

The Puzzling Change in the Transmission of US Policy Shocks

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Evidence on the International Effects of US Macroeconomic Policy

- ▶ Perceived wisdom on the international effects of US monetary policy
 - ▶ Devalues the dollar
 - ▶ Positive spillovers
- ▶ Clear theoretical predictions of standard New Keynesian models
- ▶ Existing evidence (e.g. Eichenbaum and Evans, 1995) over 15 years old.



Our contribution

- ▶ Comprehensive analysis of **spillovers** from US **fiscal** and **monetary** policy to the rest of the world.
 - ▶ 8 largest high-income economies (ex-US)
 - ▶ 9 of the 14 largest developing countries (based on data availability in high frequency)
- ▶ Show a **qualitative shift** in the nature of spillovers.
- ▶ Recent behaviour (post ~1990) **hard to reconcile with** standard **theory**



Existing Literature

▶ Large Theoretical Literature

- ▶ Obstfeld and Rogoff (1995, 1996)
- ▶ Corsetti and Pesenti (2001, 2005, 2009)
- ▶ Many others

▶ Limited Empirical Evidence

▶ Monetary Policy

- ▶ Eichenbaum and Evans (1995) (1974-1990)
- ▶ Cushman and Zha (1997), Kim and Roubini (2000) (1974-1992)
- ▶ Canova (2005) (1990-2004)
- ▶ Shambaugh (2004), di Giovanni and Shambaugh (2008)
- ▶ Fratzscher, Lo Duca and Straub (2012) on QE (recent period, differering results depnding on period/type of QE.)

▶ Fiscal Policy

- ▶ Beetsma, Giuliodori and Klaasen (2006)
 - ▶ Corsetti and Mueller (2011) (1980-2007)
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Methodology

- ▶ Create time series of monetary and fiscal shocks in the US, using (a variety of) standard identification methods
 - ▶ Monetary
 - ▶ Romer and Romer (2004)—extended to 2005
 - ▶ Christiano, Eichenbaum and Evans (1999, 2005)
 - ▶ Government spending
 - ▶ Ramey (2011) errors of Survey of Professional Forecasters
 - ▶ Ramey (2011) military spending “news” shock
 - ▶ Taxes
 - ▶ Romer and Romer (2010)
- ▶ Identification ***at least as good*** as for the US.



Methodology (2)

- ▶ Panel GLS/VAR-GLS with country FE
- ▶ Regress $T=24$ months (or $T=8$ quarters) of shock variable and of endogenous variable on panel of non-US variables:
 - ▶ Industrial production
 - ▶ Real exchange rate
 - ▶ Nominal exchange rate
 - ▶ Policy interest rate
- ▶ Plot impulse responses of endogenous variable to a one month “shock” to policy variable.



Findings

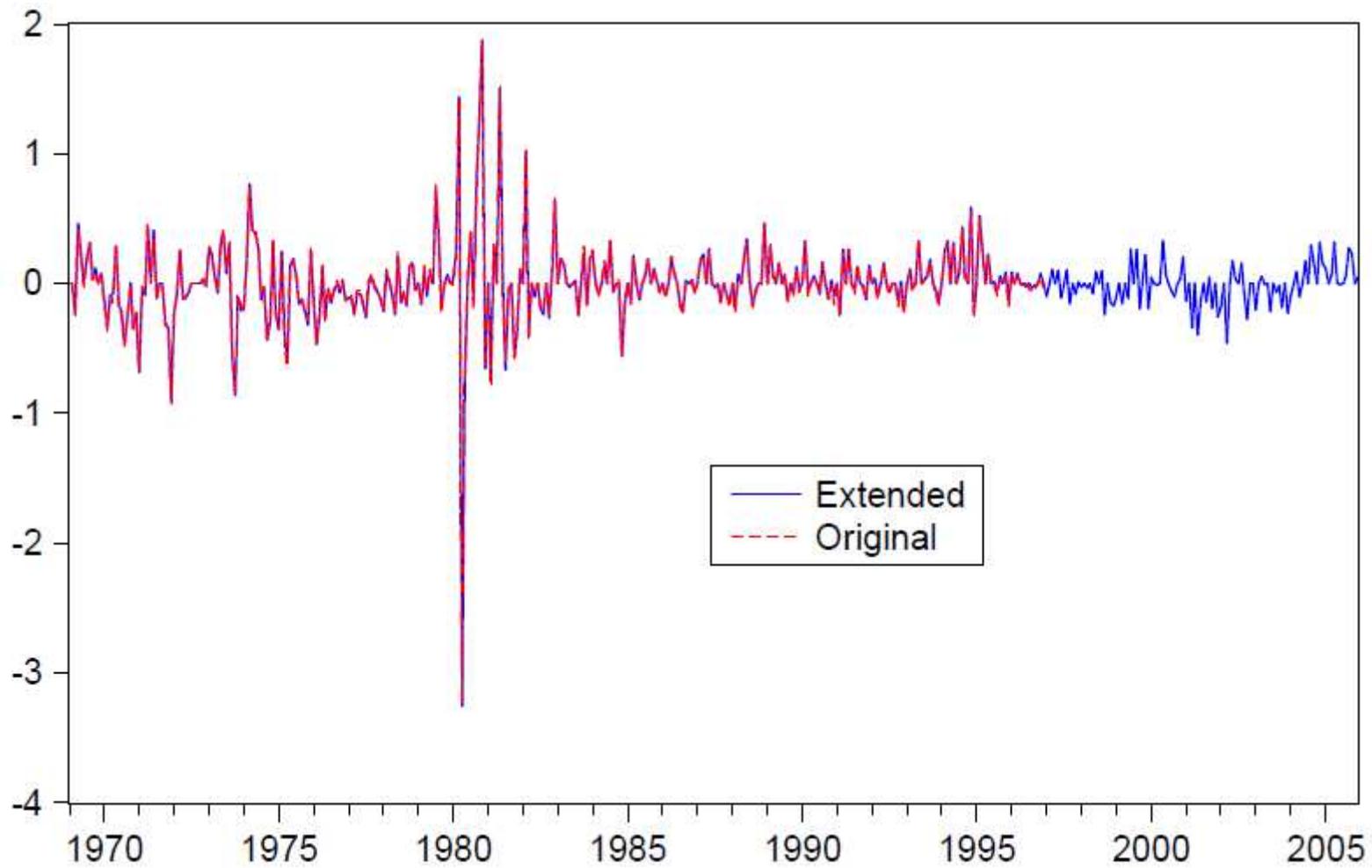
- ▶ Contractionary shock to US monetary policy (increase in the FFR)
 - ▶ **Decreased** output in ROW pre-1990 but **expanded** output after.
 - ▶ **Appreciated** real and nominal USD pre-1990 **depreciated** them after.
- ▶ Expansionary fiscal shocks in the US (increases in public spending or tax cuts)
 - ▶ **Appreciated** real and nominal USD in ROW pre-1990, but **depreciated** them after.
- ▶ Expansionary public spending shocks in the US
 - ▶ **Contracted** output in ROW pre-1990 but **expanded** output after.
- ▶ Cuts in US taxes
 - ▶ **Contracted** output in ROW pre- and post-1990.



