Mr. Keynes meets the Classics: Fiscal policy and fixed exchange rates

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How does fiscal policy work in open economies?

Received wisdom

- Fixed exchange rates: fiscal policy important stabilization tool

Keynesian view

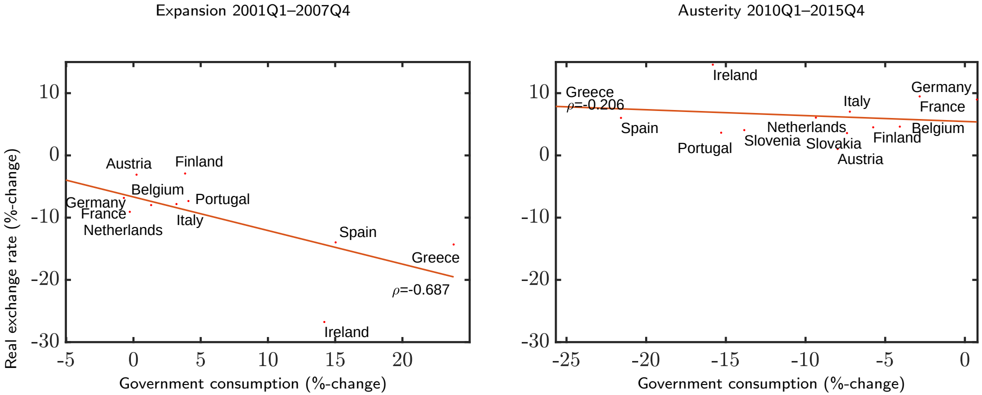
- Mundell-Fleming model: strong effect on output as prices and real exchange rate adjust sluggishly
- Similar in New Keynesian model (Corsetti et al., 2013; Farhi/Werning, 2016; Nakamura/Steinsson, 2014)

Classic view

- Strong impact on prices and real exchange rate (Sinn, 2014)

Both views have some merit in light of the facts

Government spending and real exchange rate in euro area countries



- Public sector expansion 2001–2007: real appreciation (left)
- Austerity 2010-2015: no deprecation (right)

Perhaps both views are correct . . .

Basic idea: adjustment to fiscal shocks differs depending on whether government spending is raised or cut

- Wages upwardly flexible, but downwardly rigid (e.g. Elsby/Solon, 2019; Grigsby et al., 2021)

"Worst of both worlds"-conjecture

- Expansionary shocks absorbed by rising wages: real exchange rate appreciates (Classic world)
- Contractionary shocks absorbed by falling output: real exchange rate adjusts sluggishly (Keynesian world)
- Dismal implication: any change in fiscal policy comes with undesirable consequences

This paper: two contributions

Put government spending in Schmitt-Grohé/Uribe (2016) model

- Flesh out fiscal transmission mechanism
- Confirm worst-of-both-worlds conjecture: analytical results as well as numerical simulations

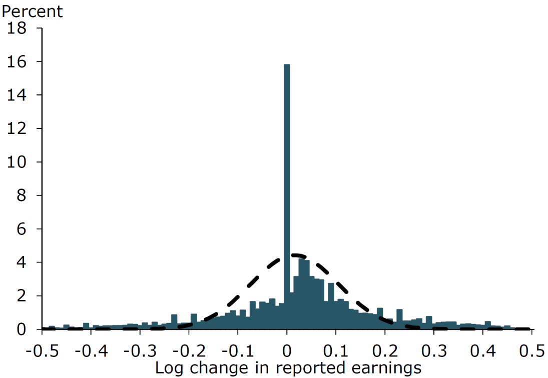
Estimate effect of government spending shocks in large panel of advanced and emerging economies

- Adjustment to spending shocks indeed asymmetric
- But only if
  i) exchange rate is fixed,
  ii) inflation is moderate,
  iii) close to full employment (no slack)

Downward nominal wage rigidity: suggestive evidence

Daly et al. (2012): hourly US wage changes in 2011

Figure 2
Distribution of observed nominal wage changes



Sources: Current Population Survey (CPS) and authors' calculations.

Evidence from behavioral research

Kahneman et al. (1986)

Question 4A. A company is making a small profit. It is located in a community experiencing a recession with substantial unemployment but no inflation. There are many workers anxious to work at the company. The company decides to decrease wages and salaries 7% this year.

($N = 125$) Acceptable 38% Unfair 62%

Question 4B. ...with substantial unemployment and inflation of 12%...The company decides to increase salaries only 5% this year.

($N = 129$) Acceptable 78% Unfair 22%

Selected literature: linear

Theory: government spending increase appreciates exchange rate, and symmetrically for spending cuts

- Mundell-Fleming, IRBC theory, New Keynesian model
- Depreciation: Betts/Devereux (2000), Ravn et al. (2012), Corsetti et al. (2012a)

Evidence: government spending in time series models depreciates exchange rate

- Kim/Roubini (2008), Enders et al. (2011), Monacelli/Perotti (2010)
- Appreciation (in developing economies): Ilzetzki et al. (2013), Miyamoto et al. (2019)

Selected literature: non-linear

Fiscal policy when nominal wages are downwardly rigid

- Barnichon et al. (2021), Burgert et al. (2019), Jo/Zubairy (2021), and Shen/Yang (2018): closed-economy analysis
- Bianchi et al. (2018): sovereign risk and exchange-rate peg (austerity vs stimulus)
- Liu (2018): sudden stop

More generally, non-linear effects of fiscal policy

- Theory: Christiano et al. (2011) consider ZLB, Corsetti et al. (2013) exchange rate regime
- Empirics: Corsetti et al. (2012b), Auerbach/Gorodnichenko (2012), Born et al. (2020) consider a financial crisis, public debt, exchange rate regime, boom/recession

The model: Schmitt-Grohé/Uribe (2016) + G

Small open economy model

- Traded goods: endowment
- Non-traded goods produced by competitive firms
- Households supply labor inelastically, nominal wages downwardly rigid
- International borrowing and lending via non-contingent bond at exogenous stochastic interest rate

New: government spending

- Consumption of non-traded goods
- Financed via lump-sum taxes
- Determined exogenously

