Fiscal delegation in a monetary union: Instrument assignment and stabilization properties

Henrique S. Basso and James Costain[1]

Banco de España

March 2017

[1] **Opinions expressed in this presentation are those of the authors. They do not necessarily coincide with those of the Banco de España or the Eurosystem.**

Problem: debt bias and volatility in a monetary union

- **Joining a monetary union increases sovereign debt fluctuations and levels**
  - Fiscal policy substitutes for independent monetary policy as stabilization tool (Mundell 1961)
  - Monetary union increases debt bias (Beetsma/Bovenberg 1999; Chari/Kehoe 2007; Krogstrup/Wyplosz 2009).
  - Cross-country banking flows amplified (Bruche/Suárez 2010; Obstfeld 2013)
  - Independent monetary policy unavailable to resist speculative attacks (Eichengreen/Hausmann 2005, DeGrauwe 2011)

- Risk of crises: **risk premium and debt can spiral out of control**

- Monetary/financial mechanisms to offset crises inviable because more solvent governments fear **moral hazard** of less solvent ones

Mechanisms to restrain deficit bias

- The Union needs a credible way of ensuring fiscal sustainability. **What are the options??**

	Mechanisms requiring government adjustments	**Mechanisms not requiring government adjustments**
Parametric budget rules	Stability/Growth Pact Swiss "debt brake"	Defined-contribution pensions Spanish pension "revaluation index"
Fiscal monitoring councils	National fiscal councils European Fiscal Board	
Fiscal delegation	*Delegated deficit limit* Eichengreen et al '97 Calmfors '03 Wyplosz '05 Maskin '16	*Delegated instruments* Gruen '01 Calmfors '03 Costain/de Blas '12 Basso/Costain '16

Mechanisms to restrain deficit bias

- The Union needs a credible way of ensuring fiscal sustainability. **What are the options??**

	Mechanisms requiring government adjustments	**Mechanisms not requiring government adjustments**
Parametric budget rules	Stability/Growth Pact Swiss "debt brake"	Defined-contribution pensions Spanish pension "revaluation index"
Fiscal monitoring councils	National fiscal councils European Fiscal Board	
Fiscal delegation	*Delegated deficit limit* Eichengreen et al '97 Calmfors '03 Wyplosz '05 Maskin '16	*Delegated instruments* Gruen '01 Calmfors '03 Costain/de Blas '12 Basso/Costain '16

- This paper: **dynamic effects of delegated fiscal instruments** in a monetary union.

Delegated fiscal instruments in Europe?

- **European Fiscal Board $\rightarrow$ European Fiscal Authority!**
  - EFB will advise and monitor member states, starting 2017
  - **But EFA would also set a fiscal shift parameter in each member state**
  - *Example*: Gruen ('01) proposes a shifter x in the tax code:

$$\text{tax rate}_{i,t} = F(\text{income}_{i,t}, \text{lots of other stuff}_{i,t})(1 + x_t).$$

- **A politically feasible quid pro quo:**
  - Members **voluntarily delegate** one or more fiscal shifters to EFA.
  - If EFA judges that the instruments give it **effective control of debt**, member becomes **eligible for a European risk-sharing mechanism**
  - *Example*: fiscal delegation could be a prerequisite for membership in Single Deposit Insurance system of Banking Union

This paper

- Compare several **policy games** to analyze **macro & poli-econ** implications of **fiscal instrument delegation** in a **monetary union**
  - Fiscal delegation is **not a new idea** (Blinder '97, . . . , Maskin '16)
  - But it has not been formally modeled
- **Our previous paper** (Basso/Costain *CESifo EcStud* '16) showed that fiscal delegation could have a **large steady-state impact on debt and welfare**

This paper

- Compare several **policy games** to analyze **macro & poli-econ** implications of **fiscal instrument delegation** in a **monetary union**
  - Fiscal delegation is **not a new idea** (Blinder '97, . . . , Maskin '16)
  - But it has not been formally modeled
- **Our previous paper** (Basso/Costain *CESifo EcStud* '16) showed that fiscal delegation could have a **large steady-state impact on debt and welfare**
- **This paper: Dynamic implications of fiscal delegation**.
  - Do large steady state gains justify short-run costs?
  - Does business cycle stabilization suffer, when budget balance is delegated to a fiscal authority?
  - How do the answers vary, depending on which instruments are delegated?

Policy games– some benchmarks

- Rogoff (1985), **"Conservative central banker"**
  - Inflation-averse CB **undoes inflation bias** due to **lack of commitment**
- Dixit and Lambertini (2003), **Invariance result for monetary union**
  - Commitment/discretion irrelevant if CB and govs have **same preferences**
- Alesina/Tabellini (1990), **impatience/deficit bias** from party politics
  - **Alternating spending priorities** leads to **excessive debt**
- Beetsma/Bovenberg (1999), Chari/Kehoe (2007)
  - **Deficit bias in monetary union** if CB not "conservative" enough...
  - ... and this is bad if governments are not patient enough.
- Basso/Costain (2016), Many forms of deficit bias in monetary union
  - Insufficiently conservative CB / Desire to inflate away nominal debt
  - Impatient government / Interest rate contagion
  - Hence **debt-averse independent fiscal authority** improves welfare

ECONOMIC ENVIRONMENT

Economy of region j - key features

- **Output** varies with **surprise inflation** and **taxes**: (Alesina/Tabellini 1987)

$$x_{j,t} = \underline{x} + \nu(\pi_t - \pi_t^e - \tau_{j,t})$$

- **Loss function** depends on inflation, output, and public services: (Leith/Wren-Lewis 2011)

$$L_{Sj} = \sum_{t=0}^{\infty} \beta_S^t \left\{ \alpha_{\pi S} \pi_t^2 + (x_{j,t} - \tilde{x})^2 + \alpha_{gS} (g_{j,t} - \tilde{g}_{j,t})^2 \right\}$$

  - **Demand for public services** follows an AR1 process:

$$\tilde{g}_{j,t} = \tilde{g} + s_{j,t} \quad (1)$$

$$s_{j,t} = \rho s_{j,t-1} + \epsilon_{j,t} \quad (2)$$

  - **Public services** are a composite of many inputs:

$$g_{j,t} = \left(\int_0^1 \omega_{j,k,t} (g_{j,k,t})^{\frac{\eta-1}{\eta}} dk \right)^{\frac{\eta}{\eta-1}}.$$

Fiscal environment of region j

- Each region faces its own **government budget constraint**:

$$d_{j,t} = \left(R\left(\bar{d}_{t-1}\right) + \chi(\pi_t^e - \pi_t)\right) d_{j,t-1} + qg_{j,t} - \tau_{j,t} - \kappa\pi_t$$

- *Ex ante* real interest rate: $R(\bar{d}_t) = 1/\beta_S + \delta\bar{d}_t$
  - **Interest rate contagion:** $R(\bar{d}_t)$ depends on average debt $\bar{d}_t \equiv \frac{1}{J}\sum_{j=1}^{J} d_{j,t}$, rather than country-specific debt
- *Ex post* real interest rate: $R\left(\bar{d}_{t-1}\right) + \chi(\pi_t^e - \pi_t)$
  - **Erosion of nominal debt:** Fraction of nominal debt is χ
- **Price of public services** q may be low or high:

$$q = \begin{cases} q_L = (E\omega^{\eta})^{1/1-\eta} & \text{if } \omega_{j,k,t} \text{ is observed} \\ q_H = (E\omega)^{\eta/1-\eta} & \text{if } \omega_{j,k,t} \text{ is not observed} \end{cases}$$

POLICY GAMES

Policy games (with debt as control variable)

- **Institutional preferences**
  - **Benevolent**, but **weight parameters may differ** from social welfare
  - Assume **elected institutions are less patient** than society is
  - Assume an institution with a **simple, clear, feasible mandate cares more about that objective** than society does

Policy games (with debt as control variable)

- **Institutional preferences**
  - **Benevolent**, but **weight parameters may differ** from social welfare
  - Assume **elected institutions are less patient** than society is
  - Assume an institution with a **simple, clear, feasible mandate cares more about that objective** than society does
- **Monetary union (scenario M)**
  - CB sets inflation
  - Regional Governments set tax and debt
  - $\Rightarrow$ government spending determined by budget constraint.
- **Fiscal delegation (scenarios F_j, F)**
  - CB sets inflation
  - Regional Governments set taxes
  - Fiscal Authority(ies) set debt
  - $\Rightarrow$ government spending determined by budget constraint.
- **Single country** with independent policy (scenario I)
- **Federal government** for monetary union (scenario G)

Generic Policy Game - Regional

Government G_j or fiscal authority F_j that acts in region j only:

$$
\begin{aligned}
V_t^{lj}(\Omega_t) \quad = \quad & \max_{\Theta_t^{lj}} \quad \frac{-1}{2}\Big\{\alpha_{\pi l}\pi_t^2 + \left(\underline{x}_{j,t} + \nu(\pi_t - \pi_t^e - \tau_{j,t}) - \tilde{x}\right)^2 \\
& + \alpha_{gl}\left(g_{j,t} - \tilde{g}_{j,t}\right)^2 + \alpha_{dl}\left(d_{j,t} - \tilde{d}_{j,t}\right)^2\Big\} \\
& + \beta_l E_t V_{t+1}^{lj}(\Omega_{t+1}) \\
& \text{s.t.} \quad d_{j,t} - \left(R\left(\bar{d}_{t-1}\right) + \chi(\pi_t^e - \pi_t)\right) d_{j,t-1} + \tau_{j,t} + \kappa\pi_t - q_{j,t}g_{j,t},
\end{aligned}
$$

where

- $\Omega_t \equiv (\vec{d}_{t-1}, \vec{s}_{t-1}, \vec{\epsilon}_t)$ is the state of the economy
- Θ_t^{lj} is the set of instruments affected by actions of player l_j

Generic Policy Game - Union

Central bank or fiscal authority $I \in \{C, F\}$ controls instruments affecting all regions j:

$$
\begin{aligned}
V_t^I(\Omega_t) \quad = \quad & \max_{\Theta_t^I} \quad \frac{-1}{2}\Bigg\{\alpha_{\pi I}\pi_t^2 + \frac{1}{J}\sum_{j=1}^{J}\Bigg[\left(\underline{x}_{j,t} + \nu(\pi_t - \pi_t^e - \tau_{j,t}) - \tilde{x}\right)^2 \\
& + \alpha_{gI}\left(g_{j,t} - \tilde{g}_{j,t}\right)^2 + \alpha_{dI}\left(d_{j,t} - \tilde{d}_{j,t}\right)^2\Bigg]\Bigg\} \\
& + \beta_I E_t V_{t+1}^I(\Omega_{t+1}) \\
& \text{s.t.} \quad d_{j,t} - \left(R\left(\bar{d}_{t-1}\right) + \chi(\pi_t^e - \pi_t)\right) d_{j,t-1} + \tau_{j,t} + \kappa\pi_t - q_{j,t}g_{j,t} \ \forall j,
\end{aligned}
$$

where

- $\Omega_t \equiv (\vec{d}_{t-1}, \vec{s}_{t-1}, \vec{\epsilon}_t)$ is the state of the economy
- Θ_t^I is the set of instruments affected by actions of player I

Welfare benchmark: Social planner

Benchmark: an **omniscient, cooperative, committed Pareto planner:**

$$
\begin{aligned}
V_t^P\left(\vec{d}_{t-1}, \vec{s}_{t-1}\right) \quad = \quad & \max_{\pi_t, \pi_t^e, \{d_{j,t}, \tau_{j,t}, g_{j,t}\}_{j=1}^J} \frac{-1}{2}\Bigg\{\alpha_{\pi S}\pi_t^2 \\
& + \frac{1}{J}\sum_{j=1}^{J}\left[\left(\underline{x} + \nu(\pi_t - \pi_t^e - \tau_{j,t}) - \tilde{x}\right)^2 + \alpha_{gS}\left(g_{j,t} - \tilde{g}_{j,t}\right)^2\right]\Bigg\} \\
& + \beta_S E_t V_{t+1}^P\left(\vec{d}_t, \vec{s}_t\right)
\end{aligned}
$$

$$
\text{s.t.} \quad d_{j,t} = \left[R(\bar{d}_{t-1}) + \chi(\pi_t^e - \pi_t)\right] d_{j,t-1} + q_L g_{j,t} - \tau_{j,t} - \kappa\pi_t \quad \forall j.
$$

- **Omniscient:** $q = q_L$
- **Cooperative:** planner chooses $\tau_{j,t}$, $d_{j,t}$ for all j
- **Committed:** commits to contingent plan $\pi_t = \Pi(d_{t-1}, s_{t-1}, \epsilon_t)$, and thus alters expectations $\pi_t^e = E_{t-1}\pi_t$
- **Pareto:** planner respects J distinct budget constraints

Monetary union (benchmark scenario M)

