The Exchange Rate Insulation Puzzle

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The Question

Do flexible exchange rates insulate economies from foreign shocks?

- Yes, according to classics: Meade (1951), Friedman (1953), Mundell (1962), Fleming (1962), Eichengreen Sachs (1985) . . . Schmitt-Grohé Uribe (2016)
- Yes, also according to more recent dominant-currency paradigm: Gopinath et al (2020)

Basic idea

- Consider drop in foreign demand, due to, say, contractionary policy shift abroad
- Exchange rate peg: monetary policy constrained to shadow foreign monetary stance
- Flex exchange rate: free to choose how far to expand in order to boost domestic absorption and depreciate currency & expenditure switching

One of the most fundamental ideas in international macro

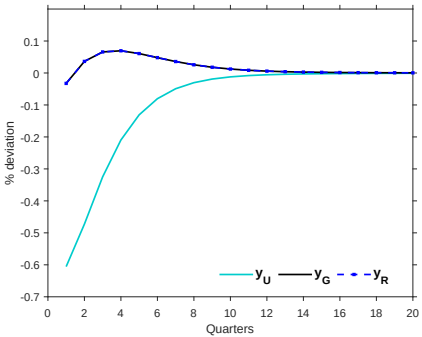
- But w/o much empirical support

Three country model of Gopinath et al (2020): full insulation

Output effect of contractionary monetary policy shock in dominant currency country U

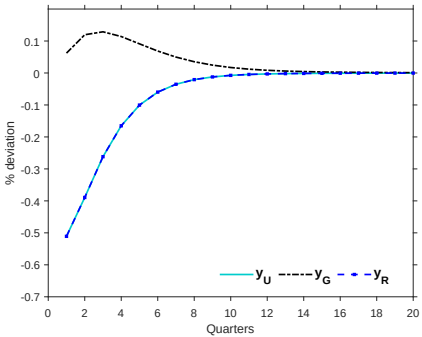
Flexible exchange rates in G and R

Gopinath et al: Figure 2.E



G floats, R pegs to dominant currency

Our simulation



This paper: confront insulation hypothesis with new evidence

Empirical strategy based on data from Europe

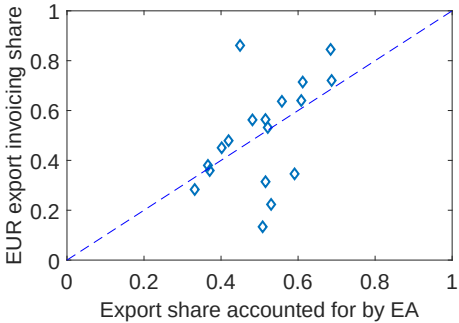
- Focus on various measures of monetary policy/financial shocks originating in the euro area
- Estimate spillovers effect using panel of 20 neighbor countries while conditioning on exchange rate regime: pegs vs floats
- Large data set ($\approx$ 5,000 obs) & large variation of exchange rate regime: across time and space

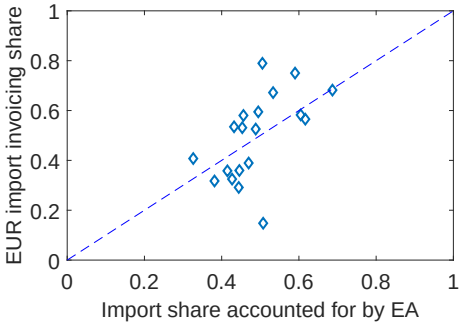
Main results

- Spillovers tend to be sizeable
- Exchange rate regime does **not** matter for spillovers: **exchange rate insulation puzzle**

For our 20 neighbor countries euro appears as dominant currency

Invoicing and trade shares in the euro-area periphery





Sources: Gopinath et al (2015) and IMF Directions of Trade Statistics

This paper: theory

Explore spillovers in New Keynesian two-country model

- Foreign country large (Euro area)
- Home country small (neighbor country): peg or float & inflation targeting

Float & domestic inflation target: accounts for **some** output spillover

- Producer currency pricing: divine coincidence, stabilize inflation by closing output gap, output spillovers only to the extent that foreign shock impacts potential output
- Dominant currency pricing: stable inflation requires output gap to absorb part of the shock

Float & **strict CPI** inflation target: output spillover as large as under peg

- Monetary policy less accommodative to contain currency depreciation
- Why is monetary policy ready to accept large output fluctuations?

Some related empirical literature

Little systematic empirical work on exchange rate regime and output performance

- Bayoumi Eichengreen (1994), Broda (2004)
- Aizenmann et al (2016), Obstfeld et al (2019), Rose Spiegel (2011), Cerutti et al (2019)
- Levy-Yeyati Sturzenegger (2003)

Monetary autonomy and policy framework

- Fear of Floating: Calvo Reinhart (2002), di Giovanni Shambaugh (2008), Klein Shambaugh (2015)
- Trilemma: Shambaugh (2004), Obstfeld et al (2005), Goldberg (2013), Edwards (2015)
- Optimal policy: Mukhin (2018), Egorov Mukhin (2020), Corsetti et al (2020)
- Plurality of instruments: Adrian et al (2020), Basu et al (2020)

Transmission of US monetary shocks (via global financial channel)

- Bluedorn Bowlder (2010), Miranda-Agrippino Rey (2020), Rey (2013), Bräuning Ivashina (2019), Iacovello Navarro (2019), Jordà et al (2019)

Data

Uniquely suited data set w/ monthly observations for period 1999 to 2018

- Euro area (changing composition)
- 20 neighbor countries with different exchange rate policy via-à-vis euro:
  EU27 net of EA11, plus UK, plus EFTA3: Iceland, Norway, Switzerland

Exchange rate regime in neighbor countries, narrow down coarse classification of Ilzetzki Reinhart Rogoff (2019) to four

- Euro adoption: 0
- Peg: 1
- Intermediate (fluctuations within $\pm 2\%$ band): 2
- Pure float: 3 (our conservative baseline)

Variation of exchange-rate regime across time and space

4800 monthly observations of which 1572 pure float (table shows change only)

