Financial Heterogeneity and Monetary Union

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Eurozone Crisis (2008–2013)

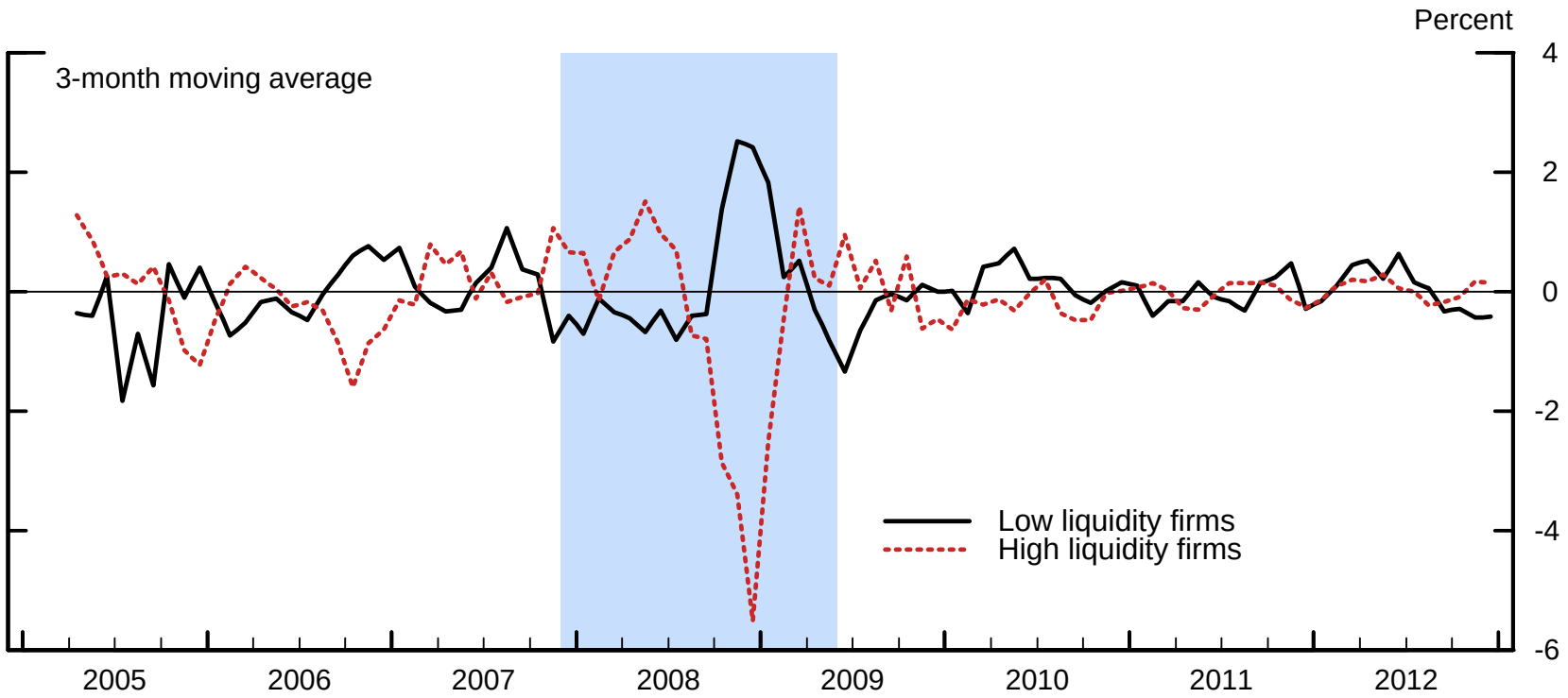
- Classic balance-of-payment crisis:
  - Mix of overvalued RERs and cheap credit fueled by economic optimism led to over- and mal-investment
  - With the Global Financial Crisis came a sudden stop
- Resolution of the crisis:
  - Realignment of overvalued RERs between the periphery and core
  - The mix of deflation in the periphery and reflation in the core
  - Surprisingly hard to achieve—why?

"Missing Deflation" in the U.S.

- New empirical evidence on the firms's price-setting behavior during the 2007–09 crisis:
  (Gilchrist & Zakrajšek [2016]; Gilchrist, Schoenle, Sim & Zakrajšek [2017])
  - Firms with strong balance sheets cut prices
  - Firms with weak balance sheets raised prices
- Similar patterns documented for the euro area
  (Montero & Urtasun [2014]; Antoun de Almeida [2015]; Montero [2017]; Duca et al. [2017])
- Theory:
  - GSSZ develop a DSGE model that can replicate such price and output patterns in periods of financial distress
  - Emphasizes the interaction between financial market frictions and firms' pricing decisions in customer markets
    (Gottfries [1991]; Chevalier & Scharfstein [1996])

