Can Structural Reforms Help Europe?*

Gauti Eggertsson
Brown University

Andrea Ferrero
FRB New York

Andrea Raffo
Board of Governors

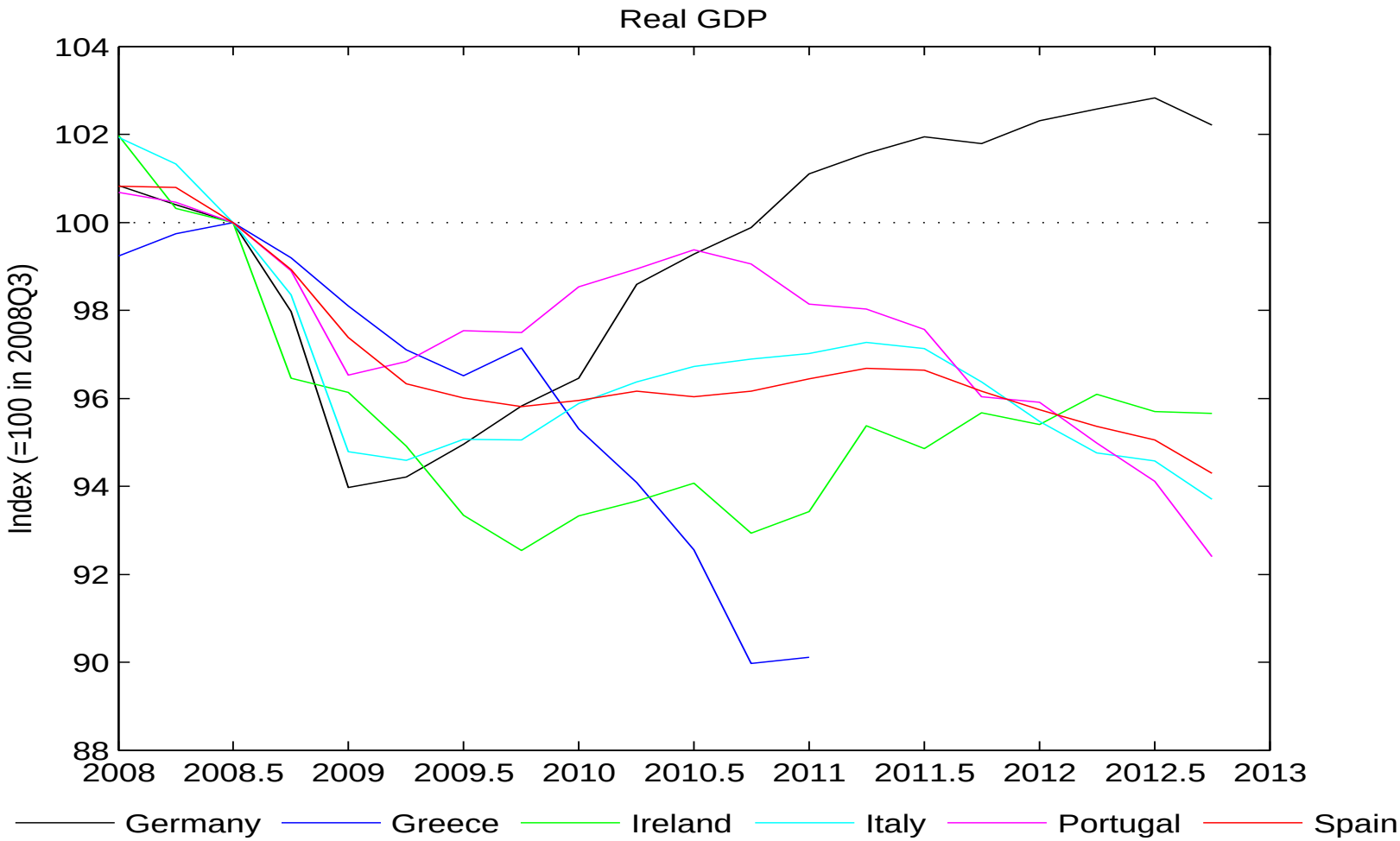
Carnegie-Rochester-NYU Conference on
"Fiscal Policy in the Presence of Debt Crises"

April 19, 2013

*The views expressed in this paper do not necessarily reflect the position of the Federal Reserve Bank of New York or the Federal Reserve System.

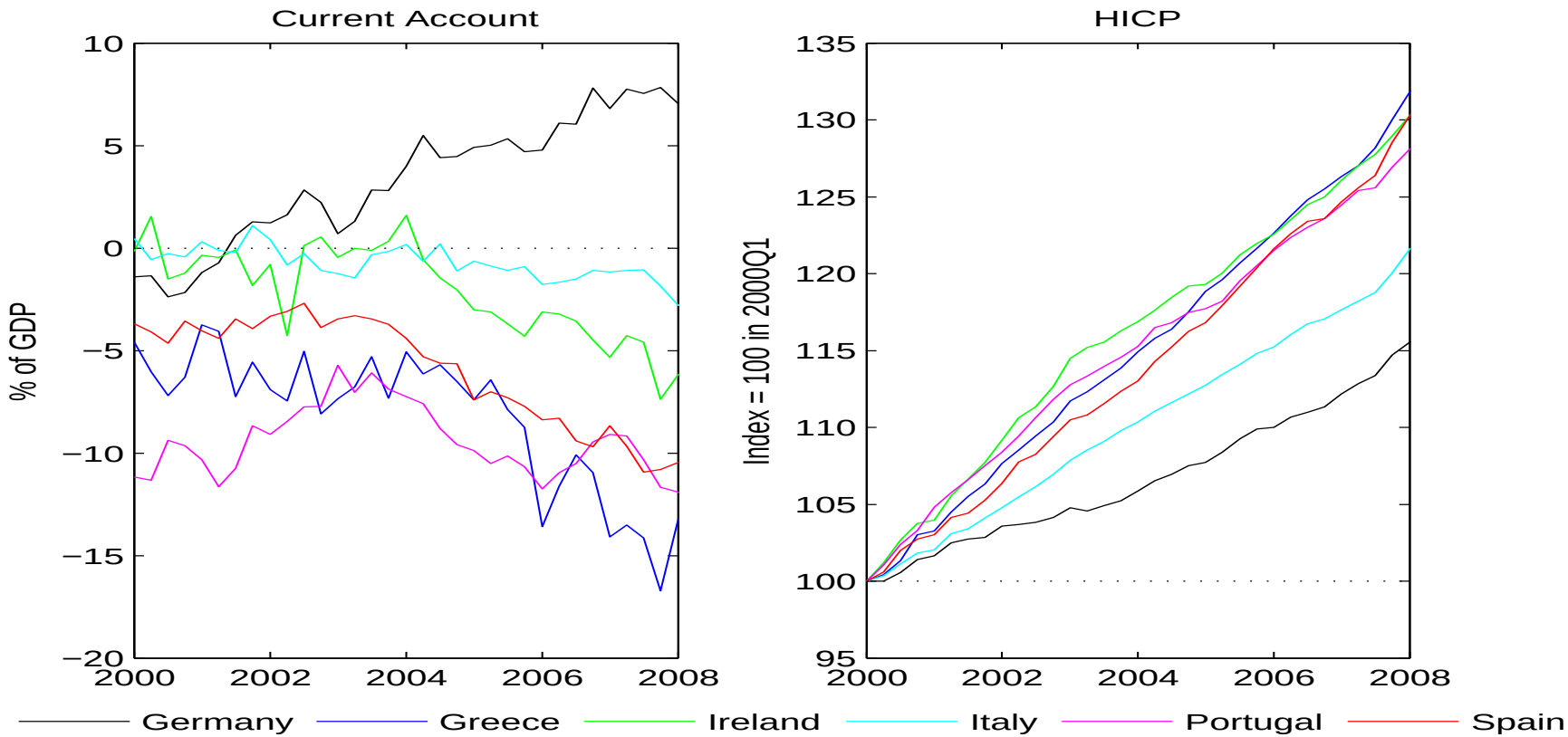
Crisis in Europe

- **Large output losses during the 2008-9 global financial crisis**
  - Different speed of recovery (or lack thereof) between core and periphery