	Czechia	Denmark	Estonia	Croatia	Cyprus	Latvia	Lithuania	Hungary	Malta	Poland	Romania	Slovenia	Sweden	United Kingdom	Norway	Switzerland	Bulgaria	Greece	Iceland	Slovakia
1999M01	2	1	1	1	1	3	1	3	3	3	3	2	3	3	3	3	1	1	2	2
1999M02	2	1	1	1	1	3	1	3	3	3	3	2	2	3	3	3	1	1	2	2
2000M11	2	1	1	1	1	3	1	3	3	3	3	2	2	3	3	3	1	1	3	2
2001M01	2	1	1	1	1	3	1	3	2	3	3	2	2	3	3	3	1	0	3	2
2001M09	2	1	1	1	1	2	1	3	2	3	3	1	2	3	3	3	1	0	3	2
2005M01	2	1	1	1	1	3	1	3	2	3	3	1	2	3	3	3	1	0	3	2
2006M07	2	1	1	1	1	3	1	3	2	3	2	1	2	3	3	3	1	0	3	2
2007M01	2	1	1	1	1	3	1	3	2	3	2	0	2	3	3	3	1	0	3	2
2008M01	2	1	1	1	0	3	1	3	0	3	2	0	2	3	3	3	1	0	3	2
2008M09	2	1	1	1	0	3	1	3	0	3	2	0	3	3	3	3	1	0	3	2
2009M01	2	1	1	1	0	3	1	3	0	3	2	0	3	3	3	3	1	0	3	1
2009M04	2	1	1	1	0	3	1	2	0	3	2	0	3	3	3	3	1	0	3	0
2009M07	2	1	1	1	0	1	1	2	0	3	2	0	3	3	3	3	1	0	3	0
2011M01	2	1	0	1	0	1	1	2	0	3	2	0	3	3	3	3	1	0	3	0
2011M09	2	1	0	1	0	1	1	2	0	3	2	0	3	3	3	1	1	0	3	0
2012M03	2	1	0	1	0	1	1	2	0	2	2	0	3	3	3	1	1	0	3	0
2012M12	2	1	0	1	0	1	1	2	0	2	1	0	3	3	3	1	1	0	3	0
2014M01	2	1	0	1	0	0	1	2	0	2	1	0	3	3	3	1	1	0	3	0
2015M02	2	1	0	1	0	0	0	2	0	2	1	0	3	3	3	3	1	0	3	0
2017M04	3	1	0	1	0	0	0	2	0	2	1	0	3	3	3	3	1	0	3	0

Trade exposure to euro area

Exports to euro area in percent of GDP, average 2002–2019

Czechia	43	Denmark	12
Estonia	26	Croatia	11
Cyprus	6	Latvia	18
Lithuania	22	Hungary	38
Malta	16	Poland	19
Romania	16	Slovenia	30
Sweden	13	United Kingdom	7
Norway	13	Switzerland	16
Bulgaria	20	Greece	4
Iceland	13	Slovakia	32

Euro area monetary policy and central bank information shocks

Jarociński Karadi (2020)

High frequency innovation in the three months EONIA interest rate swaps around monetary events

- High frequency data: change in OIS rate in 30-minute windows around press statements and 90-minute windows around press conferences, both starting 10 minutes before and ending 20 minutes after the event
- Surprise measure sum of the responses in the two windows

Jarociński Karadi (2020) estimate VAR model and restrict sign of stock market response to distinguish

- Monetary policy shock
- Central bank information shock

Euro area spread shocks

Gilchrist Mojon (2018)

Gilchrist Mojon (2018)

- Aggregate bond level data for Germany, France, Italy, Spain
- Compute spread vis-à-vis German bund for a) banks and b) non-financial corporations
- Various approaches to identify credit supply shocks deliver quite similar results: FAVAR, proxy VAR, recursive VAR

Estimate recursive VAR

- Industrial production, HICP, Eonia, bank credit spread (update available at Banque de France)
- Retrieve time series for spread shock in euro area

Estimate spillovers: empirical model

Estimate local projection (Jordà 2005)

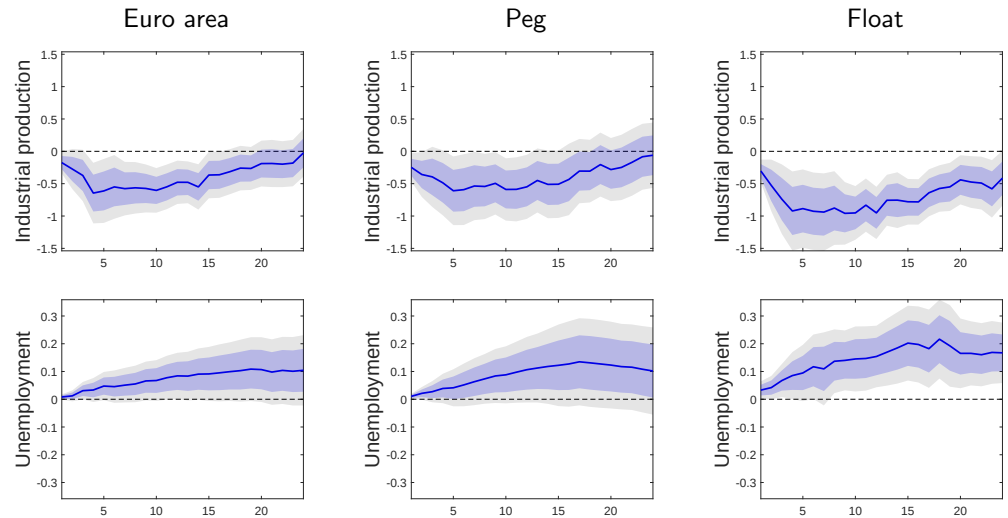
- Direct estimate of impulse response function; easy to condition on exchange rate regime
- Standard errors on generated regressor asymptotically valid under the null hypothesis that coefficient zero (Pagan 1984)

Econometric specification

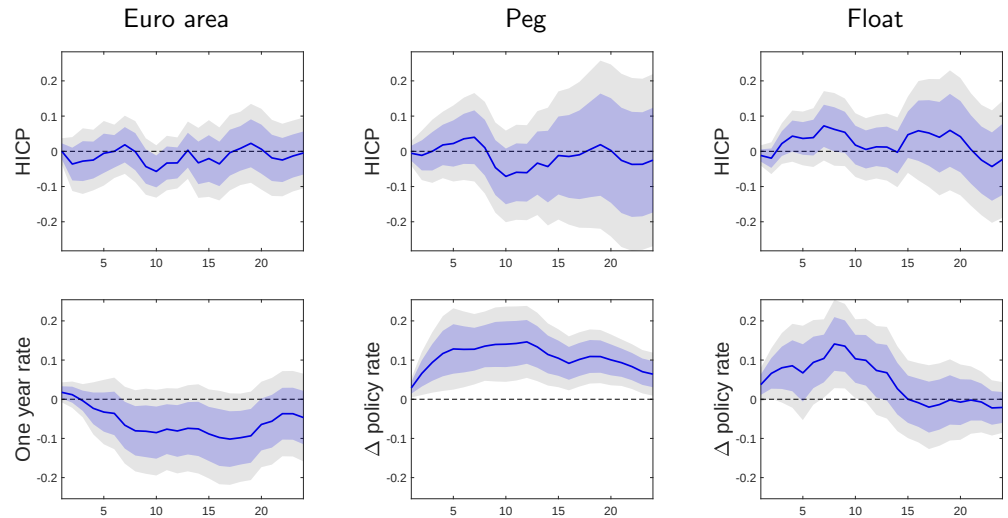
$$x_{i,t+h} = \alpha_{i,h} + I_{i,t-1}\psi_{f,h}\varepsilon_t + (1 - I_{i,t-1})\psi_{p,h}\varepsilon_t + \gamma Z_{i,t} + u_{i,t+h}$$

