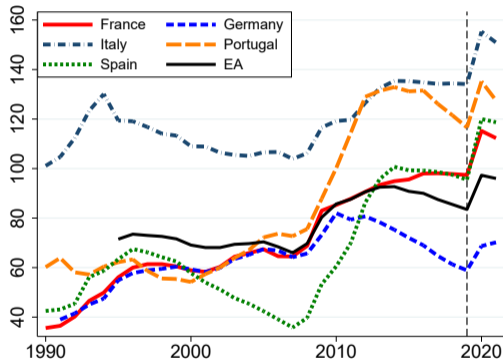
Where Does the Euro Area Stand?

- More countries in EA have now **elevated government debt**



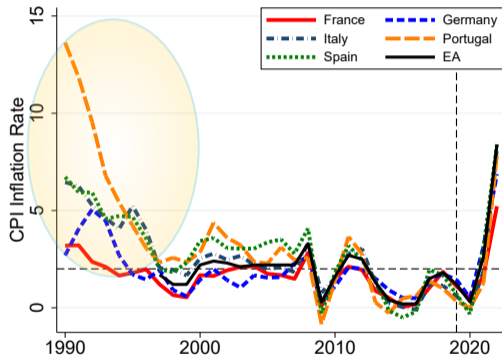
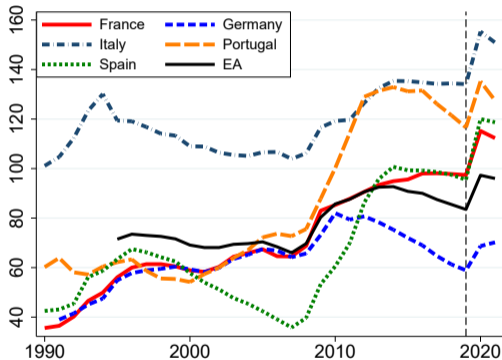
Where Does the Euro Area Stand?

- Fiscal adjustments required at a time in which the Euro Area faces old and new challenges



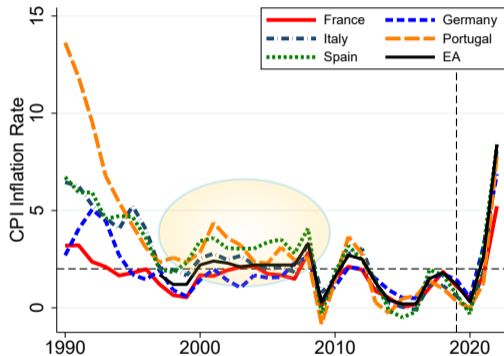
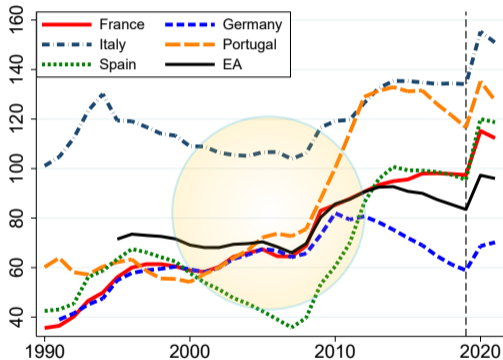
Where Does the Euro Area Stand?

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



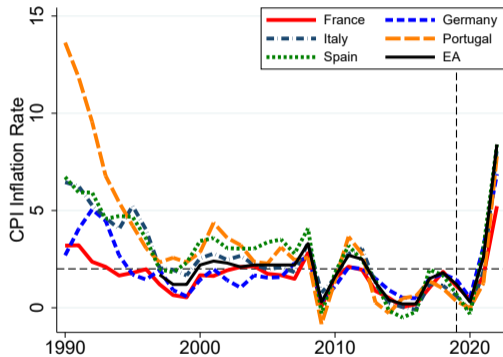
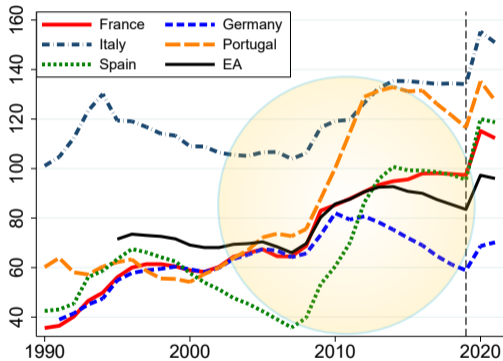
Where Does the Euro Area Stand?

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



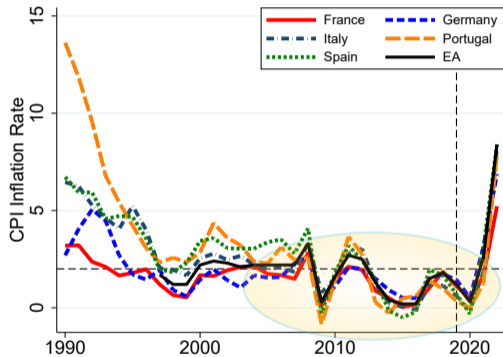
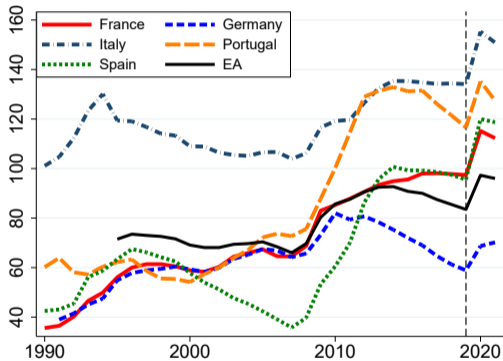
Where Does the Euro Area Stand?