Crisis in Europe

- **Narrative for why periphery is in trouble**
  - Large external imbalances pre-crisis
  - Significant inflation differentials (real exchange rate misalignments)



Policy Options for the Periphery

- Exchange rate depreciation: not an option
- Fiscal expansion: not an option
- ECB monetary easing a challenge due to zero lower bound (ZLB)

Policy Options for the Periphery

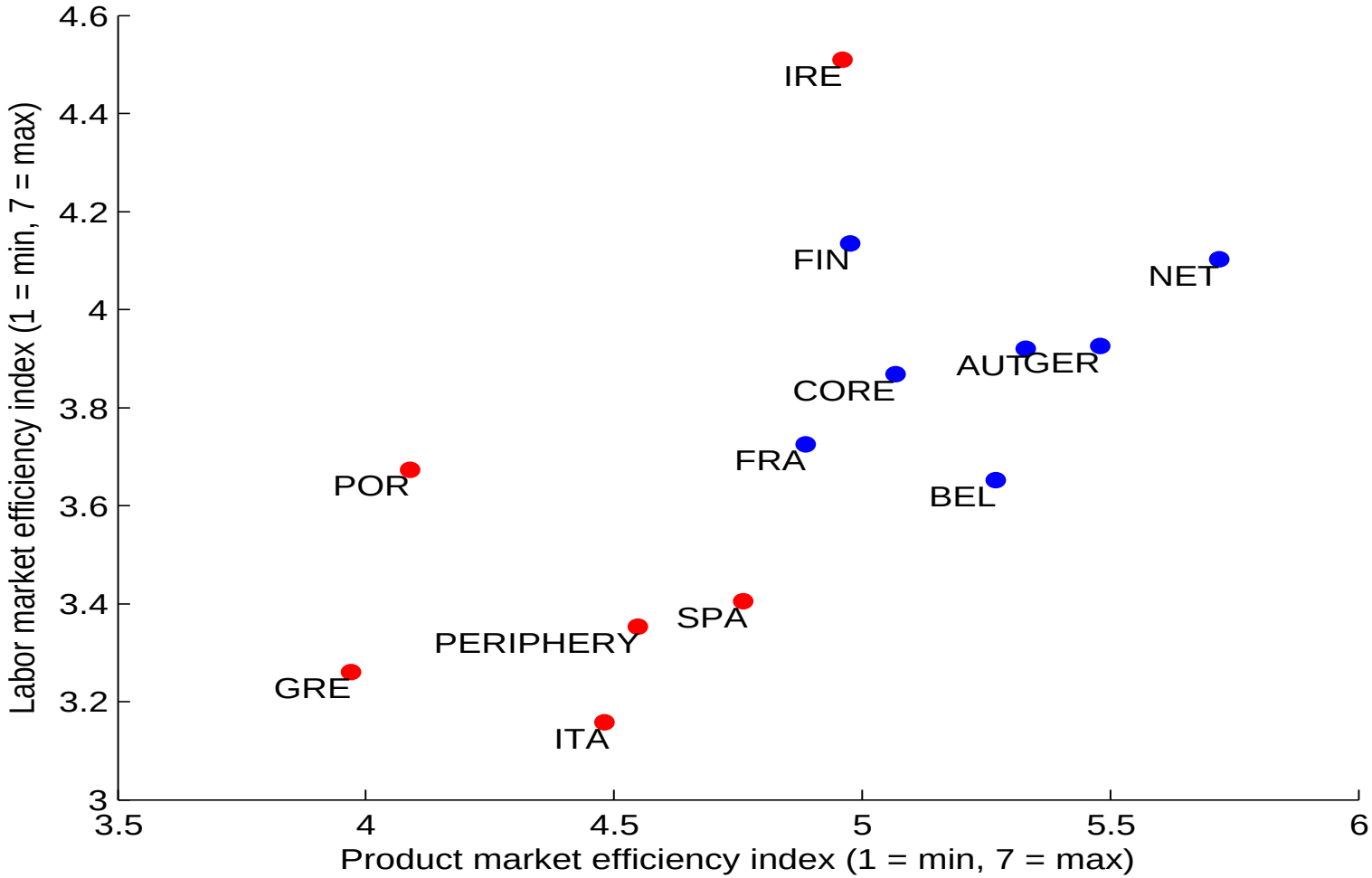
- Structural reforms recommended by various agencies to address competitiveness gap and boost income prospects

> *"...the biggest problem we have for growth in Europe is the problem of lack of competitiveness that has been accumulated in some of our Member States, and we need to make the reforms for that competitiveness.*
>
> *...to get out of this situation requires...structural reforms, because there is an underlying problem of lack of competitiveness in some of our Member States."*

José Manuel Durão Barroso
President of the European Commission
Closing Remarks following the State of the Union 2012
Strasbourg, September 12, 2012

Evidence of Labor and Product Market Inefficiencies

- Result in periphery competitiveness gap

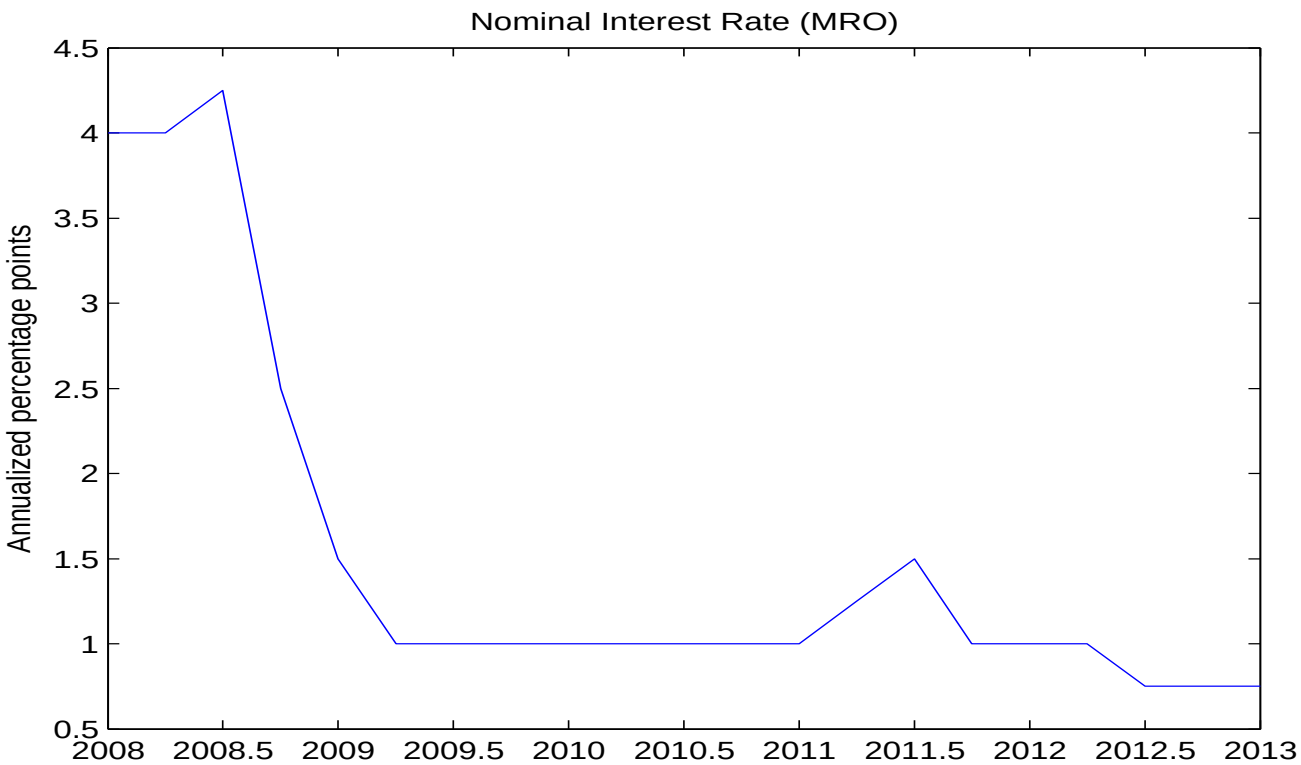


Source: World Economic Forum (2011)

Questions and Results

What are the aggregate effects of structural reforms in the periphery?