- Variable of interest: $x_{i,t+h}$; $I_{i,t-1} = 1$ if float
- Controls $Z_{i,t}$: six lags of dependent variable and shocks (baseline)
- ε_t: monetary policy, central bank info or spread shock in euro area
- Display 68% and 90% confidence bands, based on Driscoll Kraay (1998) standard errors

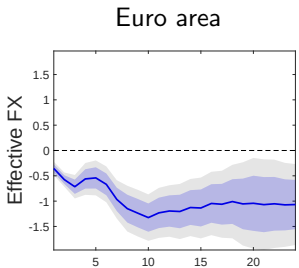
Response to euro area monetary policy shock

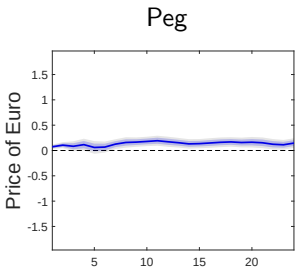


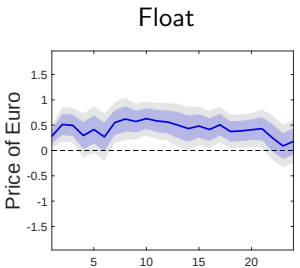
Response to euro area monetary policy shock cont'd



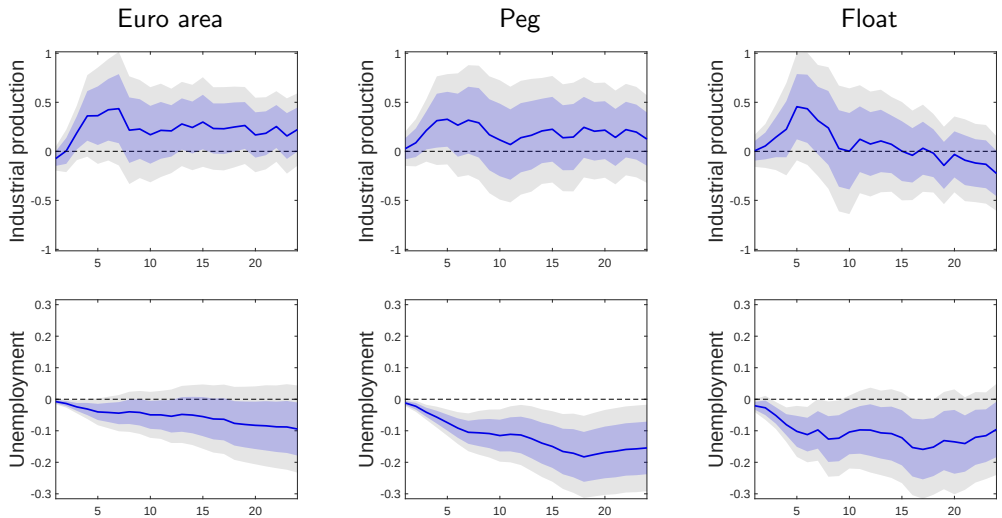
Response to euro area monetary policy shock cont'd



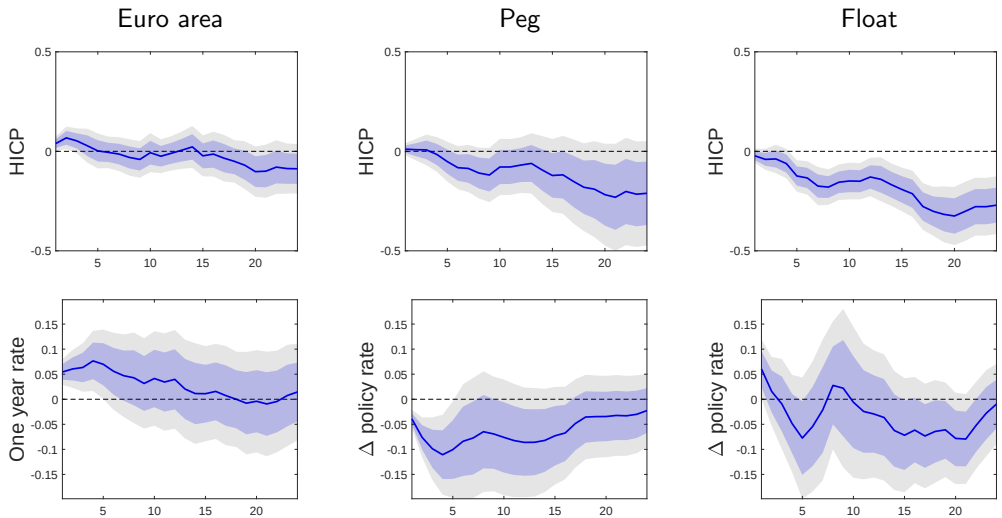




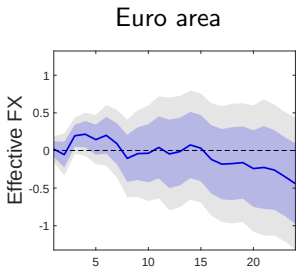
Response to euro area central bank information shock

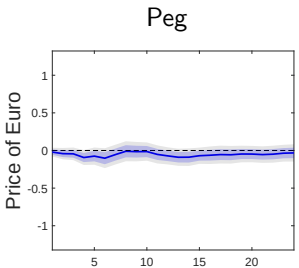


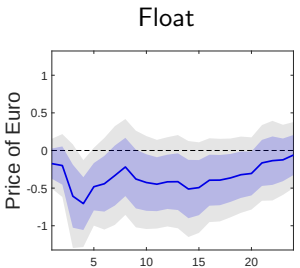
Response to euro area central bank information shock cont'd



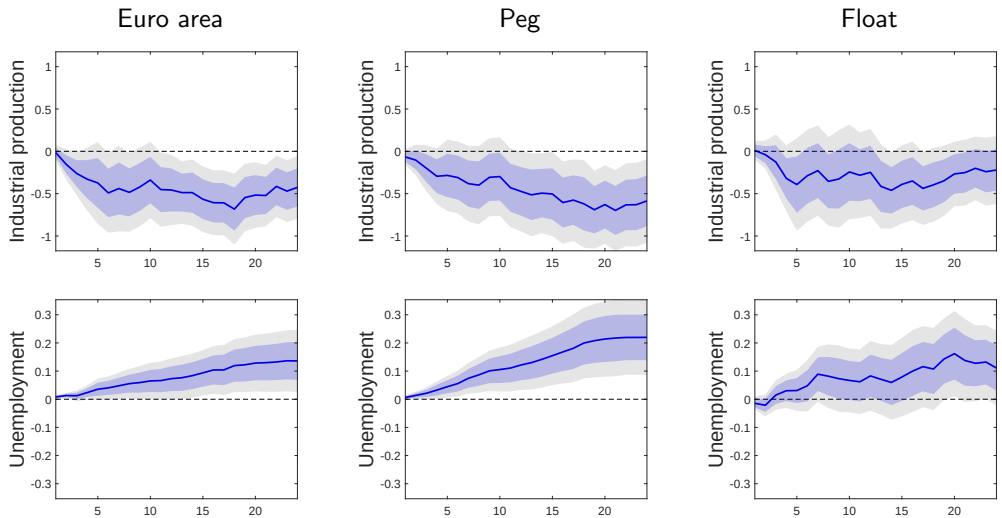
Response to euro area central bank information shock cont'd