Households

Representative household maximizes life-time utility

$$\max_{\{d_{t+1}, c_t^T, c_t^N\}_{t=0}^{\infty}} \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left[\frac{c_t^{1-\sigma}}{1-\sigma} + \psi_g \frac{g_t^{1-\varsigma}}{1-\varsigma} \right]$$

with

$$c_t = \left[\omega (c_t^T)^{1-(1/\xi)} + (1-\omega)(c_t^N)^{1-(1/\xi)} \right]^{\frac{\xi}{\xi-1}}$$

subject to a nominal budget constraint

$$\mathcal{E}_t d_t + P_t^T c_t^T + P_t^N c_t^N = \mathcal{E}_t \frac{d_{t+1}}{1+r_t} + P_t^T y_t^T + \phi_t + W_t h_t - \tau_t$$

and a debt limit $\bar{d}$ to rule out Ponzi schemes

Households cont'd

Endowment of traded goods y_t^T

- Law of one price, foreign currency price set to unity: $P_t^T = \mathcal{E}_t$

Labor endowment $\bar{h}$ supplied inelastically

- Wage rigidity captured by $\gamma > 0$: $W_t \geq \gamma W_{t-1}$
- Actual hours must satisfy: $h_t \leq \bar{h}$
- Complementary slackness: $(\bar{h} - h_t)(W_t - \gamma W_{t-1}) = 0$

Firms

Produce non-traded output using labor as only input: $y_t^N = h_t^\alpha$

Maximizing profits: $\phi_t \equiv P_t^N y_t^N - W_t h_t$ implies labor demand

$$p_t^N = \frac{W_t/\mathcal{E}_t}{\alpha h_t^{\alpha-1}}$$

where $p_t^N \equiv P_t^N / P_t^T$ is the relative price of non-traded goods

Define

- Real wage $w_t \equiv W_t/\mathcal{E}_t$
- Market clearing full employment wage w_t^f

Fiscal and monetary policy

Fiscal policy

- Government spending g_t exogenous
- Balanced budget: $\tau_t = P_t^N g_t$

Monetary policy determines nominal rate of depreciation $\epsilon_t \equiv \frac{\mathcal{E}_t}{\mathcal{E}_{t-1}}$

- Full employment if $\epsilon_t \geq \frac{\gamma w_{t-1}}{w_t^f}$
- Continuum of exchange rate arrangements

$$\epsilon_t = \max\left\{\gamma \frac{w_{t-1}}{w_t^f}, 1\right\}^{\phi_\epsilon}$$

with (peg) $0 \leq \phi_\epsilon \leq 1$ (pure float)

Inspecting the mechanism under perfect foresight

Simplifying assumptions and implications

- Permanent changes of government spending
- Complete downward rigidity: $\gamma = 1$
- Preferences: $U(c_t) = \ln(c_t^T c_t^N)$, intertemporal & intratemporal choice decoupled; demand for nontraded goods:

$$p_t^N = \frac{c_t^T}{c_t^N}$$

- Production linear ($\alpha = 1$), supply of nontraded goods:

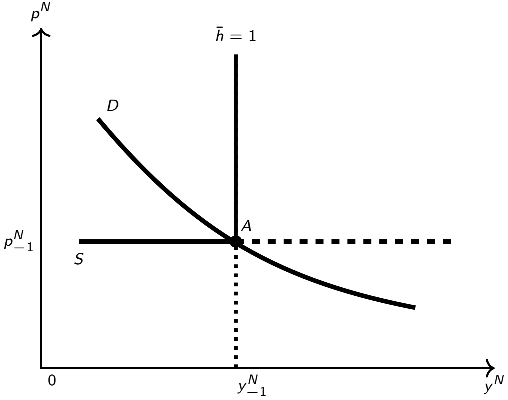
$$p_t^N = w_t$$

Formal proofs see paper: focus on intuition

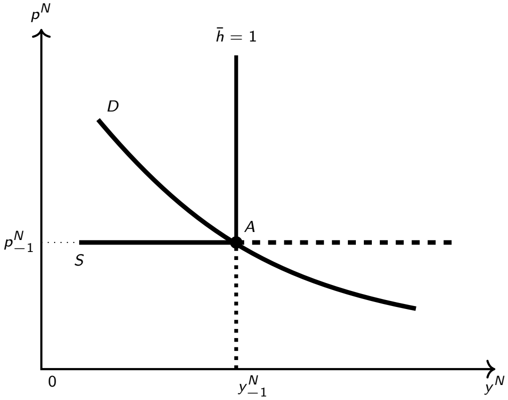
Market for non-traded goods, assuming full employment

Real exchange rate: $\left(p_t^N\right)^{-1}$

Negative shock



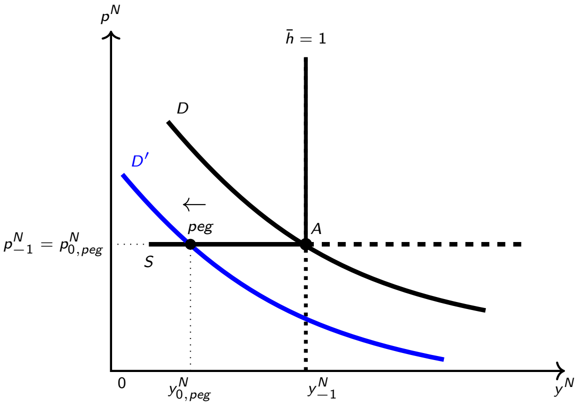
Positive shock



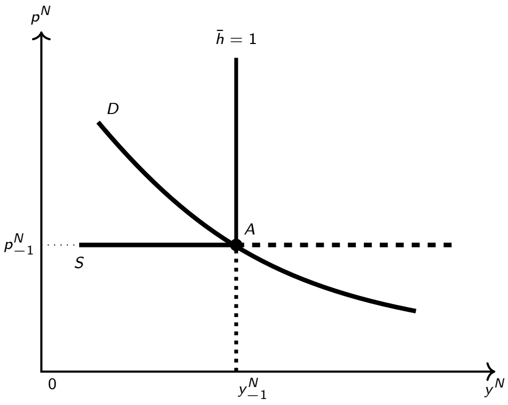
Market for non-traded goods, assuming full employment

