Fiscal policy coordination in currency unions at the effective lower bound

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The question

Need to coordinate fiscal stabilization policy in currency unions?

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Pre-crisis paradigm: no

- Stabilization of area-wide fluctuations left to monetary policy
- Country-specific fluctuations smoothed by fiscal policy (Beetsma & Jensen 2005, Galí & Monacelli 2008)

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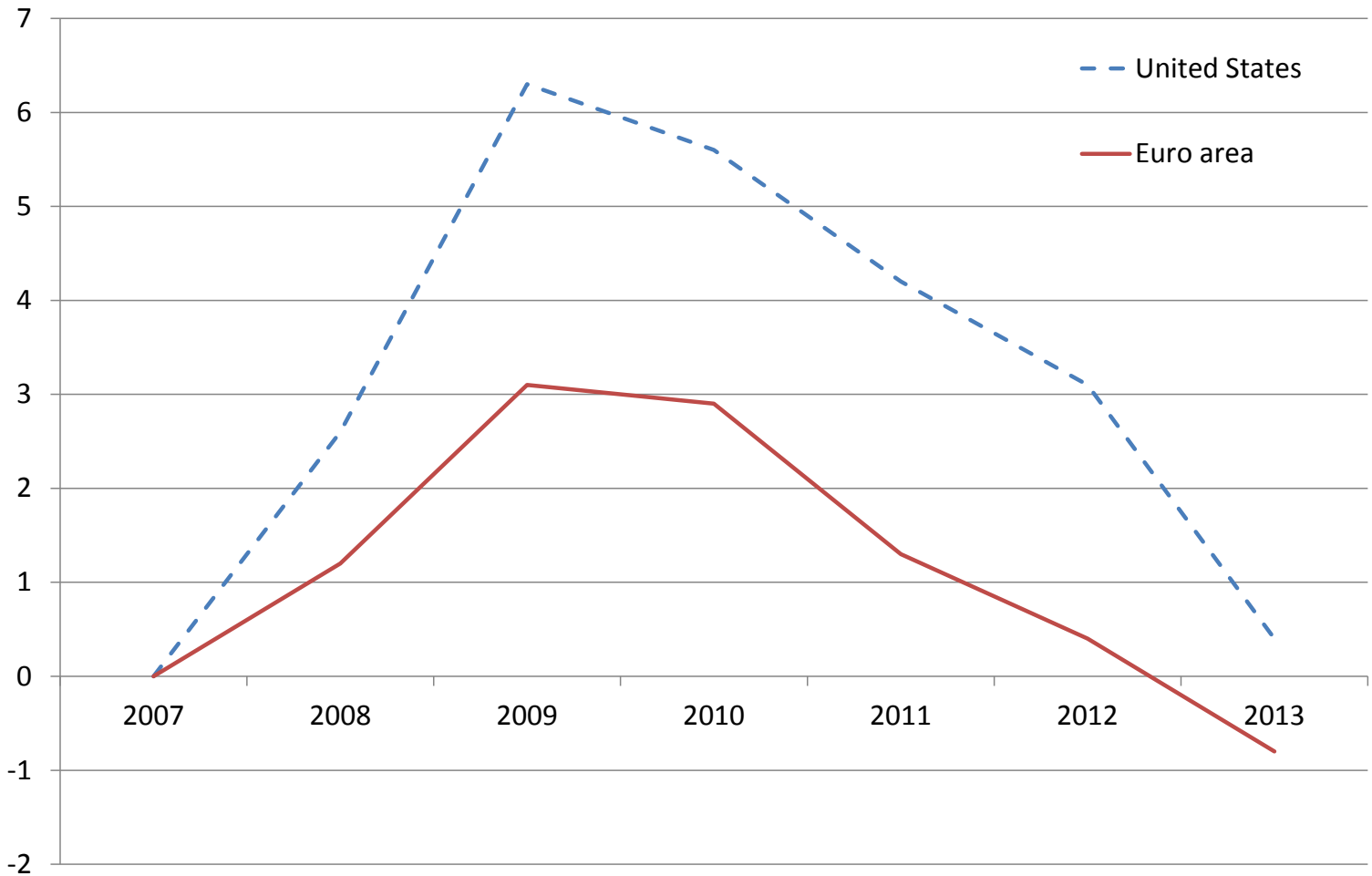
Global financial crisis