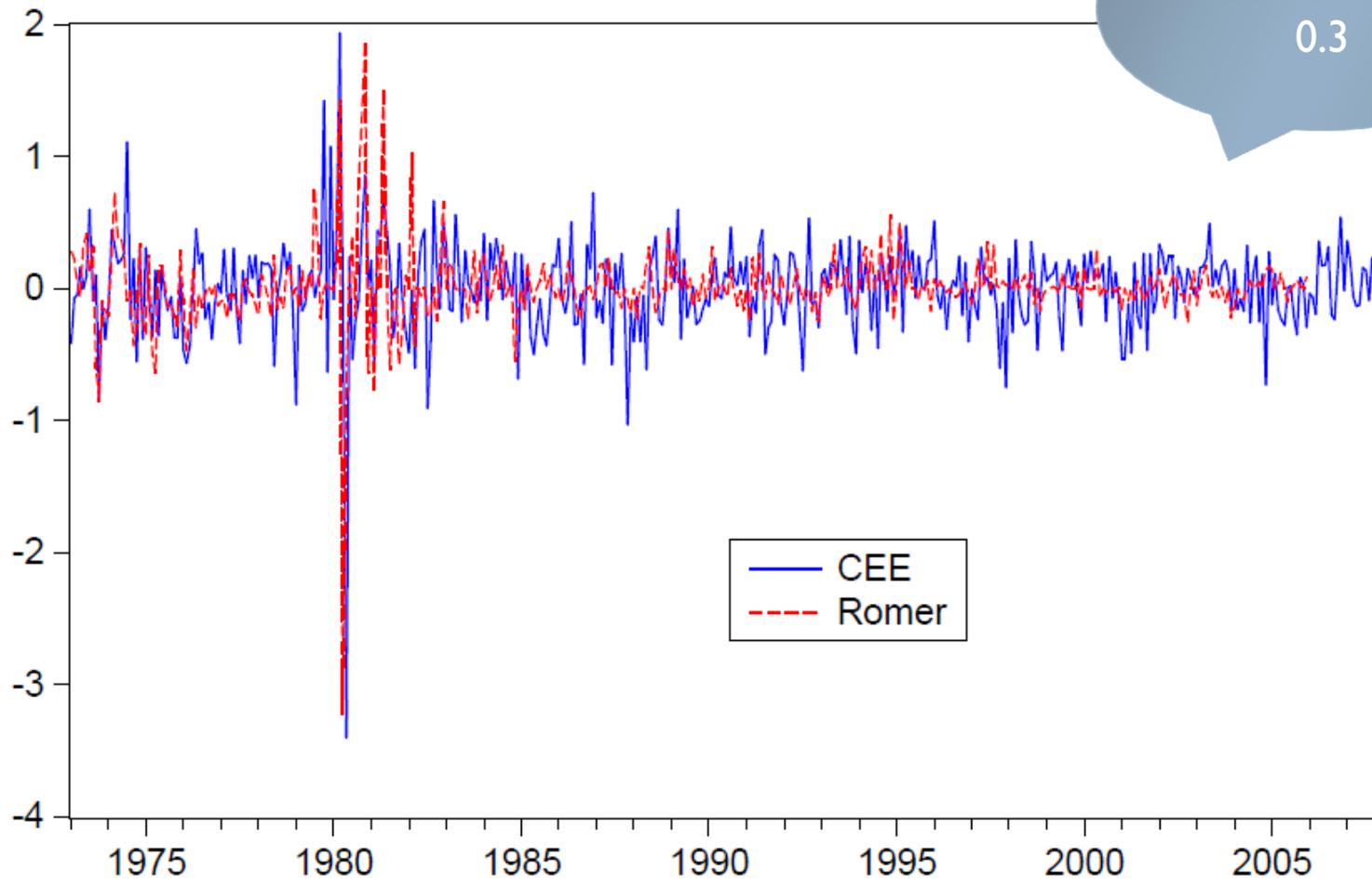
Monetary Policy



Extending Romer and Romer (2004)