Real exchange rate: $\left(p_t^N\right)^{-1}$

Negative shock



Positive shock



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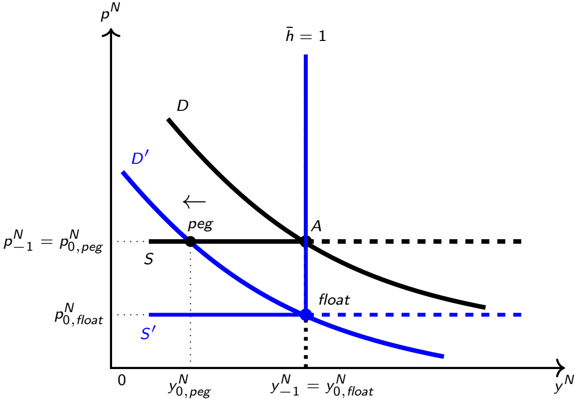
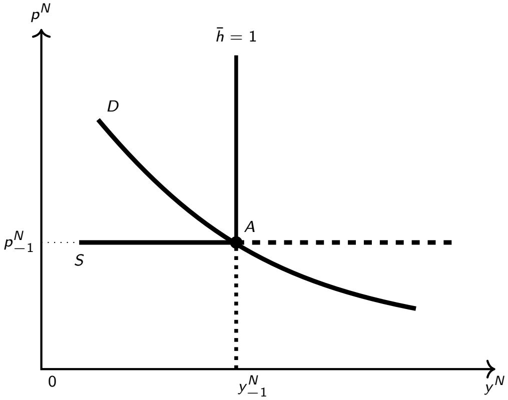


Positive shock



Market for non-traded goods, assuming full employment

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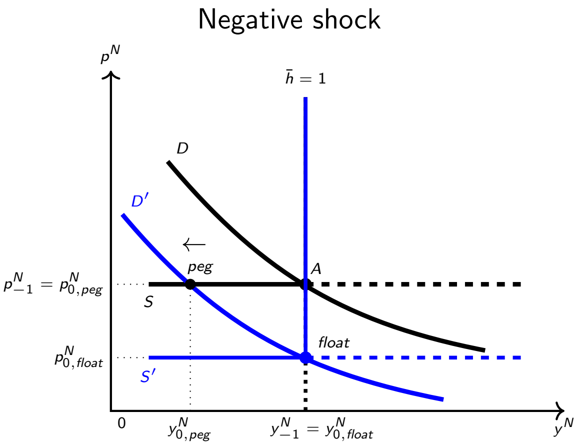
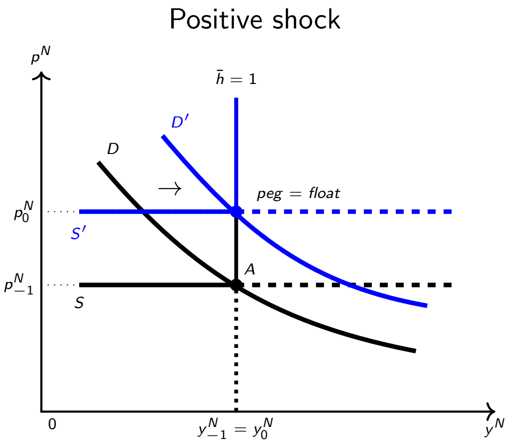
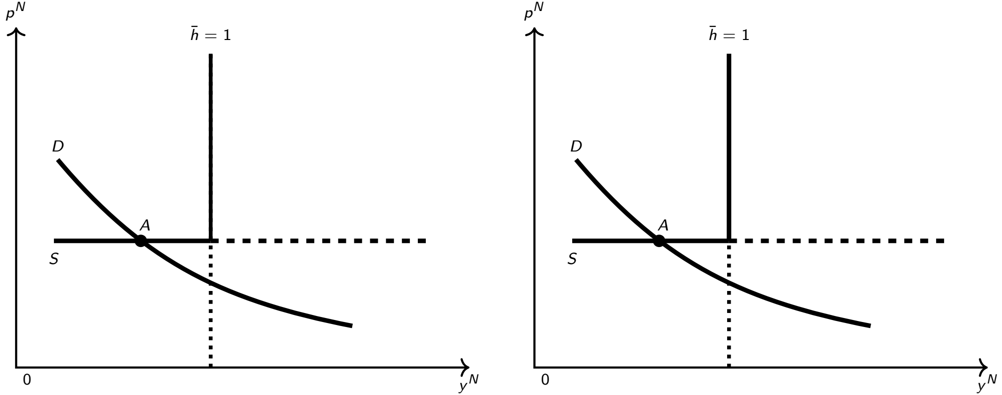




Market for non-traded goods in times of slack

Real exchange rate: $\left(p_t^N\right)^{-1}$

Negative shock | Positive shock



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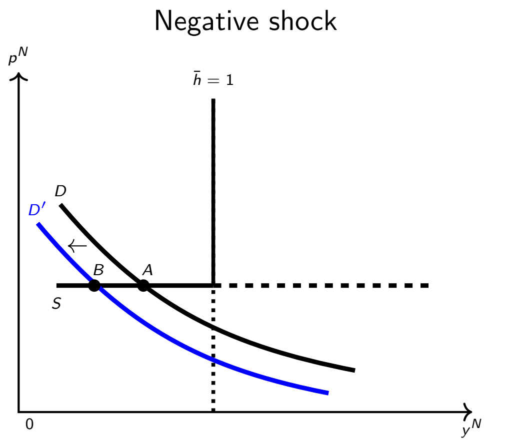
Real exchange rate: $\left(p_t^N\right)^{-1}$



Market for non-traded goods in times of slack

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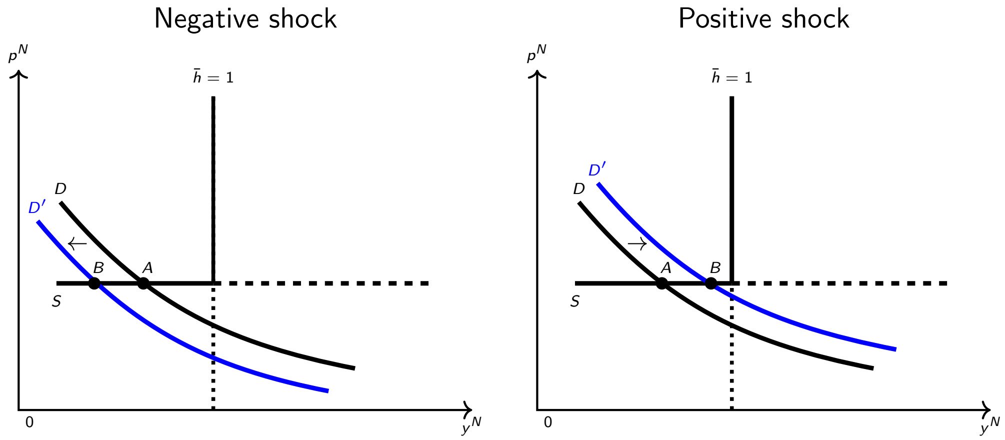