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



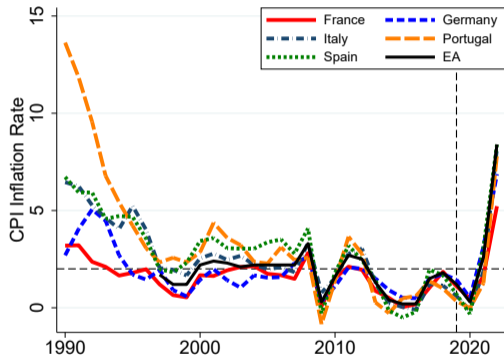
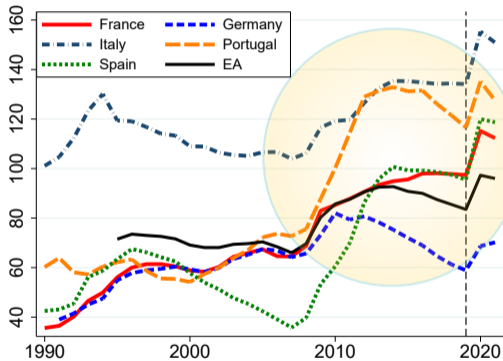
Where Does the Euro Area Stand?

- EA entered a phase of low inflation and ZLB episodes



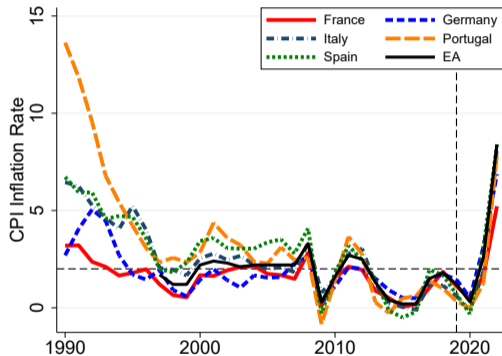
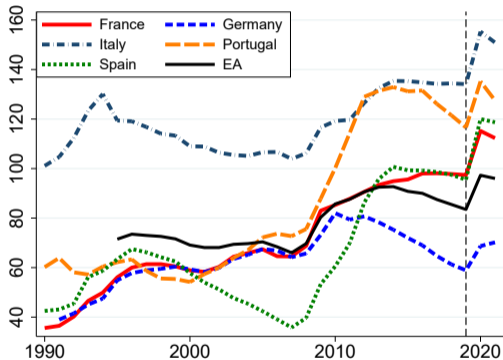
Where Does the Euro Area Stand?

- As a result, EA had a **sluggish recovery** and debt remained elevated



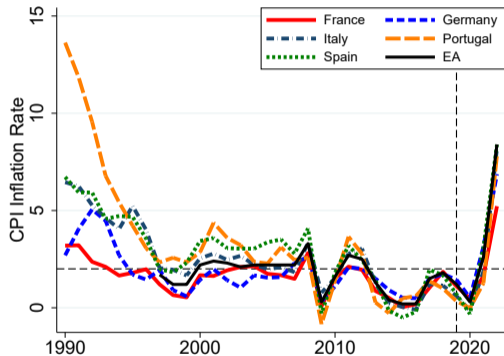
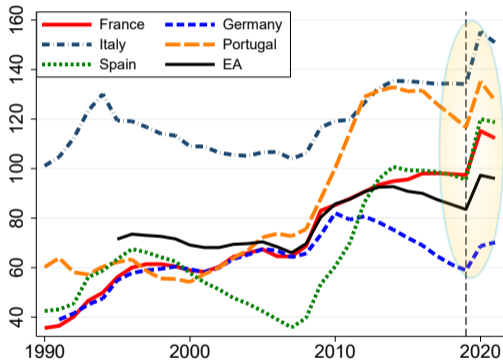
Where Does the Euro Area Stand?

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



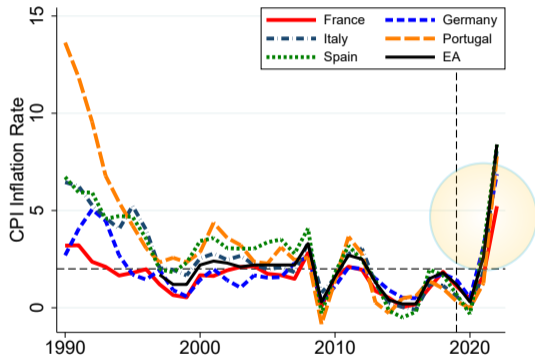
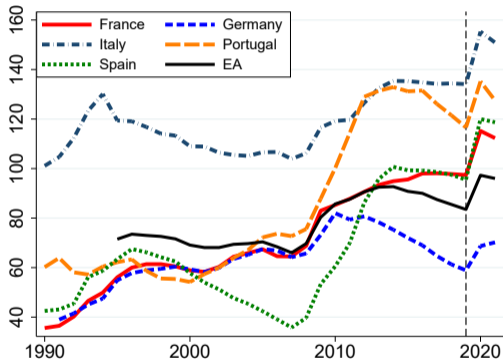
Where Does the Euro Area Stand?

- Fiscal rules were temporarily **suspended**...



Where Does the Euro Area Stand?

- ...and now **inflation** is high



The Euro Area at a Crossroads

In the Euro Area, **policy coordination is hard to achieve**:

- + Hard to implement quick fiscal interventions
- + Hard to guarantee long-run fiscal sustainability
- + Beliefs about future policies matter

Deterioration of fiscal positions and high inflation put Euro Area at crossroads:

- + Reintroduce **old monetary/fiscal framework**. Risk of:
 1. **Deflation** because of the lack of stabilization tools
 2. **High inflation** if fiscal rules are **suspended**
 3. **Fiscal stagflation** if incentives for high debt countries not to comply with fiscal rules
- + Adopt a **new monetary and fiscal framework**