- Instrument assignment: $\begin{cases} \Theta_t^C \equiv \{\pi_t, \{g_{j,t}\}_{j=1}^J\} \\ \Theta_t^{G_j} \equiv \{\tau_{jt}, d_{jt}, g_{j,t}\} \end{cases}$
- Intratemporal trade-offs

$$\begin{aligned} \nu(x_{j,t} - \tilde{x}) &= \frac{\alpha_{gS}}{q_L}(g_{j,t} - \tilde{g}_{j,t}), \\ \frac{\alpha_{\pi C}\pi_t}{1+\kappa+\chi\bar{d}_{t-1}} &= -\frac{\alpha_{gS}}{q_L}\sum_j \frac{g_{j,t}-\tilde{g}_{j,t}}{J} \end{aligned}$$

- **Symmetric equilibrium** is determined by

$$\begin{aligned} \bar{d}_t &= (R(\bar{d}_{t-1}) + \chi(\pi_t^e - \pi_t))\bar{d}_{t-1} - \breve{\kappa}(d_{t-1})\breve{\pi}_t + \tilde{z}_t, \\ \breve{\pi}_t &= \beta_G R(\bar{d}_t) E_t \breve{\pi}_{t+1}, \end{aligned}$$

where

$$\breve{\pi}_t \equiv \frac{\pi_t}{1+\kappa+\chi d_t}, \quad \tilde{z}_t \equiv \frac{\tilde{x}-\underline{x}}{\nu} + q_L\tilde{g}_t, \quad \breve{\kappa}(d_t) \equiv \kappa(1+\kappa+\chi d_t) + \frac{\alpha_{\pi C}}{\alpha_{gS}}\left(q_L^2 + \frac{\alpha_{gS}}{\nu^2}\right).$$

Solution method: symmetric equilibrium

- Two policy functions summarize symmetric equilibrium of scenario M:
  - Adjusted **inflation**: $\breve{\pi}_t = \frac{\pi_t}{1+\kappa+\chi d_{t-1}} = \breve{I}^M(\Omega_t)$
  - Gross **borrowing**: $d_t = B^M(\Omega_t)$

- Policies must satisfy budget balance, and Euler equation:

$$B^M(\Omega_t) = R\left(d_{t-1}\right) d_{t-1} + (1+\chi d_{t-1})(E_{t-1}[I^M(\Omega_t)] - I^M(\Omega_t)) - \breve{\kappa}(d_{t-1})\breve{I}^M(\Omega_t) + \tilde{z}_t,$$

$$\breve{I}^M(\Omega_t) = \beta_G \left(\beta_S^{-1} + \delta B^M(\Omega_t)\right) E_t \breve{I}^M(B^M(\Omega_t), s_t, \epsilon_{t+1}).$$

- Solve the functional equations:
  - Approximate $B^M(\Omega_t)$ and $\breve{I}^M(\Omega_t)$ as Chebyshev polynomials
  - Order (4,2,2) in the state variable $\Omega_t \equiv (d_{t-1}, s_{t-1}, \epsilon_t)$

RESULTS
with
DEBT AS A CONTROL VARIABLE

Equilibrium for Policy Games with Debt as Control Variable

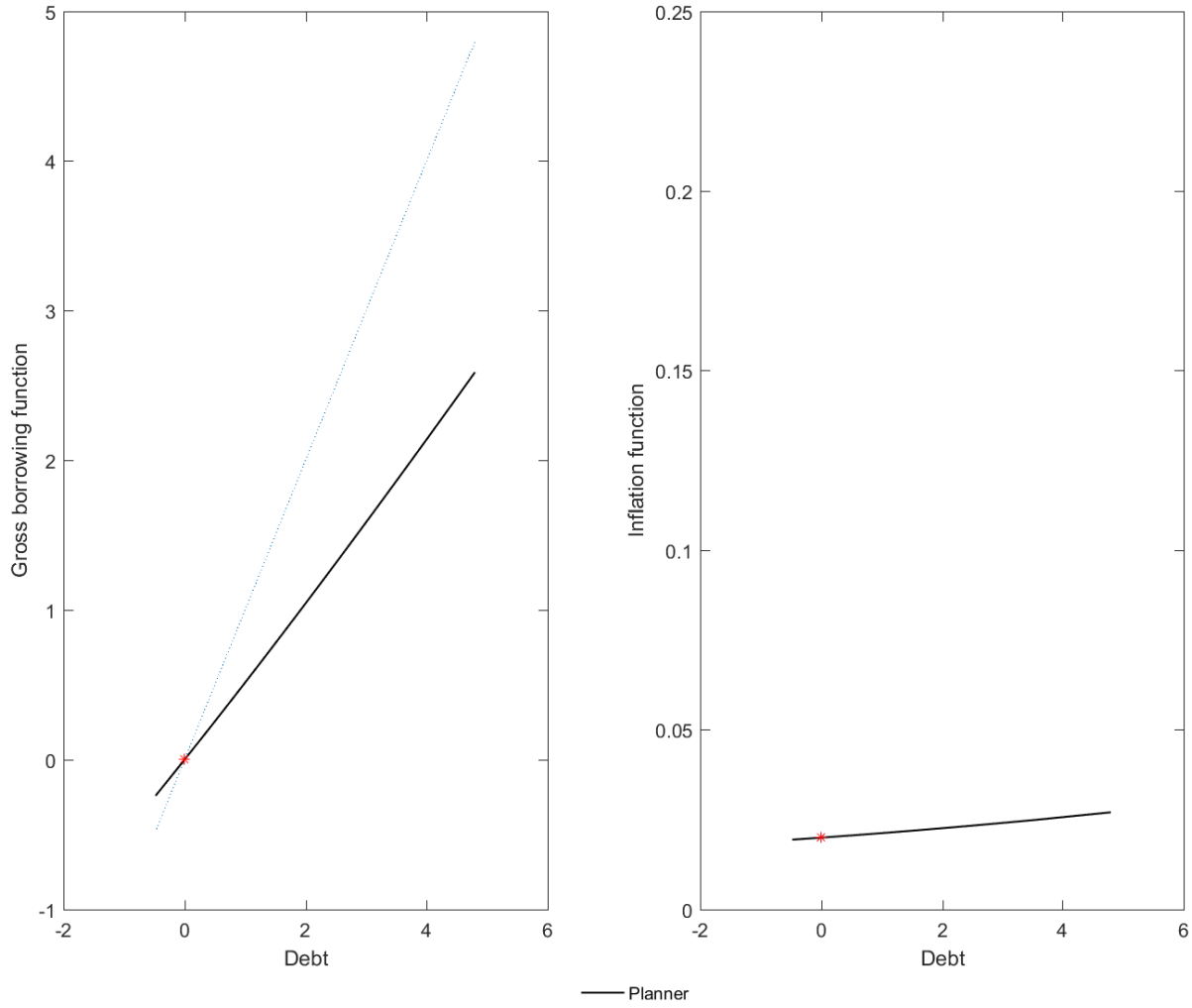
For all cases (except G), budget constraint reduces to:

$$\bar{d}_t = \left(\frac{1}{\beta_S} + \delta \bar{d}_{t-1}\right) \bar{d}_{t-1} + (\pi_t^e - \pi_t)(1 + \chi \bar{d}_{t-1}) - \breve{\kappa}(\bar{d}_{t-1})\breve{\pi}_t + \bar{\bar{z}}_t, \tag{3}$$

Game	Choice Variables	Euler Equation
I	$\Theta_t^C \equiv \{\pi_t, g_t\}$ $\Theta_t^G \equiv \{\tau_t, d_t, g_{,t}\}$	$\breve{\pi}_t = \beta_G E_t \left(\frac{1}{\beta_S} + 2\delta \bar{d}_t + \left(\gamma + \chi \frac{\alpha_{\pi G}}{\alpha_{\pi C}}\right) \frac{\partial \pi_{t+1}}{\partial d_t}\right) \breve{\pi}_{t+1}$
M	$\Theta_t^C \equiv \{\pi_t, \{g_{j,t}\}_{j=1}^J\}$ $\Theta_t^{G_j} \equiv \{\tau_{jt}, d_{jt}, g_{j,t}\}$	$\breve{\pi}_t = \beta_G \left(\frac{1}{\beta_S} + \delta \bar{d}_t\right) E_t \breve{\pi}_{t+1}$
F_j	$\Theta_t^C \equiv \{\pi_t, \{g_{j,t}\}_{j=1}^J\}$ $\Theta_t^{G_j} \equiv \{\tau_{jt}, g_{j,t}\}$ $\Theta_t^{F_j} \equiv \{d_{jt}, g_{j,t}\}$	$\breve{\pi}_t = \frac{\alpha_{dF}}{\alpha_{\pi C}} \bar{d}_t + \beta_F \left(\frac{1}{\beta_S} + \delta \bar{d}_t\right) E_t \breve{\pi}_{t+1}$
F	$\Theta_t^C \equiv \{\pi_t, \{g_{j,t}\}_{j=1}^J\}$ $\Theta_t^{G_j} \equiv \{\tau_{jt}, g_{j,t}\}$ $\Theta_t^{F_j} \equiv \{d_{jt}, g_{j,t}\}$	$\breve{\pi}_t = \frac{\alpha_{dF}}{\alpha_{\pi C}} \bar{d}_t + \beta_F E_t \left(\frac{1}{\beta_S} + 2\delta \bar{d}_t + \left(\gamma + \chi \frac{\alpha_{\pi G}}{\alpha_{\pi C}}\right) \frac{\partial \pi_{t+1}}{\partial \bar{d}_t}\right) \breve{\pi}_{t+1}$

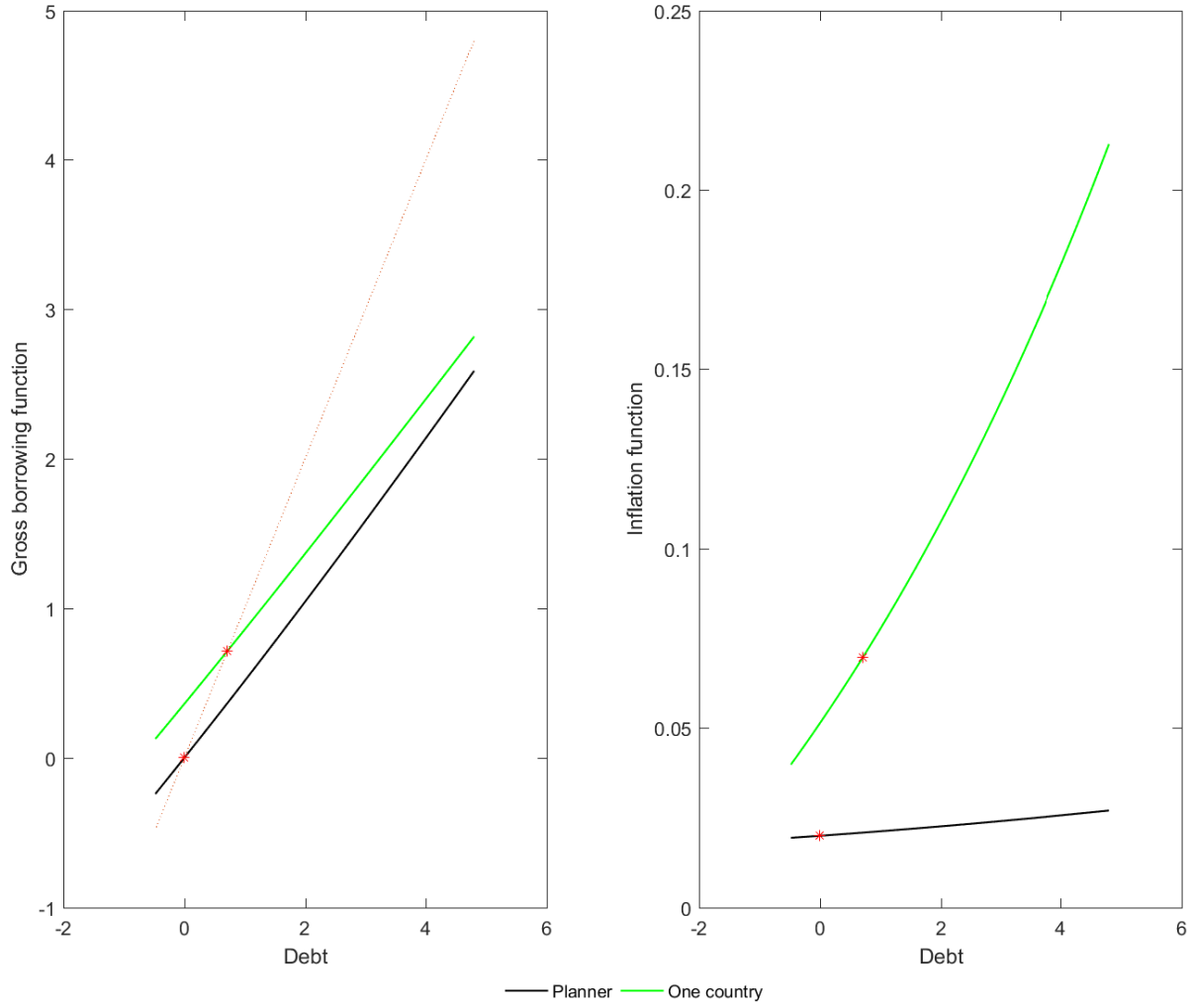
Where $\breve{\pi}_t \equiv \frac{\pi_t}{1+\kappa+\chi \bar{d}_{t-1}}$. Note $R(\bar{d}_t) = \left(\frac{1}{\beta_S} + \delta \bar{d}_t\right)$, $R(\bar{d}_t) + R'(\bar{d}_t)\bar{d}_t = \left(\frac{1}{\beta_S} + 2\delta \bar{d}_t\right)$