Model simulation

Solve model globally

- Assess quantitative relevance of results/adjustment dynamics
- Explore role of intermediate exchange-rate regime
- Calibration at quarterly frequency to Greece parameters

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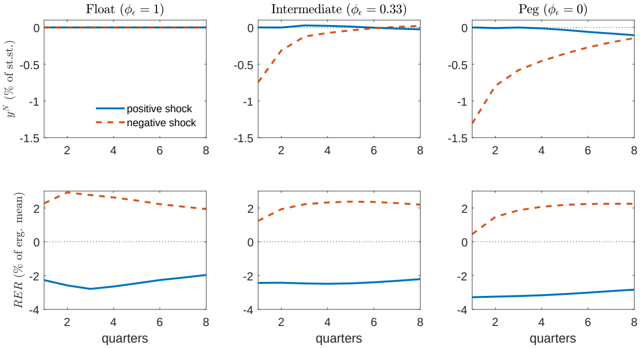
Compute generalized impulse responses to spending shock

1. positive innovation of 2.2 pp on impact
2. negative innovation of 2.2 pp on impact

Peg: asymmetric response unless there is slack



GIRFs start from a situation of moderate debt and full employment and integrate out effects of future shocks using 1 mil. replications Intermediate case

Evidence

Estimate effect of fiscal shocks on output and exchange rate

- Unbalanced quarterly panel data observations from early 1990s until 2018Q4 for 38 emerging and advanced economies

Two-stage approach

1. Two alternative measures of government spending surprises/forecast errors
2. Run local projections on forecast error

▸ Monte Carlo Evidence

First stage: fiscal surprises

Two measures (building on earlier work in Born et al., 2020)

1. Residual from panel VAR model (Blanchard/Perotti, 2002)

$$X_{i,t} = \alpha_i + \eta_t + A(L)X_{i,t-1} + \varepsilon_{i,t},$$

   where

   - α and η are fixed effects
   - $\varepsilon_{i,t}$ are reduced form innovations, with $\varepsilon^g_{i,t}$ being government spending innovation

2. Professional forecasts (Ramey, 2011)

$$\varepsilon^g_{i,t} = \Delta g_{i,t} - \mathbb{E}_{t-1}\Delta g_{i,t}$$

Second stage: local projections (Jordà, 2005)

Identification assumption (for both Ramey and Blanchard-Perotti)

- Surprises $\varepsilon^{g}_{i,t}$: shocks because government consumption predetermined

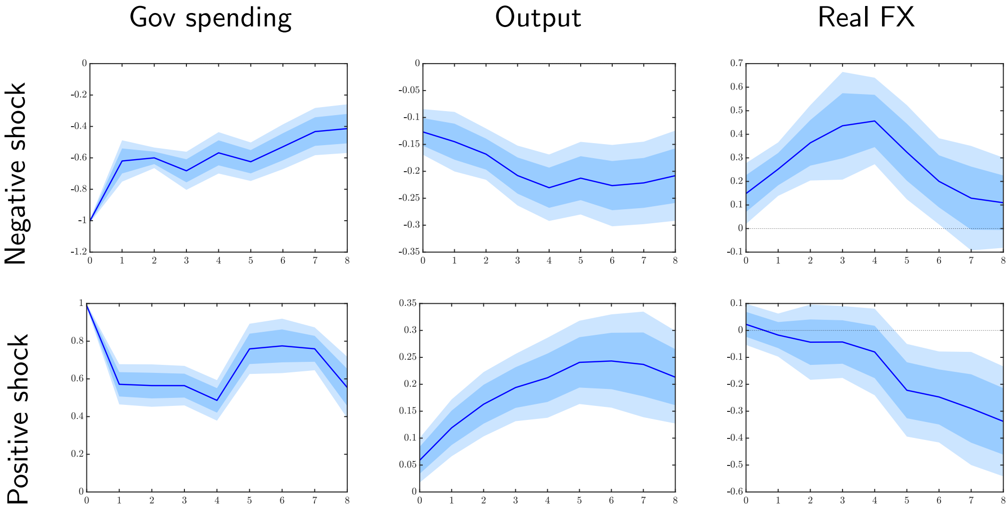
Estimate potentially asymmetric impulse response of dependent variable to shock

$$y_{i,t+h} = \alpha_{i,h} + \eta_{t,h} + \psi_h^{+}\varepsilon^{g+}_{i,t} + \psi_h^{-}\varepsilon^{g-}_{i,t} + \gamma Z_{i,t} + u_{i,t+h} ,$$

- $\varepsilon^{g+}_{i,t}$ and $\varepsilon^{g-}_{i,t}$ are positive/negative shocks from first stage
- $Z_{i,t}$ is vector of controls

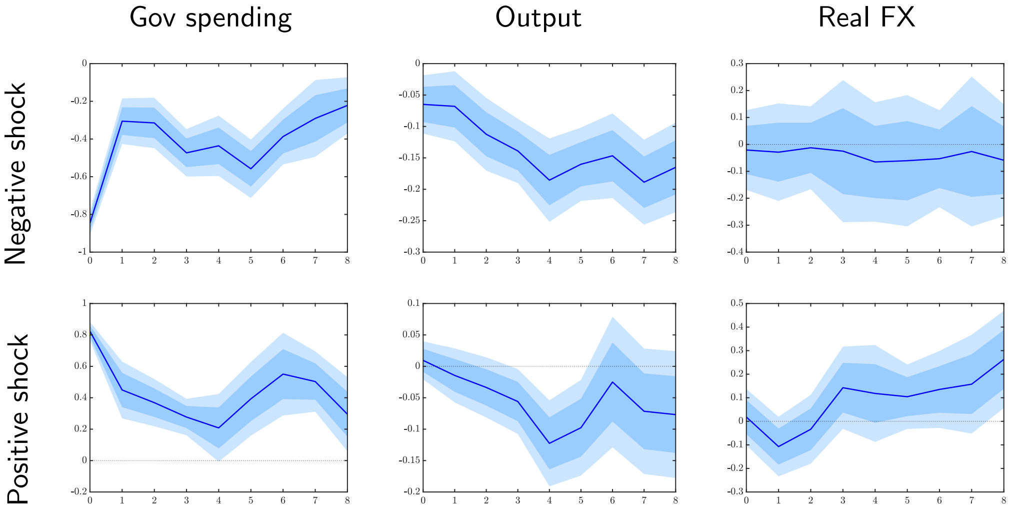
Full sample: adjustment to fiscal shocks fairly symmetric