A new policy framework

- + We study a new monetary and fiscal framework that separates the need of **short-run macroeconomic stabilisation** from issue of **long-run fiscal sustainability** of national debts
- + **Strict fiscal rules** do not apply to a **centralized EA Treasury** that implements **stabilization policies** and can issue **Eurobonds** ⇒ Effective response to **typical contractionary shock**
- + EA authorities can **coordinate** their response to an **exceptionally large** shock:
 1. The fiscal authority issues **Eurobonds** to finance the fiscal stimulus
 2. Central bank **tolerates** the rise in inflation needed to stabilise the increase in Eurobonds
 3. National governments fiscally responsible to **stabilise** national debt
⇒ No need to deviate from fiscal rules
- + We build a quantitative two-country monetary union model calibrated to the EA to evaluate **new** vs **old** policy framework

Main Findings

The **new policy framework** based on Eurobonds and a centralized EA Treasury:

- + **Removes the risk of deflation** when **debt is high** and **the ZLB is binding**:
 1. Smaller recessions → less accumulation of national debts → stronger recoveries
 2. Controlled reflation of EA when necessary → easing constraints on monetary policy
 3. Inflation increases modestly because of general equilibrium effects
- + **Removes the risk of high inflation and fiscal stagflation** because fiscal rules are not suspended at the national level:
 1. Reduces the tendency to accumulate higher debt because of better stabilization policies
 2. Lowers the incentives for high-debt country to deviate from following fiscal rules
 3. Decreases the risk of sparking spiral of **inflation-recession-debt**
- + **Improves welfare** in both high-debt and **low-debt countries**

Model Overview

- Two-country currency union model with fiscal policy and public debt
- Backbone: Medium scale NK model
 - + Households consume both domestic and imported goods
 - + Two types of households: savers and hand-to-mouth
 - + Sticky prices
 - + Sticky wages
- Government debt
 - + Each national fiscal authority issues **national bonds**
 - + A centralized EA Treasury issues **Eurobonds**
- Fiscal authorities use fiscal instruments: $\tau^L, \tau^K, \tau^C, G, Z$

▶ more

▶ calib

Three policy scenarios

We consider **three policy scenarios**

- 1 Old policy framework: **Fiscal discipline** always in place
⇒ risk of deflation
- 2 Old policy framework: **Deviation from fiscal discipline**
⇒ risk of inflation and fiscal stagflation
- 3 **New policy framework**
⇒ Stabilization policies separated from long-run fiscal sustainability
⇒ Ability to **coordinate** to avoid ZLB and deflation without sparking high inflation

Summary and parameterization

+ Policy response to a large contractionary shock

Parameter	Description	Fiscal Discipline	New framework	Deviation
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 across policy scenarios.

+ $J \in \{C, L, K, G, Z\}$

+ $\phi_\pi = 1.89$ 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

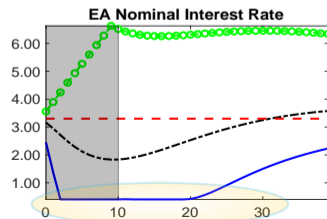
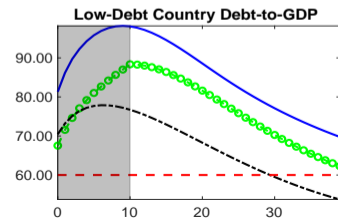
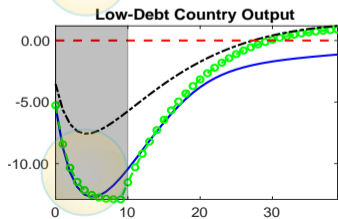
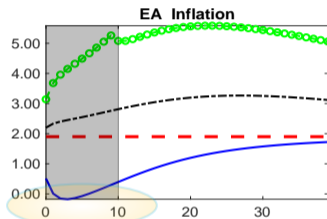
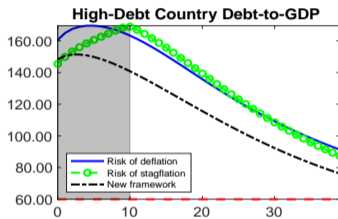
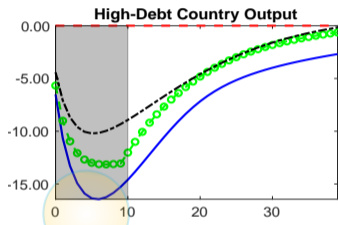
A large contractionary shock

- + Recession induced through large risk-premium shock
 - Persistence: Match average EABCN peak-to-trough
 - Volatility: Match output volatility over 1999Q1-2019Q4
- + Recessionary shock hits when debt-to-GDP away from steady state:
 - Country 1 (Italy): annual debt-to-GDP 134.8%
 - Country 2 (Germany): annual debt-to-GDP 61.9%
- + Compare:
 1. **Fiscal discipline**
 2. **Deviation from fiscal discipline**
 3. **New policy framework**

▶ calibration

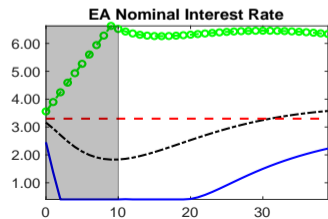
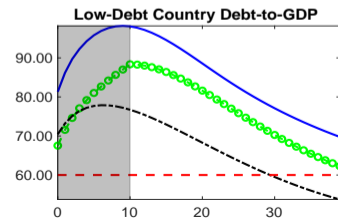
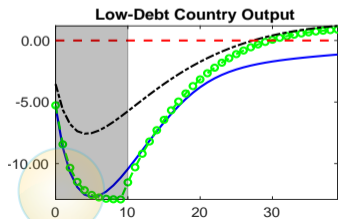
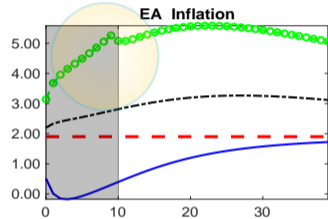
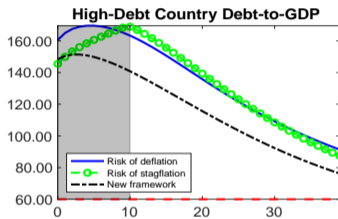
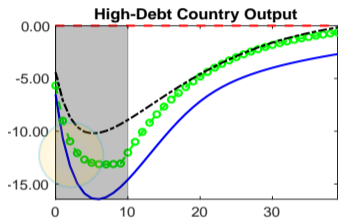
Old policy framework: From risk of deflation to risk of stagflation