Figure: Borrowing and inflation (numerical example: **planner**)



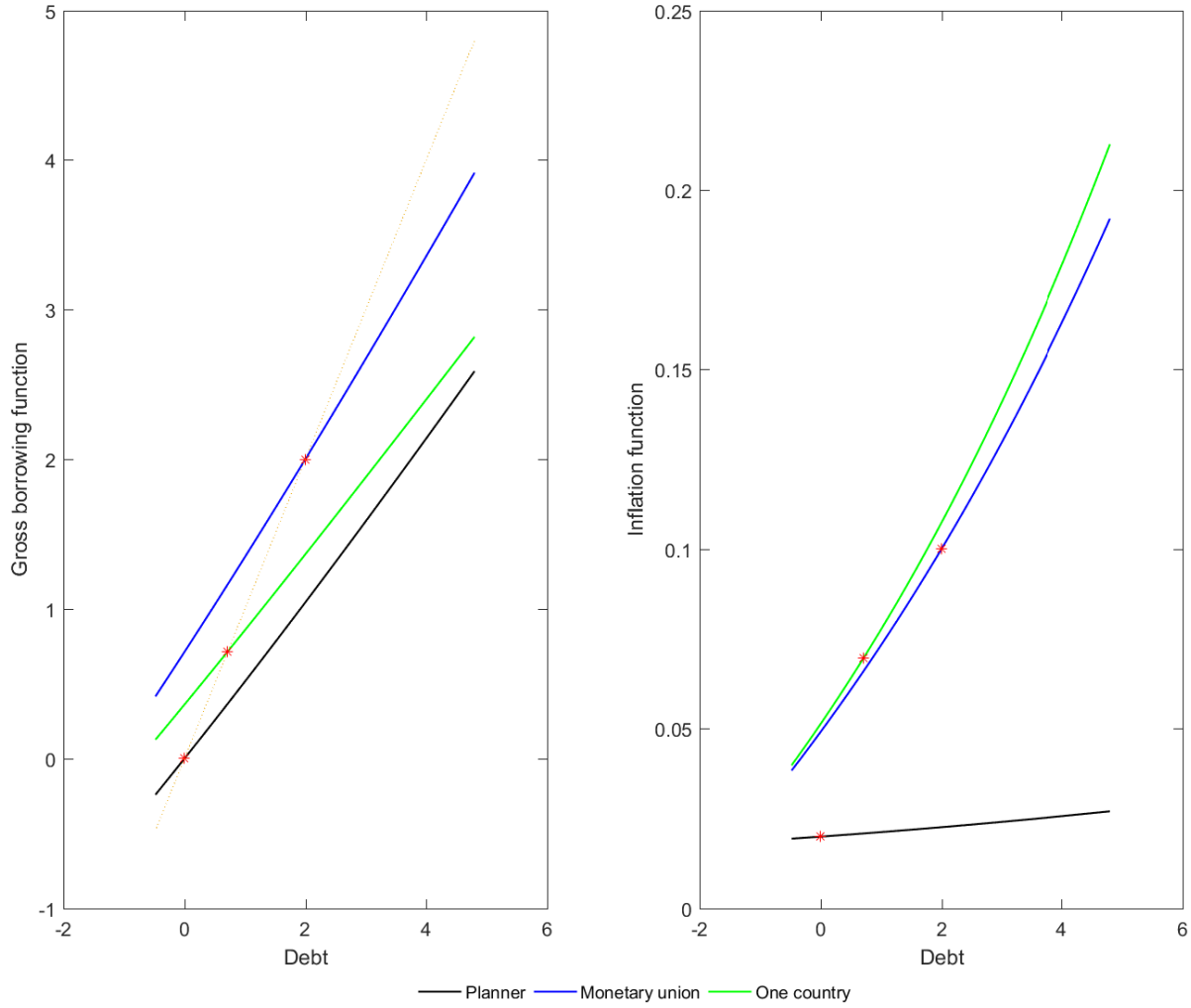
- Planner's solution

Figure: Borrowing and inflation (numerical example: **one country**)



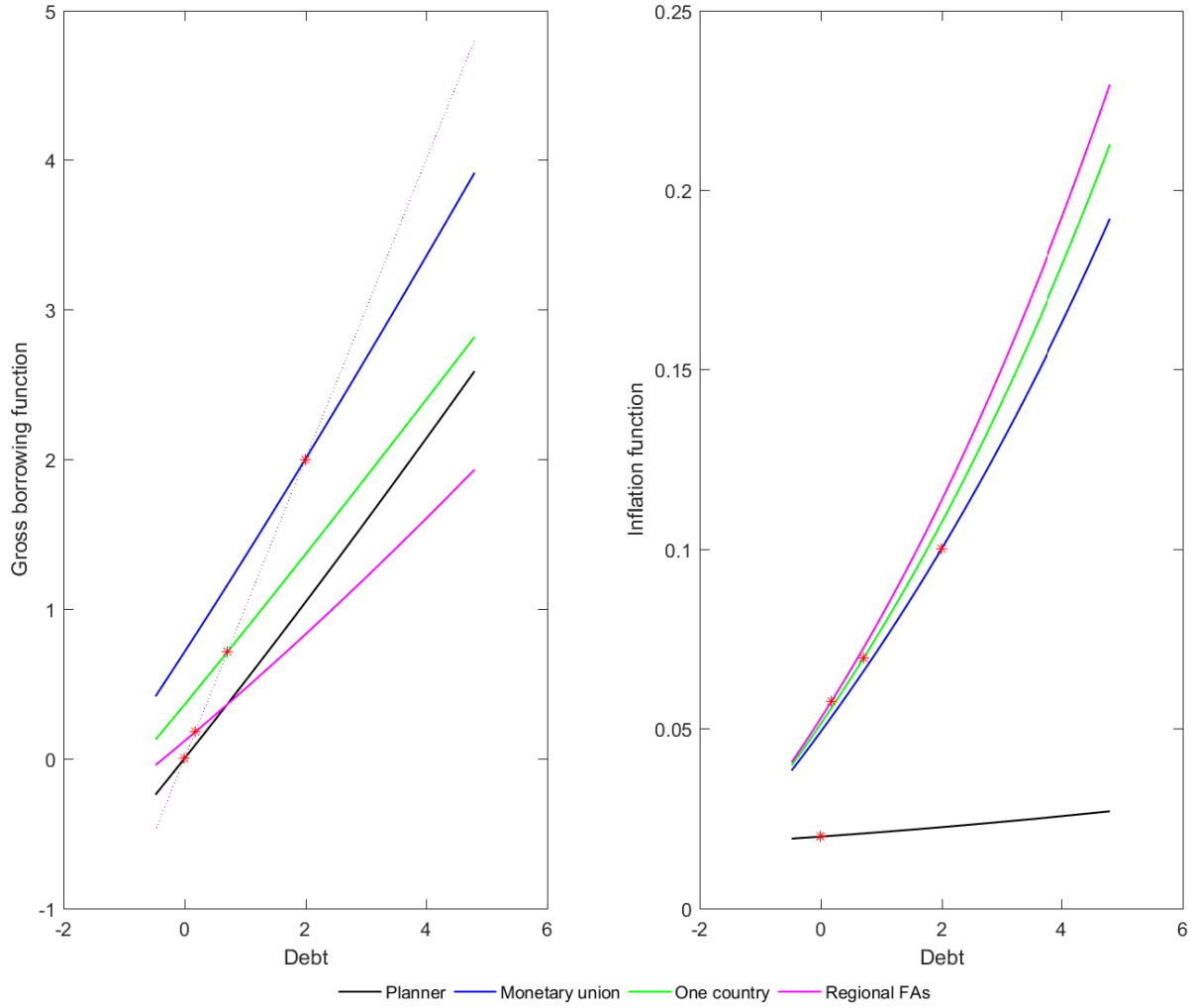
- Effect of government discretion and impatience

Figure: Borrowing and inflation (numerical example: **monetary union**)



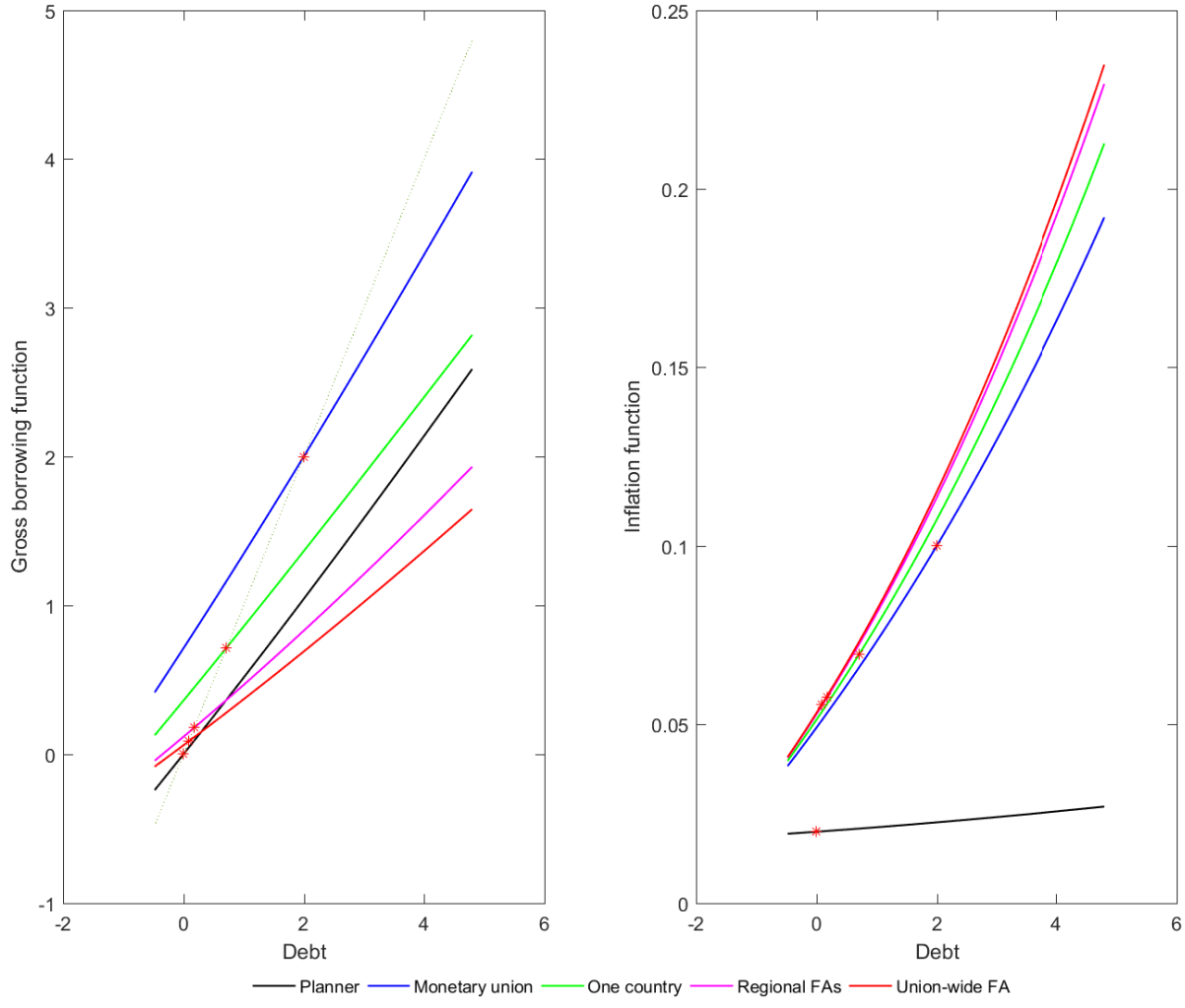
- Effect of common pool problems

Figure: Borrowing and inflation (numerical example: **Regional fiscal delegation**)