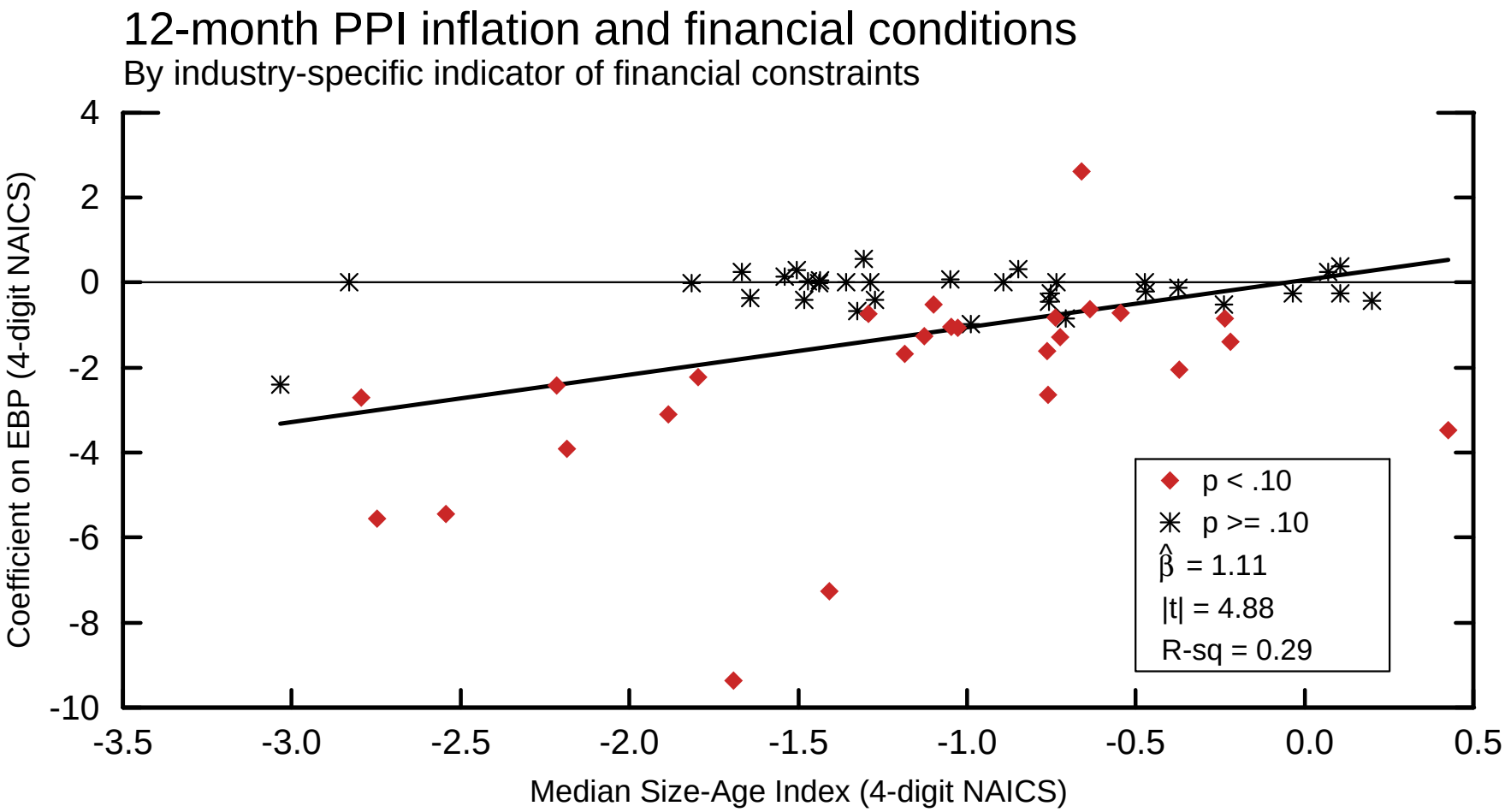
RELATIVE INFLATION

Financially unconstrained vs constrained firms

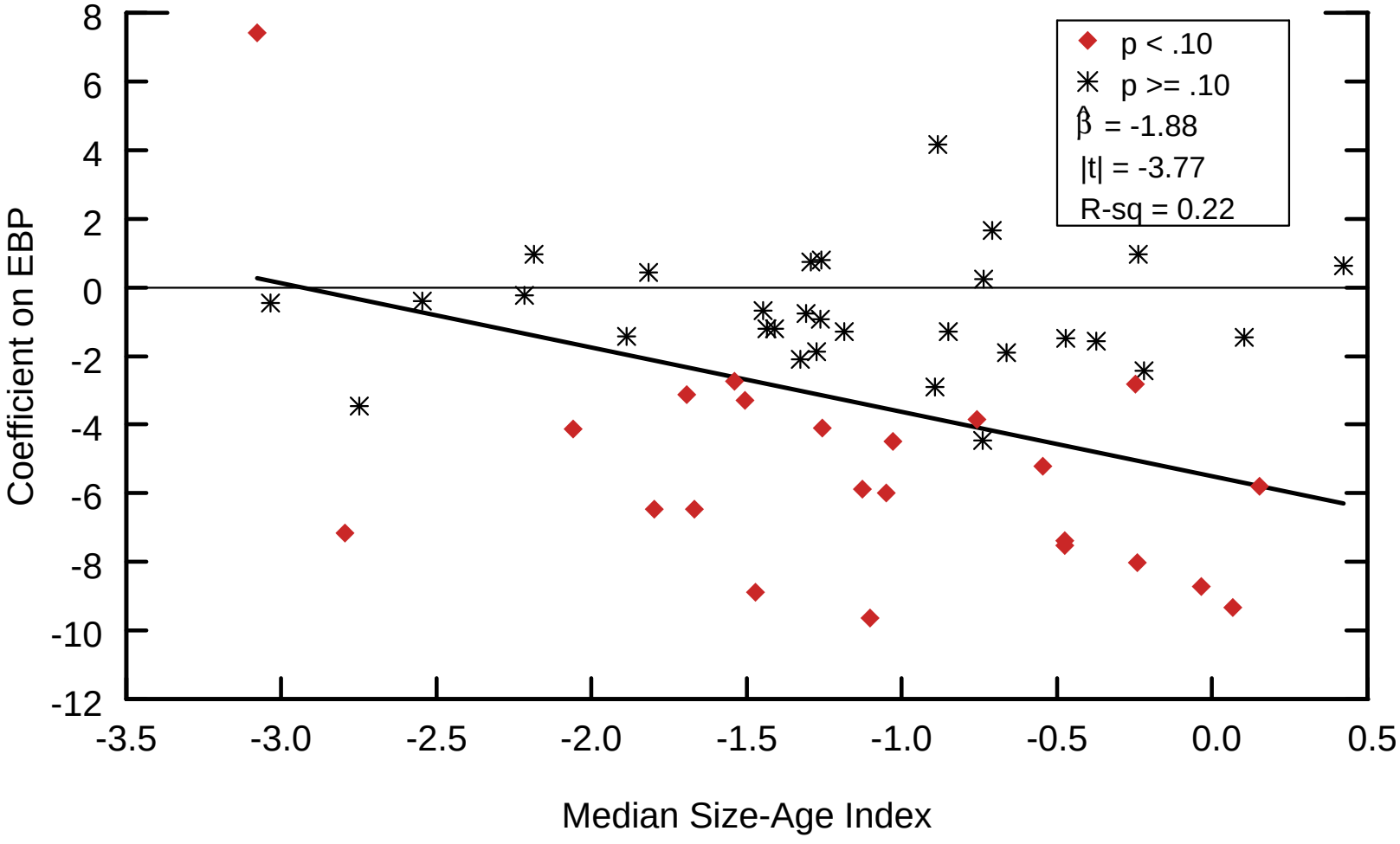


NOTE: Weighted average monthly inflation relative to industry (2-digit NAICS) inflation.

Inflation Response to EBP



Output Response to the EBP



Euro Area Inflation and Economic Activity

	1992–2007		2008–2013	
Average (%)	Core	GIIPS	Core	GIIPS
Inflation	1.74	4.02	1.49	0.55
Output gap	−0.07	0.81	−0.73	−2.98
Unemployment gap	0.46	−0.60	−0.09	1.27

Core = AUT, DEU, BEL, FIN, FRA, NLD; GIIPS = GRC, IRL, ITA, ESP, PRT
SOURCE: AMECO database.

- Is lack of disinflationary pressures in the periphery during the crisis related to financial strains?

Financial Conditions and Inflation Dynamics

- Panel-versions of the price and wage Phillips Curves:
  - Prices (backward looking):

$$\pi_{it} = \alpha_i + \beta\pi_{i,t-1} + \lambda(u_{it} - \bar{u}_{it}) + \phi\Delta\text{VAT}_{it} + \psi\mathbf{1}[i \in €] + \epsilon_{it};$$

  - Prices (hybrid New Keynesian):

$$\pi_{it} = \alpha_i + \beta_f E_t\pi_{i,t+1} + \beta_b\pi_{i,t-1} + \lambda\widehat{mc}_{it} + \phi\Delta\text{VAT}_{it} + \psi\mathbf{1}[i \in €] + \epsilon_{it},$$

  - Wages (backward looking):

$$\pi^w_{it} = \alpha_i + \beta\pi_{i,t-1} + \lambda(u_{it} - \bar{u}_{it}) + \phi\Delta\tilde{z}_{it} + \psi\mathbf{1}[i \in €] + \epsilon_{it};$$

- Data
  - Countries: AUT, DEU, BEL, FIN, FRA, NLD, GRC, IRL, ITA, ESP, PRT
  - Estimation period: 1970–2007

- Are the PC prediction errors during the crisis related to the degree of financial strains across countries?