- Strict fiscal rules + zero lower bound \Rightarrow Risk of deflation and deep recession



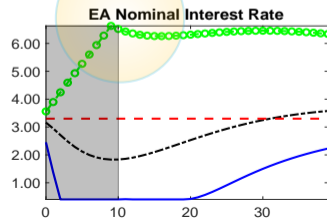
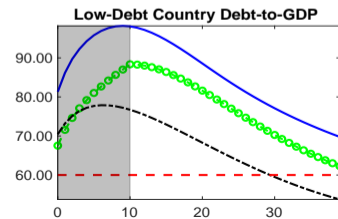
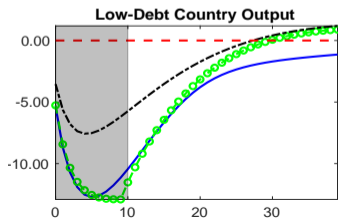
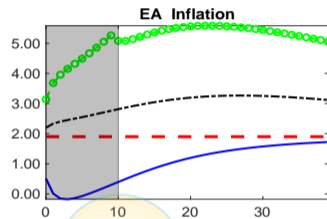
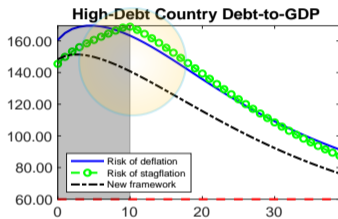
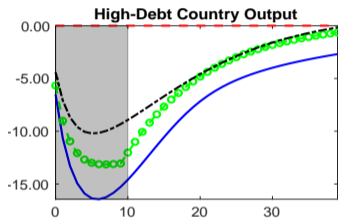
Old policy framework: From risk of deflation to risk of stagflation

- Suspend fiscal rules \Rightarrow Risk of stagflation if one country unwilling to revert to them



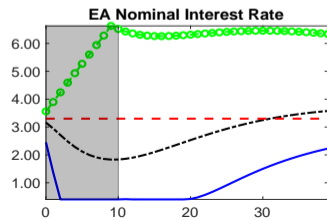
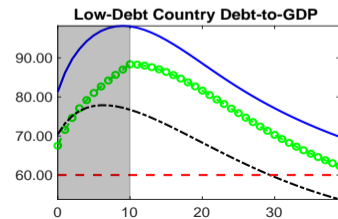
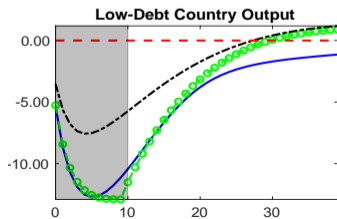
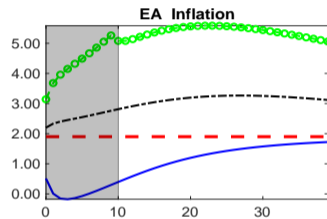
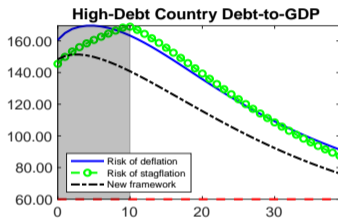
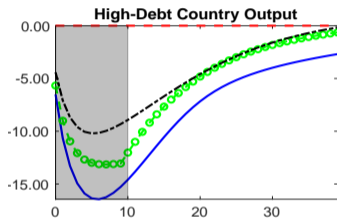
Old policy framework: From risk of deflation to risk of stagflation

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



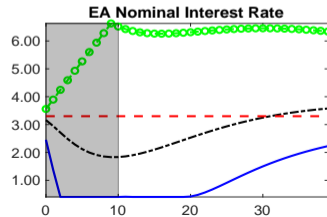
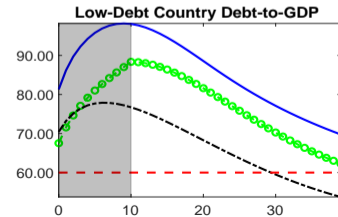
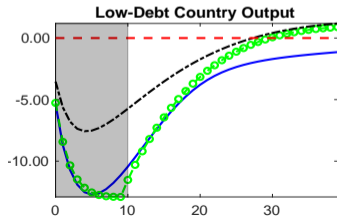
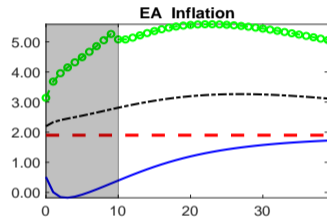
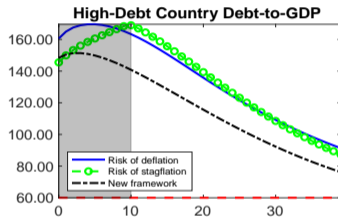
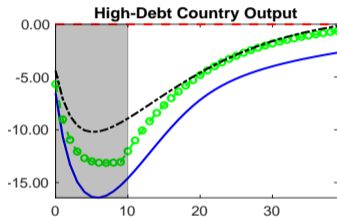
Old policy framework: From risk of deflation to risk of stagflation