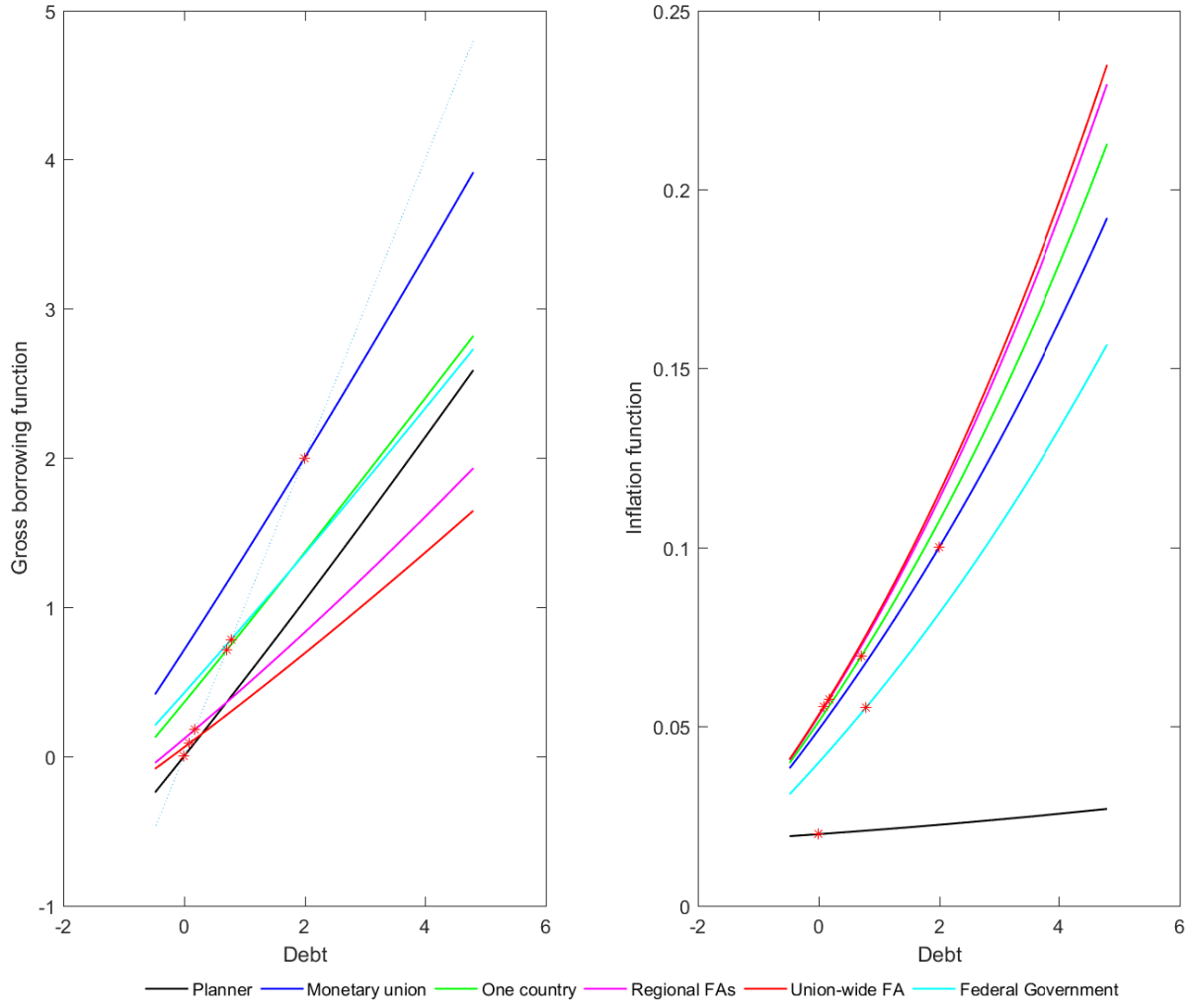
- Effect of patience and debt aversion

Figure: Borrowing and inflation (numerical example: **Union-level fiscal delegation**)



- Effect of eliminating common pool problems

Figure: Borrowing and inflation (numerical example: **Federal government**)



- Alternative: create federal government

Our baseline calibration

- Time period: annual. Target $R = 1.02$ at zero debt, $R = 1.05$ at 100% debt.
  - $\beta_S = (1.02)^{-1}$, $\delta = 0.03$.
- Numeraire: private sector annual output. Target debt=2 in steady state of monetary union.
  - $\beta_G = (1.08)^{-1}$, $\delta = 0.03$.
- Half of debt is nominal, $\chi = 0.5$; Money base is 20% of output: $\kappa = 0.2$.
- Assume elasticity of output to taxes is $\nu = 1$. Target taxes=0.5 in steady state of monetary union.
  - $\underline{x} = x_{ss}^M + \nu \tau_{ss}^M = 1.5$.
  - Can then back out steady state goverment spending from budget constraint: $g_{ss}^M = 0.36$.
- Target inflation=10% in steady state of monetary union.
- Back out α_{gS} and $\alpha_{\pi C}$ from first-order conditions between g, x, and π.
  - $\alpha_{gS} = 0.862$, $\alpha_{\pi C} = 88$.

Welfare

- Social welfare in a symmetric equilibrium of scenario $\mathcal{S}$:

$$W^{\mathcal{S}}(d_{t-1}, s_{t-1}, \epsilon_t) = -\frac{1}{J}\sum_{j=1}^{J} L_{Sj}$$

- Welfare at steady state $W^{\mathcal{S}}_{ss} \equiv W^{\mathcal{S}}(\vec{d}^{\mathcal{S}}_{ss}, \vec{0})$.

- Plug policy functions into Bellman equation to derive polynomial approximation to welfare:

$$\begin{aligned} W^{\mathcal{S}}(\Omega_t) &= \alpha_{\pi l} I^{\mathcal{S}}(\Omega_t)^2 + \left(X^{\mathcal{S}}(\Omega_t) - \tilde{x}\right)^2 \\ &\quad + \alpha_{gl}\left(G^{\mathcal{S}}(\Omega_t) - \tilde{g}_t\right)^2 + \beta_S E_t W^{\mathcal{S}}(B^{\mathcal{S}}(\Omega_t), s_t, \epsilon_{t+1}) \end{aligned}$$

Table: Debt, inflation, and welfare in scenarios $\mathcal{S}$ where debt is a control variable[a]

Debt	Inflation	Welfare	Transition gain[a]	Crisis cost[a,b]	Crisis cost,[a,b] fixing debt
$\bar{d}_{ss}^{\mathcal{S}}$	$\pi_{ss}^{\mathcal{S}}$	$W_{ss}^{\mathcal{S}} - W_{ss}^{MU}$	$W^{\mathcal{S}}(d_{ss}^{MU},0) - W_{ss}^{MU}$	$W^{\mathcal{S}}(d_{ss}^{\mathcal{S}},\epsilon_0^g) - W_{ss}^{\mathcal{S}}$	$W^{\mathcal{S}}(0,\epsilon_0^g) - W^{\mathcal{S}}(0,0)$
Scenario P: Planner					
0.1%	2.0%	+19.4%			
Scenario I: single country with independent central bank					
71.4%	7.0%	+15.3%			
Scenario MU: status quo monetary union					
199.7%	10.0%	0%			
Scenario Fj: Monetary union with regional fiscal authorities					
17.9%	5.8%	+18.4%			
Scenario F: Monetary union with union-wide fiscal authority					
8.7%	5.6%	+18.7%			
Scenario G: Monetary union with federal government					
78.3%	5.5%	+14.8%			

[a] Welfare changes expressed as equivalent variations of steady state private sector output.

[b] "Crisis" is $\epsilon_0^g = 0.02$, with autocorrelation 0.7.

Table: Debt, inflation, and welfare in scenarios $\mathcal{S}$ where debt is a control variable[a]

Debt	Inflation	Welfare	Transition gain[a]	Crisis cost[a,b]	Crisis cost,[a,b] fixing debt
$\bar{d}_{ss}^{\mathcal{S}}$	$\pi_{ss}^{\mathcal{S}}$	$W_{ss}^{\mathcal{S}} - W_{ss}^{MU}$	$W^{\mathcal{S}}(d_{ss}^{MU},0) - W_{ss}^{MU}$	$W^{\mathcal{S}}(d_{ss}^{\mathcal{S}},\epsilon_0^g) - W_{ss}^{\mathcal{S}}$	$W^{\mathcal{S}}(0,\epsilon_0^g) - W^{\mathcal{S}}(0,0)$
Scenario P: Planner					
0.1%	2.0%	+19.4%	+14.8%		
Scenario I: single country with independent central bank					
71.4%	7.0%	+15.3%	+12.2%		
Scenario MU: status quo monetary union					
199.7%	10.0%	0%	0%		
Scenario Fj: Monetary union with regional fiscal authorities					
17.9%	5.8%	+18.4%	+14.1%		
Scenario F: Monetary union with union-wide fiscal authority					
8.7%	5.6%	+18.7%	+14.2%		
Scenario G: Monetary union with federal government					
78.3%	5.5%	+14.8%	+12.6%		

[a]Welfare changes expressed as equivalent variations of steady state private sector output.

[b]"Crisis" is $\epsilon_0^g = 0.02$, with autocorrelation 0.7.

Figure: Temporary public demand shock: comparing institutional scenarios

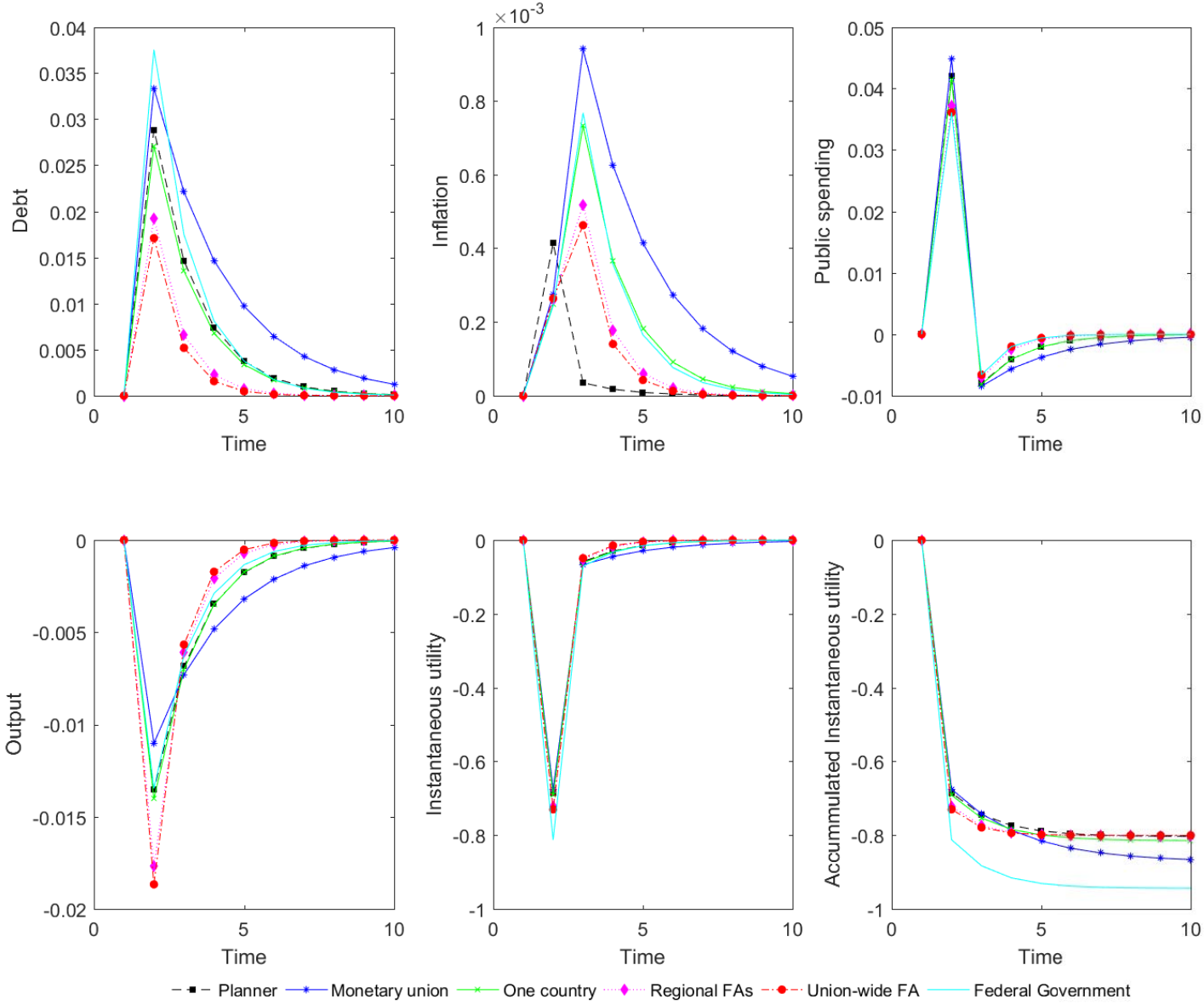


Figure: Temporary public demand shock. Comparing institutional scenarios (Levels).