1. In the long run?
2. **In the short run, when the ZLB binds?**



Questions and Results

What are the aggregate effects of structural reforms in the periphery?

- Machinery: Off-the-shelf two-country DSGE model of a currency union, where monopoly power gives rise to price and wage markups

Questions and Results

What are the aggregate effects of structural reforms in the periphery?

- Machinery: Off-the-shelf two-country DSGE model of a currency union, where monopoly power gives rise to price and wage markups
- Experiment: permanent reduction in periphery's non-tradable markups by 10 percentage points (closes gap with core)

Questions and Results

What are the aggregate effects of structural reforms in the periphery?

- Machinery: Off-the-shelf two-country DSGE model of a currency union, where monopoly power gives rise to price and wage markups
- Experiment: permanent reduction in periphery's non-tradable markups by 10 percentage points (closes gap with core)
    1. In the long run, union-wide output increases by about 2.5%

Questions and Results

What are the aggregate effects of structural reforms in the periphery?

- Machinery: Off-the-shelf two-country DSGE model of a currency union, where monopoly power gives rise to price and wage markups
- Experiment: permanent reduction in periphery's non-tradable markups by 10 percentage points (closes gap with core)
  1. In the long run, union-wide output increases by about 2.5%
  2. In the short run, however, reforms in times of crisis (ZLB) can deepen recession by more than 1%
     - ★ Disturbing: Temporary reforms involve even larger short-run output costs

Questions and Results

What are the aggregate effects of structural reforms in the periphery?

- Machinery: Off-the-shelf two-country DSGE model of a currency union, where monopoly power gives rise to price and wage markups
- Experiment: permanent reduction in periphery's non-tradable markups by 10 percentage points (closes gap with core)
  1. In the long run, union-wide output increases by about 2.5%
  2. In the short run, however, reforms in times of crisis (ZLB) can deepen recession by more than 1%
     - ★ Disturbing: Temporary reforms involve even larger short-run output costs
- Key mechanism: ZLB constraint prevents monetary policy from accommodating deflationary impact of reforms

Roadmap

- One-sector, closed economy model:
  - Basic intuition and some analytical results
- Two-country, two-sector model of a currency union:
  - Long-run effects of reforms
  - Short-run effects of reforms in normal times and in a crisis
  - Disentangling the effects of reforms

Textbook New Keynesian Model

$$\text{AD:} \qquad \hat{Y}_t = \mathbb{E}_t \hat{Y}_{t+1} - \sigma^{-1}(i_t - \mathbb{E}_t \pi_{t+1} - r_t^e)$$

$$\text{AS:} \qquad \pi_t = \kappa \hat{Y}_t + \beta \mathbb{E}_t \pi_{t+1} + \kappa \psi \omega_t$$

Textbook New Keynesian Model

$$\text{AD:} \qquad \hat{Y}_t = \mathbb{E}_t \hat{Y}_{t+1} - \sigma^{-1}(i_t - \mathbb{E}_t \pi_{t+1} - r_t^e)$$

$$\text{AS:} \qquad \pi_t = \kappa \hat{Y}_t + \beta \mathbb{E}_t \pi_{t+1} + \kappa \psi \omega_t$$

- $\omega_t \equiv$ wedge between first-best and flexible-price output due to:
  - Firms' market power
  - Markups in labor market

Textbook New Keynesian Model

$$\text{AD:} \quad \hat{Y}_t = \mathbb{E}_t \hat{Y}_{t+1} - \sigma^{-1}(i_t - \mathbb{E}_t \pi_{t+1} - r_t^e)$$

$$\text{AS:} \quad \pi_t = \kappa \hat{Y}_t + \beta \mathbb{E}_t \pi_{t+1} + \kappa \psi \omega_t$$

- $\omega_t \equiv$ wedge between first-best and flexible-price output due to:
  - Firms' market power
  - Markups in labor market
- Suppose monetary policy implements a strict inflation target ($\pi_t = 0, \forall t$):

Textbook New Keynesian Model

$$\text{AD:} \qquad \hat{Y}_t = \mathbb{E}_t \hat{Y}_{t+1} - \sigma^{-1}(i_t - \mathbb{E}_t \pi_{t+1} - r_t^e)$$

$$\text{AS:} \qquad \pi_t = \kappa \hat{Y}_t + \beta \mathbb{E}_t \pi_{t+1} + \kappa \psi \omega_t$$

- $\omega_t \equiv$ wedge between first-best and flexible-price output due to:
  - Firms' market power
  - Markups in labor market
- Suppose monetary policy implements a strict inflation target ($\pi_t = 0, \forall t$):
  - Equilibrium output (short-run=S; long-run=L)

$$\hat{Y}_S = -\psi \omega_S \qquad \text{and} \qquad \hat{Y}_L = -\psi \omega_L$$

Textbook New Keynesian Model

$$\text{AD:} \qquad \hat{Y}_t = \mathbb{E}_t \hat{Y}_{t+1} - \sigma^{-1}(i_t - \mathbb{E}_t \pi_{t+1} - r_t^e)$$

$$\text{AS:} \qquad \pi_t = \kappa \hat{Y}_t + \beta \mathbb{E}_t \pi_{t+1} + \kappa \psi \omega_t$$

- $\omega_t \equiv$ wedge between first-best and flexible-price output due to:
  - Firms' market power
  - Markups in labor market
- Suppose monetary policy implements a strict inflation target ($\pi_t = 0, \forall t$):
  - Equilibrium output (short-run=S; long-run=L)

$$\hat{Y}_S = -\psi \omega_S \qquad \text{and} \qquad \hat{Y}_L = -\psi \omega_L$$

  - Structural reforms: $\omega_t \downarrow \Rightarrow \hat{Y}_S, \hat{Y}_L \uparrow$