Comparing Monetary Shocks



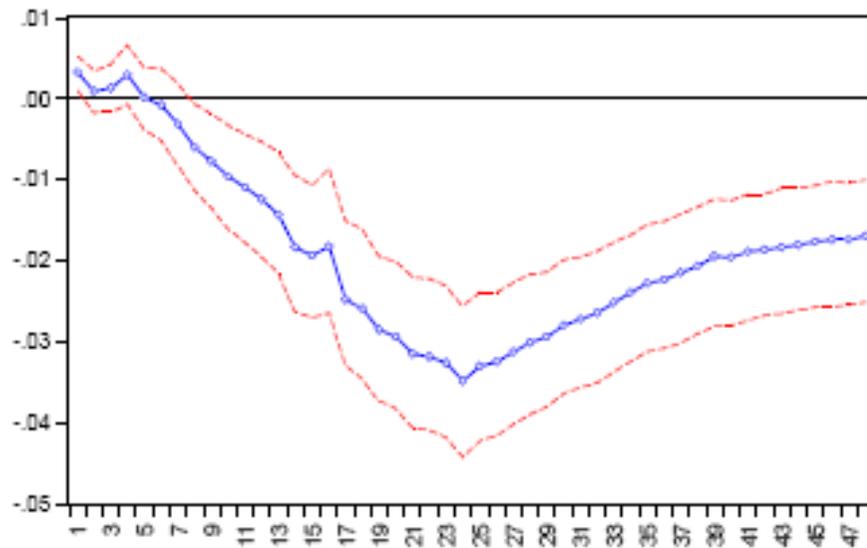
Correlation:
0.3



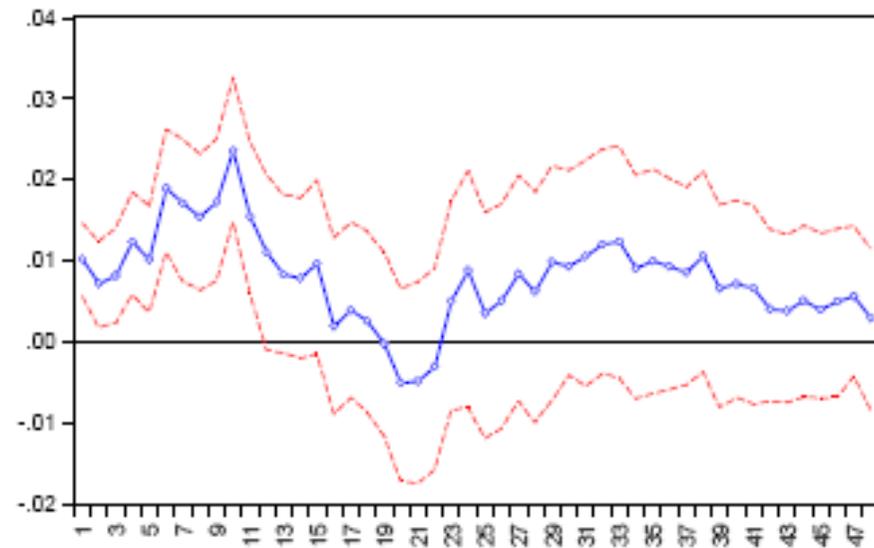
Industrial Production

Response to Romer and Romer shock

Pre-1990

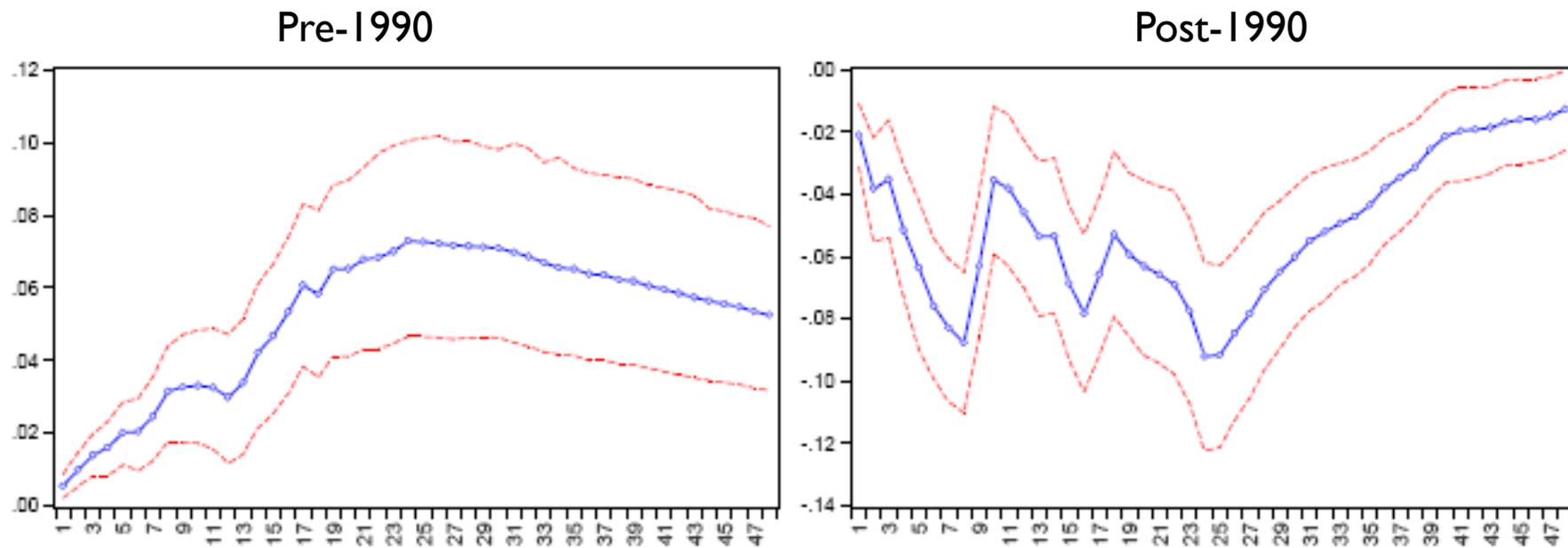


Post-1990



Nominal (bilateral) Exchange Rate

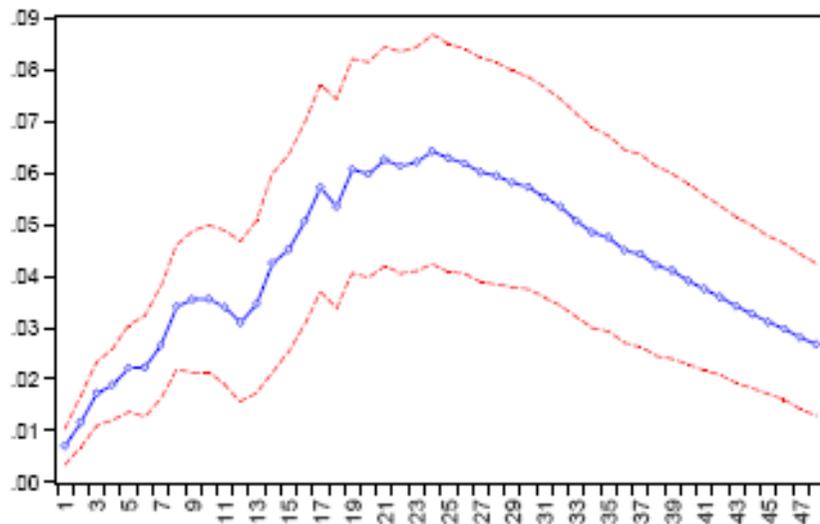
Response to Romer and Romer shock
(Up reflects a USD appreciation)



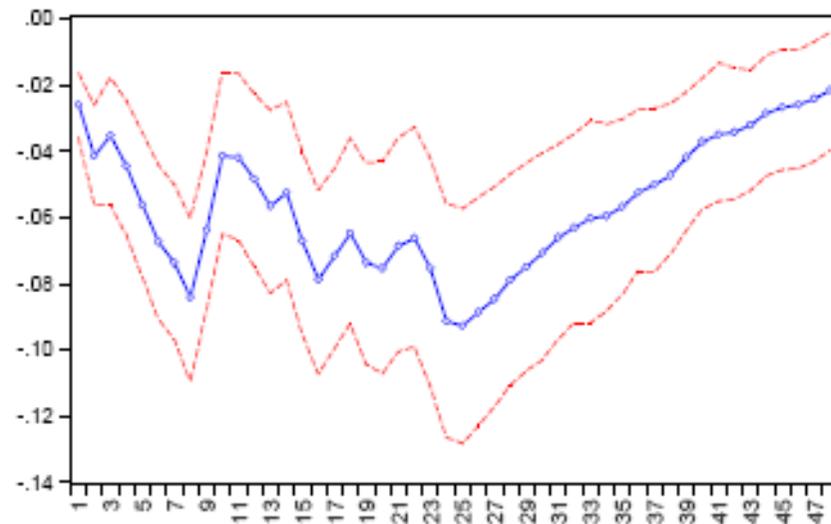
Real (bilateral) Exchange Rate

Response to Romer and Romer shock
(Up reflects a USD appreciation)