- Return of fiscal stabilization policy, notably as monetary policy constrained by effective lower bound
- Fiscal stimulus in EA smaller than in US

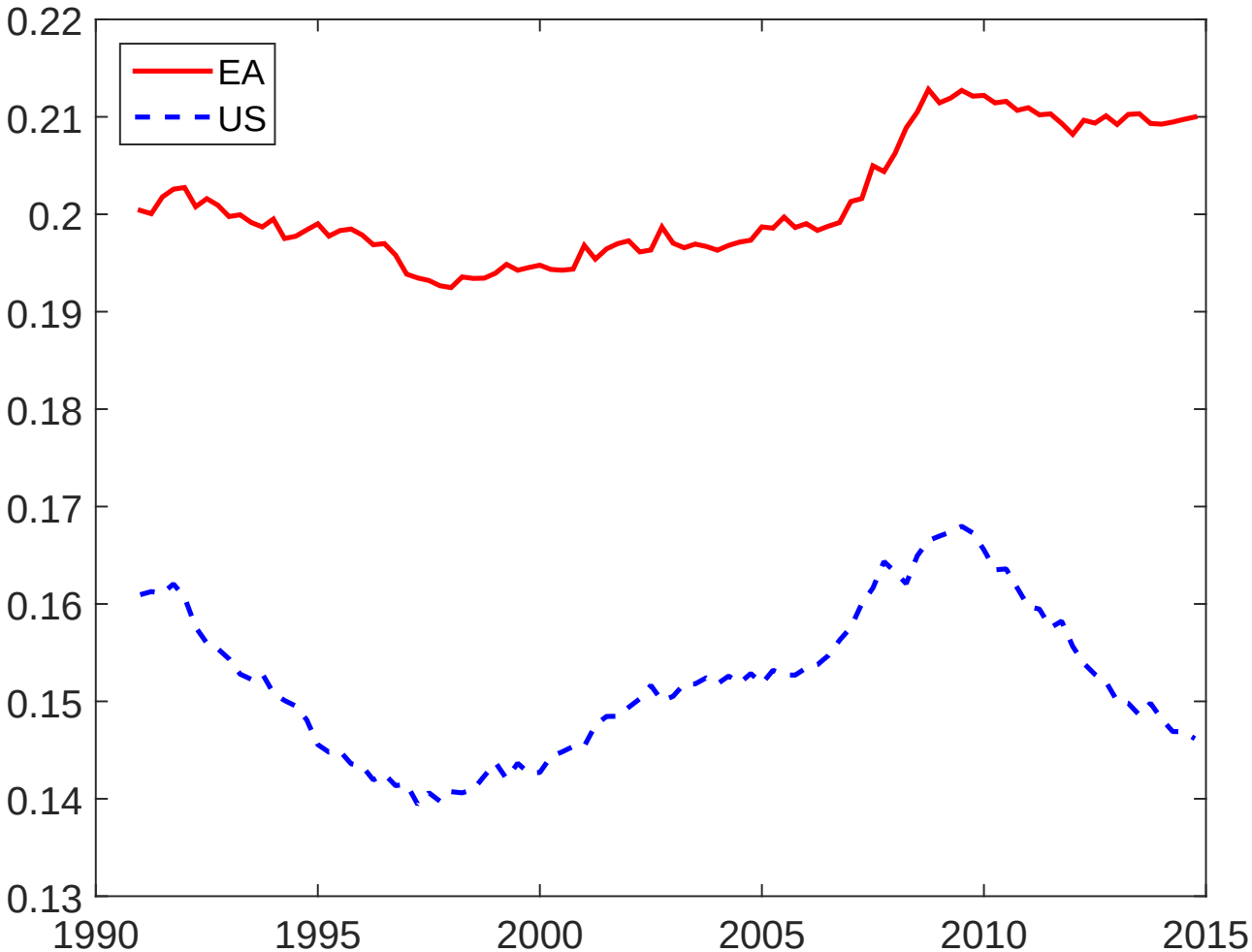
Cyclical adjusted budget deficit



Percentage point of GDP, change relative to 2007

Consumption of general government

Units of potential output



max, increase relative to mean: 5.7% (EA) vs 10.4% (US)

This paper

Optimal public consumption in currency union

- Focus on discretionary policy once effective lower bound binds
- Benchmark results in the absence of coordination against results for coordination

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- Monetary policy constrained by effective lower bound
- Optimal non-cooperative fiscal policy

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Abstract from

- Non-conventional monetary policy
- Sovereign risk e.g. Corsetti, Kuester, Meier & Müller (2014)
- Deficit bias e.g. Beetsma & Uhlig (1999), Krogstrup & Wyplosz (2010)

Related literature

Government spending multipliers: ELB vs fixed exchange rates

- Erceg & Lindé (2012), Corsetti, Kuester & Müller (2013), Fahri & Werning (2016)

Fiscal coordination in open economies at ZLB

- Cook & Devereux (2011), Blanchard, Erceg & Lindé (2016)

Terms of trade externality

- Turnovsky (1988), Devereux (1991), Corsetti & Pesenti (2001), De Paoli (2009), Forlati (2015)

New Keynesian model of a currency union

Basic model due to Galí & Monacelli (2008)

- Currency union as continuum of small open economies
- Within each country: households, firms, fiscal authority
- Common monetary policy

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No strategic interaction