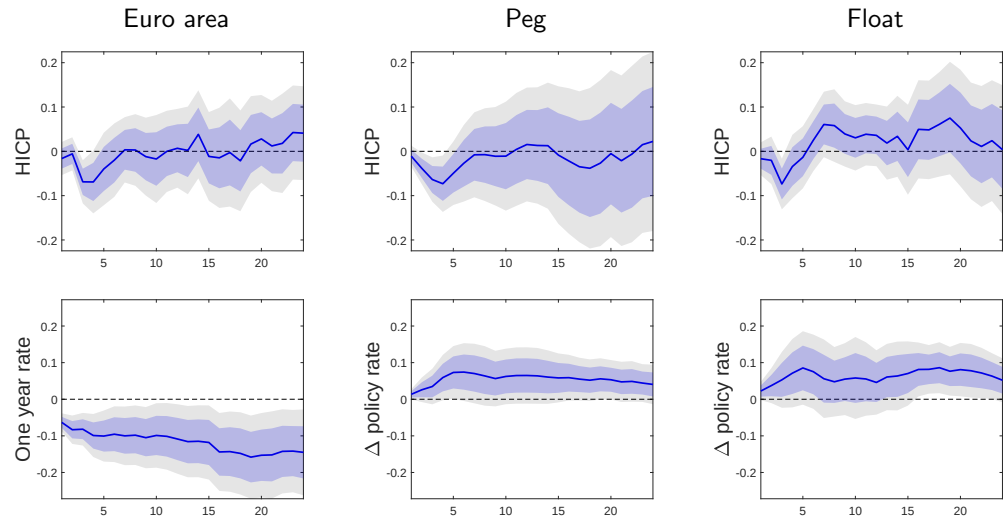




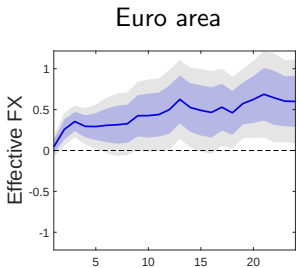
Response to euro area credit shock

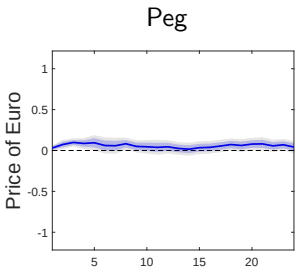


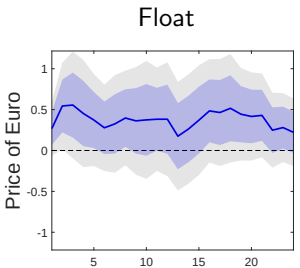
Response to euro area credit shock cont'd



Response to euro area credit shock cont'd







Controlling for financial spillovers

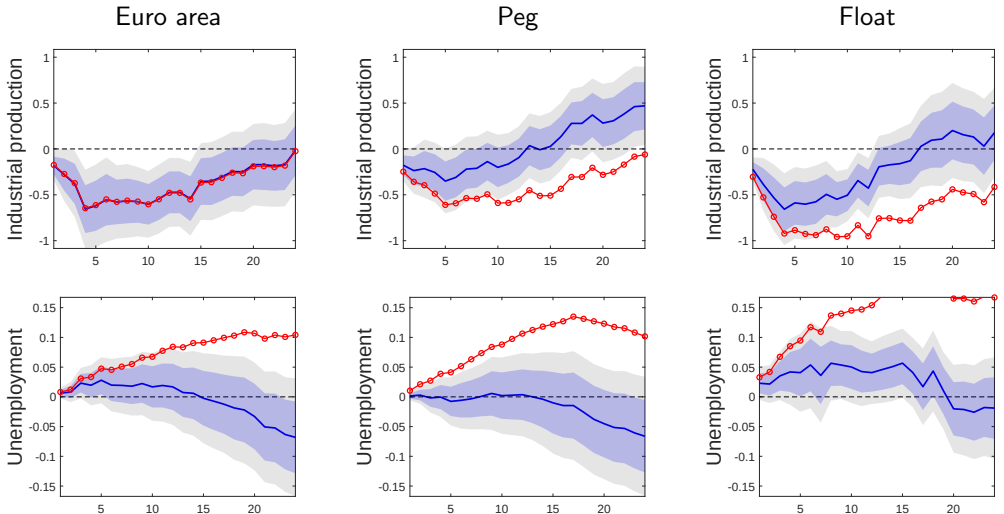
US monetary policy transmits internationally via global financial cycle (Rey 2013, Miranda-Agrippino Rey 2020)

- US monetary policy shocks impact global financial variables: e.g. asset prices, VIX
- Capital flows and industrial production contract globally
- Countries with floating exchange rate equally expose to US monetary policy shocks

Could this explain the exchange-rate insulation puzzle in Europe?

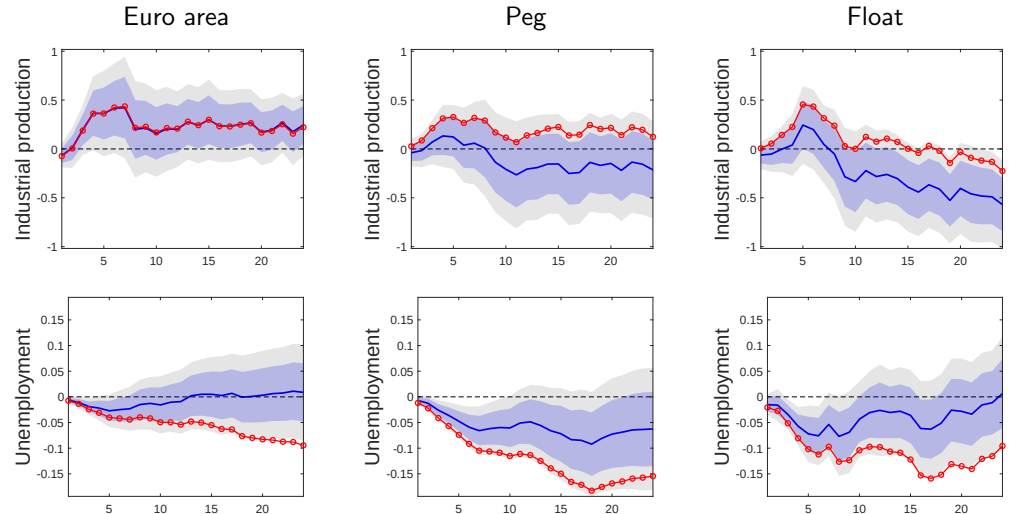
- Include both VIX and VSTOXX as control variables in empirical model

Response to euro area monetary policy shock: controlling for fin. cond.