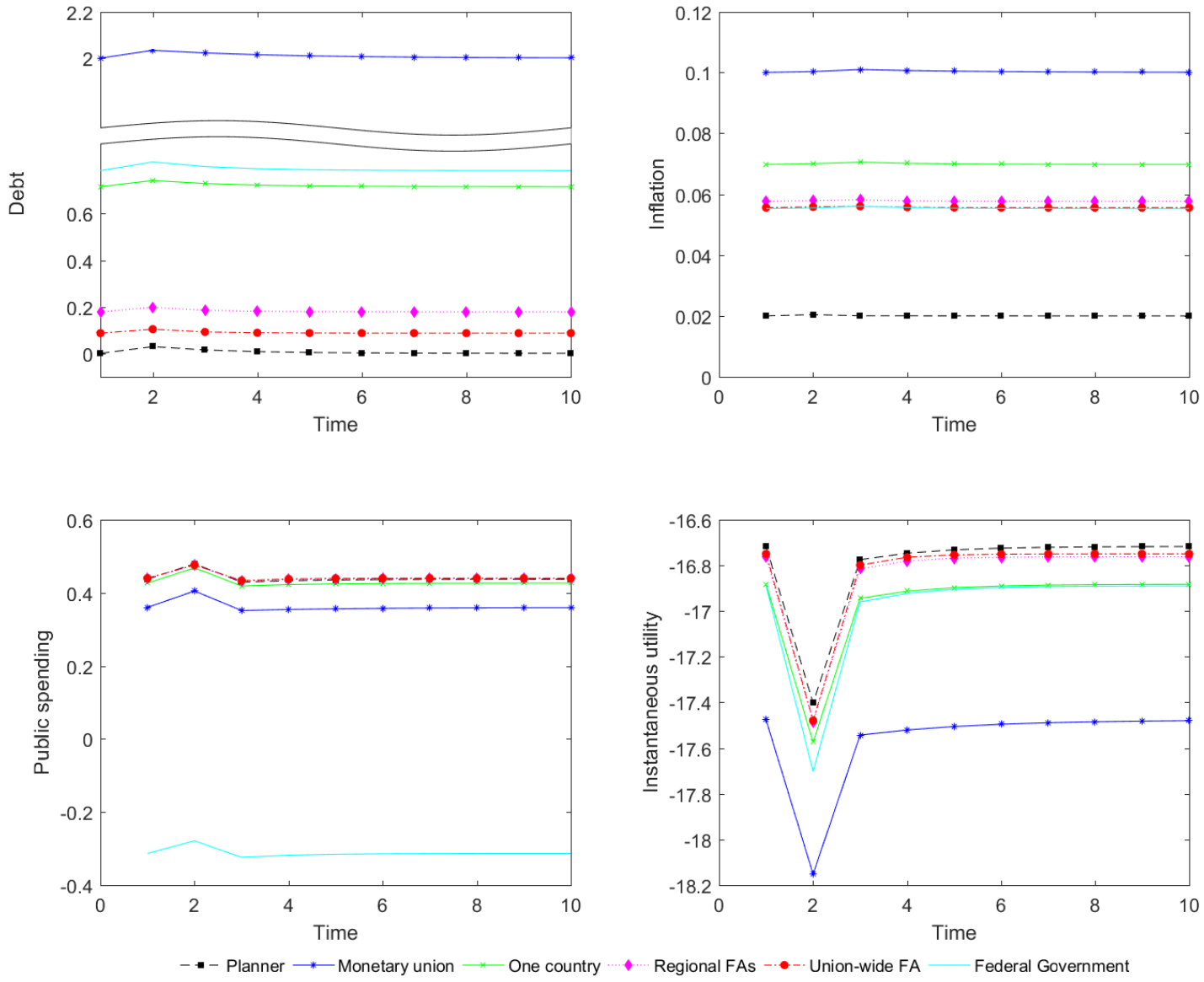


Figure: Autocorrelated public demand shock. Comparing institutional scenarios

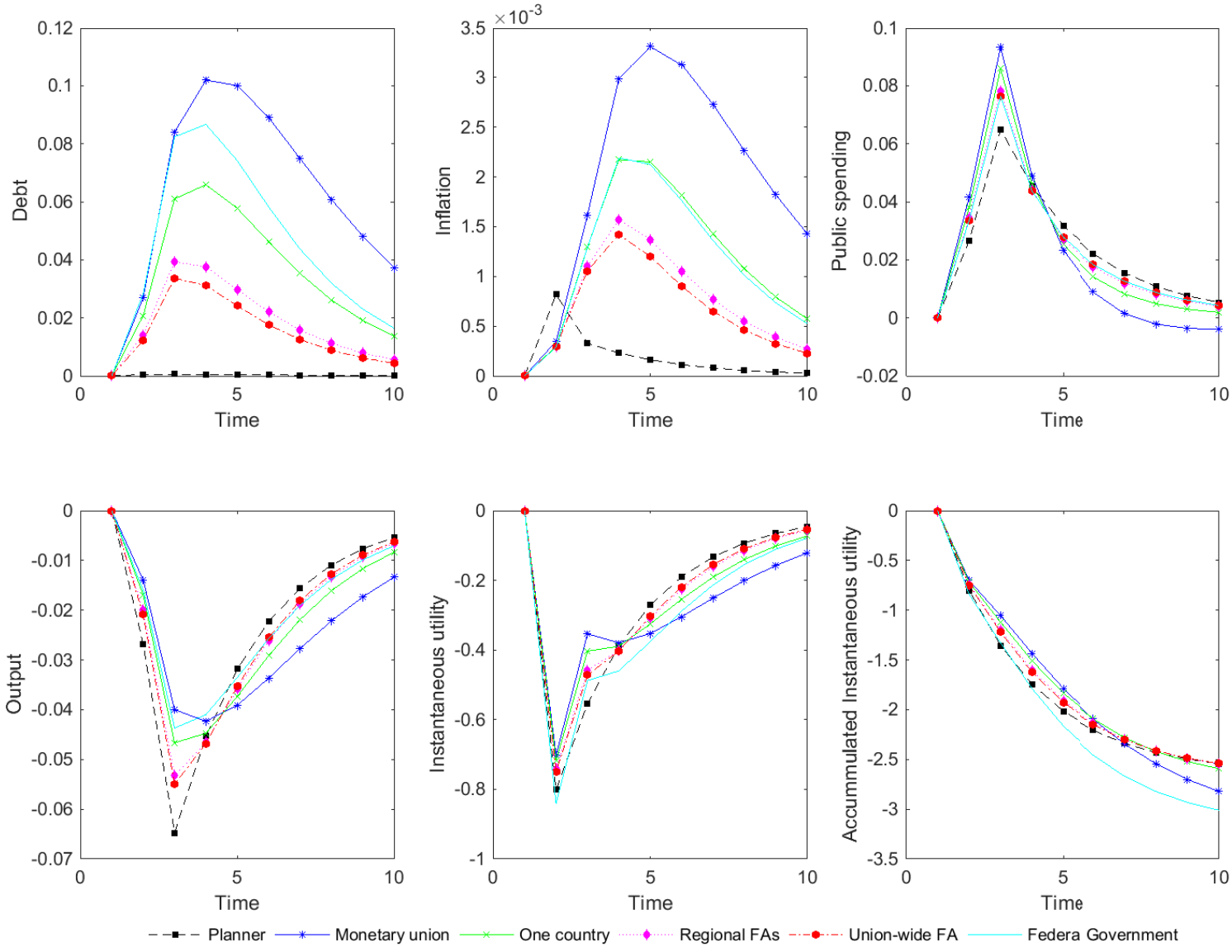


Figure: Autocorrelated public demand shock. Comparing institutional scenarios (Levels).

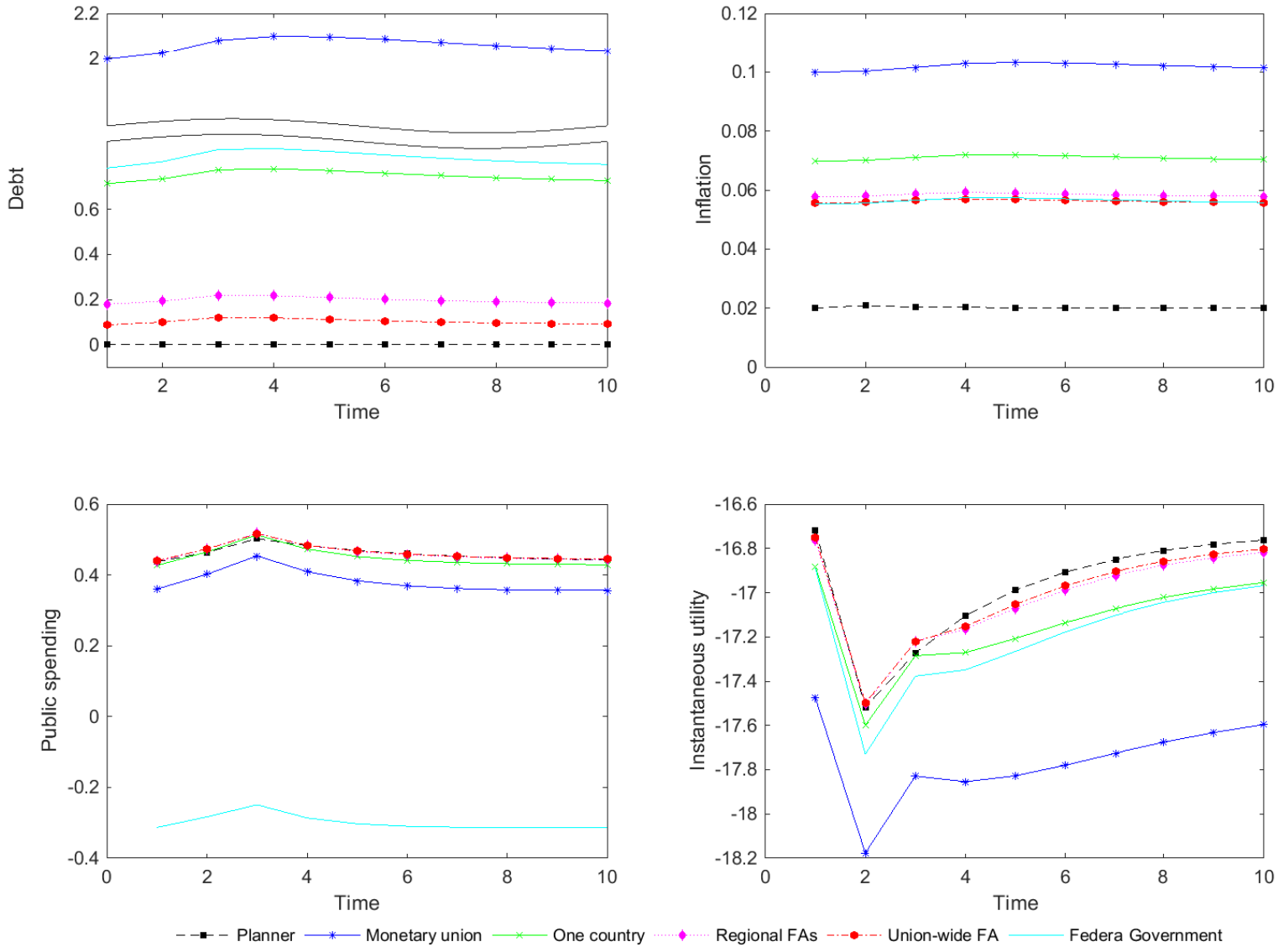


Table: Debt, inflation, and welfare in scenarios $\mathcal{S}$ where debt is a control variable[a]

Debt	Inflation	Welfare	Transition gain[a]	Crisis cost[a,b]	Crisis cost,[a,b] fixing debt
$\bar{d}_{ss}^{\mathcal{S}}$	$\pi_{ss}^{\mathcal{S}}$	$W_{ss}^{\mathcal{S}} - W_{ss}^{MU}$	$W^{\mathcal{S}}(d_{ss}^{MU},0) - W_{ss}^{MU}$	$W^{\mathcal{S}}(d_{ss}^{\mathcal{S}},\epsilon_0^g) - W_{ss}^{\mathcal{S}}$	$W^{\mathcal{S}}(0,\epsilon_0^g) - W^{\mathcal{S}}(0,0)$
Scenario P: Planner					
0.1%	2.0%	+19.4%	+14.8%	−0.75%	
Scenario I: single country with independent central bank					
71.4%	7.0%	+15.3%	+12.2%	−0.78%	
Scenario MU: status quo monetary union					
199.7%	10.0%	0%	0%	−0.90%	
Scenario Fj: Monetary union with regional fiscal authorities					
17.9%	5.8%	+18.4%	+14.1%	−0.75%	
Scenario F: Monetary union with union-wide fiscal authority					
8.7%	5.6%	+18.7%	+14.2%	−0.75%	
Scenario G: Monetary union with federal government					
78.3%	5.5%	+14.8%	+12.6%	−0.90%	

[a] Welfare changes expressed as equivalent variations of steady state private sector output.

[b] "Crisis" is $\epsilon_0^g = 0.02$, with autocorrelation 0.7.