Textbook New Keynesian Model at the ZLB

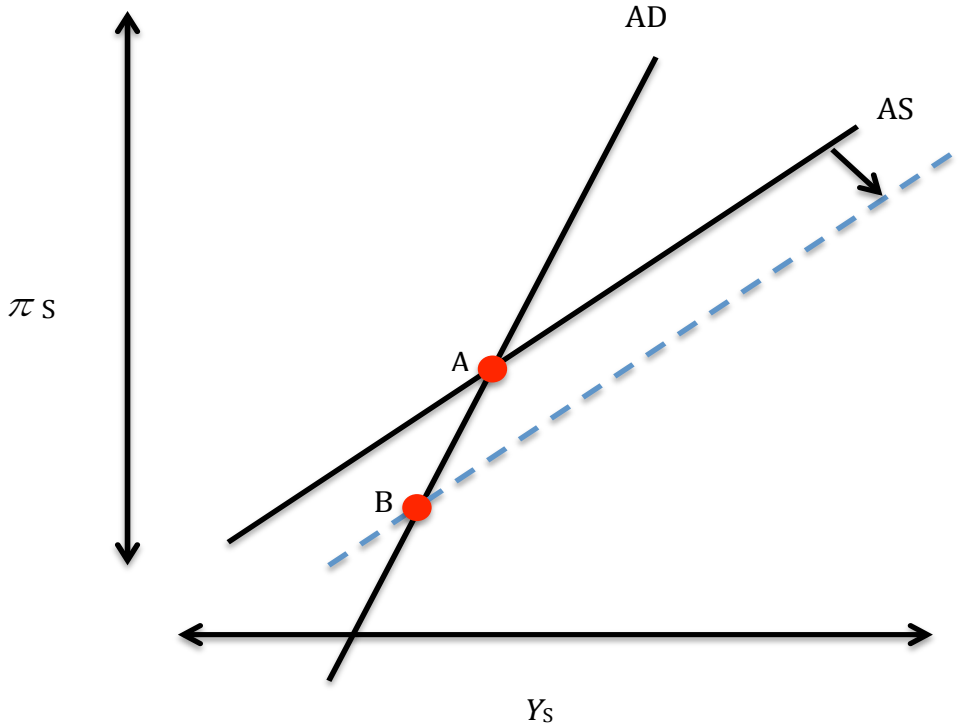
- Dynamics dramatically change at the ZLB
- Consider a negative shock to r_t^e ($r_S^e < 0$) such that:
  - Large enough to force $i_S = 0$ ($\pi_t < 0$):
  - Reverts back to (absorbing) steady state w/ prob. $1 - \mu$ in each period
- Short-run equilibrium:

$$\text{AD:} \quad \hat{Y}_S = \underbrace{\hat{Y}_L}_{=-\psi\omega_L} + \frac{\sigma^{-1}\mu}{1-\mu}\pi_S + \frac{\sigma^{-1}}{1-\mu}r_S^e$$

$$\text{AS:} \quad \pi_S = \frac{\kappa}{1-\mu\beta}\hat{Y}_S + \frac{\kappa\psi}{1-\mu\beta}\omega_S$$

Short-Run Equilibrium at the ZLB and Reforms

- Deflationary effect of reforms reduces short-run output via AS

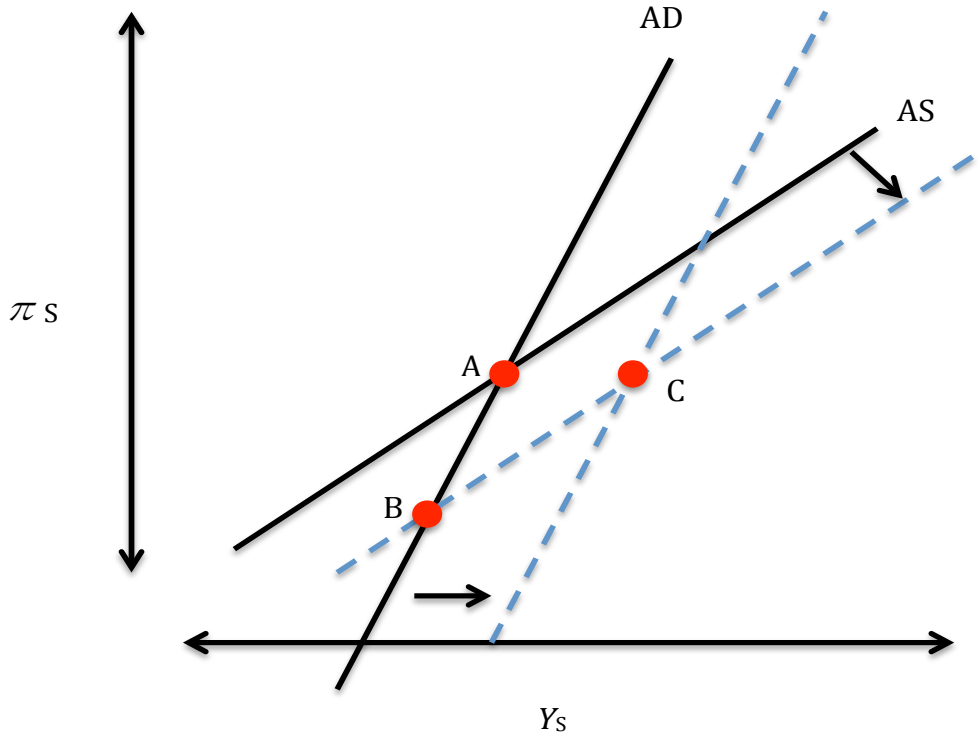


$$\text{AD:} \quad \hat{Y}_S = \hat{Y}_L + \frac{\sigma^{-1}\mu}{1-\mu}\pi_S + \frac{\sigma^{-1}}{1-\mu}r_S^e$$

$$\text{AS:} \quad \pi_S = \frac{\kappa}{1-\mu\beta}\hat{Y}_S + \frac{\kappa\psi}{1-\mu\beta}\omega_S$$

Short-Run Equilibrium at the ZLB and Reforms

- Expansionary effect of reforms increases demand via AD



$$\text{AD:} \quad \hat{Y}_S = \underbrace{\hat{Y}_L}_{=-\psi\omega_L} + \frac{\sigma^{-1}\mu}{1-\mu}\pi_S + \frac{\sigma^{-1}}{1-\mu} r_S^e$$

$$\text{AS:} \quad \pi_S = \frac{\kappa}{1-\mu\beta}\hat{Y}_S + \frac{\kappa\psi}{1-\mu\beta}\omega_S$$

Short-Run Equilibrium at the ZLB and Reforms

- Deflationary effect of reforms reduces short-run output via AS
- Expansionary effect of reforms increases demand via AD
  - Net effect depends on which force dominates (quantitative question)

Short-Run Equilibrium at the ZLB and Reforms

- Deflationary effect of reforms reduces short-run output via AS
- Expansionary effect of reforms increases demand via AD
  - Net effect depends on which force dominates (quantitative question)
- Next: Calibrated two-country (H,F), two-sector (k=T,N) model of currency union
  - Complete financial markets within each country
  - Incomplete financial markets (risk-free bond) across countries
  - Sector-specific labor supply
  - Monopolistic competition + Nominal rigidities (prices and wages)
  - Inflation targeting regime

Households

- Utility

$$U(C_{t+s}, L_{kt+s}(i)) \equiv \mathbb{E}_t \left\{ \sum_{s=0}^{\infty} \beta^s \varsigma_{t+s} \left[\frac{C_{t+s}^{1-\sigma}}{1-\sigma} - \frac{L_{kt+s}(i)^{1+\nu}}{1+\nu} \right] \right\}$$

where

$$C_t = \left[\gamma^{\frac{1}{\varphi}} C_{Tt}^{\frac{\varphi-1}{\varphi}} + (1-\gamma)^{\frac{1}{\varphi}} C_{Nt}^{\frac{\varphi-1}{\varphi}} \right]^{\frac{\varphi}{\varphi-1}} \qquad C_{Tt} = \left[\omega^{\frac{1}{\epsilon}} C_{Ht}^{\frac{\epsilon-1}{\epsilon}} + (1-\omega)^{\frac{1}{\epsilon}} C_{Ft}^{\frac{\epsilon-1}{\epsilon}} \right]^{\frac{\epsilon}{\epsilon-1}}$$

- Households have monopoly power in setting wages (but adjust on a staggered basis)

- Labor demand (labor agencies)

$$L_{kt}(i) = \frac{1}{\gamma_k} \left[\frac{W_{kt}(i)}{W_{kt}} \right]^{-\phi_k} L_{kt}(j)$$