Pre-1990



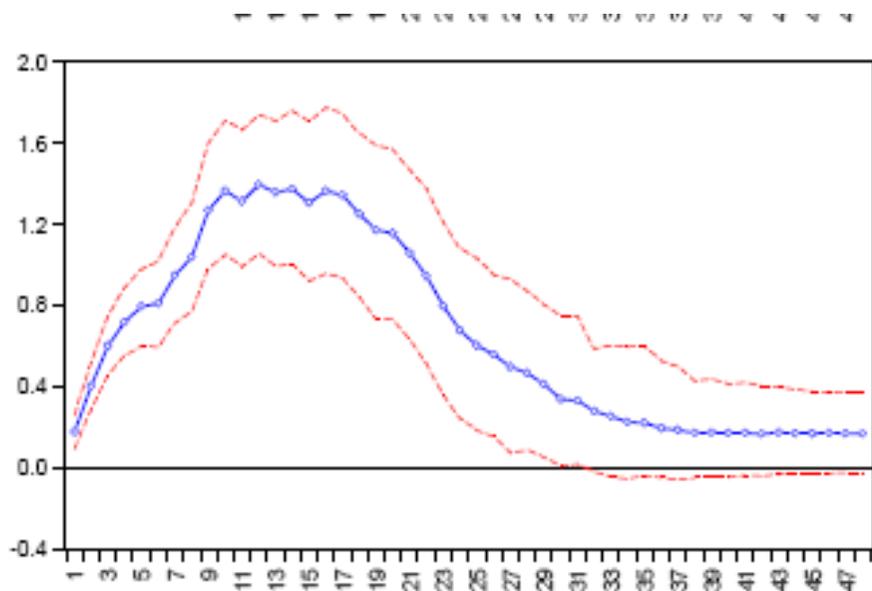
Post-1990



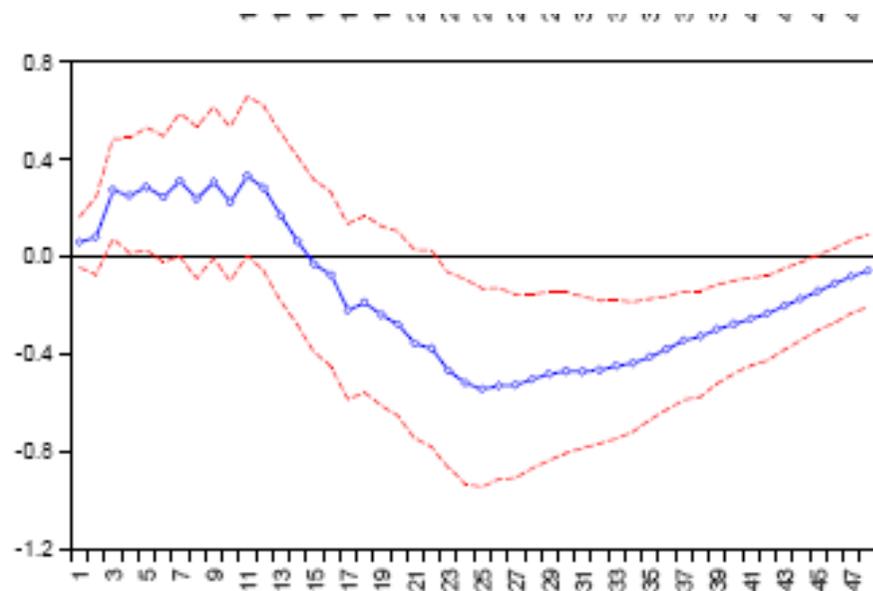
Policy Interest Rate

Response to Romer and Romer shock

Pre-1990



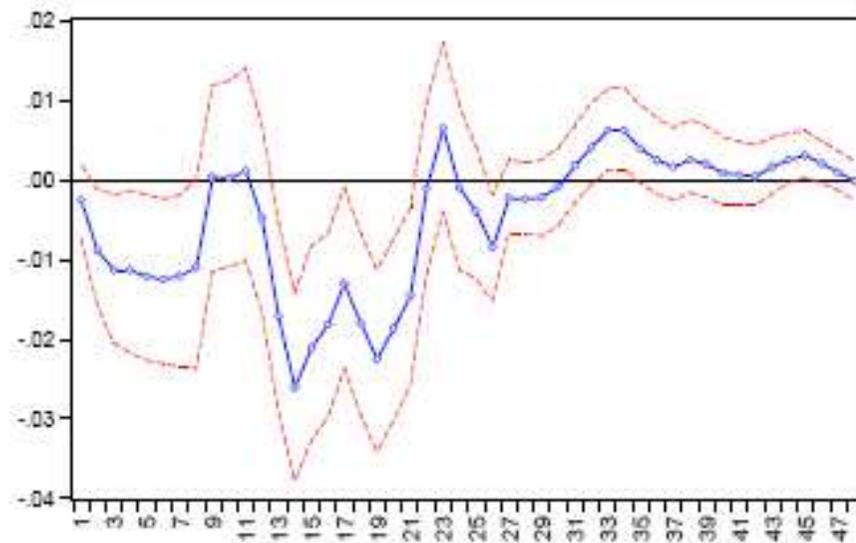
Post-1990



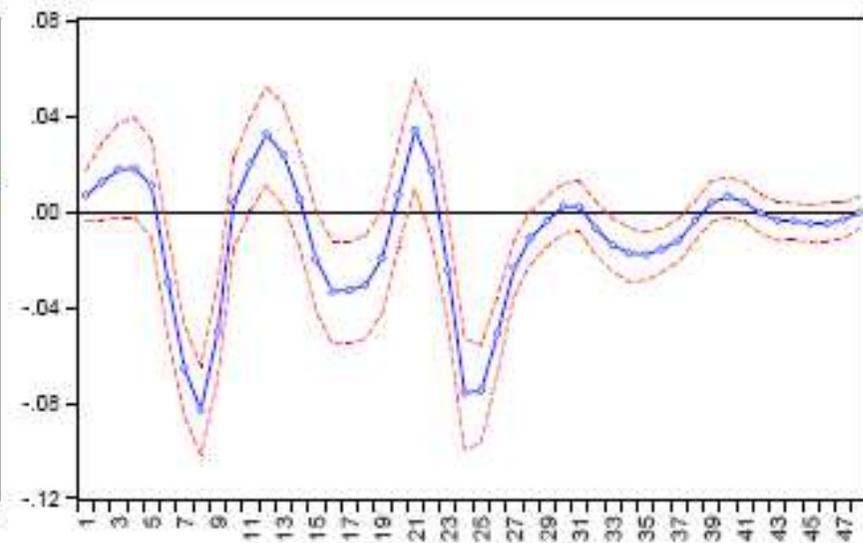
Excess Returns on (3-month) non-US Bonds