- Country-wide developments impact terms of trade, but not union-wide variables

Representative household in country $i \in [0,1]$

Period utility

$$U(C_t^i, N_t^i, G_t^i) = (1-\chi)\log C_t^i + \chi \log G_t^i - \frac{\left(N_t^i\right)^{1+\varphi}}{1+\varphi}$$

$$\text{with } C_t^i \equiv \frac{\left(C_{H,t}^i\right)^{1-\alpha}\left(C_{F,t}^i\right)^{\alpha}}{(1-\alpha)^{1-\alpha}\,\alpha^{\alpha}}$$

- C_t^i denotes private and G_t^i public consumption, N_t^i is hours worked, $0 < \chi < 1$ and $\varphi > 0$
- $C_{H,t}$ and $C_{F,t}$: aggregates of domestic and union wide bundles
- $\alpha \in (0,1)$: home bias accounts for deviation from PPP
- Financial markets are complete

Firms, fiscal & monetary policy

Variety producing firm $j \in [0, 1]$ in country i

- Produce with linear technology $Y_t^i(j) = N_t^i(j)$
- Monopolistic competition, price rigidities (Calvo)

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- Public consumption G_t^i: domestically produced goods only
- Lump-sum taxes (Ricardian equivalence)

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Monetary policy

- Sets nominal interest rate at union level: i_t^*

Approximate equilibrium dynamics: country level

New Keynesian Phillips curve (with $\gamma \equiv G/Y$)

$$\pi_t^i = \beta E_t\{\pi_{t+1}^i\} + \lambda\left(\frac{1}{1-\gamma} + \varphi\right)\hat{y}_t^i - \frac{\lambda\gamma}{1-\gamma}\hat{g}_t^i \tag{1}$$

Inflation and terms of trade

$$\pi_t^i - \pi_t^* = -(s_t^i - s_{t-1}^i) \tag{2}$$

where $\pi_t^i \equiv p_t^i - p_{t-1}^i$ and $s_t^i \equiv p_t^* - p_t^i$

Aggregate demand

$$\hat{y}_t^i = \gamma\left(\hat{g}_t^i - \hat{g}_t^*\right) + (1-\gamma)s_t^i + \hat{y}_t^* \tag{3}$$