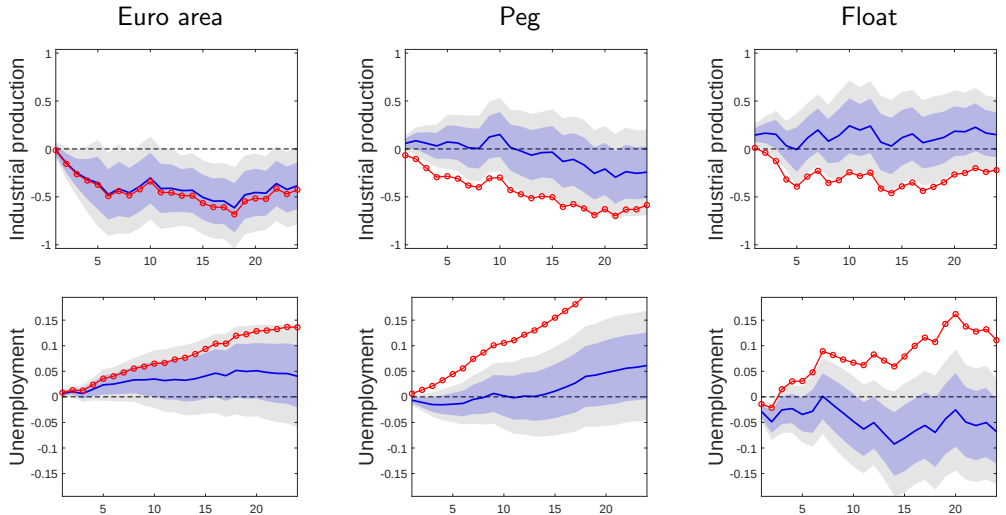
Red line: baseline w/o control

Response to central bank information shock: controlling for fin. cond.



Red line: baseline w/o control

Response to euro area credit shock: controlling for fin. cond.



Red line: baseline w/o control

Evidence: takeaway

Euro area shocks generate large spillovers on neighbor countries

- Size of spillovers independent of exchange rate regime
- In particular: flexible exchange rates fail to provide insulation

Spillovers partly depend on financial variables

- Smaller once we control for VIX/VSTOXX
- Exchange rate regime makes again no difference

Standard New Keynesian open economy model

Basic structure

- Monopolistic competition and sticky prices
- Goods market incompletely integrated because of home bias
- Unrestricted cross-border trade of state-contingent securities

Two countries Home and Foreign

- Differ in size: Foreign (euro area) large, Home small (neighbor country)
- Monetary policy in Home: exchange rate peg or inflation targeting
- Compare transmission under dominant currency pricing and producer currency pricing

Model exposition: brief

- Linearized equilibrium conditions
- Monetary policy shock in Foreign (more shocks in paper)

Foreign (euro area)

Operates exactly like closed economy, canonical representation:

$$\begin{aligned} y_t^* &= E_t y_{t+1}^* - \left(i_t - E_t \pi_{t+1}^*\right) \\ \pi_t^* &= \beta E_t \pi_{t+1}^* + \kappa(1+\varphi) y_t^* \\ i_t^* &= \phi \pi_t^* + \epsilon_t^{m*} \end{aligned}$$

Assuming autocorrelation of monetary policy shock ρ_{ϵ^*}, solution for output

$$y_t^* = -\frac{1-\beta\rho_{\epsilon^*}}{(1-\rho_{\epsilon^*})(1-\beta\rho_{\epsilon^*}) + \kappa^*(\phi_{\pi^*} - \rho_{\epsilon^*})} \epsilon_t^*$$

Home (generic neighbor country)

Under DCP the law of one price fails

$$m_t = e_t + p^*_{H,t} - p_{H,t}$$

Two Phillips curves and market clearing (& risk sharing)

$$\begin{aligned}
\pi_{H,t} &= \beta E_t \pi_{H,t+1} + \kappa \left[(1+\varphi)\, y_t + \omega s_t + v(1+(1-v)(1-\eta)) m_t - v\xi^*_t \right] \\
\pi^*_{H,t} &= \beta E_t \pi^*_{H,t+1} + \kappa \left[(1+\varphi)\, y_t + \omega s_t - (1-v)(1-v(1-\eta)) m_t - v\xi^*_t \right] \\
y_t &= (1-\omega) s_t + y^*_t - (1-v)\xi^*_t + (1-v)(1-v(1-\eta)) m_t \\
s_t &= s_{t-1} + \pi^*_t - \pi^*_{H,t}
\end{aligned}$$

where $\omega \equiv v(1-\eta)(2-v)$ and $v \in (0,1)$ captures openness (steady state import share), and η is the trade price elasticity

Home (neighbor): monetary policy

Dynamic IS equation pins down interest rate

$$y_t = E_t y_{t+1} - [i_t - E_t(\pi_{H,t+1} + \omega \Delta s_{t+1} + v(1 - (1-v)(\eta - 1))\Delta m_{t+1}) + v E_t \Delta \xi^*_{t+1}]$$

for alternative monetary/exchange-rate regimes

- Exchange rate peg: $\Delta e_t = 0$
- Domestic inflation target: $\pi_{H,t} = 0$
- CPI inflation target: $\pi_t = 0$

Home output: spillovers via potential and/or gap? $y_t = y_t^n + \tilde{y}_t$

Solution for Home potential output

$$y_t^n = v\frac{(1-\eta)(2-v)}{1+\varphi-(1-\eta)(2-v)v\varphi}y_t^*$$

- $\eta < 1$ positive comovement of potential output
- $\eta > 1$ negative comovement of potential output
- $\eta = 1$: potential output insulated

If $\eta = 1$ and domestic inflation targeting

- PCP: divine coincidence $\rightarrow$ output gap closed, full insulation
- DCP: divine coincidence fails $\rightarrow$ output spillover $\in (-v, 0)$

Model simulation

Theory: output spillovers under float

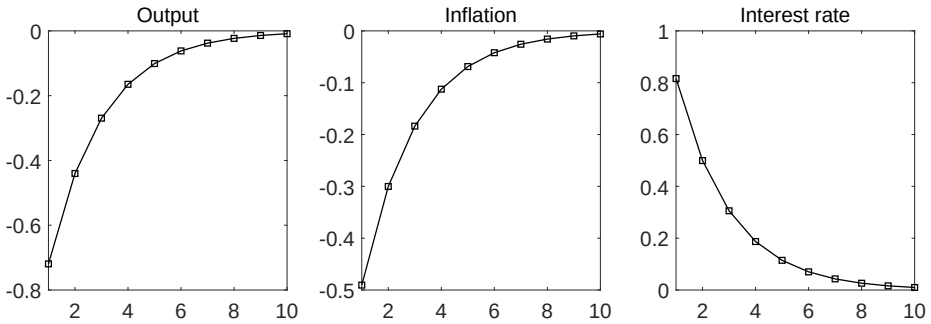
- Potential output declines with foreign output if $\eta < 1$
- DCP breaks divine coincide: negative output gap

How important are these effects quantitatively?