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



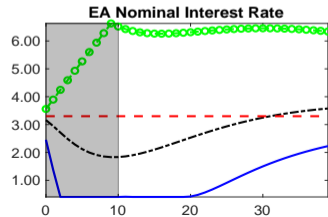
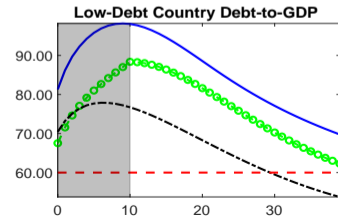
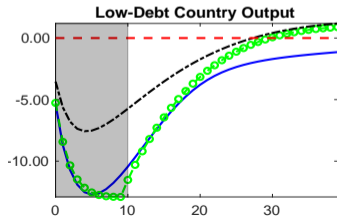
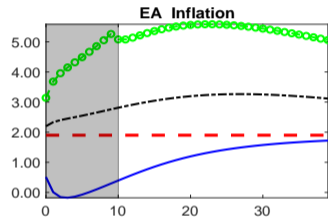
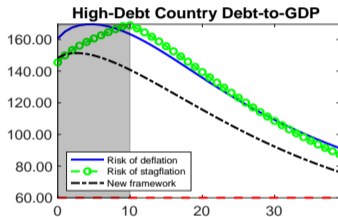
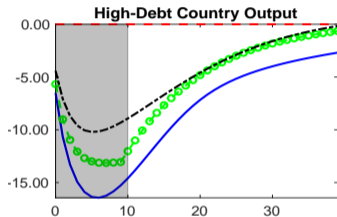
New policy framework: Controlled reflation

- New policy framework based on Eurobonds and EA Treasury eliminates both risks



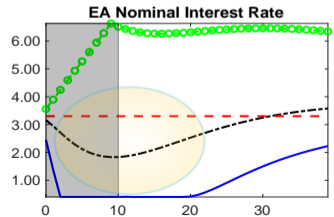
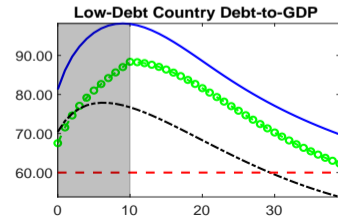
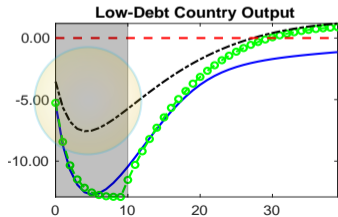
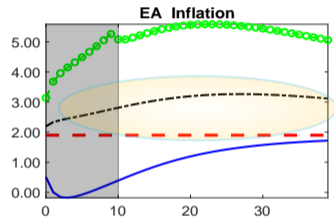
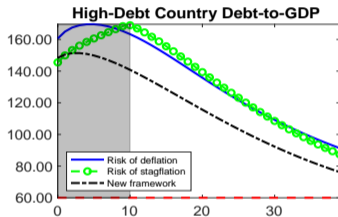
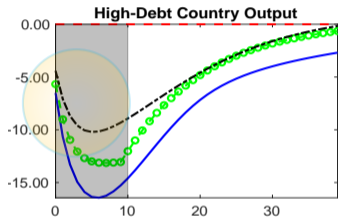
New policy framework: Controlled reflation

- No need to suspend the rule + ability to coordinate policies at ZLB



New policy framework: Controlled reflation

- No ZLB, milder recession, contained increase in inflation

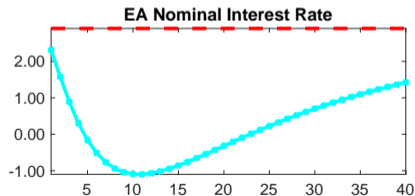
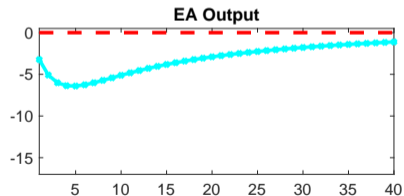
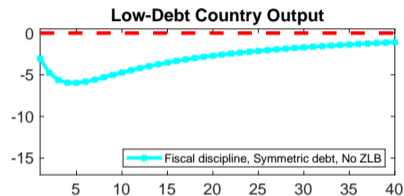
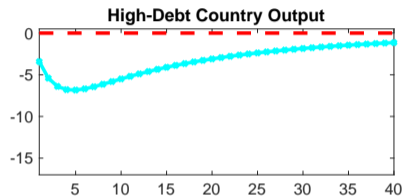


Emergency Budget, Real Activity, and Inflation

- + Emergency Budget mitigates the recession relative to Fiscal Discipline because:
 - Works as **automatic stabilizer** that boosts spending and inflation expectations and lowers real interest rates
 - Increase in amount of Eurobonds caused by fiscal stimulus not backed by expectations of future fiscal adjustments → **fiscal stimulus more effective**
- + Reinforcing effects
 - Economy avoids the ZLB → **monetary policy not constrained**
 - Milder recession → less accumulation of debt → smaller expected fiscal adjustments
- + Only a **moderate** increase in **inflation**
 - GE effect: milder recession needs smaller stimulus and less inflation to stabilise Eurobonds
 - Fiscal discipline still maintained at national level

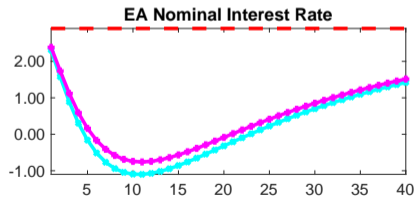
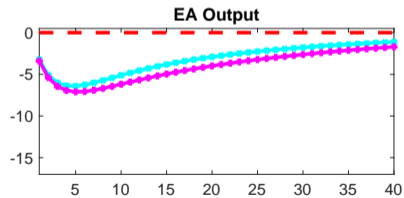
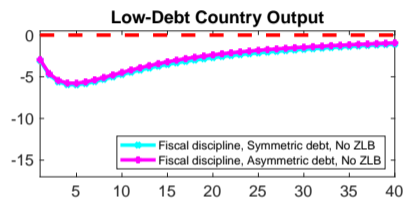
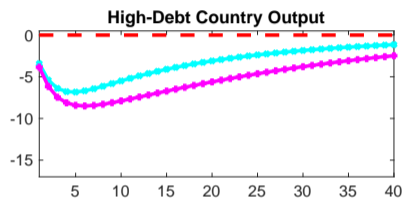
Why Both Countries Benefit from the Policy Reform?