Firms

- Technology

$$Y_{kt}(j) = Z_{kt} L_{kt}(j)$$

- Firms have monopoly power in setting prices (but adjust on a staggered basis)

- Product demand (retailers)

$$Y_{kt}(j) = \frac{1}{\gamma_k} \left[\frac{P_{kt}(j)}{P_{kt}} \right]^{-\theta_k} Y_{kt}$$

Monetary Policy

- Strict inflation targeting

$$\Pi_t^{MU} = \bar{\Pi}$$

where

$$\Pi_t^{MU} = (\Pi_t)^{0.5}(\Pi_t^*)^{0.5}$$

Monetary Policy

- Strict inflation targeting

$$\Pi_t^{MU} = \bar{\Pi}$$

where

$$\Pi_t^{MU} = (\Pi_t)^{0.5}(\Pi_t^*)^{0.5}$$

- Take ZLB explicitly into account

$$i_t \geq i^{zlb} \geq 0$$

Government Policy

- Product market reforms

$$Markup_p = \frac{1}{1+\tau_N^p}\frac{\theta_N}{\theta_N - 1}$$

- Labor market reforms

$$Markup_w = \frac{1}{1+\tau_N^w}\frac{\phi_N}{\phi_N - 1}$$

- Subsidies are financed through lump-sum taxes

Calibration of Markups

- Estimates of product market markups (OECD, 2005)

	Markup Estimates	
	Periphery (H)	Core (F)
Aggregate	1.36	1.25
Tradable	1.17	1.14
Non-Tradable	1.48	1.33

Note: Periphery: Italy and Spain. Core: France and Germany.

Calibration of Markups

- Estimates of product market markups (OECD, 2005)

	Markup Estimates	
	Periphery (H)	Core (F)
Aggregate	1.36	1.25
Tradable	1.17	1.14
Non-Tradable	1.48	1.33

Note: Periphery: Italy and Spain. Core: France and Germany.

- For labor market markups, combine evidence on
  - Wage premia by sector (Jean and Nicoletti, 2002)
  - Average wage bargaining power in Europe (Everaert and Schule, 2006)

Calibration of Markups

- Estimates of product market markups (OECD, 2005)

	Markup Estimates	
	Periphery (H)	Core (F)
Aggregate	1.36	1.25
Tradable	1.17	1.14
Non-Tradable	1.48	1.33

Note: Periphery: Italy and Spain. Core: France and Germany.

- For labor market markups, combine evidence on
  - Wage premia by sector (Jean and Nicoletti, 2002)
  - Average wage bargaining power in Europe (Everaert and Schule, 2006)
  - Numbers for ϕ_k comparable with product market estimates (Bayoumi, Laxton and Pesenti, 2004; Forni, Gerali and Pisani, 2010)

Other Parameters

Households			
Home bias	ω	$=$	0.65
Consumption share of tradable goods	γ	$=$	0.45
Elasticity of substitution tradables-nontradables	ϵ	$=$	0.5
Elasticity of substitution Home-Foreign tradables	φ	$=$	1.5
Individual discount factor	β	$=$	0.99
Elasticity of intertemporal substitution	σ^{-1}	$=$	2
Inverse Frisch elasticity	ν	$=$	2
Price and Wage Setting			
Probability of not being able to adjust prices	ξ_p	$=$	0.66
Probability of not being able to adjust wages	ξ_w	$=$	0.66
Monetary Policy			
Inflation target	$\bar{\Pi}$	$=$	1
Effective lower bound on nominal interest rate	i^{zlb}	$=$	0.0025

Structural Reforms in Normal Times

- Increase subsidies τ_N^p and τ_N^w to permanently reduce markups in the periphery
- Solve model non-linearly under perfect foresight, taking ZLB into account

Structural Reforms in Normal Times

- Increase subsidies τ_N^p and τ_N^w to permanently reduce markups in the periphery
- Long-run effect of 10 p.p. reform on union-wide output $> 2\%$

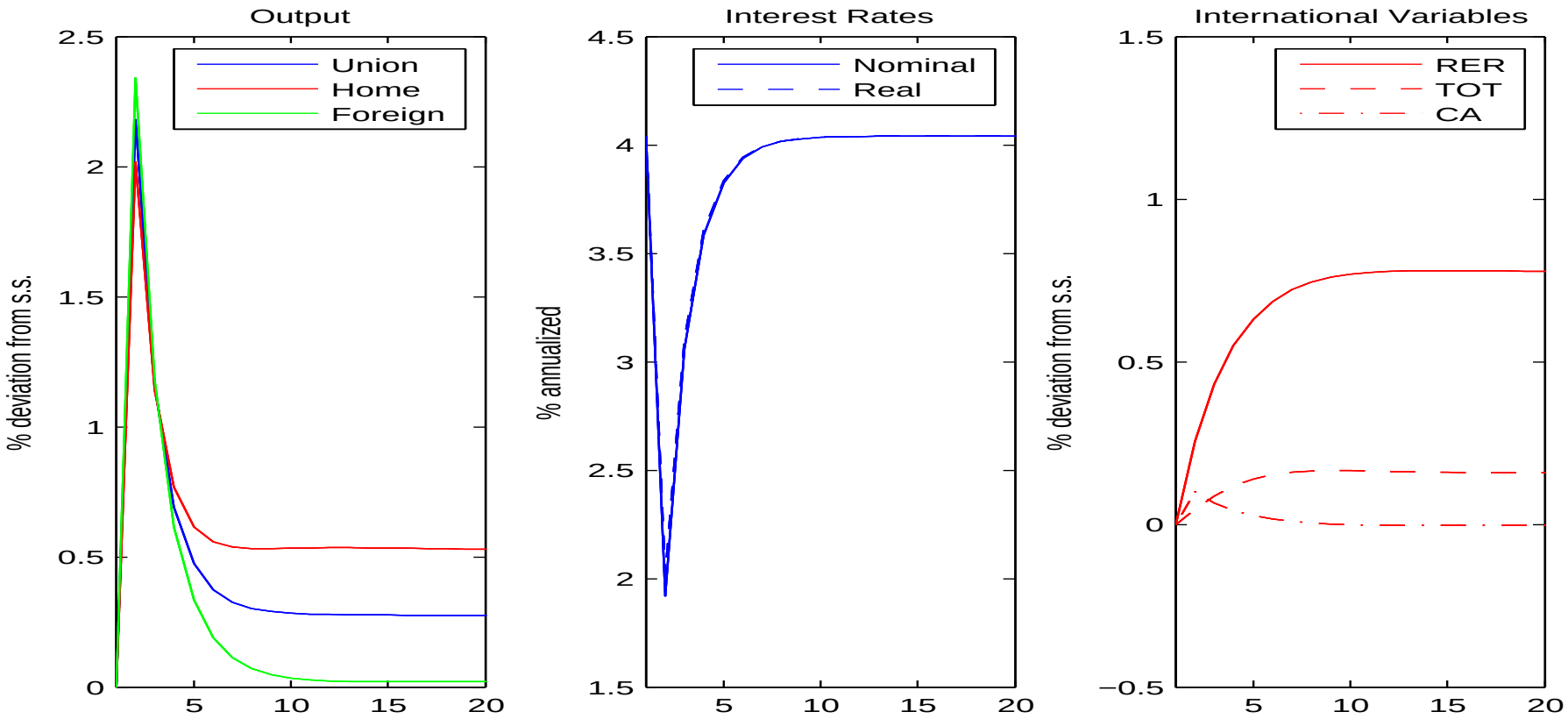
Long-run effects in the periphery

$\tau_N^p = \tau_N^w$ (in p.p.)	**Output**	**Terms of Trade**	**Real Exchange Rate**
1	0.45	0.13	0.67
5	2.22	0.61	3.31
10	4.35	1.20	6.54