Table: Debt, inflation, and welfare in scenarios $\mathcal{S}$ where debt is a control variable[a]

Debt	Inflation	Welfare	Transition gain[a]	Crisis cost[a,b]	Crisis cost,[a,b] fixing debt
$\bar{d}_{ss}^{\mathcal{S}}$	$\pi_{ss}^{\mathcal{S}}$	$W_{ss}^{\mathcal{S}} - W_{ss}^{MU}$	$W^{\mathcal{S}}(d_{ss}^{MU},0) - W_{ss}^{MU}$	$W^{\mathcal{S}}(d_{ss}^{\mathcal{S}},\epsilon_0^g) - W_{ss}^{\mathcal{S}}$	$W^{\mathcal{S}}(0,\epsilon_0^g) - W^{\mathcal{S}}(0,0)$
Scenario P: Planner					
0.1%	2.0%	+19.4%	+14.8%	−0.75%	−0.75%
Scenario I: single country with independent central bank					
71.4%	7.0%	+15.3%	+12.2%	−0.78%	−0.75%
Scenario MU: status quo monetary union					
199.7%	10.0%	0%	0%	−0.90%	−0.82%
Scenario Fj: Monetary union with regional fiscal authorities					
17.9%	5.8%	+18.4%	+14.1%	−0.75%	−0.74%
Scenario F: Monetary union with union-wide fiscal authority					
8.7%	5.6%	+18.7%	+14.2%	−0.75%	−0.75%
Scenario G: Monetary union with federal government					
78.3%	5.5%	+14.8%	+12.6%	−0.90%	−0.88%

[a] Welfare changes expressed as equivalent variations of steady state private sector output.

[b] "Crisis" is $\epsilon_0^g = 0.02$, with autocorrelation 0.7.

Table: Debt, inflation, and welfare in scenarios $\mathcal{S}$ where debt is a control variable[a]

Debt $\bar{d}_{ss}^{\mathcal{S}}$	Inflation $\pi_{ss}^{\mathcal{S}}$	Welfare $W_{ss}^{\mathcal{S}} - W_{ss}^{MU}$	Transition gain[a] $W^{\mathcal{S}}(d_{ss}^{MU},0) - W_{ss}^{MU}$	Crisis cost[a,b] $W^{\mathcal{S}}(d_{ss}^{\mathcal{S}},\epsilon_0^g) - W_{ss}^{\mathcal{S}}$	Cyclical cost,[a,c] $W_{ss}^{\mathcal{S}} - W_n^{\mathcal{S}}(d_{ss}^{\mathcal{S}},0)$
Scenario P: Planner					
0.1%	2.0%	+19.4%	+14.8%	−0.75%	−0.86%
Scenario I: single country with independent central bank					
71.4%	7.0%	+15.3%	+12.2%	−0.78%	−0.68%
Scenario MU: status quo monetary union					
199.7%	10.0%	0%	0%	−0.90%	−0.83%
Scenario Fj: Monetary union with regional fiscal authorities					
17.9%	5.8%	+18.4%	+14.1%	−0.75%	−0.70%
Scenario F: Monetary union with union-wide fiscal authority					
8.7%	5.6%	+18.7%	+14.2%	−0.75%	−0.71%
Scenario G: Monetary union with federal government					
78.3%	5.5%	+14.8%	+12.6%	−0.90%	−0.95%

[a]Welfare changes expressed as equivalent variations of steady state private sector output.

[c]Comparing stochastic economy with $\epsilon_t^g \sim N(0, 0.02)$, to nonstochastic economy ($\epsilon_t^g \equiv 0$).

RESULTS
with
DEBT AS A RESIDUAL

Key finding: results qualitatively unchanged when the fiscal authority **controls the tax rate** instead of **controlling debt directly**.

Games with Debt as a Residual

- **Monetary union (Scenario *Md*)**
  - CB sets inflation
  - Regional governments set tax and spending
  - $\Rightarrow$ debt determined by budget constraint.
- **Fiscal delegation (Scenarios *Fjd*, *Fd*)**
  - CB sets inflation
  - Regional governments set spending
  - Fiscal authority(ies) set taxes
  - $\Rightarrow$ debt determined by budget constraint.
- **More realistic!** Typically public spending and taxes are subject to long-run planning. Debt issuance takes up the slack.
- But treating a state variable as a residual rather than a control complicates the Euler equation

Debt as A Residual - Monetary Union

- Central bank no longer has a intratemporal trade-off inflation versus spending $\bar{\hat{g}}_t = -\frac{\alpha_{\pi C} q_H}{\alpha_{gS}} \breve{\pi}_t$, now condition is also intertemporal. For the MU case

$$\begin{aligned}
\alpha_{\pi C}\pi_t + \nu\bar{\hat{x}}_t \quad = \quad & \beta_S \frac{\chi\bar{d}_{t-1}+\kappa}{\chi\bar{d}_t+\kappa}\Bigg[(\alpha_{\pi C}\pi_{t+1}+\nu\bar{\hat{x}}_{t+1})\left(\frac{1}{\beta_S}+2\delta\bar{d}_{t-1}\right)+ \\
& +\left(\frac{1}{\nu}+\frac{q_L^2\nu}{\alpha_{gC}}\right)(\alpha_{\pi C}\pi_{t+1}+(1+\chi\bar{d}_t+\kappa)\nu\bar{\hat{x}}_{t+1})\frac{\partial\bar{x}_{t+1}}{\partial d_t}+ \\
& +(\chi\bar{d}_t\alpha_{\pi C}\pi_{t+1}-\nu\bar{\hat{x}}_{t+1})\frac{\partial\pi_{t+1}}{\partial d_t}\Bigg]
\end{aligned}$$

Plus, one intratemporal condition linking output(taxes) and spending, and

$\hat{x}_{j,t} = \beta_G\left(\frac{1}{\beta_S}+\delta\bar{d}_{t-1}\right)E_t\hat{x}_{j,t+1}$

$\bar{d}_t = \left(\frac{1}{\beta_S}+\delta\bar{d}_{t-1}\right)\bar{d}_{t-1}+(\pi_t^e-\pi_t)(1+\chi\bar{d}_{t-1})+\left(\frac{1}{\nu}+\frac{q_L^2\nu}{\alpha_{gC}}\right)\bar{\hat{x}}_t-\kappa\pi_t+\bar{\hat{z}}_t$

Policy Games - Debt as A Residual - *Fj* case

$$
\begin{aligned}
\alpha_{\pi C}\pi_t + \nu\bar{\hat{x}}_t &= \beta_S \frac{\chi\bar{d}_{t-1}+\kappa}{\chi\bar{d}_t+\kappa}\Bigg[(\alpha_{\pi C}\pi_{t+1}+\nu\bar{\hat{x}}_{t+1})(R(d_t)+R'(d_t)d_t)+ \\
&\quad +(\alpha_{gC}\bar{\hat{g}}_{t+1}(1+\chi\bar{d}_t)+q_L(\alpha_{\pi C}\pi_{t+1}+\nu\bar{\hat{x}}_{t+1}))\frac{\partial\bar{\hat{g}}_{t+1}}{\partial d_t}+ \\
&\quad +\left(\frac{1}{\nu}\right)(\alpha_{\pi C}\pi_{t+1}+(1+\chi\bar{d}_t+\kappa)\nu\bar{\hat{x}}_{t+1})\frac{\partial\bar{\hat{x}}_{t+1}}{\partial d_t}+ \\
&\quad +(\chi\bar{d}_t\alpha_{\pi C}\pi_{t+1}-\nu\bar{\hat{x}}_{t+1})\frac{\partial\pi_{t+1}}{\partial d_t}\Bigg] \\
\hat{g}_{j,t} &= \beta_G E_t\left[R(\bar{d}_t)\hat{g}_{j,t+1}-\left(\frac{q_L}{\alpha_{gG}}\hat{x}_{j,t+1}-\frac{1}{\nu}\hat{g}_{j,t+1}\right)\frac{\partial\bar{x}_{t+1}}{\partial d_t}\right], \\
\nu\hat{x}_{j,t}+\alpha_{dF}d_{j,t} &= \beta_F E_t\left[\nu\hat{x}_{j,t+1}R(\bar{d}_t)+\left(q_L\nu\hat{x}_{j,t+1}-\alpha_{gG}\hat{g}_{j,t+1}\right)\frac{\partial g_{j,t+1}}{\partial d_t}\right], \\
\bar{d}_t &= \left(\frac{1}{\beta_S}+\delta\bar{d}_{t-1}\right)\bar{d}_{t-1}+(\pi_t^e-\pi_t)(1+\chi\bar{d}_{t-1})+\frac{1}{\nu}\bar{\hat{x}}_t+q_L\bar{\hat{g}}_t-\kappa\pi_t+\bar{\tilde{z}}_t
\end{aligned}
$$

Figure: Borrowing and inflation. Comparing institutional scenarios when debt is a residual and a control variable

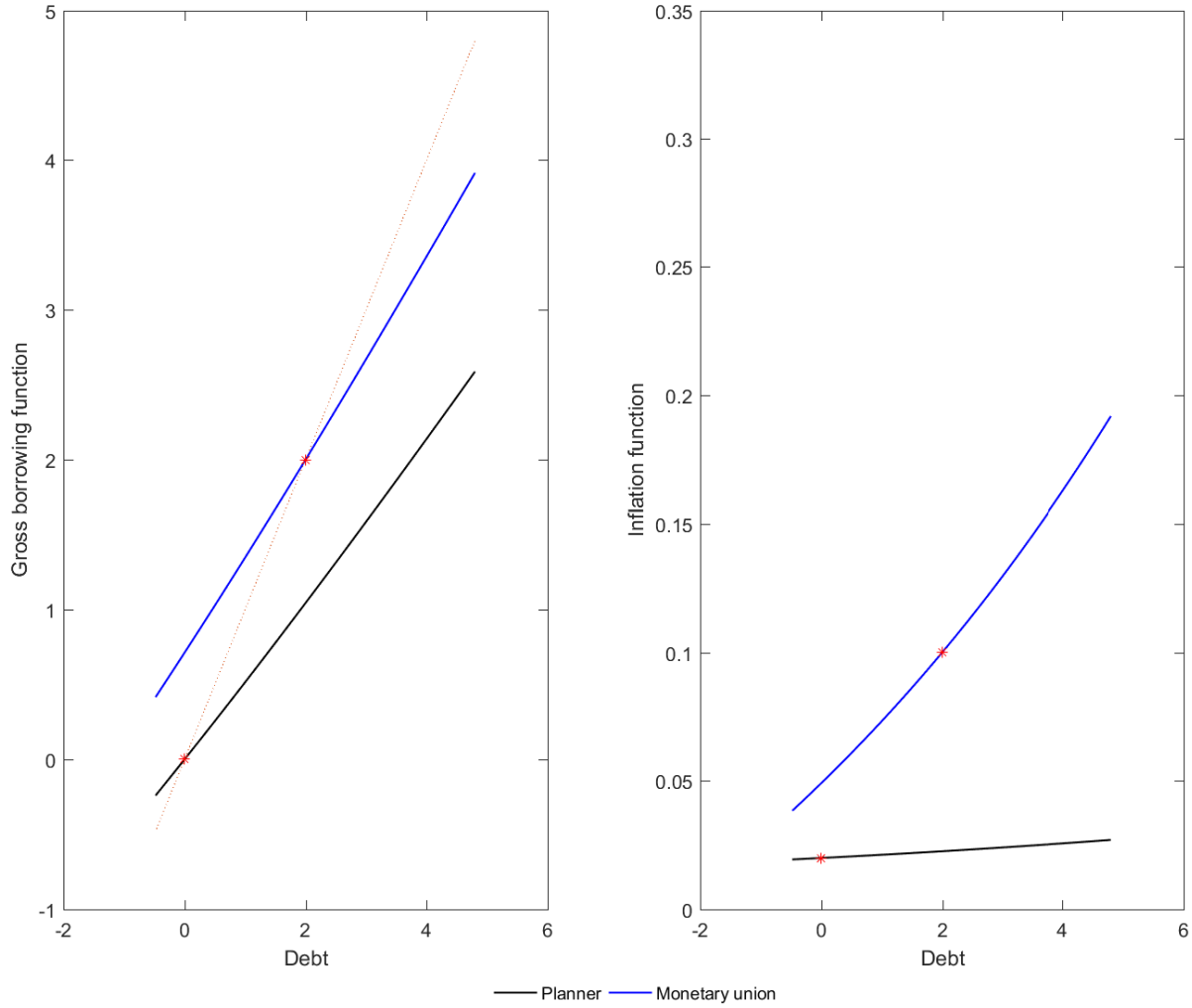


Figure: Borrowing and inflation. Comparing institutional scenarios when debt is a residual and a control variable