Response to Romer and Romer shock

Pre-1990



Post-1990



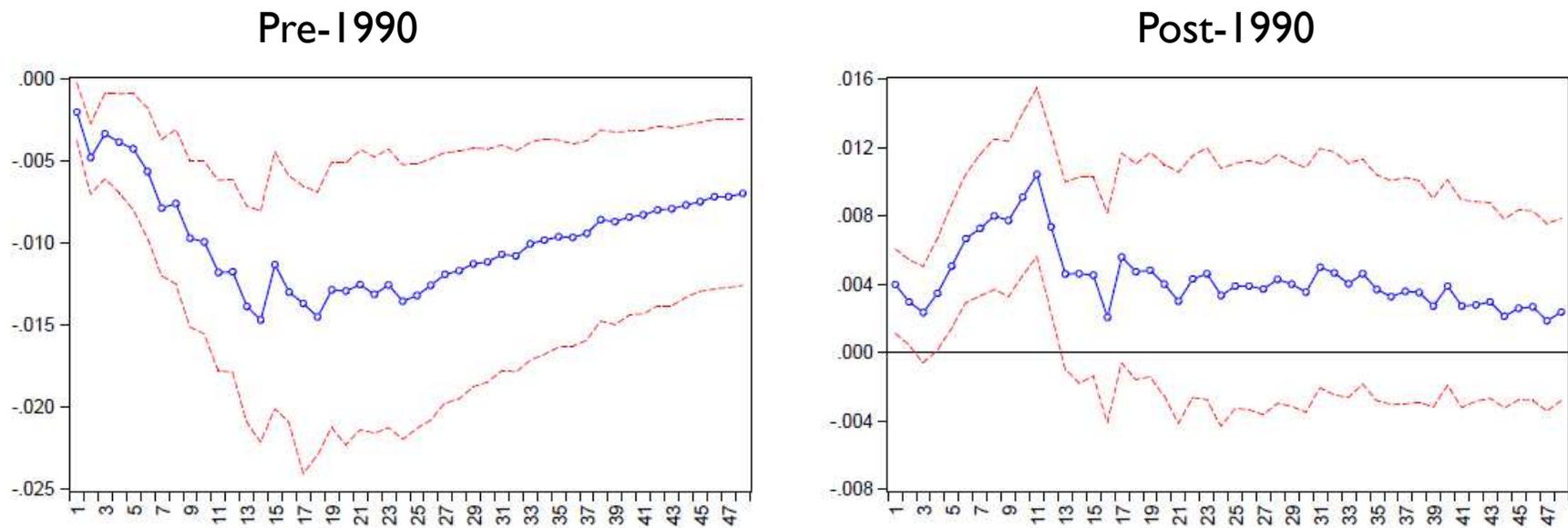
Robustness

- ▶ Different cut-off dates +/- 6 years
- ▶ Linear, quadratic, or stochastic trend
- ▶ Different lag specifications
- ▶ GLS / OLS
- ▶ w / wo country fixed effects
- ▶ Developing countries (in the later sample)
- ▶ Using US NEER or REER instead of panel of bilateral exchange rates.
- ▶ Identification
 - ▶ Eichenbaum and Evans or Christiano Eichenbaum and Evans:



Industrial Production

Response to Christiano, Eichenbaum and Evans shock



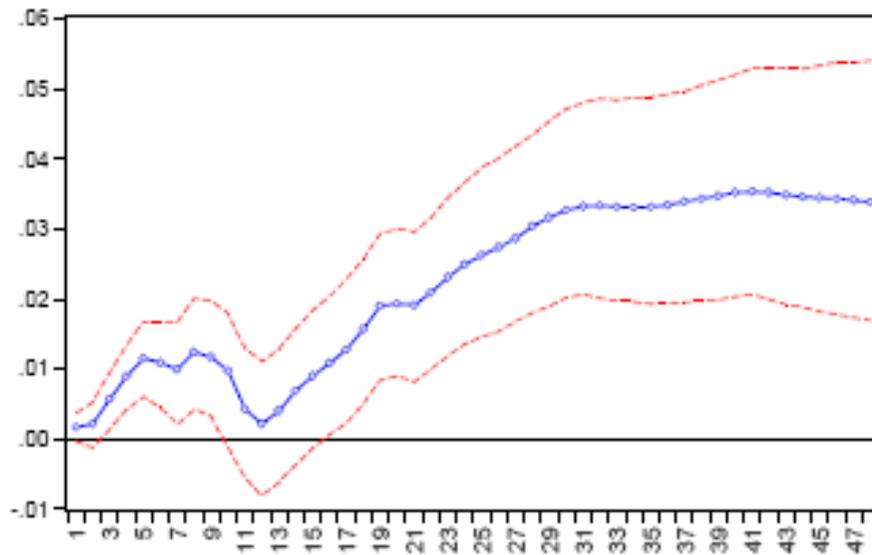
Responses of foreign industrial production to 1 percentage point CEE innovation in the FFR. Left-hand column: 1973-1990. Right-hand column: 1991-2005.