- When monetary policy unconstrained, it is an effective stabilisation tool



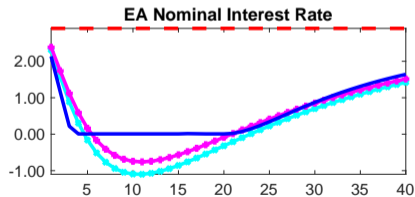
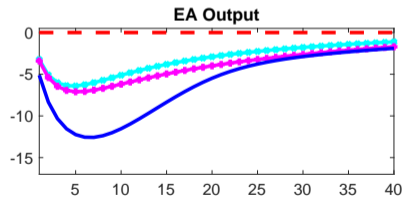
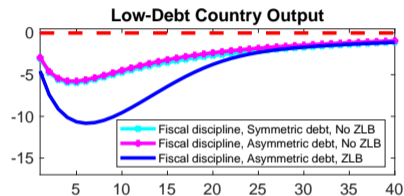
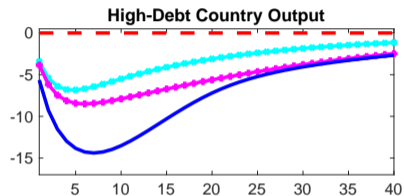
Why Both Countries Benefit from the Policy Reform?

- Large national debt matters somewhat for recovery under fiscal discipline



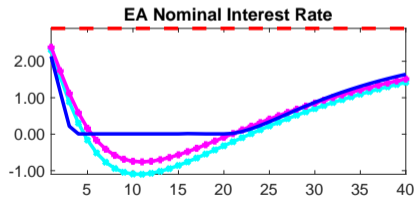
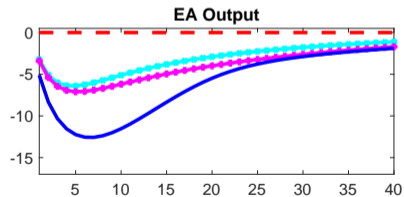
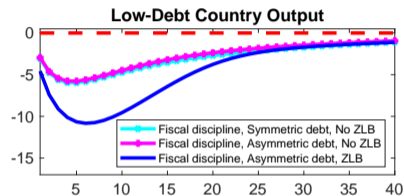
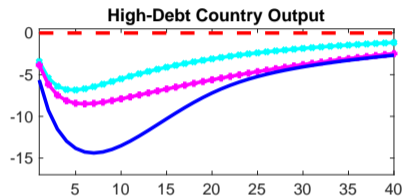
Why Both Countries Benefit from the Policy Reform?

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



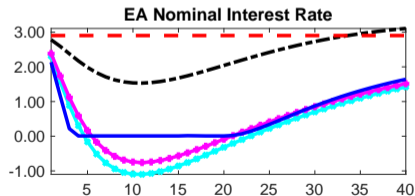
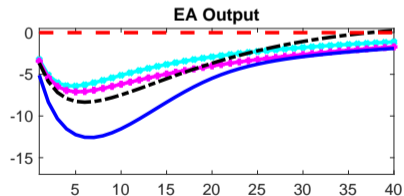
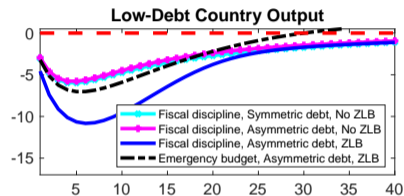
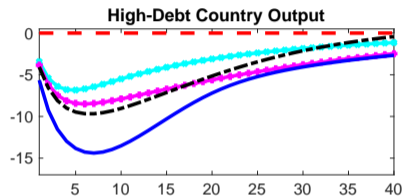
Why Both Countries Benefit from the Policy Reform?

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



Why Both Countries Benefit from the Policy Reform?

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



Welfare Implications

Variables	Old framework	New Framework
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

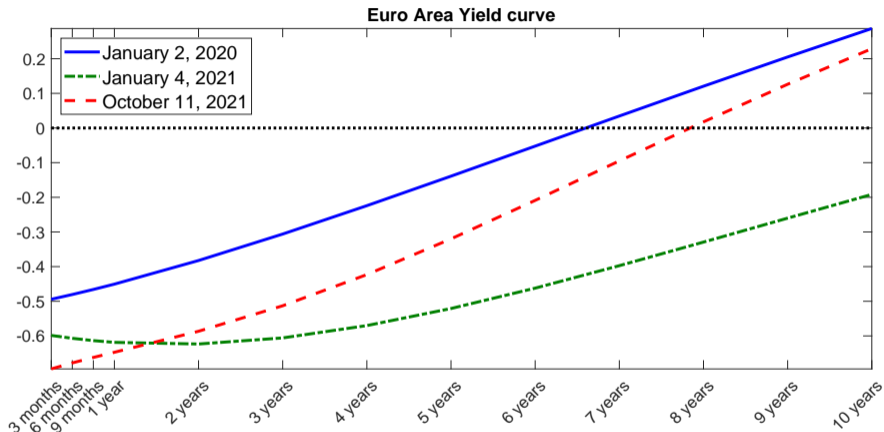
Table: Volatilities of Output and Inflation for 1000 simulations of 40 periods under *Fiscal Discipline* and *Emergency Budget*.