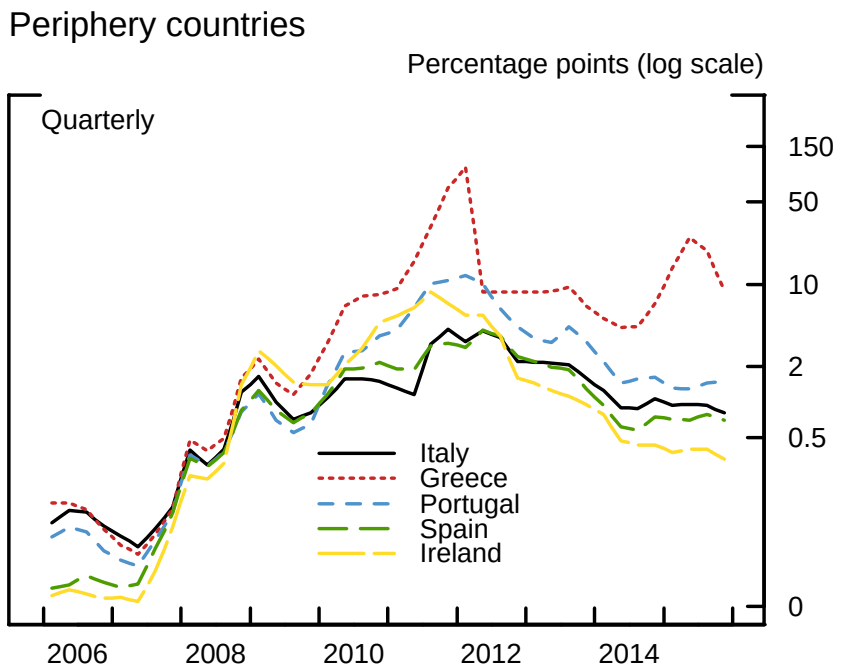
Estimated Euro Area Phillips Curves

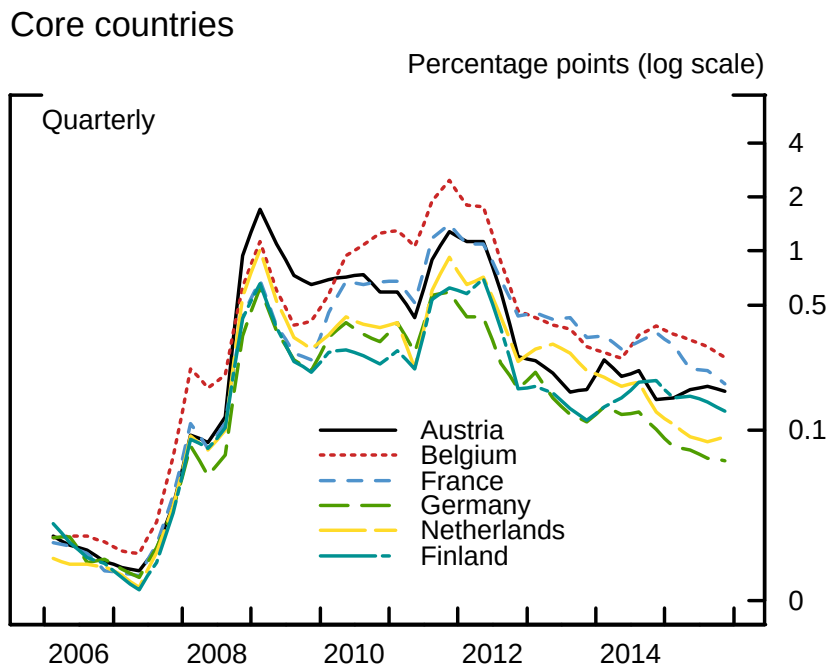
	Prices			Wages	
Explanatory Variables	(1)	(2)	(3)	(4)	(5)
$(u_{it} - \bar{u}_{it})$	−0.273	−0.529	.	−0.559	−0.659
	(0.117)	(0.127)		(0.096)	(0.118)
$(y_{it} - \bar{y}_{it})$	.	.	0.134	.	.
			(0.084)	.	.
$\pi_{i,t-1}$	0.845	0.813	0.561	0.763	0.745
	(0.046)	(0.046)	(0.078)	(0.057)	(0.050)
$E_t \pi_{i,t+1}$	.	.	0.407	.	.
			(0.085)		
$\Delta \tilde{z}_{it}$	.	.	.	0.689	0.668
				(0.127)	(0.104)
ΔVAT_{it}	0.091	0.072	0.035	.	.
	(0.040)	(0.039)	(0.057)		
$\mathbf{1}[i \in €]$	−0.631	−0.657	−0.315	−1.529	−1.230
	(0.300)	(0.298)	(0.202)	(0.358)	(0.286)
Adj. R^2	0.839	0.845	.	0.858	0.872
Pr $> J$	.	.	0.109	.	.
Equal coeff. on $(u_{it} - \bar{u}_{it})$	.	$<.001$	.	.	$<.001$

NOTE: Time-clustered standard errors in parentheses.

Financial Conditions in the Euro Area

Sovereign (5-year) CDS spreads





SOURCE: Markit.