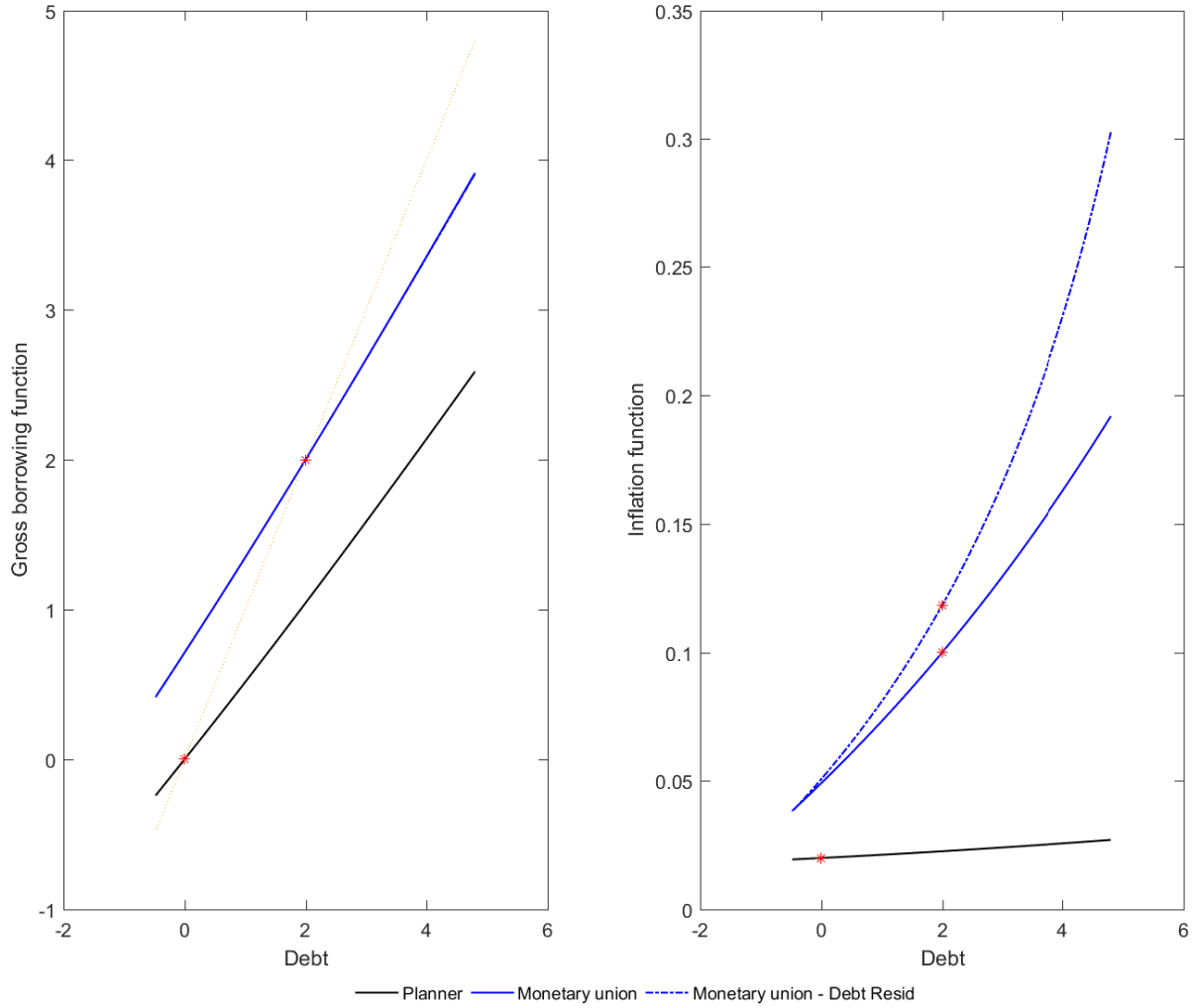


Figure: Borrowing and inflation. Comparing institutional scenarios when debt is a residual and a control variable

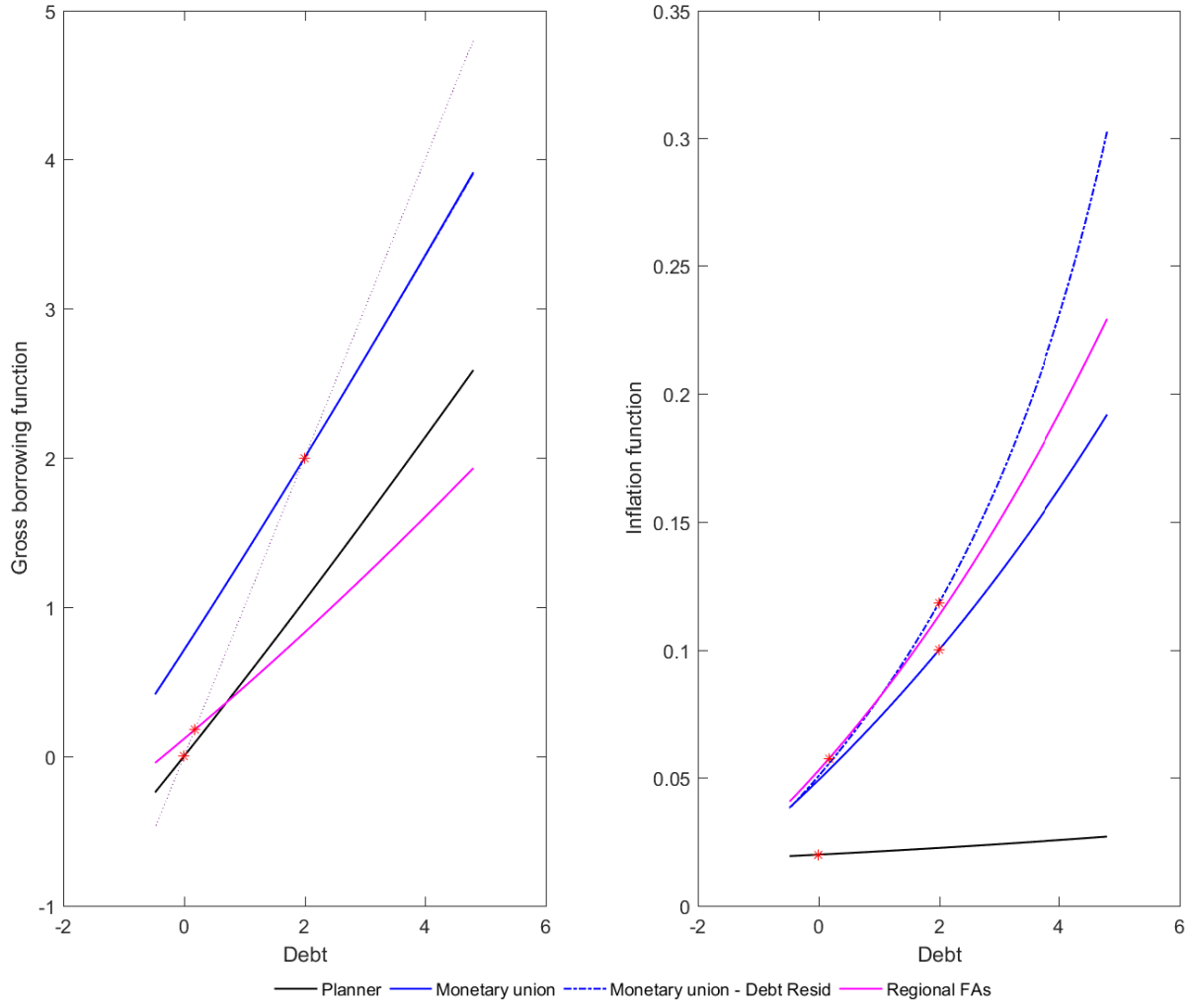


Figure: Borrowing and inflation. Comparing institutional scenarios when debt is a residual and a control variable

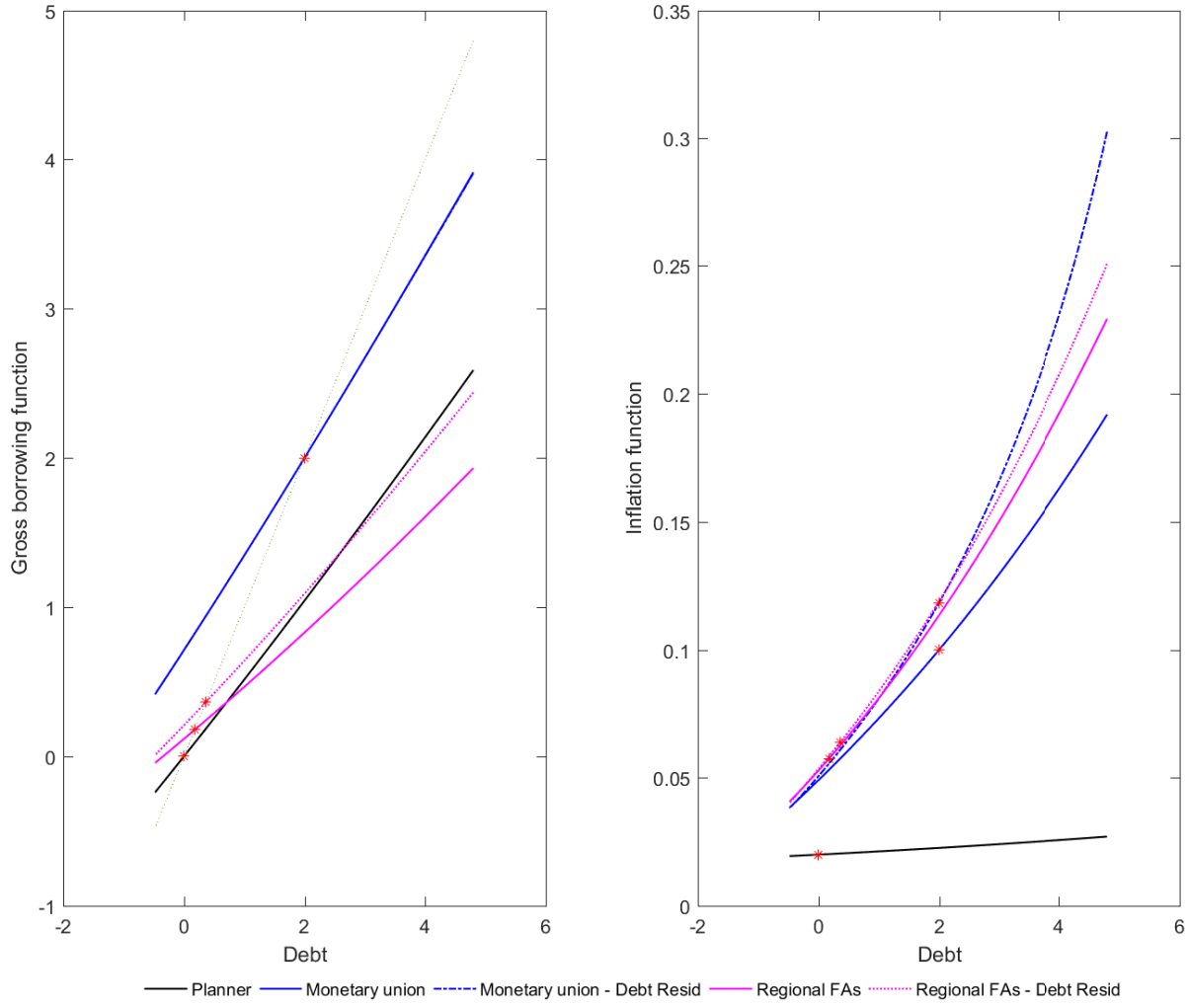


Figure: Temporary public demand shock. Comparing scenarios when debt is a residual.

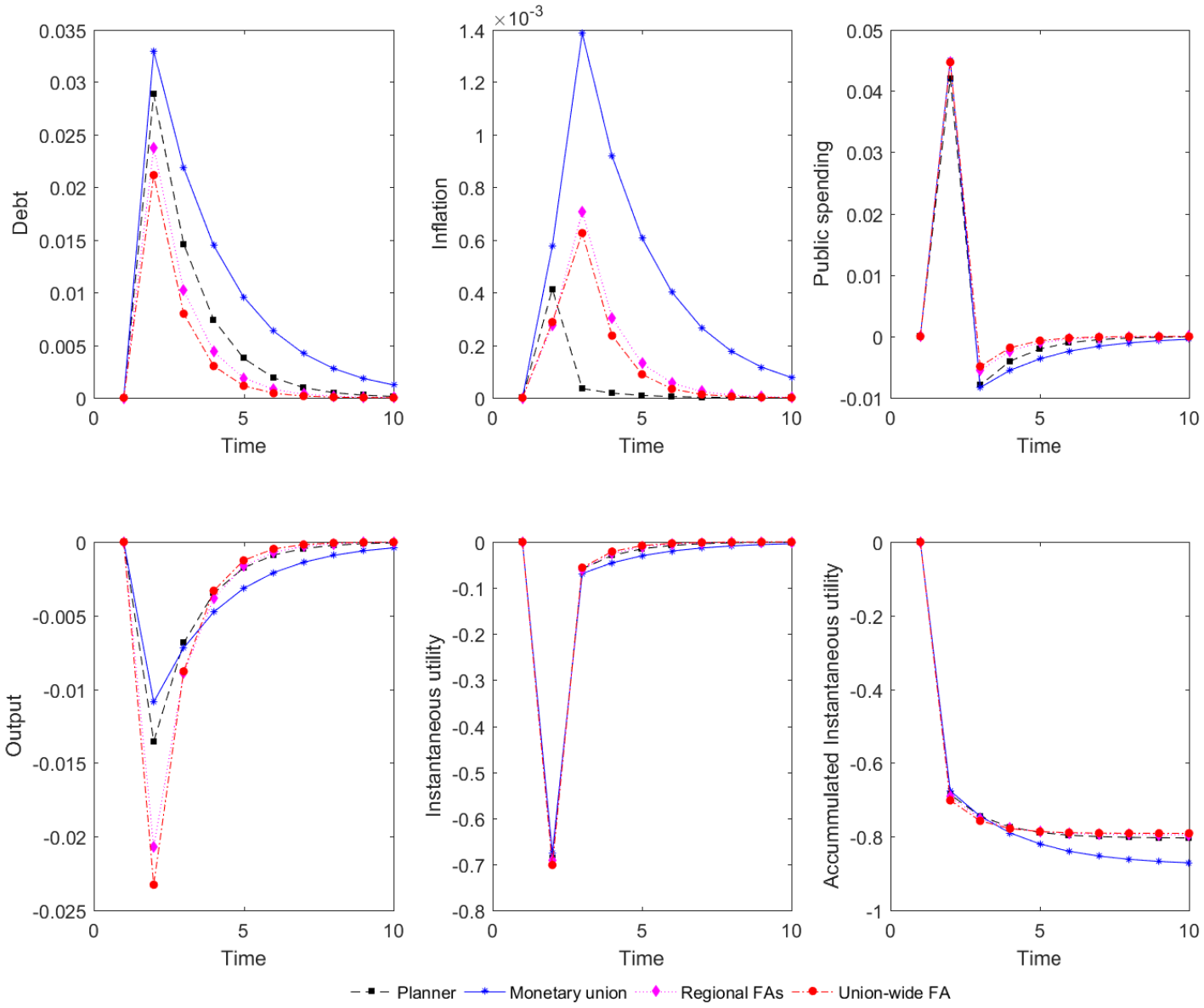


Figure: Autocorrelated public demand shock. Comparing scenarios when debt is a residual.