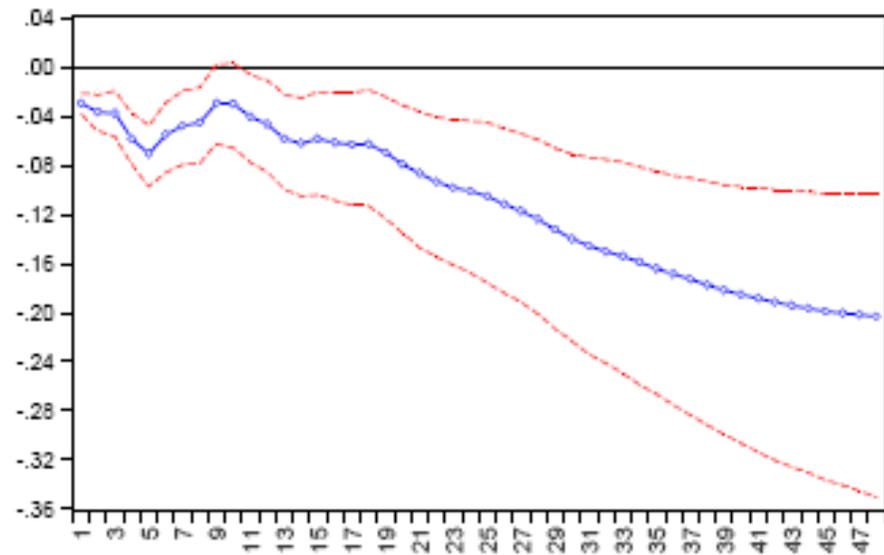
Nominal(bilateral)Exchange Rate

Response to Christiano, Eichenbaum and Evans shock.
(Up reflects a USD appreciation)