Shock measure based on VAR forecasts (baseline)



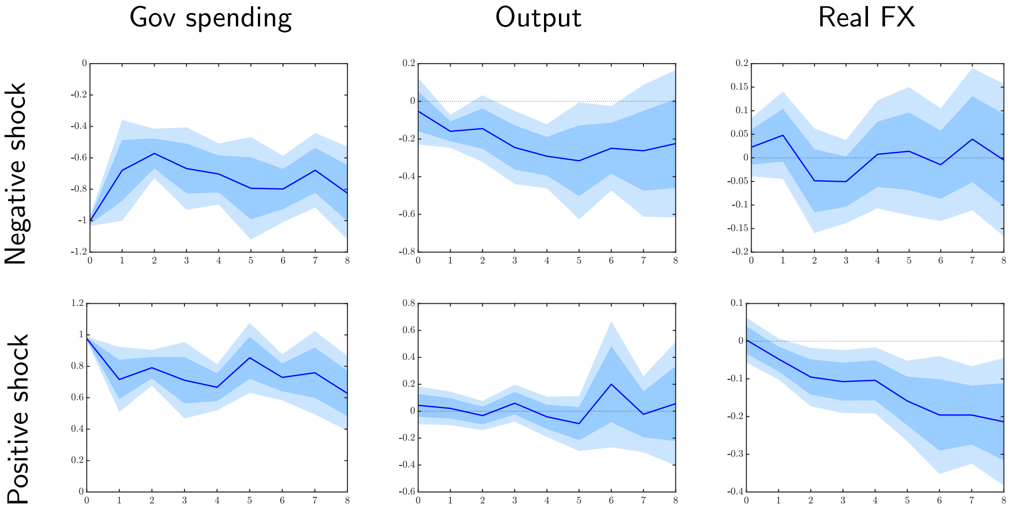
Full sample: adjustment to fiscal shocks fairly symmetric

Shock measure based on professional forecasts



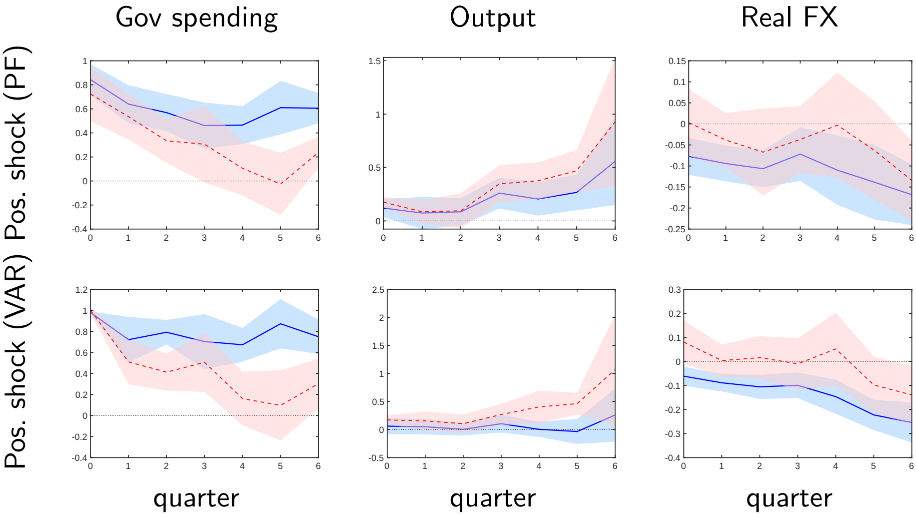
Euro area: adjustment to fiscal shocks asymmetric

Shock measure based on VAR forecasts



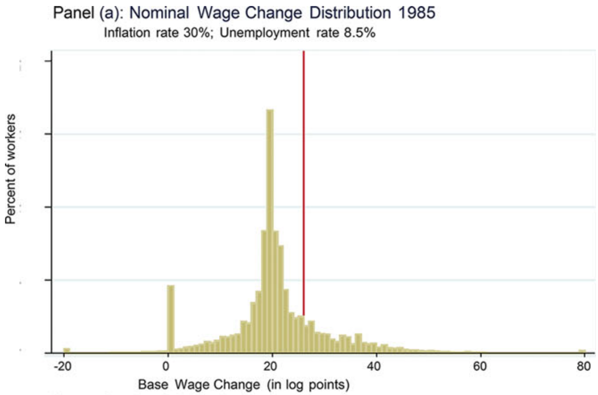
Slack vs full Euro sample: responses indeed symmetric

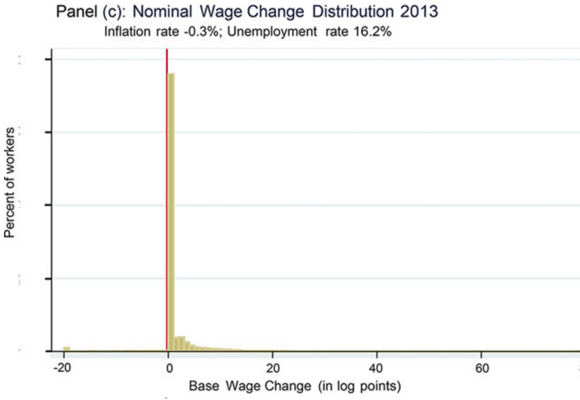
Unemployment above country median as in Barro/Redlick (2011)



DNWR matters less in periods of high inflation

Evidence from Portugal (Addison et al., 2017)