Approximate equilibrium dynamics: union level

New Keynesian Phillips curve

$$\pi_t^* = \beta E_t\{\pi_{t+1}^*\} + \lambda\left(\frac{1}{1-\gamma} + \varphi\right)\hat{y}_t^* - \frac{\lambda\gamma}{1-\gamma}\hat{g}_t^* \tag{4}$$

Aggregate demand

$$\begin{aligned}\hat{y}_t^* \quad = \quad & E_t\{\hat{y}_{t+1}^*\} - \gamma E_t\{\hat{g}_{t+1}^* - \hat{g}_t^*\} \\ & -(1-\gamma)\left[i_t^* - E_t\{\pi_{t+1}^*\} + \Delta_t + r\right]\end{aligned} \tag{5}$$

where Δ_t is exogenous spread (Woodford, 2011)

- Markov: shock $\Delta_t = \Delta_H$ lasts with prob. μ, else zero

Interest rate rule

$$i_t^* = \max\left\{r - \Delta_t + \phi_\pi \pi_t^*, 0\right\} \tag{6}$$

Equilibrium

Given initial conditions (s_{-1}) and a path for the exogenous spread $\{\Delta_t\}_{t=0}^{\infty}$ an equilibrium is a collection of

1. country-specific stochastic processes $\{\hat{y}_t^i, \pi_t^i, s_t^i\}_{t=0}^{\infty}$ for all $i \in [0,1]$
2. union-wide stochastic processes $\{\hat{y}_t^*, \pi_t^*\}_{t=0}^{\infty}$ with $\hat{y}_t^* = \int_0^1 \hat{y}_t^i di$, $\pi_t^* = \int_0^1 \pi_t^i di$

such that for given $\{\hat{g}_t^i\}_{t=0}^{\infty}$ for all $i \in [0,1]$ with $\hat{g}_t^* = \int_0^1 \hat{g}_t^i di$ and the path for the nominal interest rate $\{i_t^*\}_{t=0}^{\infty}$ determined by (6)

3. equilibrium conditions (3) - (2) are satisfied for each country i and
4. equilibrium conditions (5) and (4) are satisfied on the union level.

Government spending multiplier on output

Corsetti, Kuester, Müller (2013), Fahri, Werning (2016)

Consider exogenous variation in government consumption while effective lower bound binds, then

$$\frac{1}{\gamma}\frac{d\hat{y}_L^i}{d\hat{g}_L^i} \leq 1 \leq \frac{1}{\gamma}\frac{d\hat{y}_L^*}{d\hat{g}_L^*}$$

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Intuition: government spending inflationary

- Union-wide impulse: real interest rate declines, boosting private expenditure

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- Union-wide impulse: real interest rate declines, boosting private expenditure
- Country level only: terms of trade appreciate, reducing demand for domestic goods

Optimal discretionary fiscal policy

Need to coordinate fiscal stabilization policy in currency unions?

- Optimal policy w/ coordination:
  maximize union-wide welfare
- Optimal policy w/o coordination (Nash):
  maximize domestic welfare taking aggregate variables as given

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Strategy based on linear quadratic approach

- Compute steady states w/ and w/o coordination as solution to social planner problems
- Approximate welfare up to 2nd order, relying on Benigno & Woodford (2006)
- Compute optimal discretionary fiscal policy at effective lower bound

Optimal government spending in steady state

Turnovsky (1988), Devereux (1991)

Steady states w/ and w/o coordination are given by

$$\gamma^{Coord} = \chi < \frac{\chi}{(1-\alpha)(1-\chi)+\chi} = \gamma^{Nash}$$

Intuition

- Coordination: provide efficient level of spending
- Nash: appreciate terms of trade to economize on labor effort