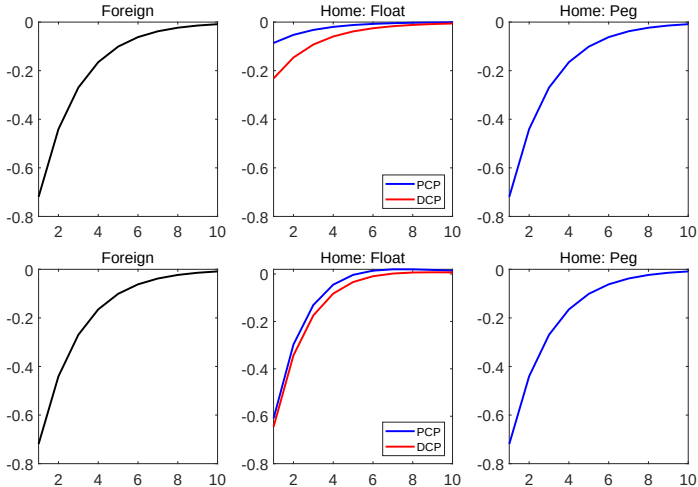
- Run model simulation

Parameters	Description	Values
β	Discount factor	0.995
φ	Inverse of labor supply elasticity	1
ϵ	Elasticity of substitution between intermediate goods	10
η	Trade elasticity	2/3
υ	Share of imported goods in domestic consumption basket	0.4
ω	Price adjustment costs	300

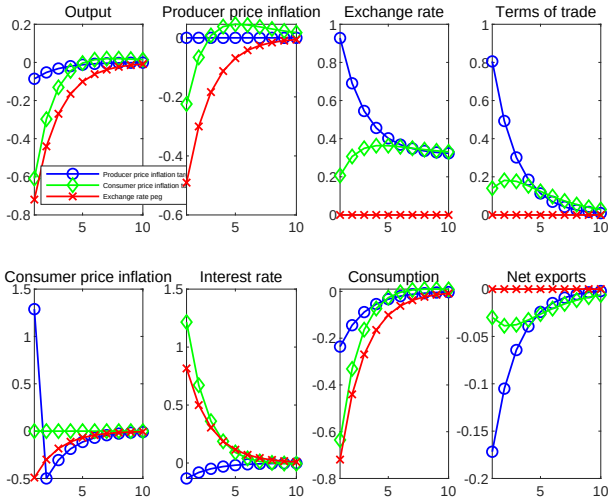
Impulse responses of Foreign to monetary policy shock in Foreign



Output response at Home
Spillovers depend on inflation target: domestic (top) vs CPI (bottom)



Impulse responses of Home to a Foreign monetary policy shock under PCP



Output spillovers in response to Foreign monetary policy shock

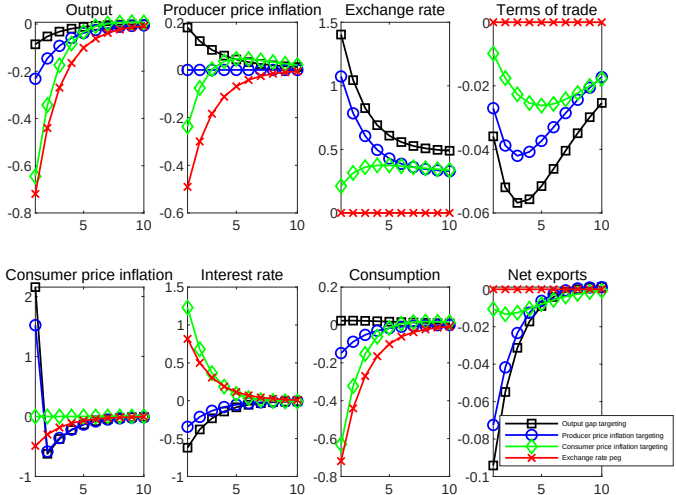
Upshot

- With domestic inflation target: output spillover under float tiny, perhaps 1/10 of what happens under peg
- Why? Response of potential output moderate even though trade price elasticity of 2/3 is already quite low

CPI inflation target does the trick

- Monetary policy raises interest rates to avoid currency from depreciating too much
- Stabilizes consumer prices and depresses domestic absorption
- Net exports/expenditure switching negligible role

Impulse responses of Home to a Foreign monetary policy shock under DCP



Conclusion

Exchange rate insulation puzzle

- Output spillovers from euro area large, and no smaller for floaters
- Theory: could reflect impact on potential output and/or non-zero gap because of DCP
- Quantitative: spillover as large as in data only for CPI target

At fundamental level the puzzle still stands: why are policy makers tolerating exposure of output and employment to external shocks?

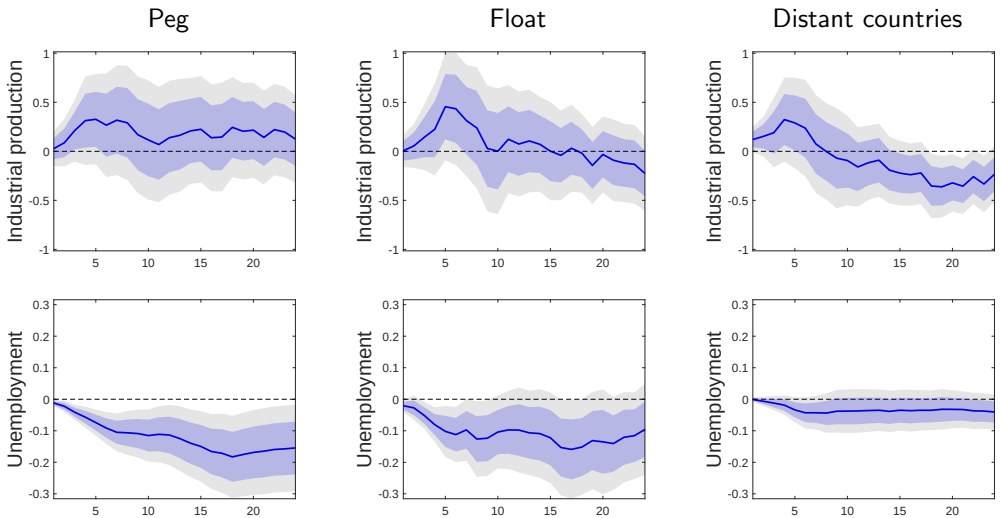
- Optimal policy: stabilize marginal costs in domestic currency (Egorov Mukhin 2020, Corsetti et al 2020)