Financial Conditions and PC Prediction Errors

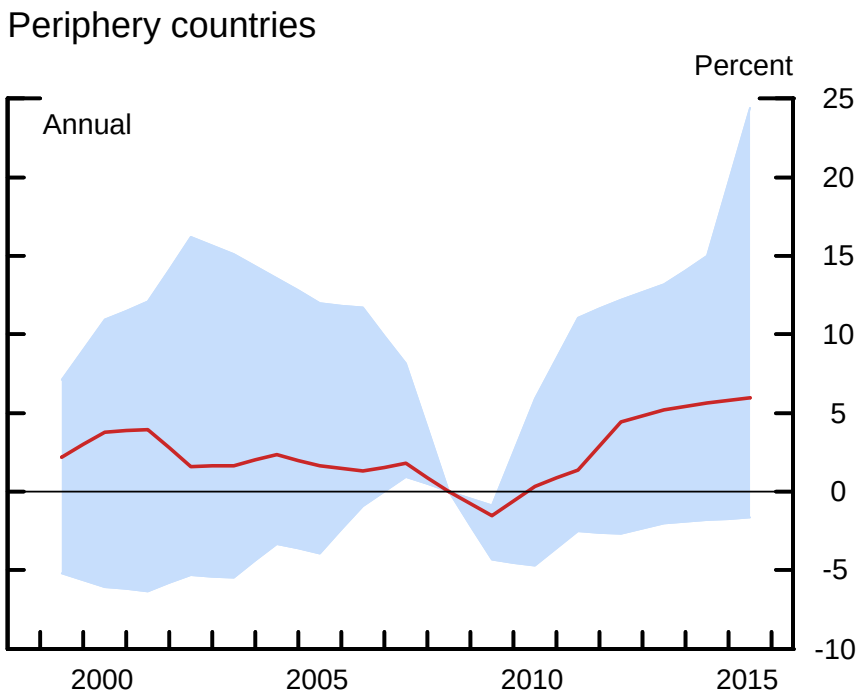
With time fixed effects, 2008–2013

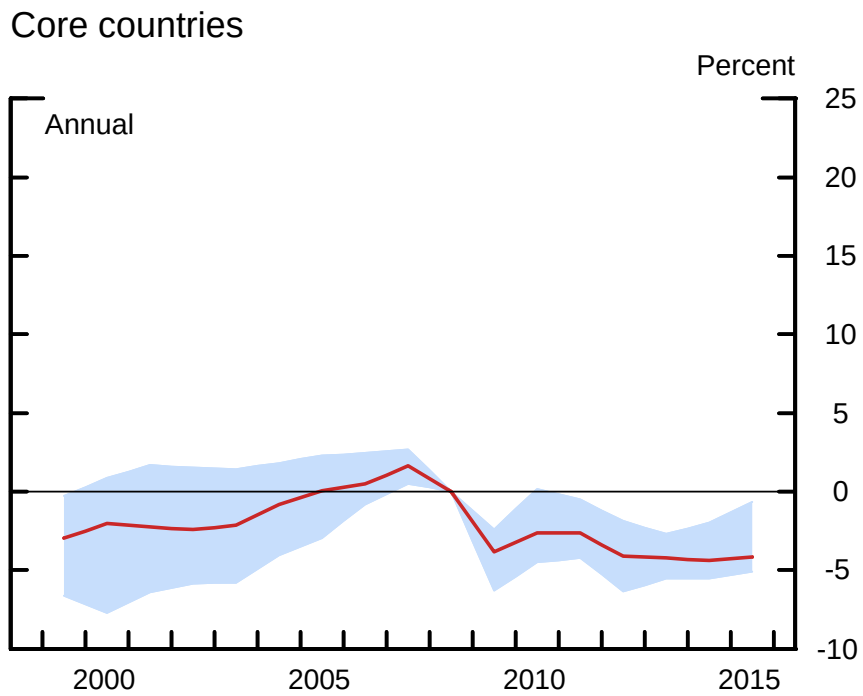
	Explanatory Variable		
PC Prediction Error	$\ln \text{CDS}_{i,t-1}$	$\ln \text{CDS}_{i,t-1} \times \mathbf{1}[i \in \text{P}]$	R^2
(2) Prices (heterogeneous)	0.684	0.275	0.419
	$[0.369, 0.999]$	$[0.031, 0.519]$	
(5) Wages (heterogeneous)	-2.196	-1.469	0.542
	$[-2.731, -1.661]$	$[-2.550, -0.389]$	

NOTE: Bootstrapped 95% confidence intervals in brackets.

Price Markups

Euro area, 2000–2015





NOTE: The markup is equal to minus (100 times) the log or real unit labor costs (2008 = 1).
SOURCE: AMECO database.

Financial Conditions and Price Markups

Euro area, 2008–2013

Specification	Explanatory Variable		R^2
	$\ln \text{CDS}_{i,t-1}$	$\ln \text{CDS}_{i,t-1} \times \mathbf{1}[i \in \text{P}]$	
A. *Aggregate markups*			
(2) With time fixed effects	-0.312 $[-0.528, -0.095]$	1.148 $[0.926, 1.372]$	0.681
B. *Sectoral markups*			
(4) With time fixed effects	-0.331 $[-1.915, 1.254]$	1.974 $[1.244, 2.704]$	0.152

NOTE: Bootstrapped 95% confidence intervals in brackets.

Financial Heterogeneity as a Propagation Mechanism

- This paper:
  - Extend GSSZ [2015] to a two-country setting ("core" and "periphery")
  - Study the consequences of forming a monetary union among countries with heterogeneous financial capacities
- Implications:
  - During a financial crisis in the periphery, firms from the core have an incentive to lower markups to gain market share
  - Firms in the periphery are forced to raise markups to maintain current cashflows, thereby sacrificing future market shares
  - RER appreciating for periphery rather than for core creates a feedback loop that reinforces liquidity crisis in the periphery

Preferences

- Two countries: home (h = periphery) and foreign (f = core)
- Two types of goods: $\begin{cases} \text{home goods } (h): & c^j_{i,h,t},\ i \in N_h \equiv [0,1] \\ \text{foreign goods } (f): & c^j_{i,f,t},\ i \in N_f \equiv [1,2] \end{cases}$
- Preferences of household j in the home country:

$$\mathbb{E}_t \sum_{s=0}^{\infty} \delta^s U(x^j_{t+s}, h^j_{t+s});$$

  - labor (h) is immobile across countries.

"Deep Habits"

Ravn, Schmitt-Grohe & Uribe [2006]

- Consumption/habit aggregator:

$$x_t^j = \left[\sum_{k=h,f} \Xi_k \left[\int_{N_k} \left(c_{i,k,t}^j / s_{i,k,t-1}^{\theta} \right)^{1-1/\eta} di \right]^{\frac{1-1/\epsilon}{1-1/\eta}} \right]^{1/(1-1/\epsilon)}$$

- Law of motion for (external) deep habits:

$$s_{i,k,t} = \rho s_{i,k,t-1} + (1-\rho) \int_0^1 c_{i,k,t}^j dj; \quad k = h, f$$

  - "Keeping up with the Joneses" at the good level

Technology

- Continuum of monopolistically competitive firms producing variety of differentiated goods of type h and type f.
- Production function of home country firms:

$$y_{it} = c_{i,h,t} + c^*_{i,h,t} = \left(\frac{A_t}{a_{it}} h_{it}\right)^{\alpha} - \phi; \quad i \in N_h$$

  - a_{it}: i.i.d. idiosyncratic cost shock.
  - ϕ: fixed costs $\Rightarrow$ firms can incur operating losses.

Financial Frictions

- Costly external equity financing:
  (Myers & Majluf [1984]; Gomes [2001]; Stein [2003])
  - 1 € claim raises only $(1-\varphi)$ € of funds $(0<\varphi<1)$
- Heterogeneity in financial capacity: $\varphi^* < \varphi$

"Beggar Thy Neighbor" at the Micro Level

- Liquidity crisis in the periphery is a good time for firms from the core to "steal" market share by undercutting their competitors' prices

  "Mr. Marchionne and other auto executives accuse Volkswagen of exploiting the crisis to gain market share by offering aggressive discounts. "It's a bloodbath of pricing and it's a bloodbath on margins," he said."

  – *The New York Times*, July 25, 2012

Optimal Pricing

Symmetric equilibrium

- Assume flexible prices and no customer markets.
- When $\alpha = 1$, optimal pricing (home market) $\Rightarrow$

$$p_{h,t} = \underbrace{\underbrace{\frac{\eta}{\eta - 1}}_{\text{accounting markup}} \times \frac{\mathbb{E}_t^a[\zeta_{it} a_{it}]}{\mathbb{E}_t^a[\zeta_{it}]}}_{\text{economic markup}} \times \underbrace{\left[\frac{W_t / P_t}{A_t}\right]}_{\text{real marginal cost}}$$

- Financial frictions $\Rightarrow$

$$\begin{aligned} \mathbb{E}_t^a[\zeta_{it}] &> 1 \\ \frac{\mathbb{E}_t^a[\zeta_{it} a_{it}]}{\mathbb{E}_t^a[\zeta_{it}]} &= 1 + \text{Cov}[\zeta_{it} a_{it}] \geq 1 \end{aligned}$$

Optimal Pricing (cont.)