Estimate model for high-inflation euro area episodes

Threshold: inflation above 3 percent

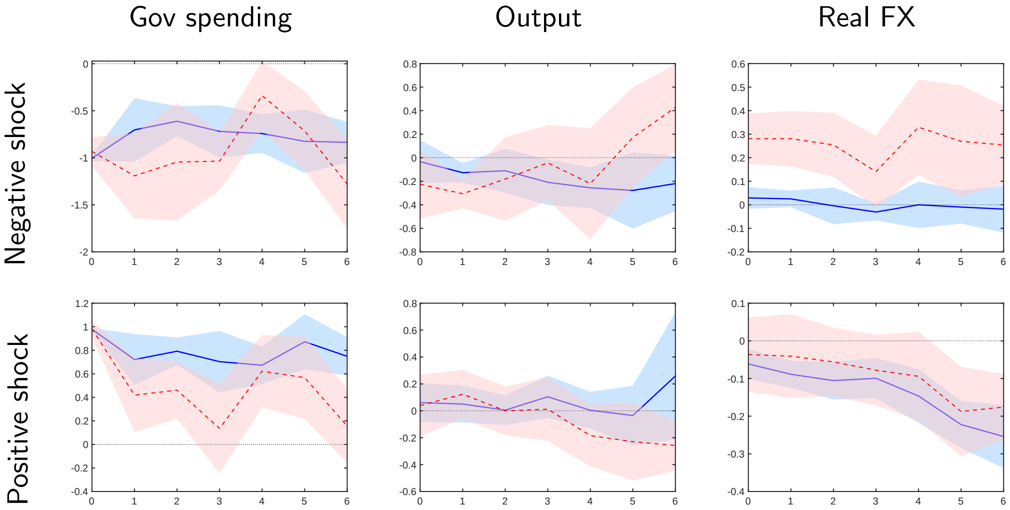
- Full sample: # countries = 15, # of observations = 963
- High inflation: # countries = 14, # of observations = 236

Inflation neutralizes DNWR because real wages become downward flexible

- Response to fiscal shocks should be symmetric

High inflation vs full sample: responses indeed symmetric

Shock measure based on VAR forecasts



Conclusion

Adjustment to fiscal shocks asymmetric under fixed exchange rates

- Spending cut: no exchange rate response, output declines
- Spending increase: appreciation, no output effect unless economy in recession

Twofold contribution

- New evidence for the relevance of DNWR
- Reconcile classic and Keynesian view on fiscal policy

Policy implication

- Fiscal policy needs to be handled with care
- Countercyclical: cut in booms, raise only in deep recessions

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Calibration

Parameter	Value	Source/Target
Wage rigidity	$\gamma = 0.9922$	SGU (2016)
Elasticity of substitution	$\xi = 0.44$	SGU (2016)
Risk aversion, private consumption	σ=5	Standard value
Labor share in nontradable sector	$\alpha = 0.75$	Uribe (1997)
Debt limit	$\bar{d} = 16.5418$	99 % of natural debt limit
Inelastic supply of hours worked	$\bar{h} = 1$	Normalization
Exogenous interest rate	$r = 0.011$	Average interest rate
Steady state endowment tradables	$y^T = 1$	Normalization
Steady state government consumption	$g^N = 0.2548$	Greek government spending share
Discount factor	$\beta = 0.9375$	SGU (2016)
Weight on tradables in CES	$\omega = 0.37$	tradable share of 0.26

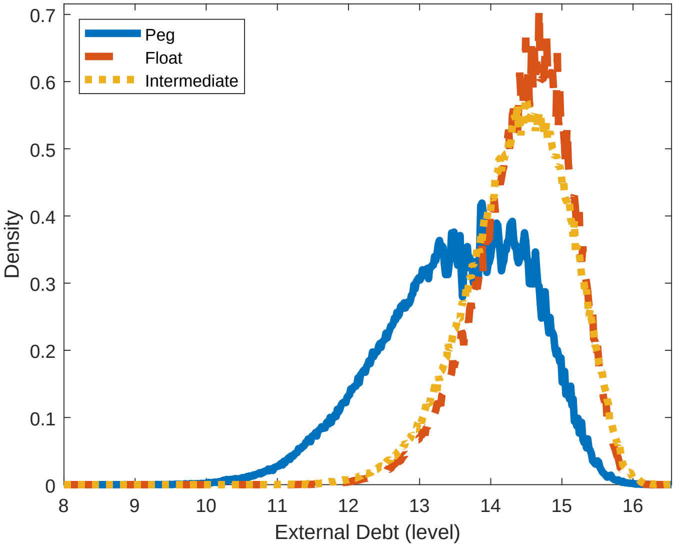
$$\begin{bmatrix} \ln y_t^T \\ \ln \frac{1+r_t}{1+r} \\ \ln \frac{g_t^N}{g^N} \end{bmatrix} = \begin{bmatrix} 0.88 & -0.42 & 0 \\ -0.05 & 0.59 & 0 \\ 0 & 0 & 0.924 \end{bmatrix} \begin{bmatrix} \ln y_{t-1}^T \\ \ln \frac{1+r_{t-1}}{1+r} \\ \ln \frac{g_{t-1}^N}{g^N} \end{bmatrix} + \varepsilon_t,$$

$$\varepsilon_t \overset{iid}{\sim} N\left(0, \begin{bmatrix} 5.36e-4 & -1.0e-5 & 0 \\ -1.0e-5 & 6.0e-5 & 0 \\ 0 & 0 & 0.0228^2 \end{bmatrix}\right)$$