- Periphery partly closes competitiveness gap through large decline in relative price of non-traded goods

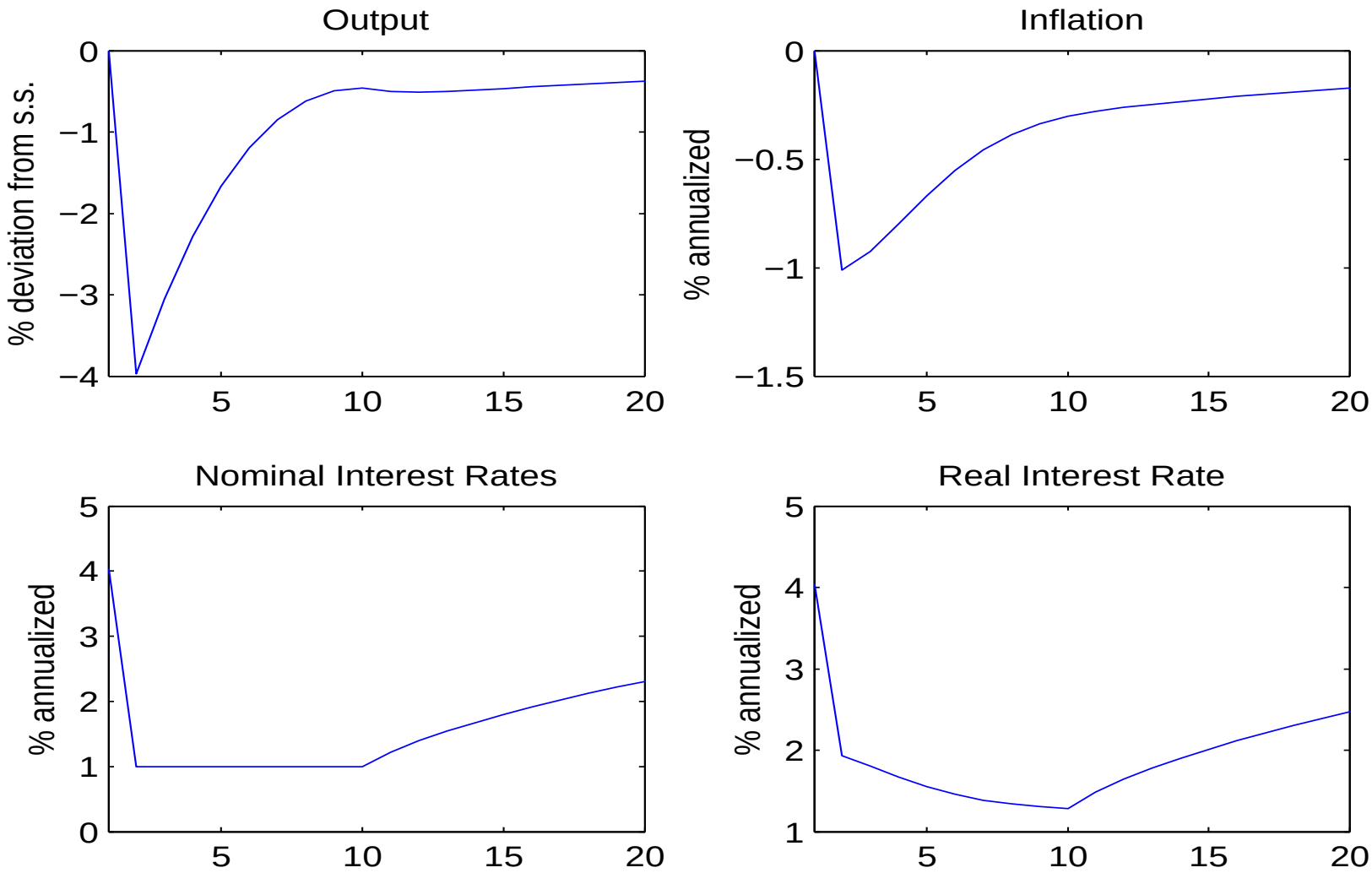
Structural Reforms in Normal Times

- Increase subsidies τ_N^p and τ_N^w to permanently reduce markups in the periphery
- Dynamics ($\tau_N^p = \tau_N^w = 1$ p.p.)



Structural Reforms in a Crisis

- Shock to the discount factor calibrated to match $\approx 4\%$ drop in EMU output during the global financial crisis



Structural Reforms in a Crisis

- Shock to the discount factor calibrated to match $\approx 4\%$ drop in EMU output during the global financial crisis

- Main Result: Reforms can aggravate the crisis for the currency union as a whole

Impact response of aggregate variables

$\tau_N^p = \tau_N^w$ (in p.p.)	**Output**	**Inflation**	**Real Rate**
0	-4.0	-1.0	1.9
1	-4.1	-1.4	2.2
5	-4.5	-3.1	3.3
10	-5.0	-5.2	4.6

Structural Reforms in a Crisis: Key Mechanism

- Short-run effects of 1 p.p. permanent cut in product and labor market markups
  - In normal times: $\approx +2\%$
  - In a crisis: $\approx -0.1\%$

Structural Reforms in a Crisis: Key Mechanism

- Short-run effects of 1 p.p. permanent cut in product and labor market markups
  - In normal times: $\approx +2\%$
  - In a crisis: $\approx -0.1\%$
- Key mechanism:
  - In a crisis, reforms worsen deflationary pressures
  - ZLB constrains ability to provide monetary stimulus
  - Higher real interest rate further depresses output

Effects of Temporary Reforms in a Crisis

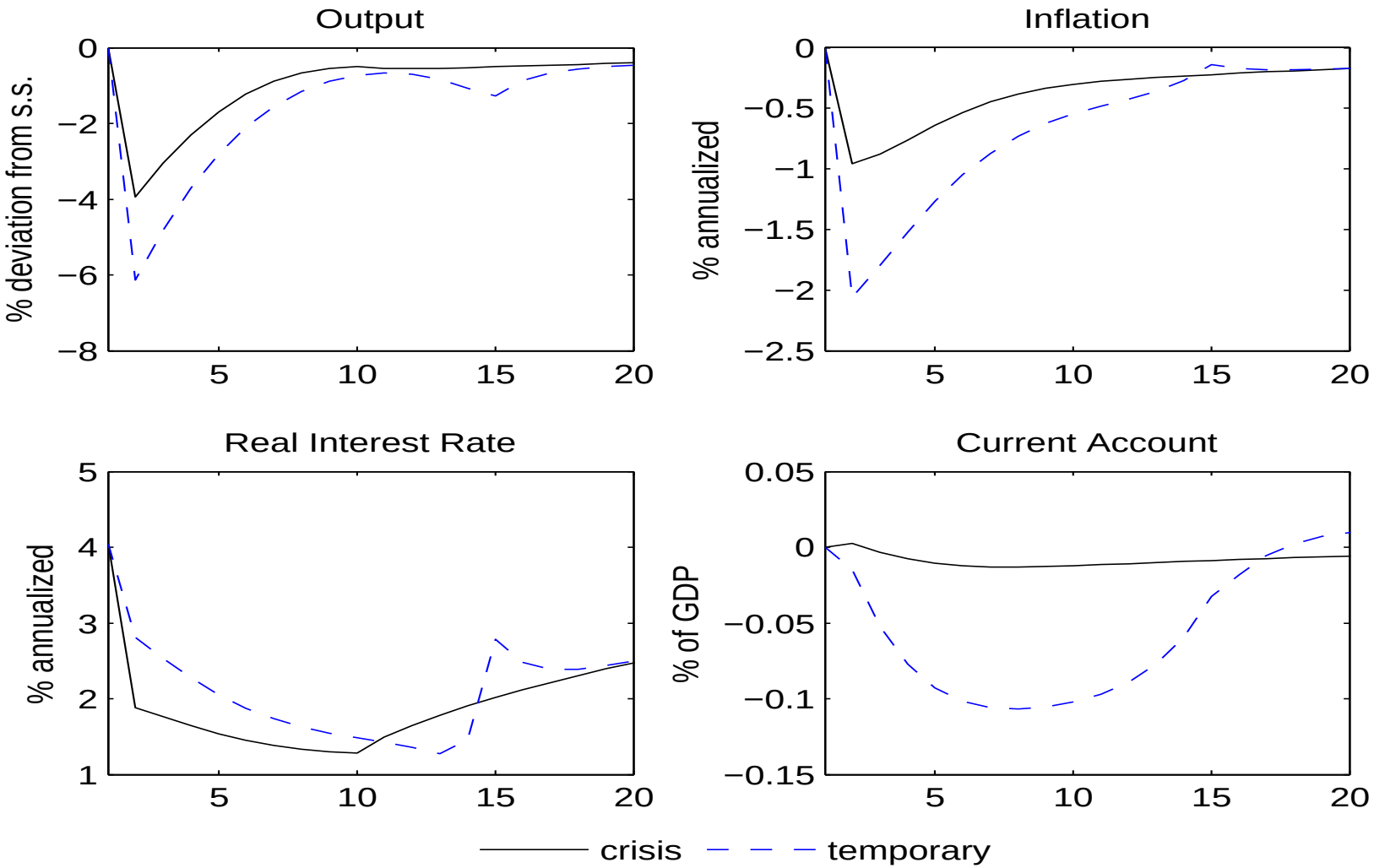
- Adoption of structural reforms in a crisis may lead to political backlash and social unrest
  - Debate over labor reforms in recent Italian elections