Symmetric equilibrium

- Bring back customer markets (still flexible prices!)
- Growth-adjusted, compounded discount rate:

$$\beta_{h,t,s} = \begin{cases} m_{s-1,s} g_{h,s} & \text{if } s = t+1; \\ m_{s-1,s} g_{h,s} \times \prod_{j=1}^{s-(t+1)} (\rho + \chi g_{h,t+j}) m_{t+j-1,t+j} & \text{if } s > t+1; \end{cases}$$

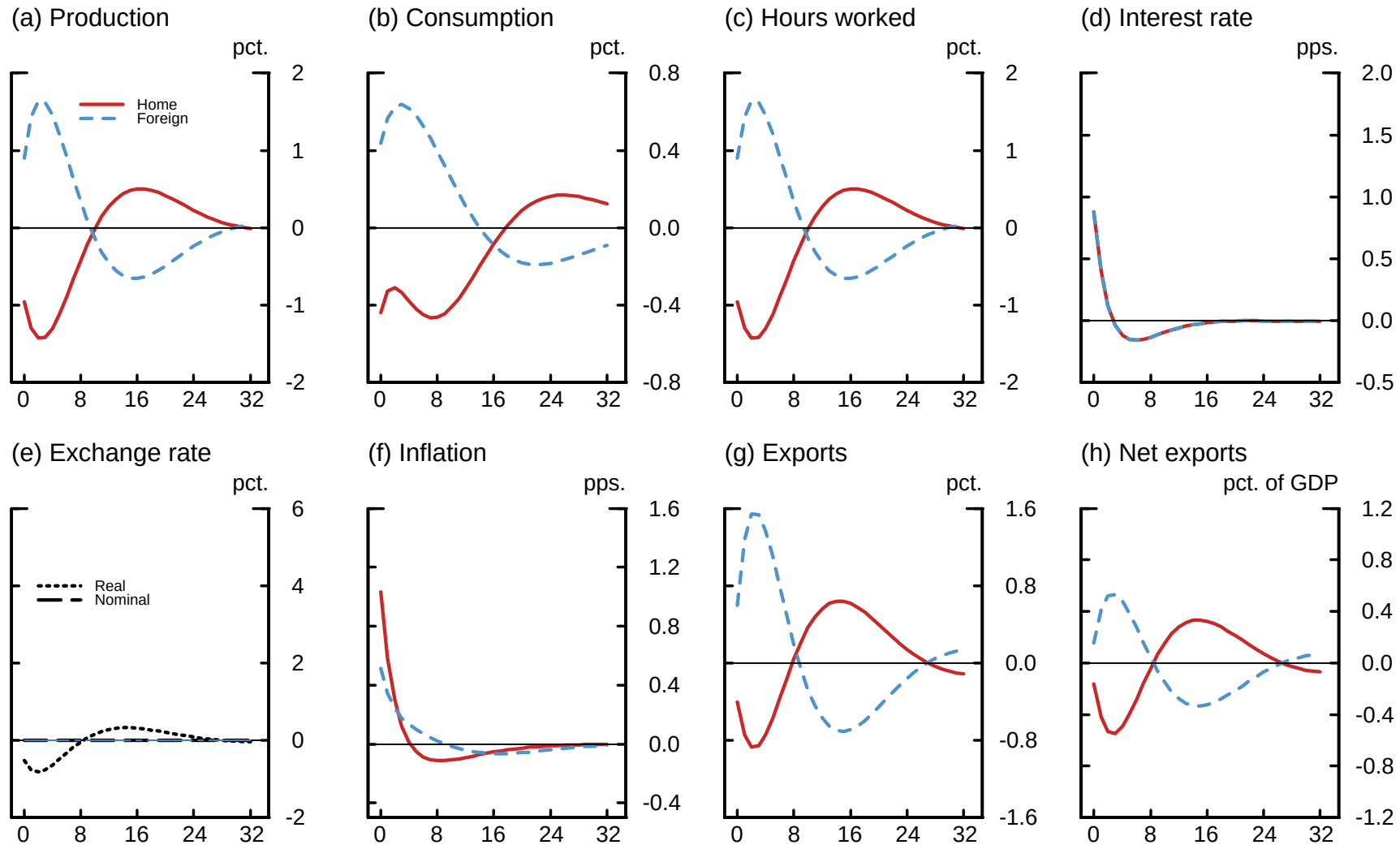
where $g_{h,t} = \frac{s_{h,t}/s_{h,t-1} - \rho}{1-\rho}$ and $\chi = (1-\rho)\theta(1-\eta) > 0$

- Optimal pricing $\Rightarrow$

$$p_{h,t} = \frac{\eta}{\eta - 1} \frac{\mathbb{E}_t^a[\zeta_{it} a_{it}]}{\mathbb{E}_t^a[\zeta_{it}]} \left[\frac{W_t / P_t}{A_t} \right] + (1-\rho)\theta\eta \mathbb{E}_t \left[\sum_{s=t+1}^{\infty} \beta_{h,t,s} \frac{\mathbb{E}_s^a[\zeta_{i,s}]}{\mathbb{E}_t^a[\zeta_{i,t}]} \left(p_{h,s} - \frac{\mathbb{E}_t^a[\zeta_{is} a_{is}]}{\mathbb{E}_t^a[\zeta_{is}]} \left[\frac{W_s / P_s}{A_s} \right] \right) \right]$$