Some empirical observations

- US data: $\gamma^{Coord} = 0.15$; EA data: $\gamma^{Nash} = 0.19$
- Implies $\alpha = 0.29$

Optimal fiscal stabilization under discretion at ELB: Coordination

Maximize union wide (period) utility

$$-\frac{1}{2}\int_0^1 \left(\frac{\varepsilon}{\lambda}(\pi_t^i)^2 + (1+\varphi)(\hat{y}_t^i)^2 + \frac{\gamma}{1-\gamma}(\hat{g}_t^i - \hat{y}_t^i)^2\right) di$$

Subject to

$$\begin{aligned}
\hat{y}_t^* &= E_t\{\hat{y}_{t+1}^*\} - (1-\gamma)\left[i_t^* - E_t\{\pi_{t+1}^*\} + \Delta_t\right] - \gamma E_t\{\hat{g}_{t+1}^* - \hat{g}_t^*\} \\
\pi_t^* &= \beta E_t\{\pi_{t+1}^*\} + \lambda\left(\frac{1}{1-\gamma} + \varphi\right)\hat{y}_t^* - \frac{\lambda\gamma}{1-\gamma}\hat{g}_t^*
\end{aligned}$$

where $\gamma = \gamma^{Coord}$ and $i_t^* = 0$

Optimal fiscal stabilization under discretion at ELB: Nash

Maximize

$$V(s_{t-1}^i, \pi_t^*, \hat{c}_t^*) = \max_{\pi_t^i, \hat{y}_t^i, \hat{g}_t^i, s_t^i} \left[-\frac{1}{2} \left(\frac{\varepsilon}{\lambda} (\pi_t^i)^2 + (1+\varphi)(\hat{y}_t^i)^2 + \frac{\gamma}{1-\gamma} \left(\hat{g}_t^i - \hat{y}_t^i \right)^2 \right) + \beta E_t V(s_t^i, \pi_{t+1}^*, \hat{c}_{t+1}^*) \right]$$

Subject to

$$\hat{y}_t^i = \gamma \left(\hat{g}_t^i - \hat{g}_t^* \right) + (1-\gamma) s_t^i + \hat{y}_t^*$$

$$\pi_t^i = \beta E_t \{ \pi_{t+1}^i \} + \lambda \left(\frac{1}{1-\gamma} + \varphi \right) \hat{y}_t^i - \frac{\lambda \gamma}{1-\gamma} \hat{g}_t^i$$

$$\pi_t^i - \pi_t^* = -(s_t^i - s_{t-1}^i)$$

where $\gamma = \gamma^{Nash}$

A special case: smaller stimulus w/o coordination

Effective lower bound, symmetric equilibrium and $\beta \to 0$

$$\hat{g}_L^{*,Nash} < \hat{g}_L^{*,Coord}$$

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Inflationary impact of higher government spending differs

- *Union-wide* inflation lowers real rate: expansionary
- *Domestic* inflation appreciates terms of trade: contractionary

Different from steady state

- Non-cooperative policy maker prefers weaker terms of trade ("being competitive"), because output below potential at ELB