Effects of Temporary Reforms in a Crisis

- Adoption of structural reforms in a crisis may lead to political backlash and social unrest
  - Debate over labor reforms in recent Italian elections
- Experiment: Temporary reforms
  - Reforms are implemented in a crisis...
  - ...but unwound when ZLB stops being binding
  - Agents correctly foresee reforms to be temporary

Effects of Temporary Reforms in a Crisis

$$\tau_N^p = \tau_N^w = 1 \text{ p.p.}$$



Disentangling the Effects of Reforms in a Crisis: Two Experiments

1. Temporary Collusion

2. Credible announcement about future reforms

Disentangling the Effects of Reforms in a Crisis: Two Experiments

1. Eggertsson (2012): In crisis, higher markups can be expansionary
   - State-contingent design of "New Deal" policy

$$\tau_t^p = \tau_t^w = \tau_t^{nd} = \min\left\{0, \phi_\tau\left[(1+i)\left(\Pi_t^{MU}\right)^{\varphi_\pi} - (1+i^{zlb})\right]\right\}$$

Disentangling the Effects of Reforms in a Crisis: Two Experiments

1. Eggertsson (2012): In crisis, higher markups can be expansionary
   - State-contingent design of "New Deal" policy

$$\tau_t^p = \tau_t^w = \tau_t^{nd} = \min\left\{0, \phi_\tau\left[(1+i)\left(\Pi_t^{MU}\right)^{\varphi_\pi} - (1+i^{zlb})\right]\right\}$$

2. Fernandez-Villaverde, Guerron-Quintana and Rubio-Ramirez (2012): Announce reforms implemented when ZLB stops being binding
   - State-contingent design of "Delay" policy

$$\tau_t^p = \tau_t^w = \tau_t^d = \max\left\{0, \tau\left[(1+i)\left(\Pi_t^{MU}\right)^{\varphi_\pi} - (1+i^{zlb})\right]/(i-i^{zlb})\right\}$$

Disentangling the Effects of Reforms in a Crisis: Two Experiments

1. Eggertsson (2012): In crisis, higher markups can be expansionary
   - State-contingent design of "New Deal" policy

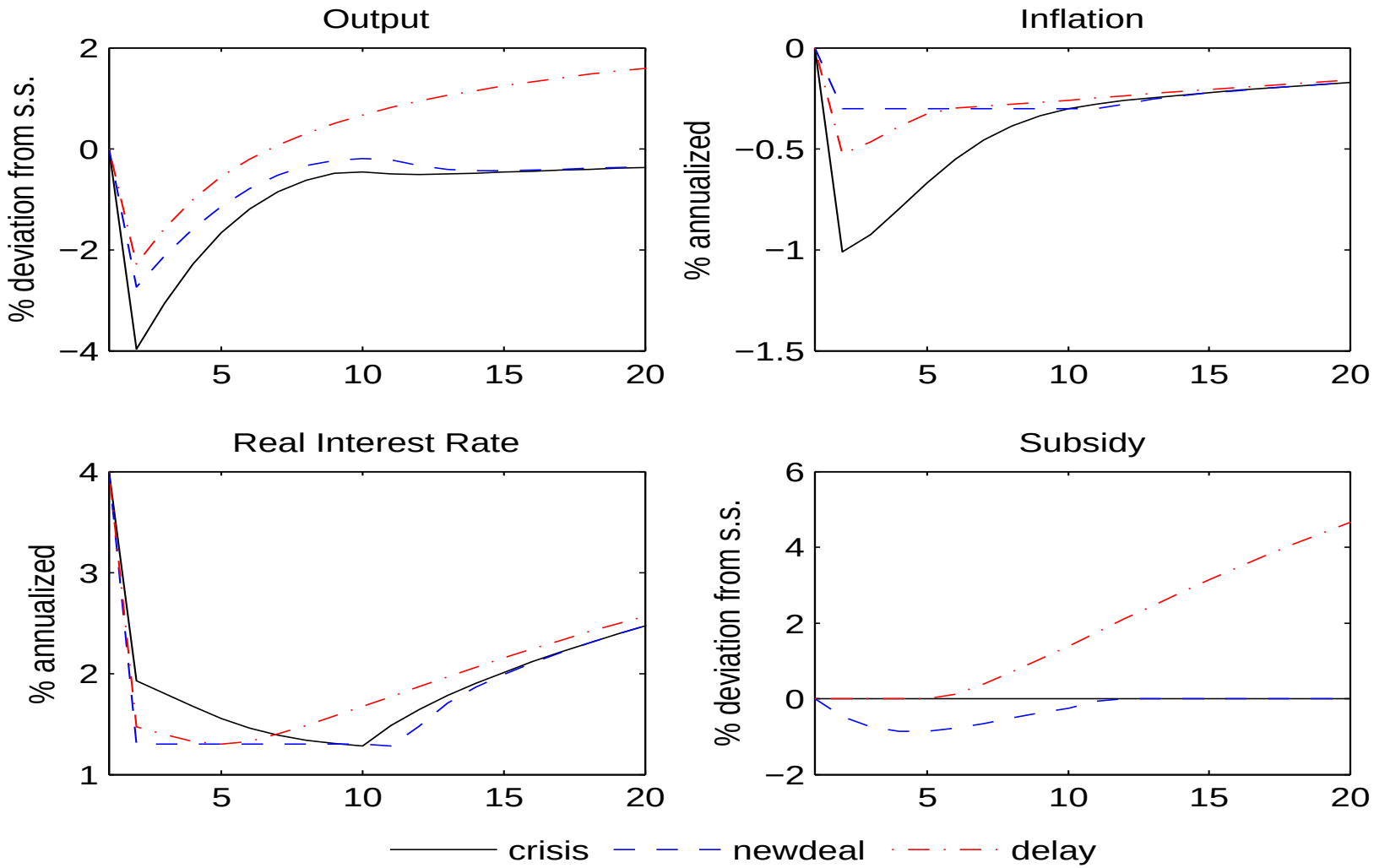
$$\tau_t^p = \tau_t^w = \tau_t^{nd} = \min\left\{0, \phi_\tau\left[(1+i)\left(\Pi_t^{MU}\right)^{\varphi_\pi} - (1+i^{zlb})\right]\right\}$$