Pre-1990



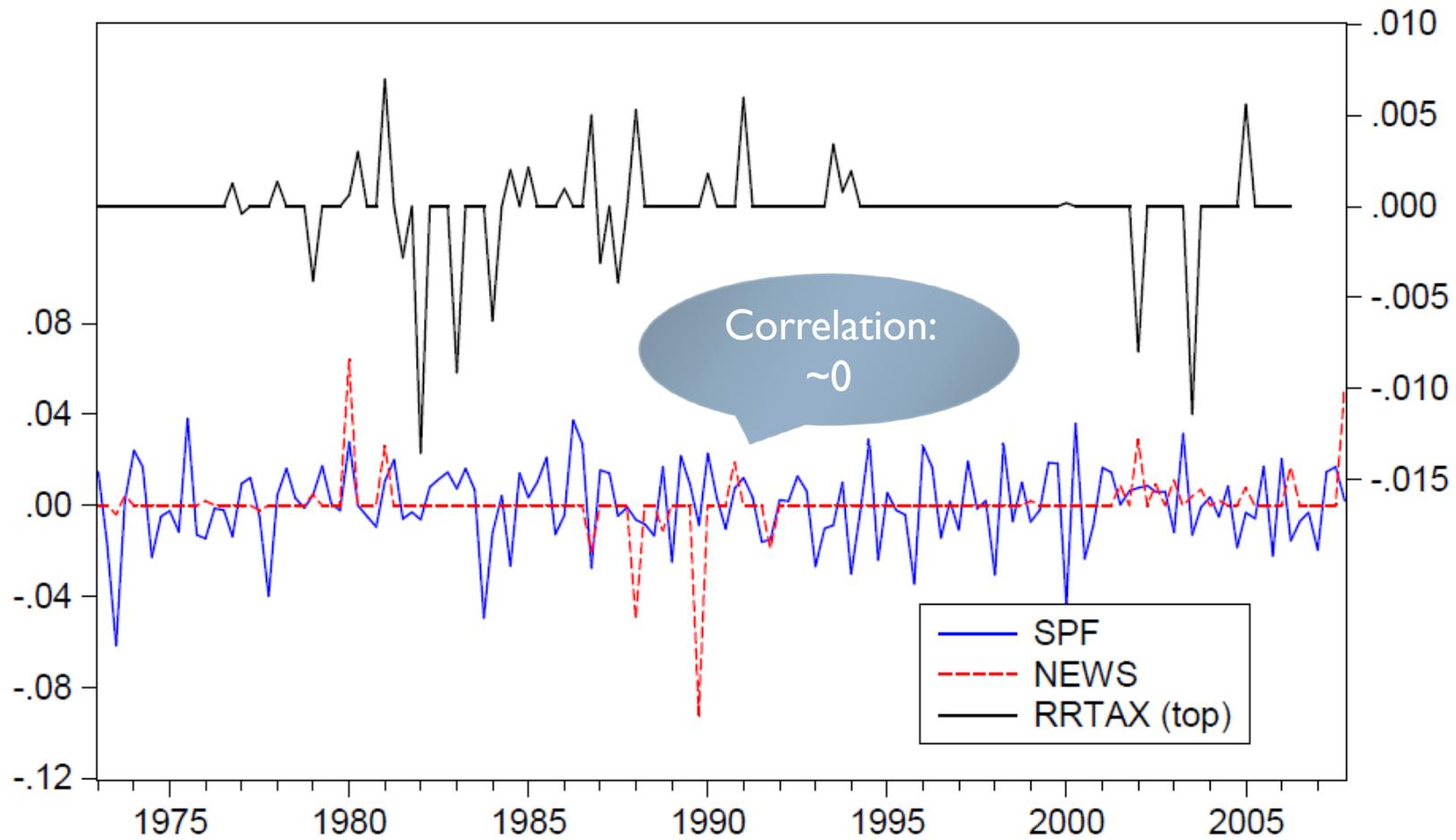
Post-1990



Government Spending



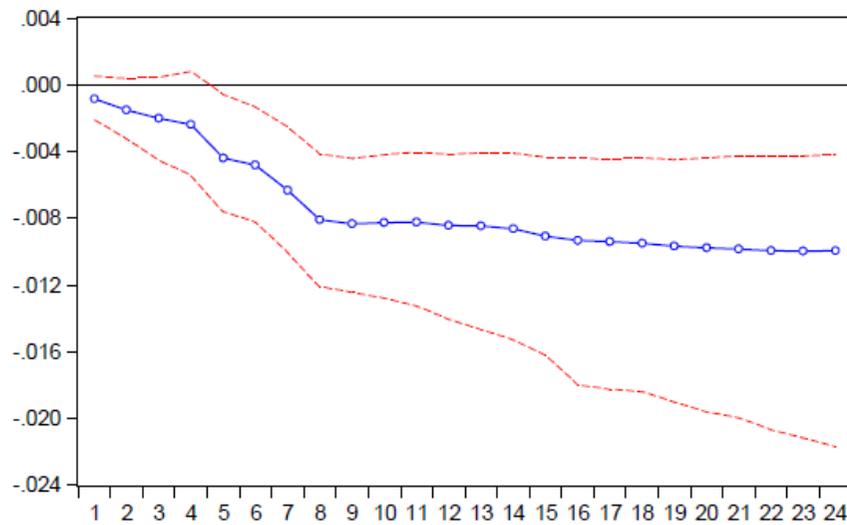
Comparing Fiscal Shocks



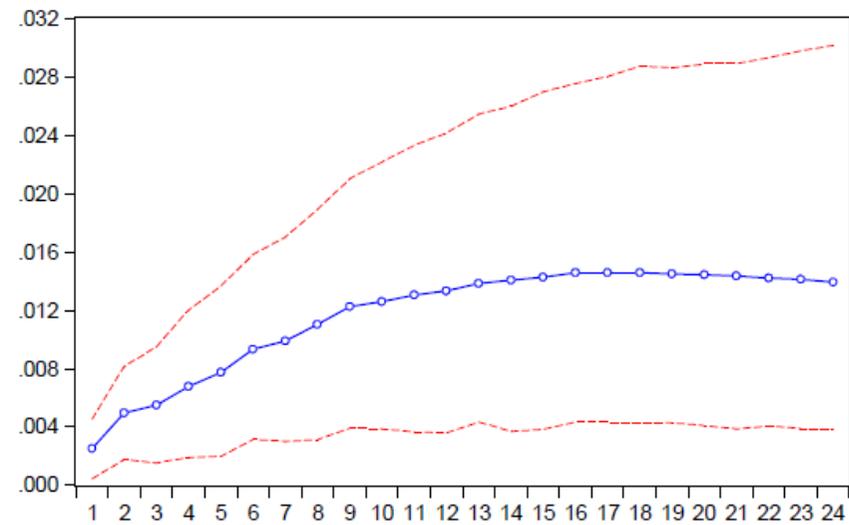
Industrial Production

Response to Ramey Government Spending “News” shock

Pre-1990