Implications of an Asymmetric Financial Shock

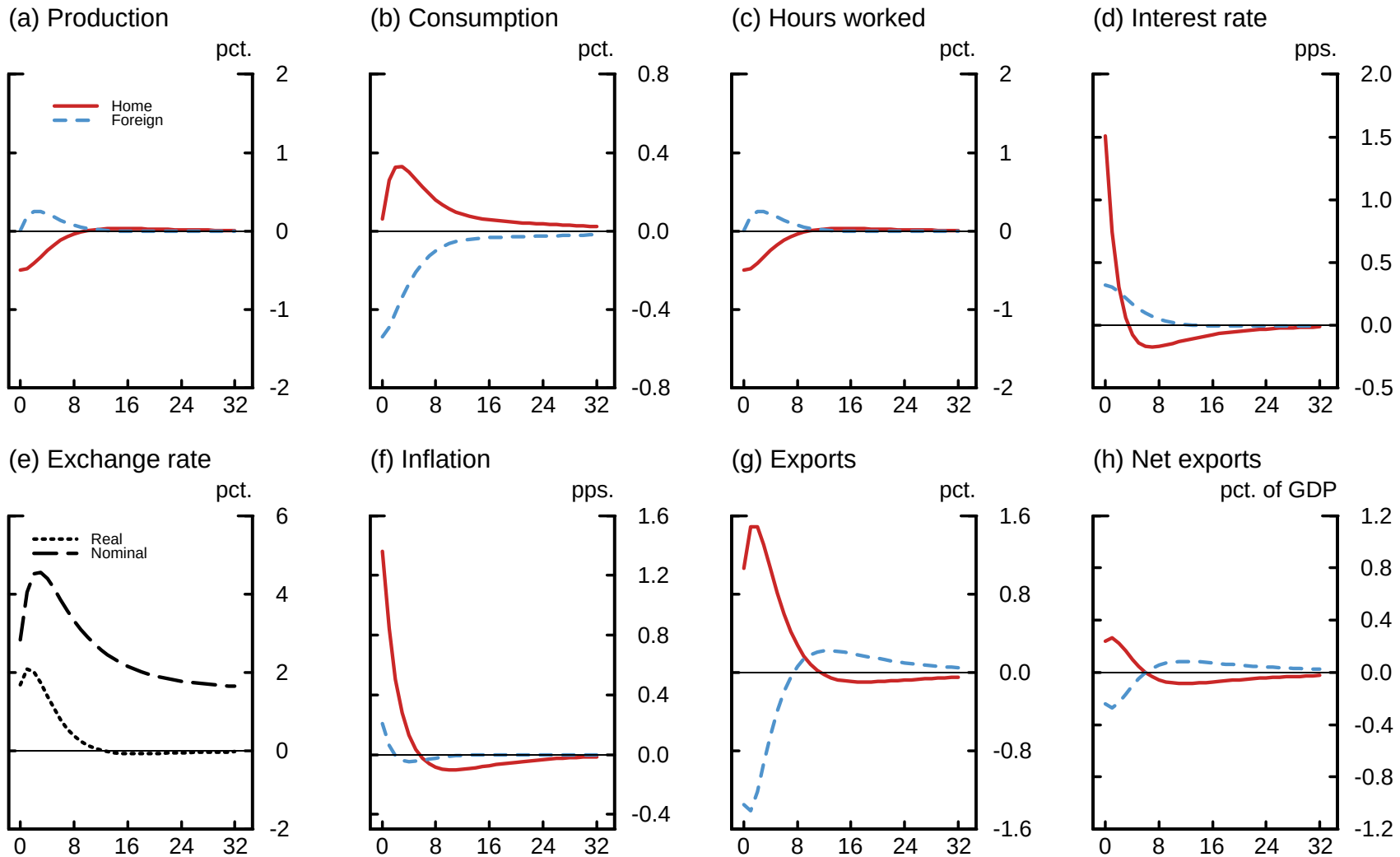
Monetary union ($\varphi = 0.20$, $\varphi^* = 0.02$)



NOTE: Exchange rates are expressed as home currency relative to foreign currency.

Implications of an Asymmetric Financial Shock

Flexible exchange rates ($\varphi = 0.20$, $\varphi^* = 0.02$)

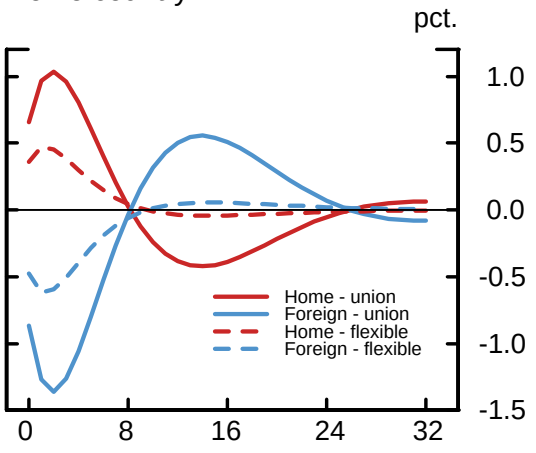


NOTE: Exchange rates are expressed as home currency relative to foreign currency.

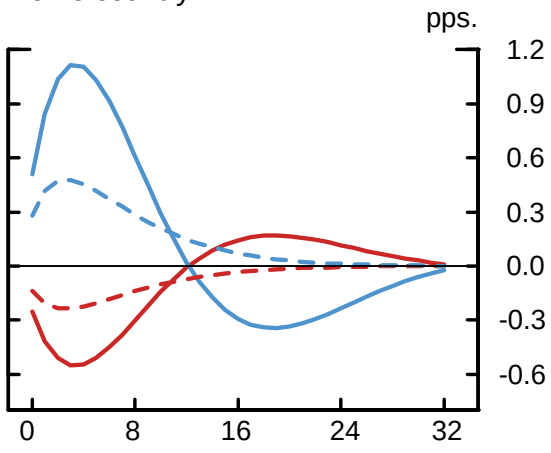
Asymmetric Financial Shock and Price Dynamics

Monetary union vs. flexible exchange rates ($\varphi = 0.20$, $\varphi^* = 0.02$)