2. Fernandez-Villaverde, Guerron-Quintana and Rubio-Ramirez (2012): Announce reforms implemented when ZLB stops being binding
   - State-contingent design of "Delay" policy

$$\tau_t^p = \tau_t^w = \tau_t^d = \max\left\{0, \tau\left[(1+i)\left(\Pi_t^{MU}\right)^{\varphi_\pi} - (1+i^{zlb})\right]/(i-i^{zlb})\right\}$$

Disentangling the Effects of Reforms in a Crisis: Two Experiments

$$\tau_N^p = \tau_N^w = 10 \text{ p.p. for "Delay"}$$



Conclusions

- In the long-run, structural reforms boost output and reduce competitiveness gap between core and periphery
  - 10 p.p. reduction of product and labor market markups
    - ★ $\approx$ 2.5% increase in union-wide output
    - ★ $\approx$ 6.5% depreciation of periphery real exchange rate

Conclusions

- In the long-run, structural reforms boost output and reduce competitiveness gap between core and periphery
  - 10 p.p. reduction of product and labor market markups
    - ★ $\approx$ 2.5% increase in union-wide output
    - ★ $\approx$ 6.5% depreciation of periphery real exchange rate

- But short-run effects crucially depend on the ability of central bank to provide monetary accommodation
  - If implemented aggressively in times of crisis (ZLB), reforms can substantially deepen the recession
  - Temporary reforms are particularly costly

Open Economy Dimension

- Do structural reforms address
  1. Competitiveness gap between periphery and core?
  2. External imbalances between periphery and core?

Open Economy Dimension

- Do structural reforms address

  1. Competitiveness gap between periphery and core?
     Yes, long run RER depreciation of almost 7%

  2. External imbalances between periphery and core?
     No, CA improves by less than 1%

- Competitiveness gap mostly in non-tradable sector
  - Structural reforms reduce relative price of NT but do not affect TOT

Open Economy Dimension

- Alternative experiment: Demand shock only hits periphery

Open Economy Dimension

- Alternative experiment: Demand shock only hits periphery
  - Main result goes through

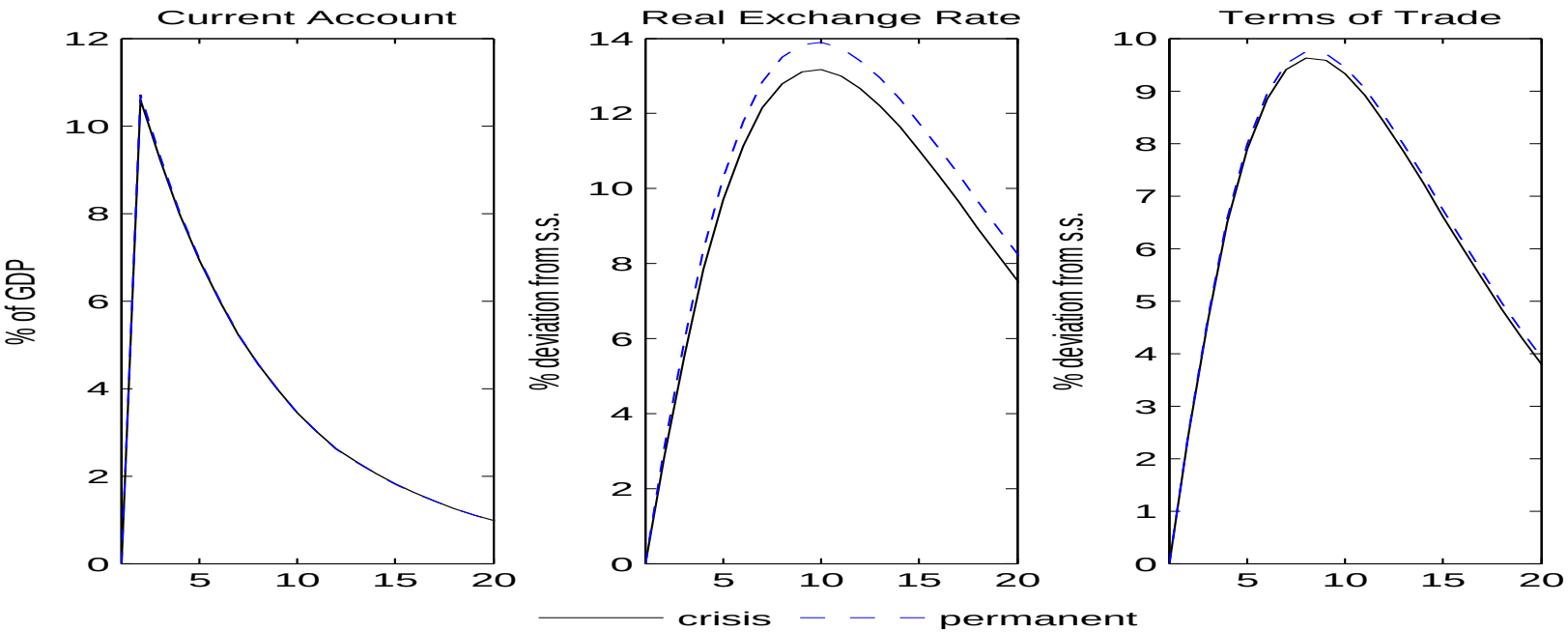
Impact response

$\tau_N^p = \tau_N^w$ (in p.p.)	**Output**		**Inflation**		**Real Rate**	
	Symm	Asymm	Symm	Asymm	Symm	Asymm
0	-3.95	-3.95	-0.95	-2.10	1.88	2.86
1	-4.07	-3.99	-1.40	-2.54	2.18	3.13
5	-4.51	-4.19	-3.12	-4.28	3.30	4.21
10	-5.03	-4.41	-5.22	-6.40	4.62	5.46

Open Economy Dimension

- Alternative experiment: Demand shock only hits periphery
  - Large adjustment of terms of trade and current account

$$\tau_N^p = \tau_N^w = 1 \text{ p.p.}$$



  - But just a function of asymmetric nature of shock

Sensitivity to σ^{-1}

- Results balance
  - Long-run wealth effect: Higher output in new steady state
  - Short-run substitution effect: High real interest rated due to ZLB

- Elasticity of intertemporal substitution affects this balance

Experiment: $\tau_N^p = \tau_N^w = 10$ p.p.

σ^{-1}	2	1	0.5
Y_1^{MU}	-5.03	-3.90	-3.53

Note: Shock such that $Y_1^{MU} = -3.95\%$ with $\tau^p = \tau^w = 0$ as σ varies

Sensitivity to φ_π

- Implement strict inflation targeting via Taylor rule

$$1 + i_t = \max\left\{1 + i^{zlb}, (1+i)\left(\Pi_t^{MU}\right)^{\varphi_\pi}\right\}$$

φ_π	Y_1^{MU}		ZLB Duration	
	Crisis	Permanent	Crisis	Permanent
10	-3.95	-4.07	10	10
20	-3.95	-4.06	11	11
5	-3.95	-4.04	9	9
2	-3.95	-3.88	5	6

- Crisis: $\tau_N^p = \tau_N^w = 0$
- Permanent: $\tau_N^p = \tau_N^w = 1$ percentage point