Quantitative illustration

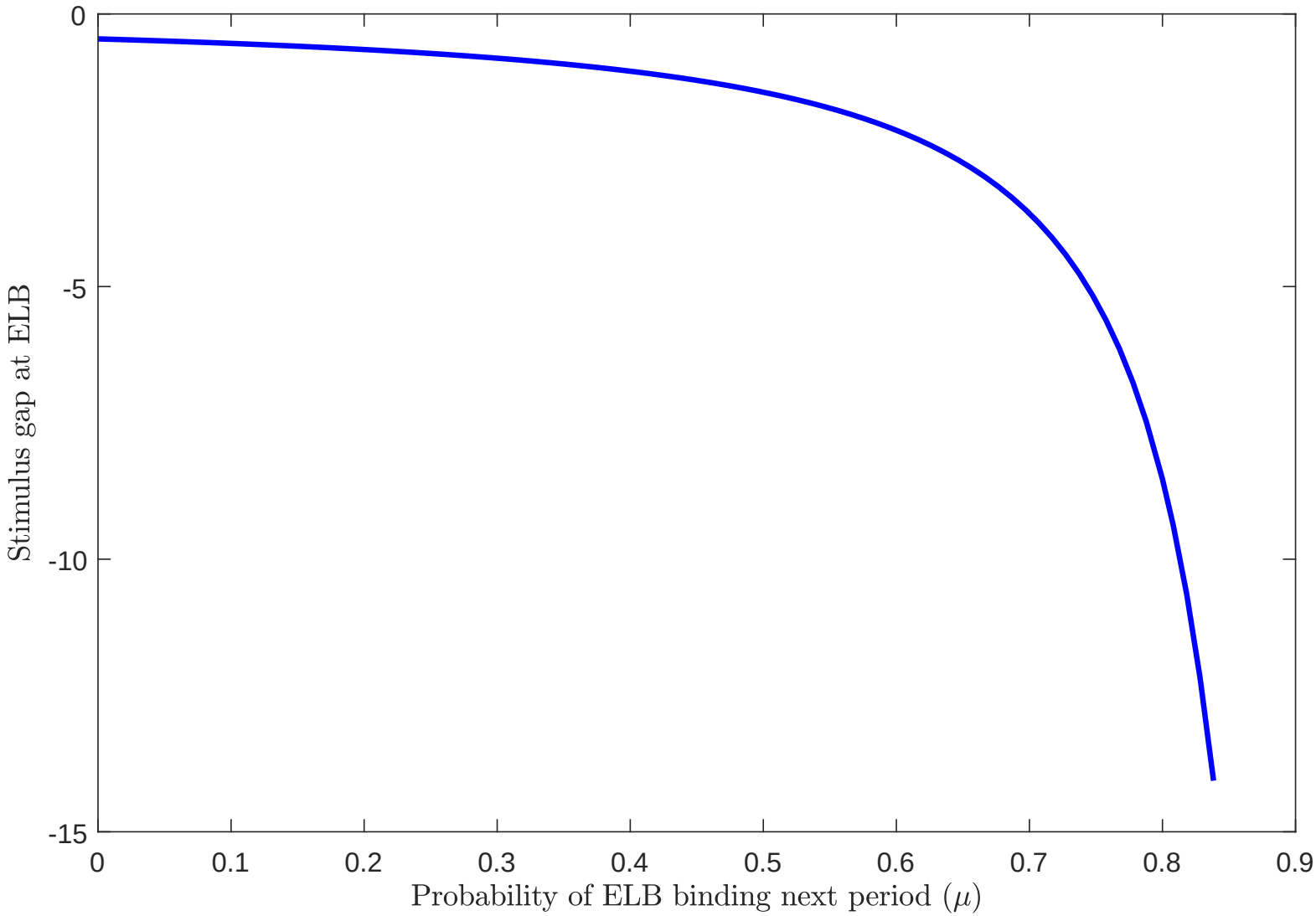
Contrast optimal fiscal response w/ and w/o coordination