Appendix

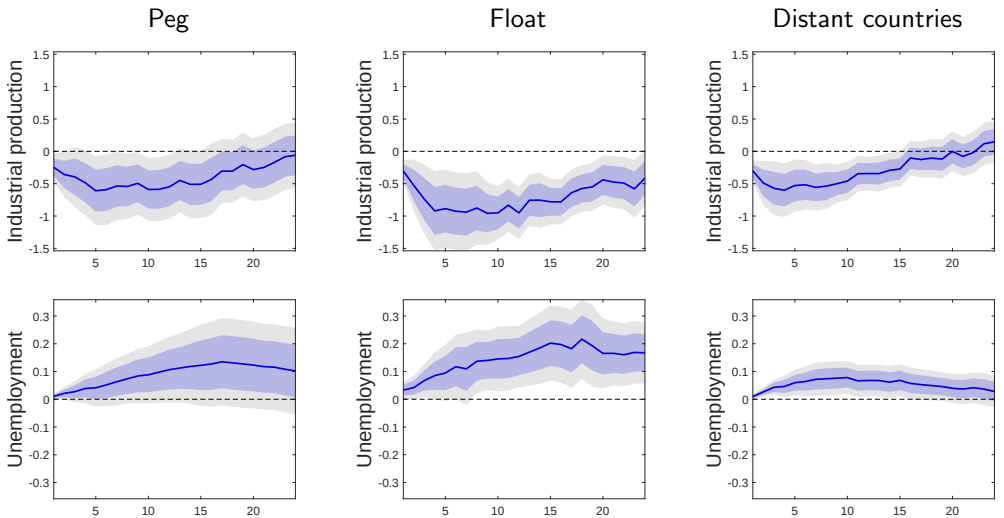
Distant countries (also: exports to euro area less than 4 percent of GDP), sample varies due to data availability in OECD data base

- Industrial production: CAN,JPN,KOR,USA,BRA,COL,IND,IDN
- Unemployment: AUS,CAN,JPN,KOR,USA

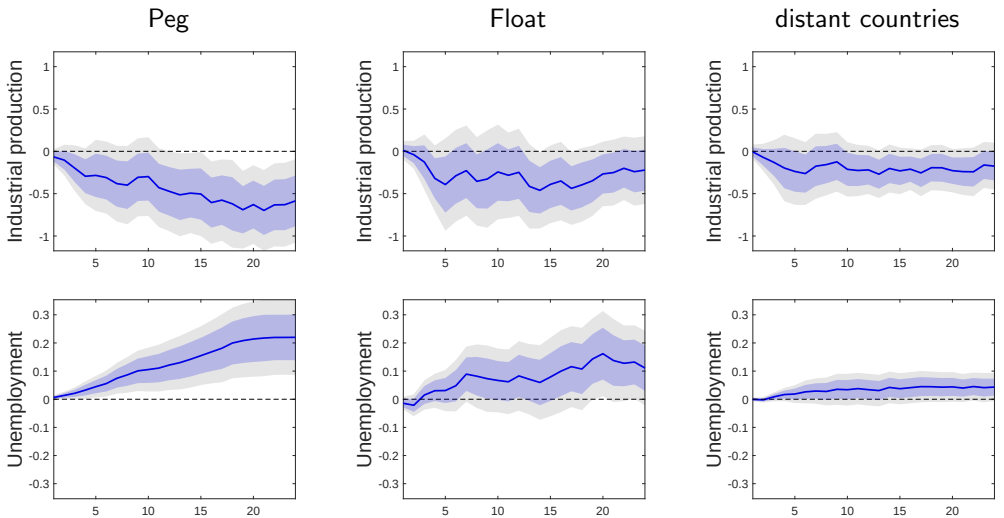
Response to central bank info shock: neighbors vs distant countries



Response to EA monetary policy shock: neighbors vs distant countries

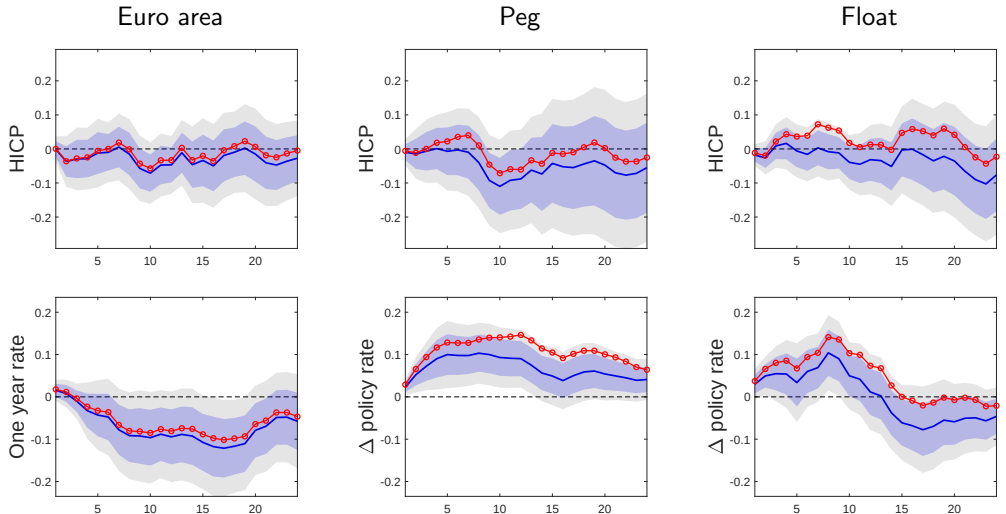


Response to EA monetary policy shock: neighbors vs distant countries



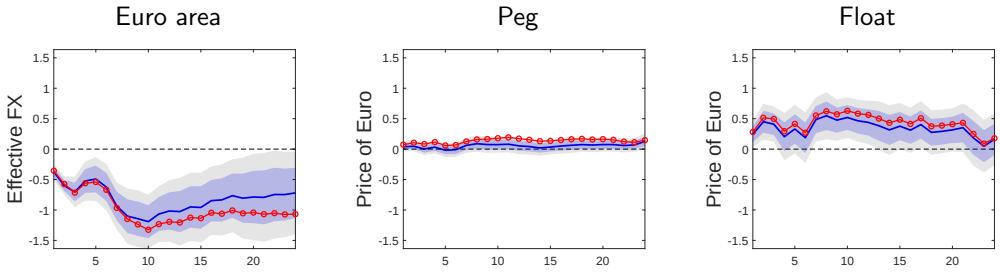
Responses of additional variables in specification with financial controls

Response to euro area monetary policy shock: controlling for fin. cond.