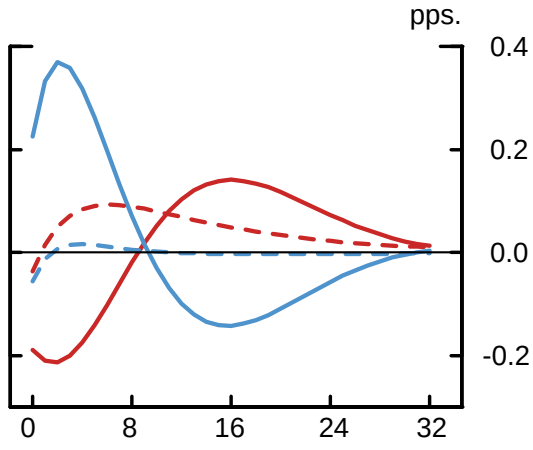
(a) Relative prices
Home country



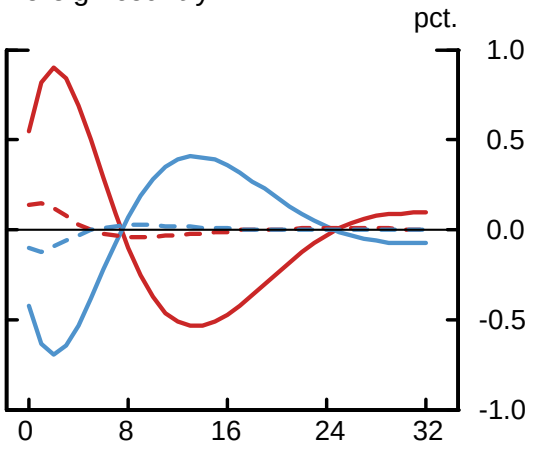
(b) Market share
Home country



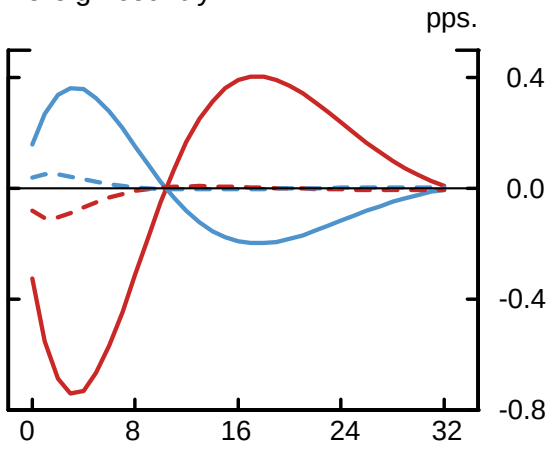
(c) Wage inflation



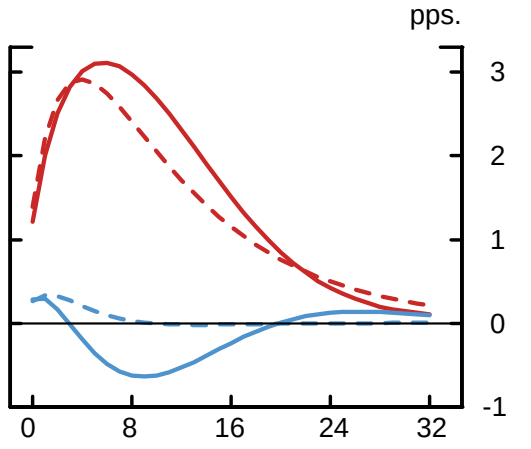
(d) Relative prices
Foreign country



(e) Market share
Foreign country



(f) Markup



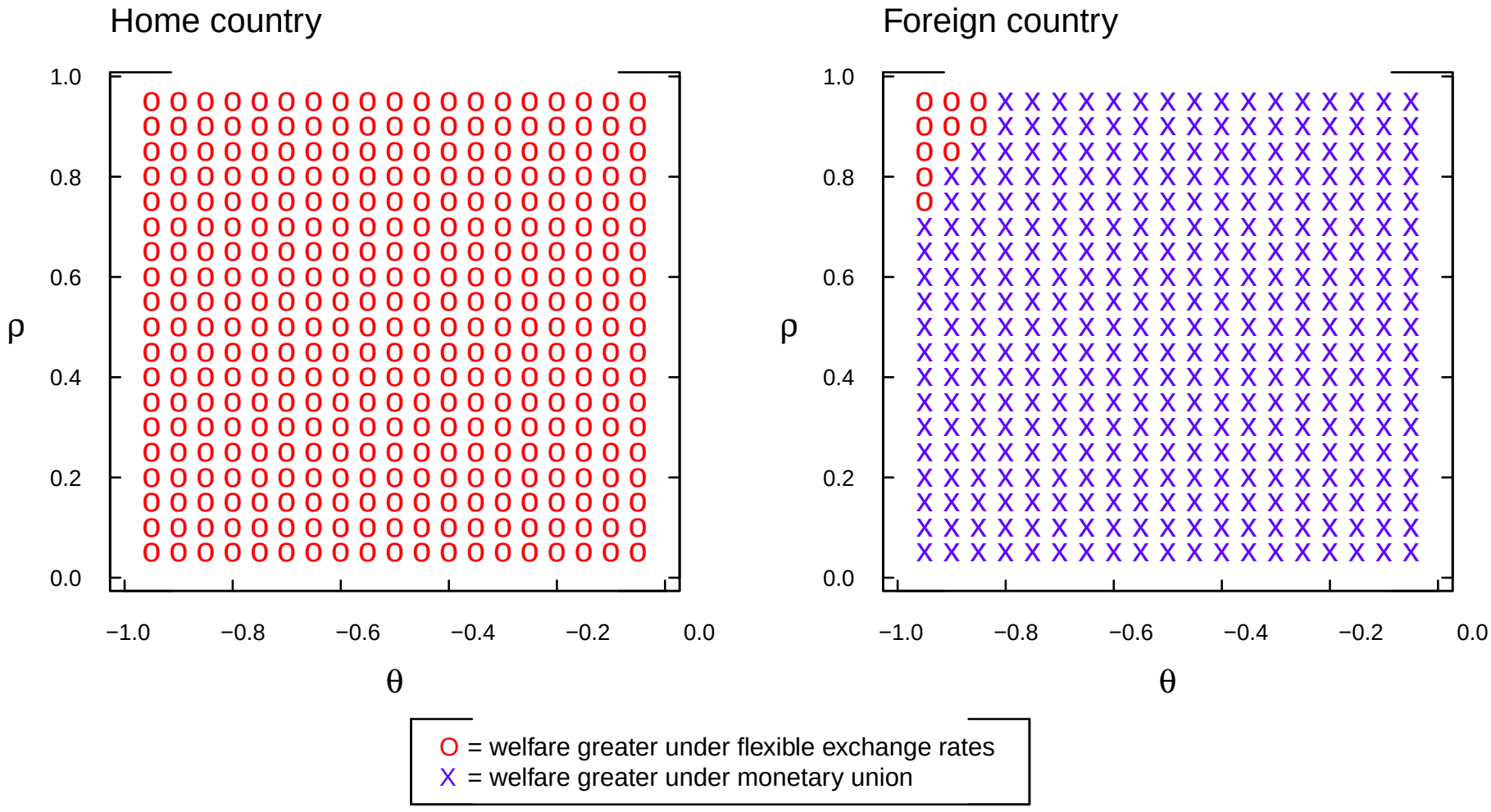
Welfare Consequences of a Monetary Union

Heterogeneous financial capacity ($\varphi = 0.20$, $\varphi^* = 0.02$)

	$\mu(c^U)/\mu(c^F)$	$\sigma(c^U)/\sigma(c^F)$	$\sigma(h^U)/\sigma(h^F)$	CE (pct.)
Home country	0.99	1.55	2.92	2.53
Foreign country	1.01	1.51	4.31	-0.11

Welfare Gains and Losses

The role of deep habits (θ, ρ)



Theory of Fiscal Devaluation

Adao, Correia & Teles [2009]; Farhi, Gopinath & Itskhoki [2014]

- Consider payroll subsidy (ς_t^P) financed by VAT (τ_t^V):
- Modified equity issuance threshold:

$$a_t^E = \frac{A_t}{\left(1-\varsigma_t^P\right) w_t} \left[\frac{p_{h,t}\left(1-\tau_t^V\right) c_{h,t} + q_t p_{h,t}^* c_{h,t}^*}{\left(\phi + c_{h,t} + c_{h,t}^*\right)^{\frac{1}{\alpha}}} \right]$$

Implementable Plan

- Linear and revenue neutral FD rules:

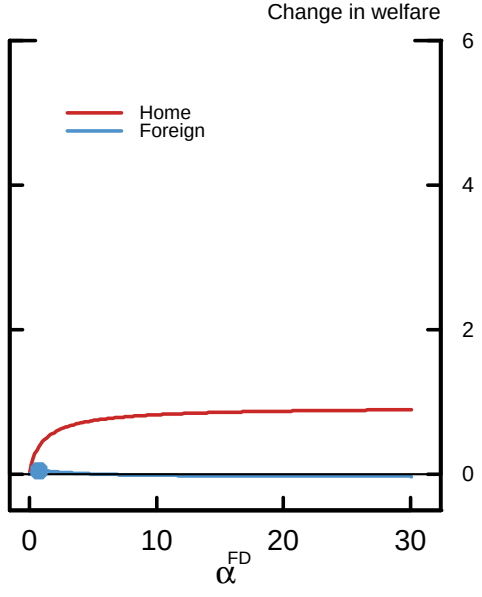
$$\begin{aligned} \tau_t^V &= \frac{\Delta_t}{1+\Delta_t} \\ \Delta_t &= -\alpha^{FD} \times \ln\left(\frac{y_t}{\bar{y}}\right) \quad (\alpha^{FD} > 0) \\ \varsigma_t^P w_t h_t &= \tau_t^V \times (p_{h,t} c_{h,t} + p_{f,t} c_{f,t}) \end{aligned}$$