- ELB binds because of spread shock
- Severity of crisis measured by μ

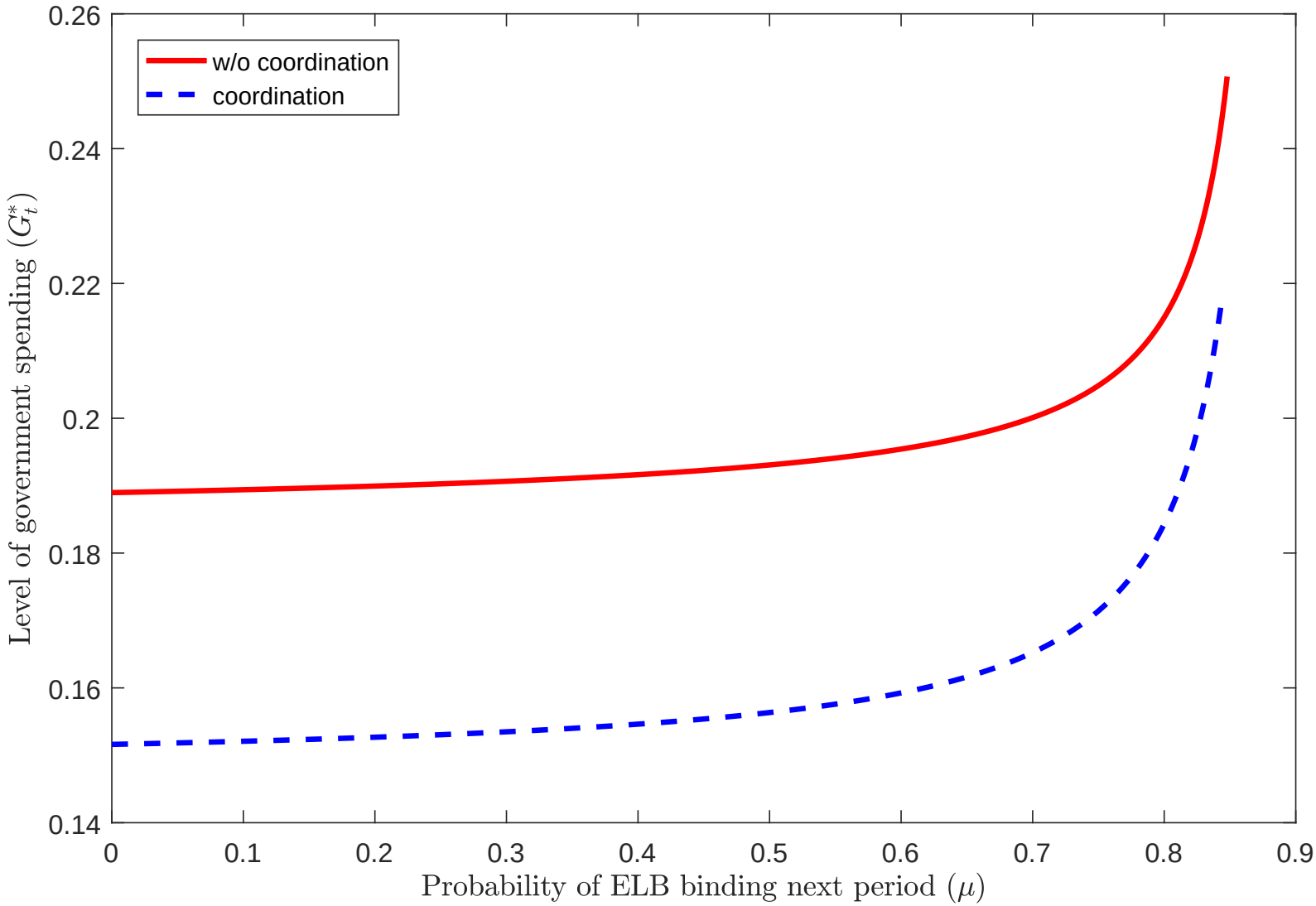
Parameterization

β	0.99	Time discount factor
χ	0.148	Public consumption-GDP ratio
α	0.2874	Import-share in steady state
θ	0.925	Degree of price stickiness
ε	6	Elasticity of substitution
φ	4	Inverse of Frisch elasticity of labor supply
ϕ_π	1.5	Taylor coefficient
Δ_H	0.02	ELB scenario