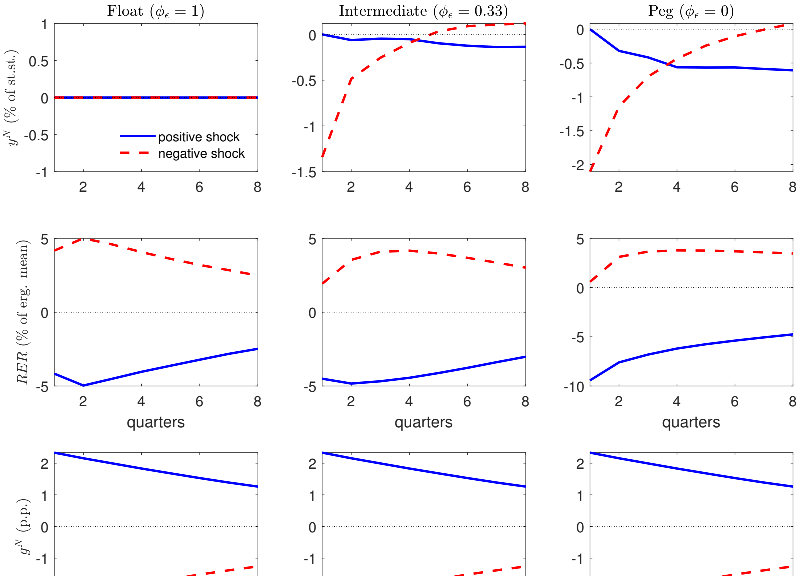
Model Moments

	$Mittelwert(peg)$	$Std(peg)$	$Mittelwert(int)$	$Std(int)$	$Mittelwert(float)$	$Std(float)$
$\bar{h} - h_t$	0.141	0.115	0.032	0.040	0.000	0.000
c_t	0.697	0.142	0.753	0.100	0.767	0.092
c_t^N	0.635	0.139	0.721	0.079	0.745	0.070
y_t^N	0.890	0.103	0.976	0.031	1.000	0.000
$y_t^T - c_t^T$	0.153	0.099	0.161	0.117	0.162	0.119
w_t	2.606	0.249	1.946	0.448	1.822	0.486
y_t^T	1.002	0.067	1.002	0.067	1.002	0.067
r_t^{ann}	0.045	0.055	0.044	0.055	0.045	0.055
d_t	13.509	0.076	14.386	0.050	14.463	0.046
$d_t/4(y_t^T + p_t^N c_t^N)$	0.902	0.263	1.165	0.485	1.217	0.524
G/Y	0.213	0.047	0.180	0.051	0.174	0.052

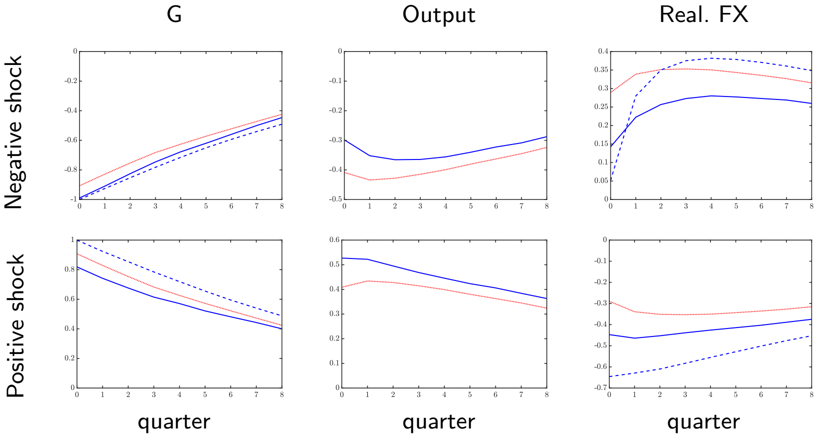
Simulated debt distribution



Asymmetric response to shocks except for free float



Monte Carlo Evidence: Quantitative model with full employment



Blue line: empirical IRF with asymmetric effects. Blue dashed line: theoretical model IRF. red line: symmetric empirical IRF (linear model)

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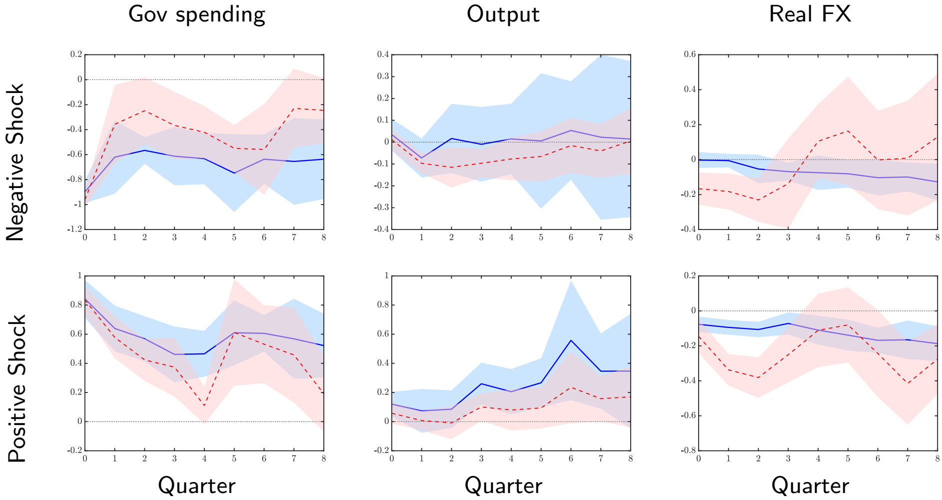
All Pegs vs. EMU-Sample

Shock measure based on professional forecasts



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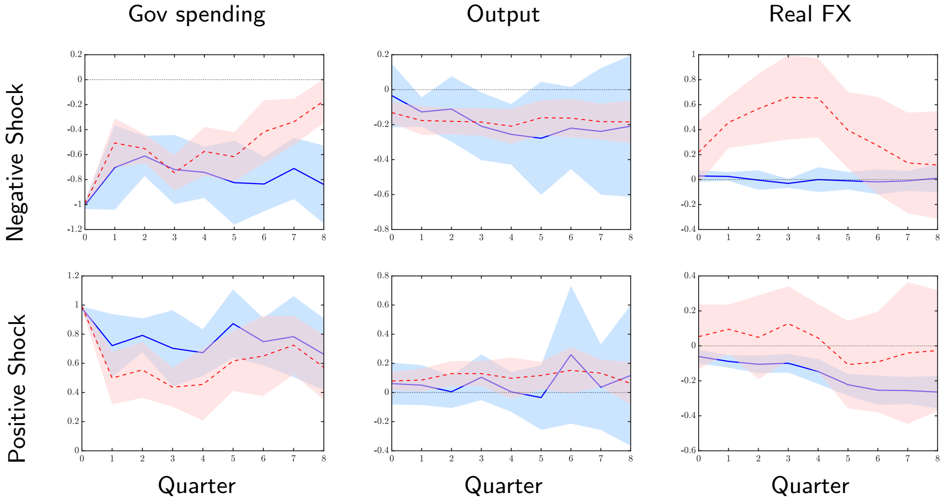
All floaters vs. EMU-Sample