Conclusions

- + Coordination harder to achieve in the Euro Area
 - ① Fiscal rules and ZLB limit stabilization policies if large contractionary shock
 - ② Robust fiscal interventions require suspending fiscal rules
- + Swings between **risk of deflation** and **risk of inflation and stagflation**
- + Need to adopt new framework based on **coordination** and **Eurobonds** that separates:
 - ① The need for **short-run stabilisation** (done at EA level)
 - ② From the issue of **long-run fiscal sustainability** (done at national level)
- + By doing so, the new framework helps **reducing both risks**
- + **New framework welfare improving for both high-debt and low-debt countries**

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)

Literature

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- Beetsma and Jensen (2005), Galí and Monacelli (2008), Ferrero (2009), Nakamura and Steinsson (2014), Farhi and Werning (2017)

+ Fiscal theory of the price level

- Sargent and Wallace (1981), Leeper (1991), Sims, (1994), Woodford, (1994, 1995, 2001); Cochrane (1999, 2001), Bergin (2000), Schmitt-Grohé and Uribe (2020), Jarocinski and Mackowiak (2017), Bianchi and Melosi (2019), Bianchi, Faccini, and Melosi (2020)

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This paper: Monetary-fiscal coordination in CU with Eurobonds

▶ Back

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

▶ bc hh

- Final goods firms:

- Intermediate goods firms:

- Labor packers:

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▶ preferences

- Final goods firms:

- + combine domestic and imported good with CES aggregator
- + sell this good to domestic households

▶ final goods

- Intermediate goods firms:

- Labor packers:

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▶ preferences

- Final goods firms:

- + combine domestic and imported good with CES aggregator
- + sell this good to domestic households

▶ final goods

- Intermediate goods firms:

- + hire labor and rent capital in competitive markets
- + price setters subject to a Calvo lottery
- + sell goods to domestic and foreign final goods firms

▶ interm. goods

- Labor packers:

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- + sell goods to domestic and foreign final goods firms

▶ 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

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

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

- EA fiscal authority

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- EA fiscal authority

- + issues Eurobonds with a maturity structure to home and foreign country's savers
- + levies distortionary taxes on home and foreign country's households
- + transfers resources to home and foreign country's households

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

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- EA monetary authority

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

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

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

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 $j \in [0, \mu]$

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

Households' Budget Constraints

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

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

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

$$\begin{aligned} P_t^C(1 + \tau_t^C + \tau_t^{EA,C})C_t^S(j) + P_t^I I_t(j) + \underbrace{E_t\left(\frac{Q_{t,t+1}B_{s,t+1}}{\epsilon_t^{rp}}\right)}_{\text{AD securities}} + \underbrace{P_t^B B_t(j)}_{\text{national bond}} + \underbrace{P_t^{B,EA} B_t^{EA}(j)}_{\text{Eurobond}} \\ = B_{s,t}(j) + (1 + \rho P_t^B)B_{t-1}(j) + (1 + \rho P_t^{B,EA})B_{t-1}^{EA}(j) \\ + (1 - \tau_t^L - \tau_t^{EA,L}) \int_0^1 W_t(l)L_t^S(j, l)dl \\ + (1 - \tau_t^K - \tau_t^{EA,K})R_t^K v_t(j)\bar{K}_{t-1}^S(j) - \psi(v_t)\bar{K}_{t-1}^S + P_t^C Z_t^S(j) + D_t(j) \end{aligned}$$

▶ back

Price Indices

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

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

▶ Back

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

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- + 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%

▶ table fiscal

▶ table

▶ back

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)

▶ Back

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.

▶ Back

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_{IT}^L	Steady-state tax rate on labor IT	19.7%	EC, DG Taxation and Customs Union, 2018
τ_{DE}^L	Steady-state tax rate on labor DE	25.2%	EC, DG Taxation and Customs Union, 2018
τ_{EA}^L	Steady-state tax rate on labor EA	3%	
τ_{IT}^K	Steady-state tax rate on capital IT	29.2%	EC, DG Taxation and Customs Union, 2018
τ_{DE}^K	Steady-state tax rate on capital DE	30.6%	EC, DG Taxation and Customs Union, 2018
τ_{EA}^K	Steady-state tax rate on capital EA	3%	
τ_{IT}^C	Steady-state tax rate on cons. IT	22%	EC, DG Taxation and Customs Union, 2018
τ_{DE}^C	Steady-state tax rate on cons. DE	19%	EC, DG Taxation and Customs Union, 2018
τ_{EA}^C	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 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_{IT}^L	Persistence of τ^L in IT	0.735	Estimated 2004-2020, EC, DG Taxation & Customs Union
ρ_{DE}^L	Persistence of τ^L in DE	0.735	Estimated 2004-2020, EC, DG Taxation & Customs Union
ρ_{EA}^L	Persistence of τ^L in EA	0.726	Estimated 2004-2020, EC, DG Taxation & Customs Union
ρ_{IT}^K	Persistence of τ^K in IT	0.606	Estimated 2006-2018, EC, DG Taxation & Customs Union
ρ_{DE}^K	Persistence of τ^K in DE	0.662	Estimated 2006-2018, EC, DG Taxation & Customs Union
ρ_{EA}^K	Persistence of τ^K in EA	0.502	Estimated 2006-2018, EC, DG Taxation & Customs Union
ρ_{IT}^C	Persistence of τ^C in IT	0.884	Estimated 2000-2020, EC, DG Taxation & Customs Union
ρ_{DE}^C	Persistence of τ^C in DE	0.833	Estimated 2000-2020, EC, DG Taxation & Customs Union
ρ_{EA}^C	Persistence of τ^C in EA	0.895	Estimated 2000-2020, EC, DG Taxation & Customs Union
ρ_{IT}^G	Persistence of G in IT	0.659	Estimated over 2007-2019, Eurostat
ρ_{DE}^G	Persistence of G in DE	0.365	Estimated over 2007-2019, Eurostat
ρ_{IT}^Z	Persistence of transfers rule	0.785	Estimated over 1996-2019, Eurostat
ρ_{DE}^Z	Persistence of transfers rule	0.636	Estimated over 2002-2019, Eurostat
ρ_{EA}^Z	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