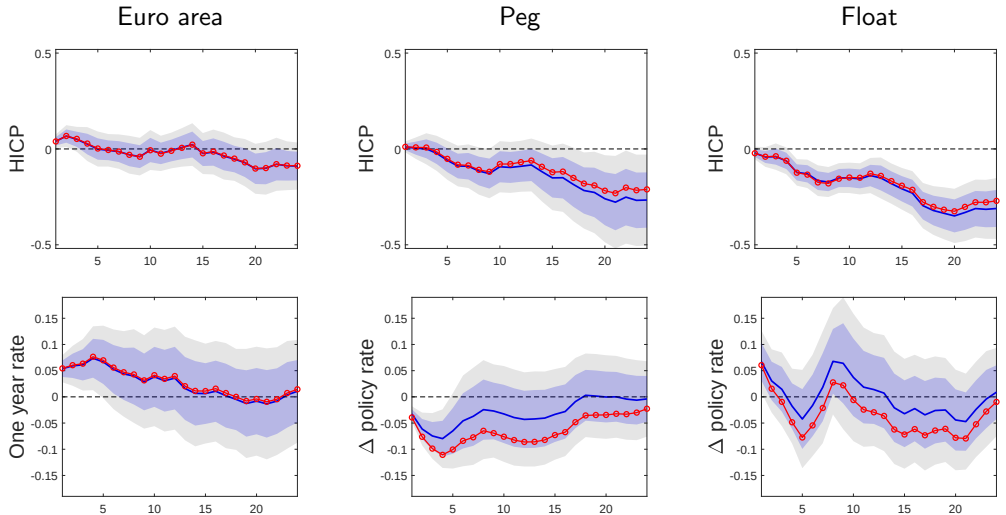
Red line: baseline w/o control

Response to euro area monetary policy shock: controlling for fin. cond.



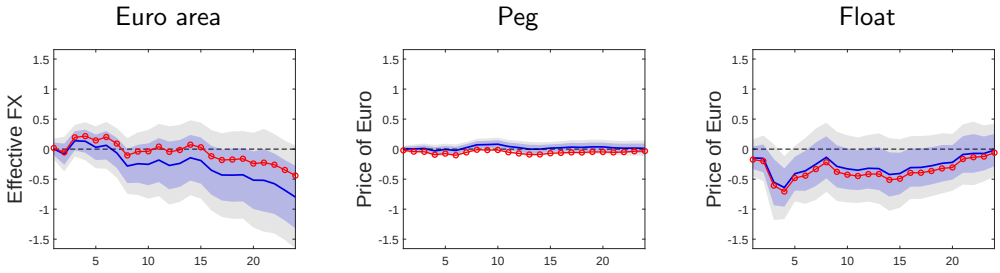
Red line: baseline w/o control

Response to central bank information shock: controlling for fin. cond.



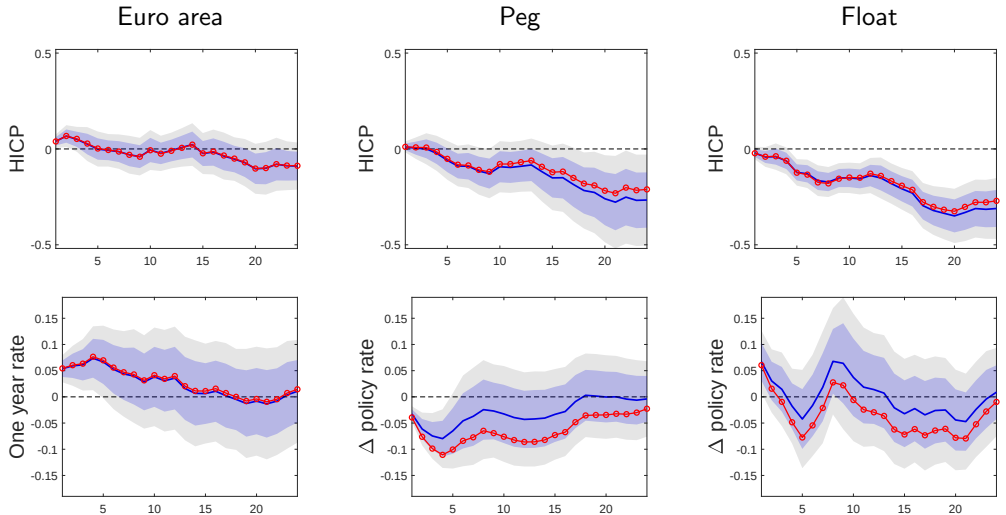
Red line: baseline w/o control

Response to central bank information shock: controlling for fin. cond.



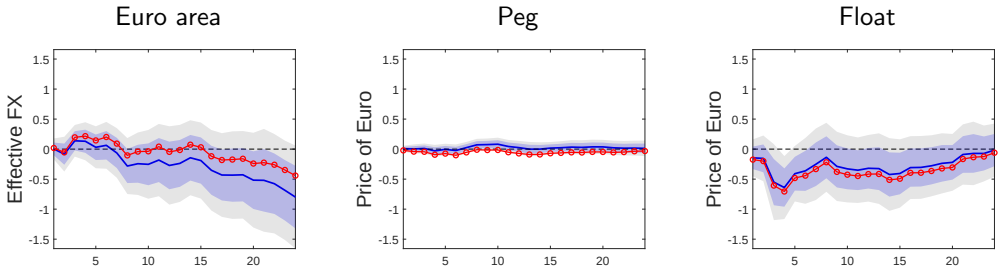
Red line: baseline w/o control

Response to euro area credit shock: controlling for fin. cond.



Red line: baseline w/o control

Response to euro area credit shock: controlling for fin. cond.

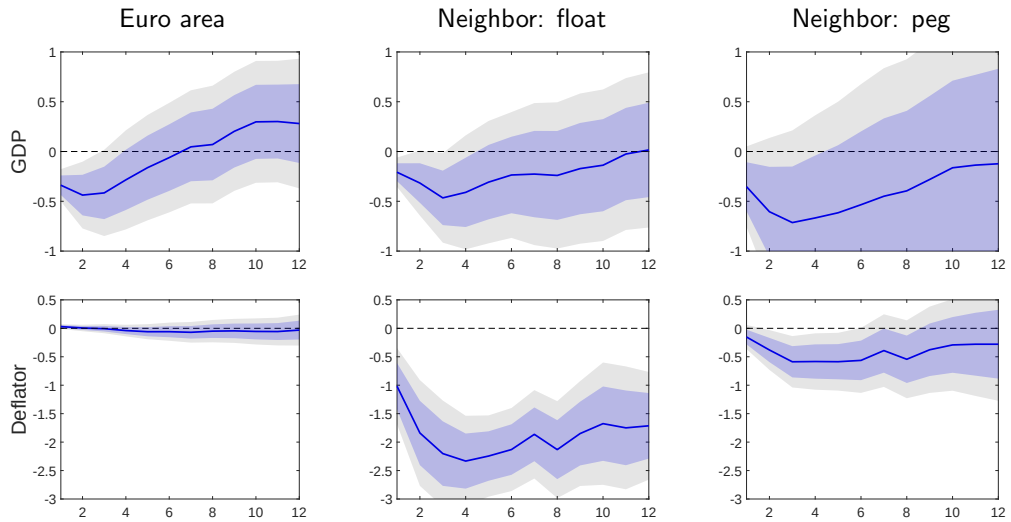


Red line: baseline w/o control

Supply shocks in the euro area

Redo Blanchard Quah (1989) on quarterly data for euro erea

Exchange rate insulation puzzle: responses to EA adverse supply shock



Exchange rate responses to EA adverse supply shock