Shock measure based on VAR forecasts



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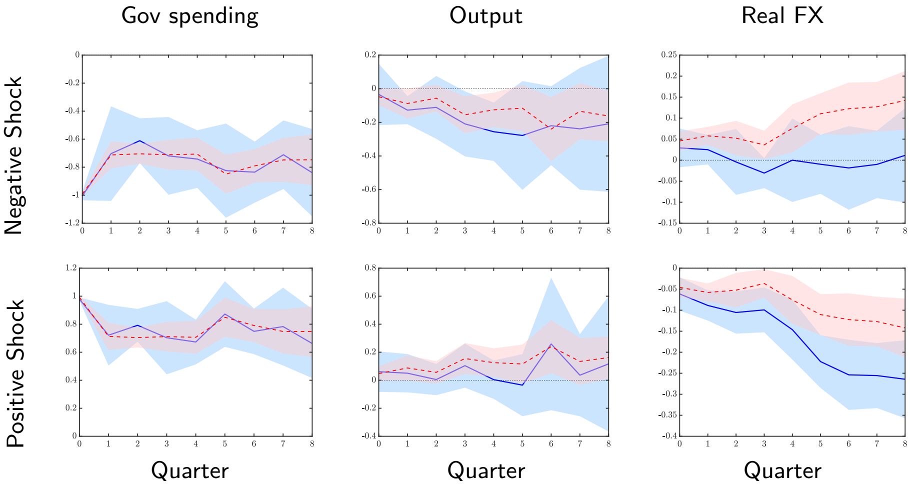
Symmetric Model vs. Baseline

Shock measure based on VAR forecasts



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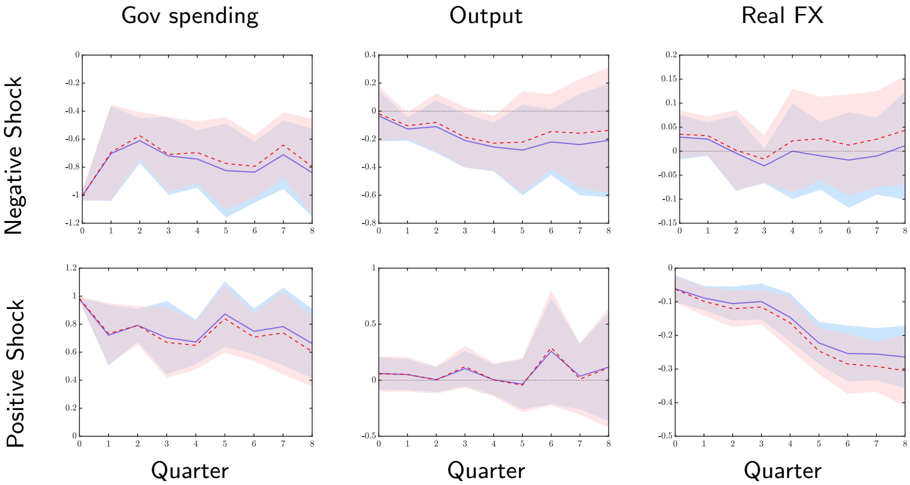
EMU without GER, FR, I vs. Baseline

Shock measure based on VAR forecasts



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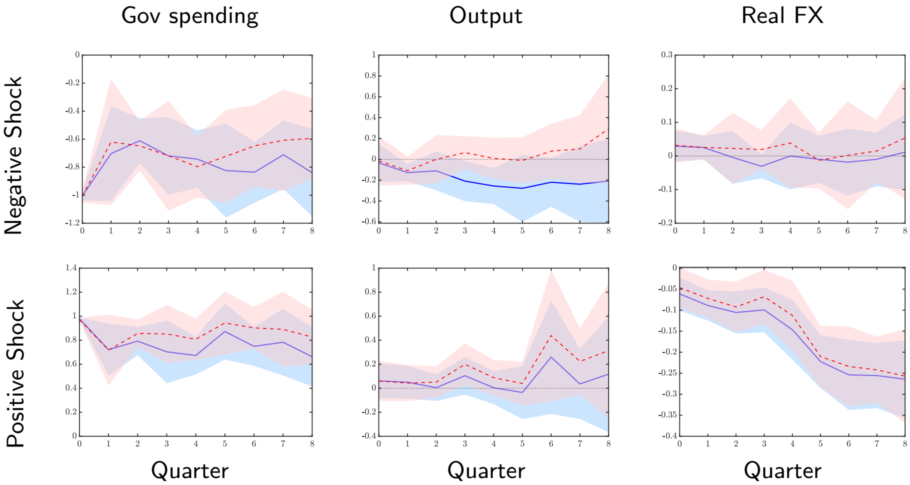
EMU without Greece vs. Baseline

Shock measure based on VAR forecasts



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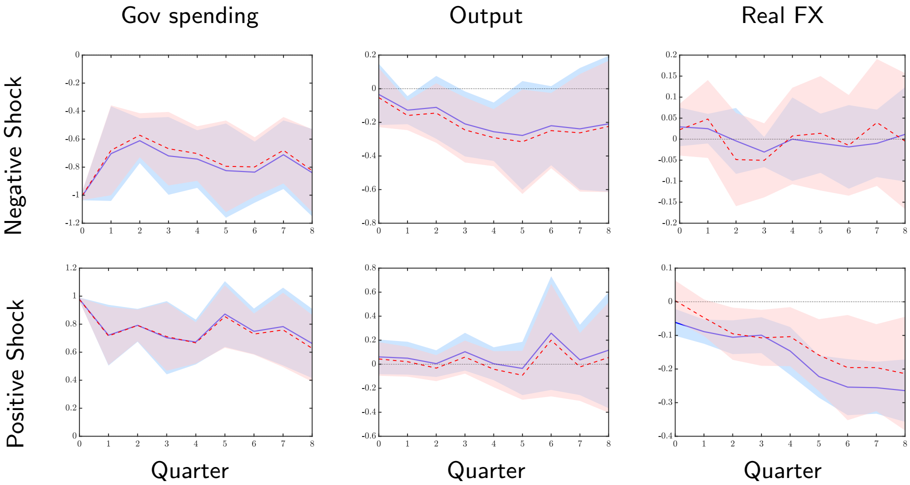
Broad REER-measure vs. Baseline

Shock measure based on VAR forecasts



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