▶ Back

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

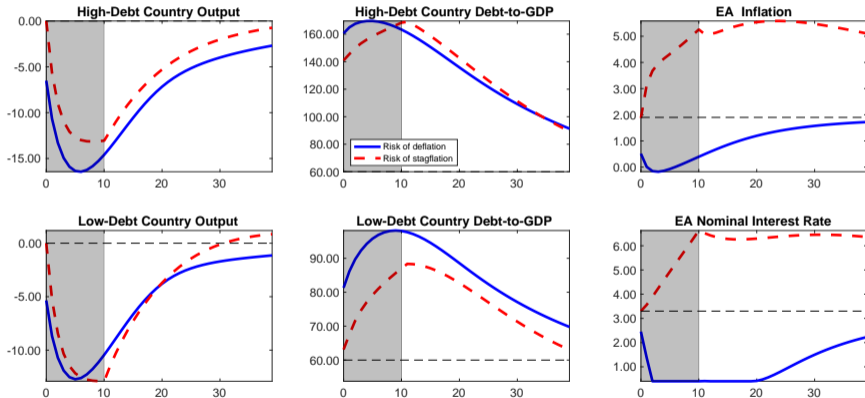
▶ Back

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

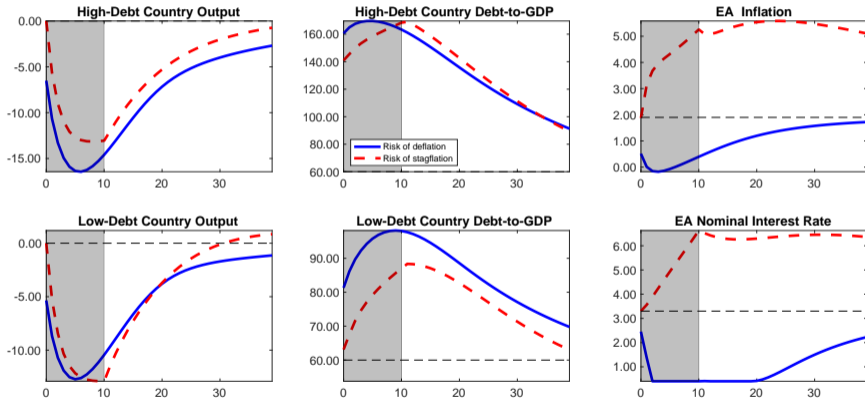
Facing a Recession

- Fiscal discipline in response to shock costly for **both** countries



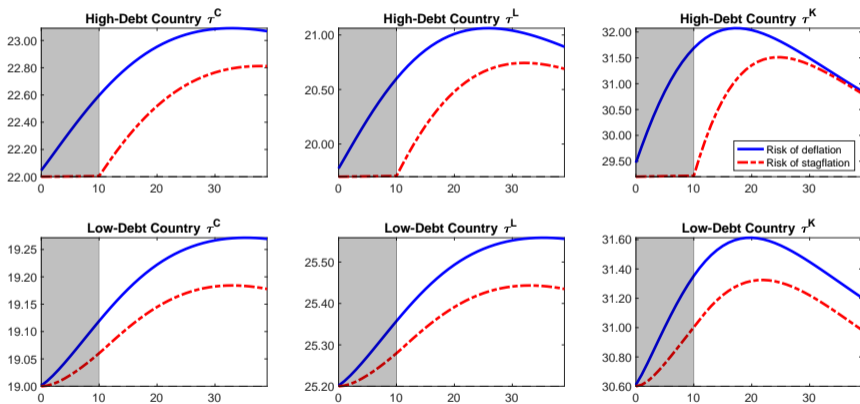
Facing a Recession

- Using EA emergency budget mitigates recession in **both** countries



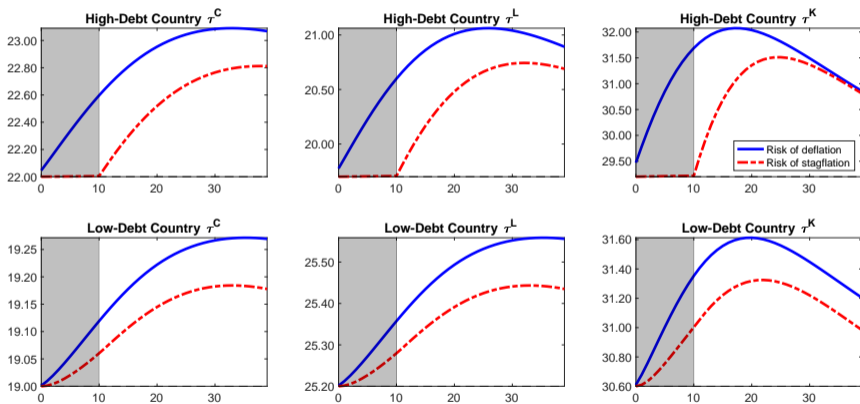
Facing a Recession

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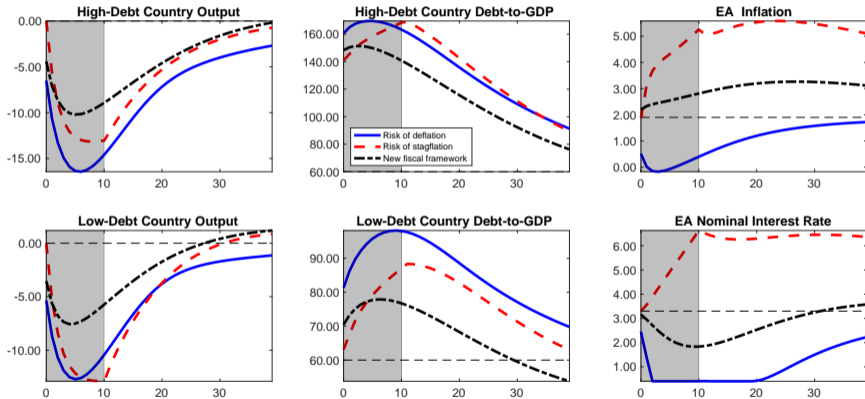
Facing a Recession

- Using EA emergency budget mitigates recession in **both** countries



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