  - Home country firms are not subject to VAT in the foreign country

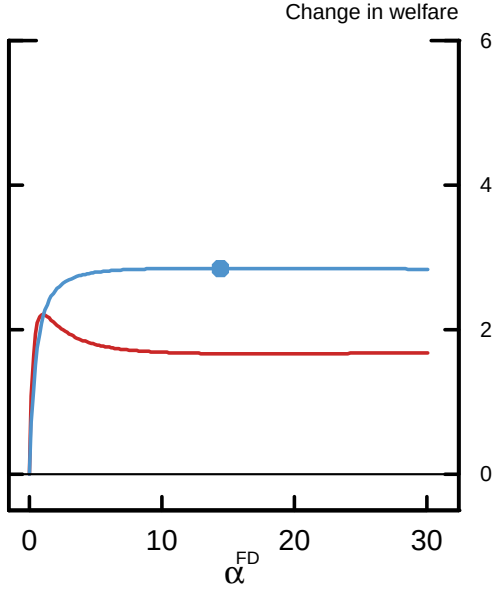
Welfare Implications of Fiscal Devaluations

Monetary union ($\varphi = 0.20$, $\varphi^* = 0.02$)

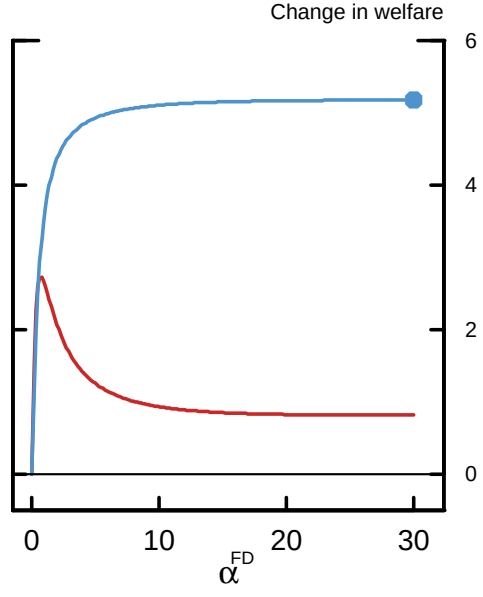
(a) Deep habits: $\theta = -0.3$; $\rho = 0.3$



(b) Deep habits: $\theta = -0.86$; $\rho = 0.85$

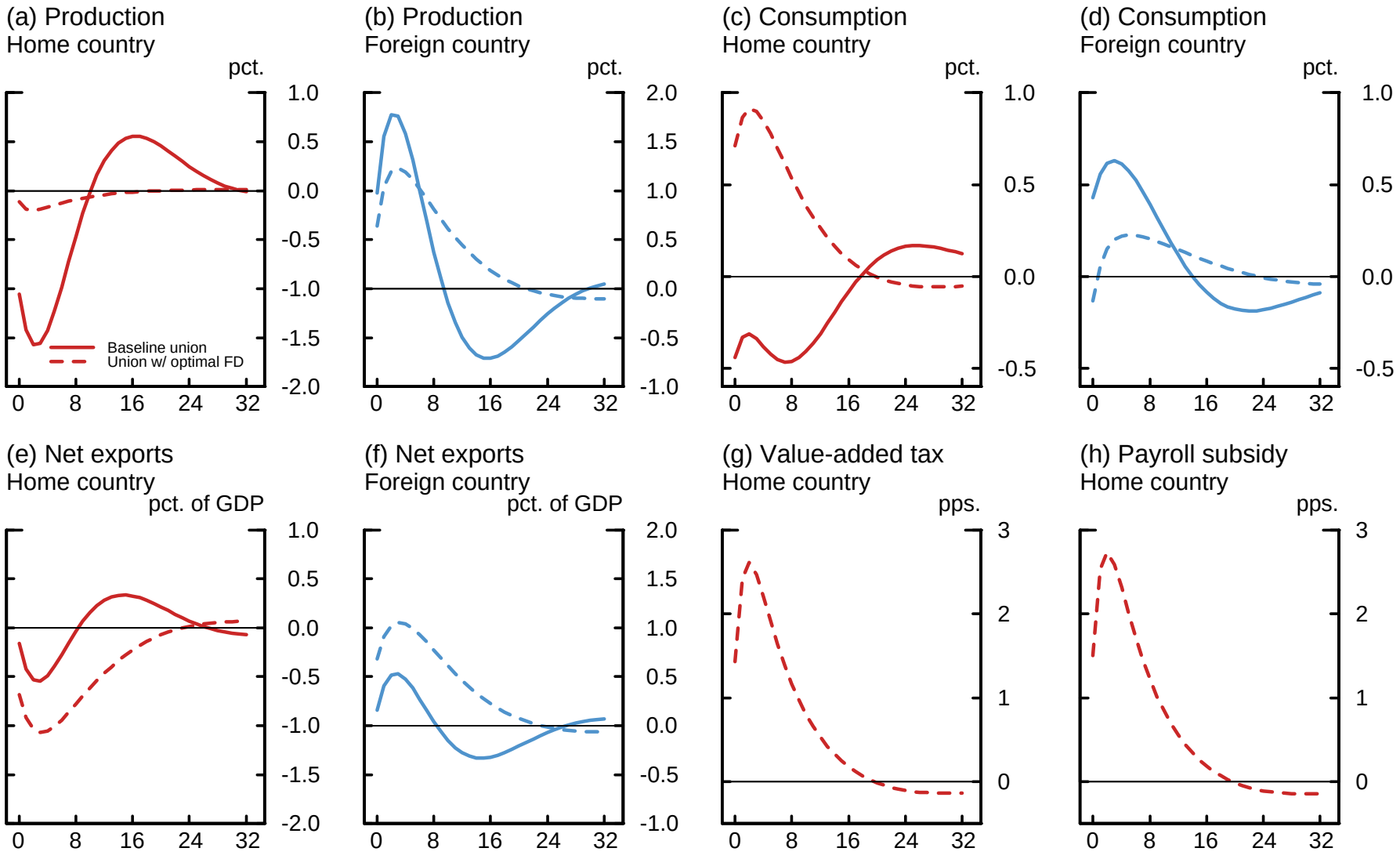


(c) Deep habits: $\theta = -0.95$; $\rho = 0.95$



Optimal Fiscal Devaluation

Monetary union ($\varphi = 0.20$, $\varphi^* = 0.02$)



Summary

- With customer markets, differences in financial capacity across countries imply a strong amplification mechanism.
- Monetary union impedes adjustment of RERs and exacerbates the downturn in response to an adverse financial shock.
- Unilateral fiscal devaluation by periphery may be welfare improving for both periphery and core.