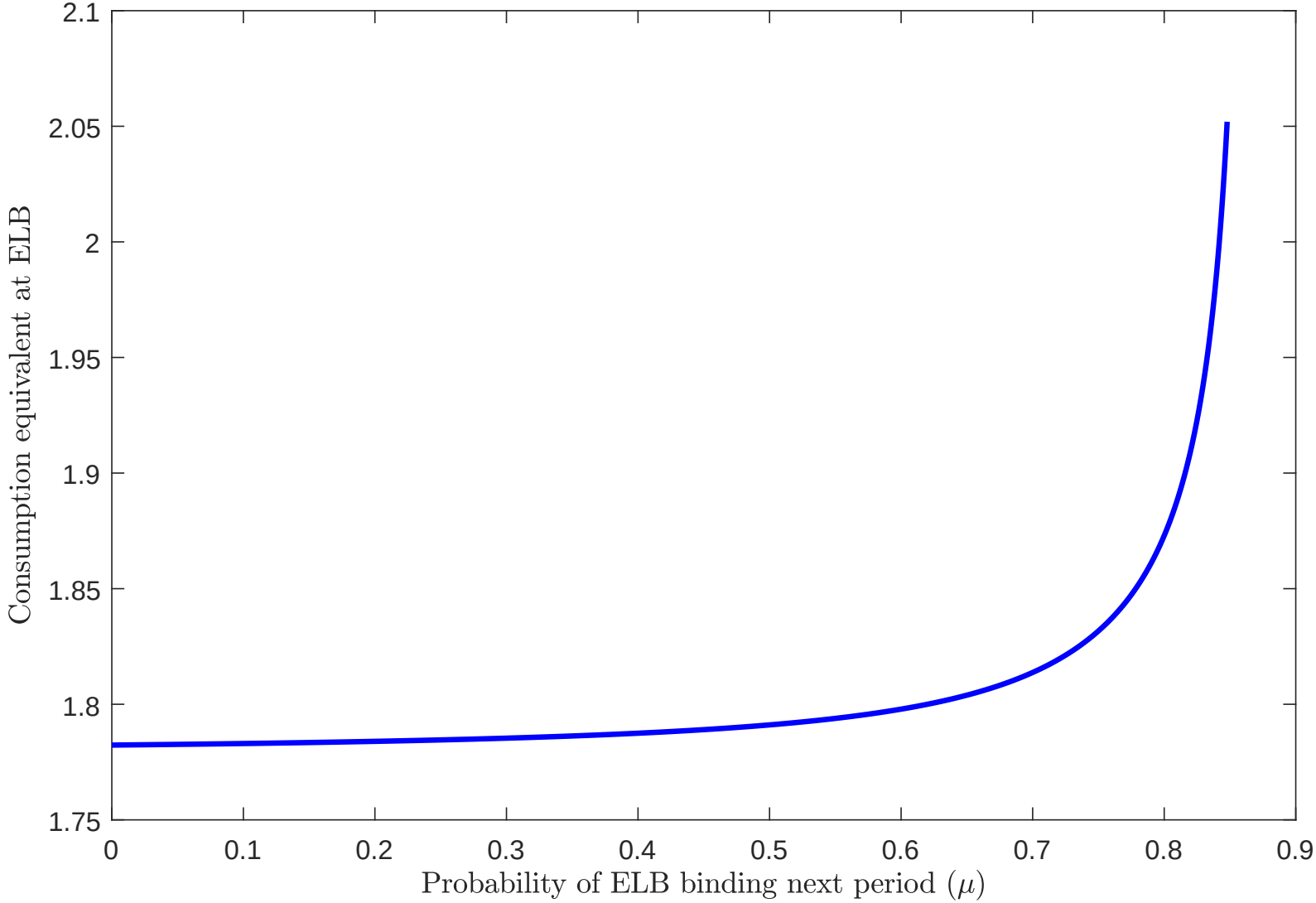
Gap between Nash and Coordination: $\hat{g}_L^{*,Nash} - \hat{g}_L^{*,Coord}$



Optimal level of spending: w/ and w/o coordination



Consumption-equivalent compensation for lack of coordination at ELB



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Fiscal policy outcomes w/o coordination

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- Too little stimulus at effective lower bound

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Consumption-equivalent compensation increases in expected duration of ELB episode

- Strong case for coordination