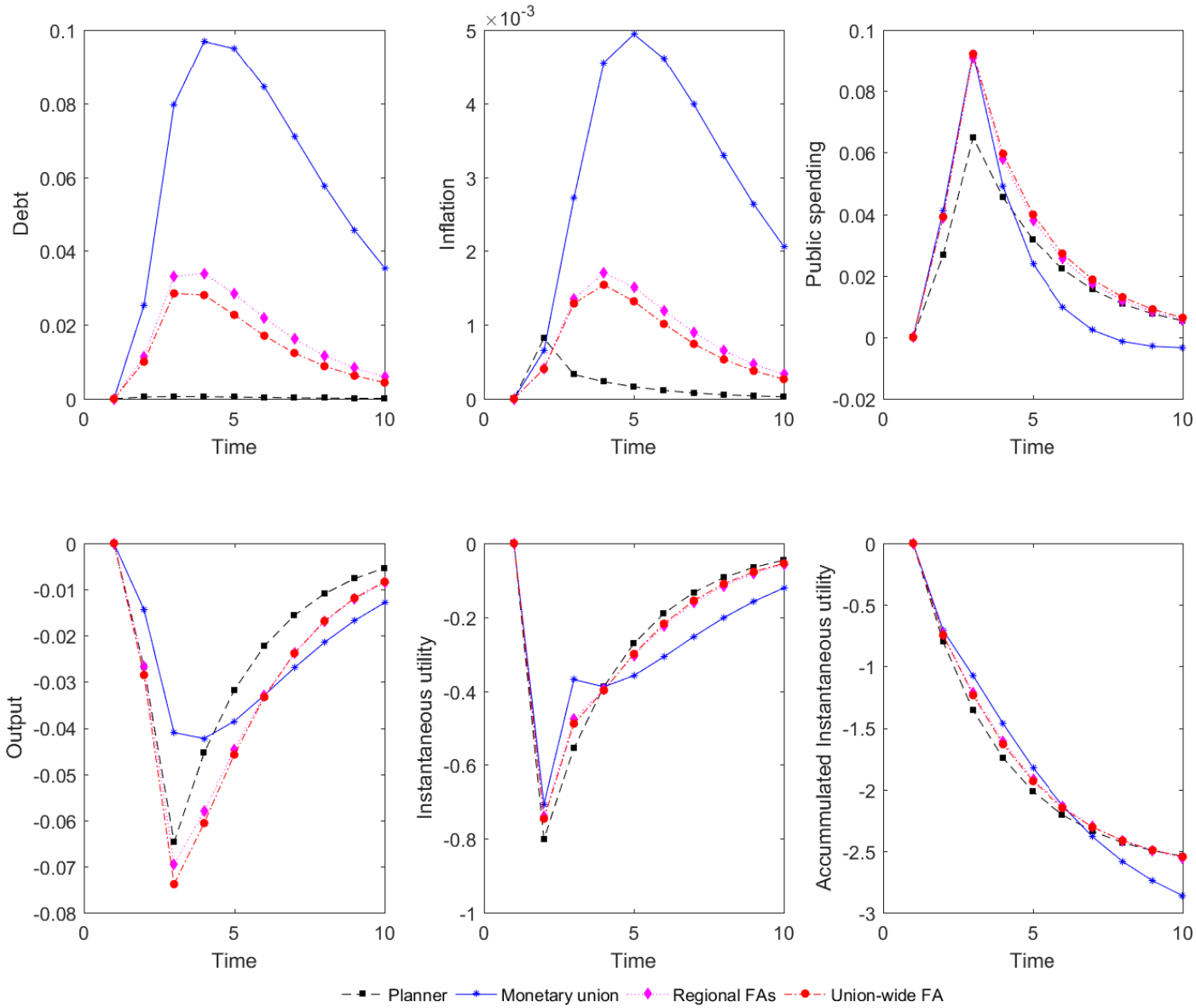


Table: Debt, inflation, and welfare in scenarios $\mathcal{S}$ where debt is a residual*

Debt $\bar{d}_{ss}^{\mathcal{S}}$	Inflation $\pi_{ss}^{\mathcal{S}}$	Welfare $W_{ss}^{\mathcal{S}} - W_{ss}^{MU}$	Transition gain[a] $W^{\mathcal{S}}(d_{ss}^{MU},0) - W_{ss}^{MU}$	Crisis cost[a,b] $W^{\mathcal{S}}(d_{ss}^{\mathcal{S}},\epsilon_0^g) - W_{ss}^{\mathcal{S}}$	Crisis cost,[a,b] fixing debt $W^{\mathcal{S}}(0,\epsilon_0^g) - W^{\mathcal{S}}(0,0)$
Scenario P: Planner					
0.1%	2.0%	+21.2%	+16.6%	−0.75%	−0.75%
Scenario MUdr: status quo monetary union					
199.7%	11.8%	0	0	−0.91%	−0.83%
Scenario Fjdr: Monetary union with regional fiscal authorities					
36.4%	6.4%	+18.9%	+14.9%	−0.76%	−0.75%
Scenario Fdr: Monetary union with union-wide fiscal authority					
15.7%	5.9%	+19.9%	+15.4%	−0.76%	−0.75%

[a] Welfare changes expressed as equivalent variations of steady state private sector output.

[b] "Crisis" is $\epsilon_0^g = 0.02$, with autocorrelation 0.7.

Table: Debt, inflation, and welfare in scenarios $\mathcal{S}$ where debt is a residual*

Debt $\bar{d}_{ss}^{\mathcal{S}}$	Inflation $\pi_{ss}^{\mathcal{S}}$	Welfare $W_{ss}^{\mathcal{S}} - W_{ss}^{MU}$	Transition gain[a] $W^{\mathcal{S}}(d_{ss}^{MU},0) - W_{ss}^{MU}$	Crisis cost[a,b] $W^{\mathcal{S}}(d_{ss}^{\mathcal{S}},\epsilon_0^g) - W_{ss}^{\mathcal{S}}$	Cyclical cost,[a,b] $W_{ss}^{\mathcal{S}} - W_n^{\mathcal{S}}(d_{ss}^{\mathcal{S}},0)$
Scenario P: Planner					
0.1%	2.0%	+21.2%	+16.6%	−0.75%	−0.86%
Scenario MUdr: status quo monetary union					
199.7%	11.8%	0	0	−0.91%	−0.90%
Scenario Fjdr: Monetary union with regional fiscal authorities					
36.4%	6.4%	+18.9%	+14.9%	−0.76%	−0.74%
Scenario Fdr: Monetary union with union-wide fiscal authority					
15.7%	5.9%	+19.9%	+15.4%	−0.76%	−0.77%

[a]Welfare changes expressed as equivalent variations of steady state private sector output.

[c]Comparing stochastic economy with $\epsilon_t^g \sim N(0, 0.02)$, to nonstochastic economy ($\epsilon_t^g \equiv 0$).

IMPLICATIONS for EUROPE

Role of fiscal delegation for Europe?

- **Lack of commitment is very costly** in a monetary union
- Delegating a budget shifter to an independent fiscal authority (IFA) could yield **large steady state welfare gains**
  - Comes closer to commitment solution, with much lower debt
- Dynamic analysis reinforces our conclusions!
  - **Transition is preferred** to status quo, in spite of costly austerity
  - Surprisingly, there is **no tradeoff against stabilization**.
    - ⋆ Under IFA, negative shock implies greater austerity, but is **less costly** over the course of the downturn
  - Same conclusions when IFA controls debt directly, or controls taxes
- Could the new European Fiscal Board be transformed into a **European Fiscal Authority**?
  - A promising alternative to more complex rules with more complex monitoring process and (supposedly) more strongly binding sanctions!

European Fiscal Board $\rightarrow$ European Fiscal Authority

- EFA would **monitor and forecast** fiscal trends in each member state
- EFA could **provide advice** on fiscal impact of new policy proposals
  - Those are the jobs foreseen for the EFB, starting 2017

European Fiscal Board → European Fiscal Authority

- EFA would **monitor and forecast** fiscal trends in each member state
- EFA could **provide advice** on fiscal impact of new policy proposals
  - Those are the jobs foreseen for the EFB, starting 2017

- **EFA would have the power to set fiscal instrument(s) that give it effective control over national debt levels**

- Need not control debt directly... **tax instrument suffices**...
  e.g. Gruen (1997) proposes a multiplicative shifter x in the tax code:

$$\text{tax rate}_{i,t} = F(\text{income}_{i,t}, \text{ lots of other stuff}_{i,t})(1 + x_t).$$

  Hence redistributive properties of tax code are maintained.
- Alternative: adjust public expenditure (Costain/de Blas '12A,B)
- Alternative: adjust pensions (**already** done in Spain: see Sánchez '14)

Is EFA politically feasible?

- Fiscally fragile Eurozone states **need ECB protection against debt crises and banking crises** (e.g. Eurobonds, deposit insurance)
- Fiscally strong Eurozone states oppose ECB guarantees because they fear **moral hazard**: weaker countries may fail to balance budgets if they take ECB protection for granted.

Is EFA politically feasible?

- Fiscally fragile Eurozone states **need ECB protection against debt crises and banking crises** (e.g. Eurobonds, deposit insurance)
- Fiscally strong Eurozone states oppose ECB guarantees because they fear **moral hazard**: weaker countries may fail to balance budgets if they take ECB protection for granted.

- **A feasible quid pro quo:**
- Members **voluntarily delegate** one or more fiscal shifters to EFA.
- EFA evaluates whether these give it **effective control of debt**.
- When a member state has delegated an effective instrument to EFA, **ECB guarantees protection against crises** (which are less likely since EFA decreases biases, increases credibility, reduces premia).

Is EFA politically feasible?

- Fiscally fragile Eurozone states **need ECB protection against debt crises and banking crises** (e.g. Eurobonds, deposit insurance)
- Fiscally strong Eurozone states oppose ECB guarantees because they fear **moral hazard**: weaker countries may fail to balance budgets if they take ECB protection for granted.

- **A feasible quid pro quo:**
- Members **voluntarily delegate** one or more fiscal shifters to EFA.
- EFA evaluates whether these give it **effective control of debt**.
- When a member state has delegated an effective instrument to EFA, **ECB guarantees protection against crises** (which are less likely since EFA decreases biases, increases credibility, reduces premia).
  - If EFA says instrument is not effective, or is **no longer** effective, **ECB revokes protection**.

Conclusions

- **Lack of commitment is very costly** in a monetary union
- Delegating a budget shifter to an independent fiscal authority (IFA) could yield **large steady state welfare gains**
  - Comes closer to commitment solution, with much lower debt
- Dynamic analysis reinforces our conclusions!
  - **Transition is preferred** to status quo, in spite of costly austerity
  - Surprisingly, there is **no tradeoff against stabilization**.
    - ⋆ Under IFA, negative shock implies greater austerity, but is **less costly** over the course of the downturn
  - Same conclusions when IFA controls debt directly, or controls taxes
- **Current European impasse shows potential for quid pro quo that would make IFA politically feasible.**

Possible extensions

- Build a DSGE instead of this reduced-form model, for better quantitative assessment, especially regarding stabilization.
- Allow for endogenous, costly default. (Endgame with fiscal authority as default comes near?)
- Allow for private information of the local government about the level of its spending requirements– implies moral hazard.

Postscript

- This sounds very ambitious... but **institutional ingredients and possible quid pro quo** are already in place.
  - Compare this to the reforms/agreements/referendums necessary to create a federal Europe!
- Voluntarily **delegating fiscal instruments to a joint authority** is a feasible and robust way to **build a closer union among a subset** (or remnant) of member states.

THANKS FOR YOUR ATTENTION!