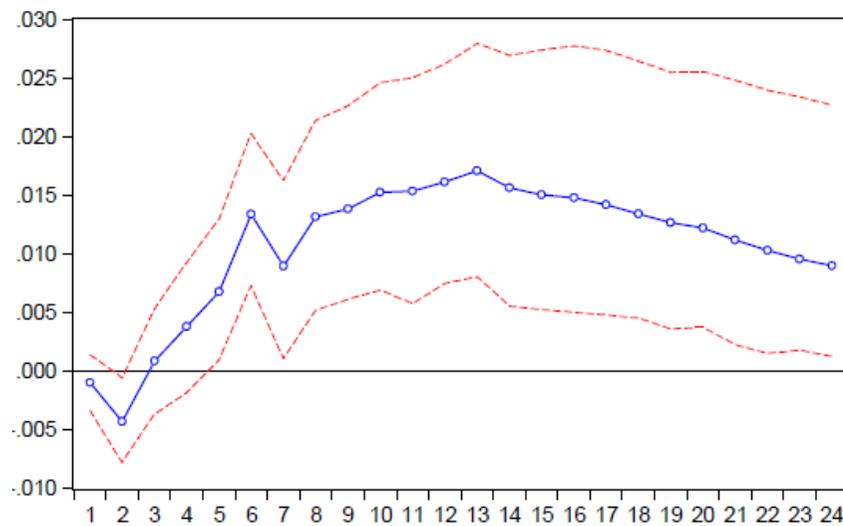
Post-1990



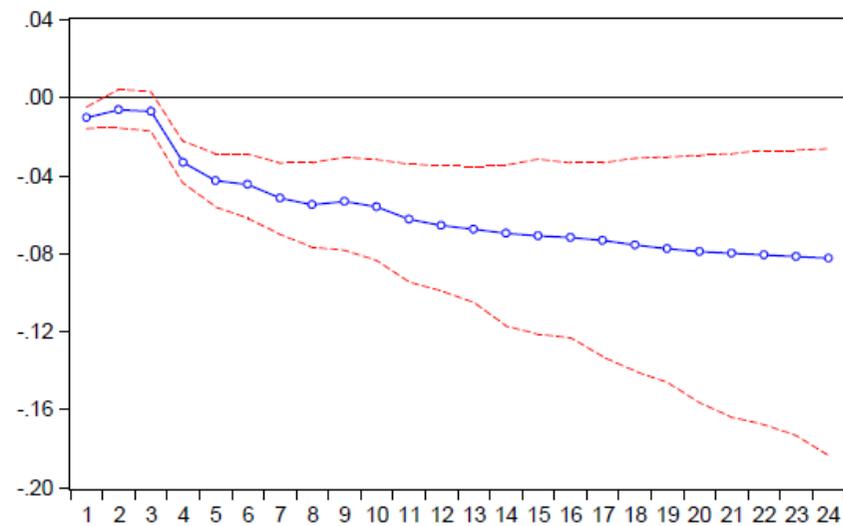
Real exchange rate

Response to Ramey Government Spending “News” shock

Pre-1990



Post-1990



Robustness

- ▶ As before +
- ▶ Identification
 - ▶ Forecast errors of the Survey of Professional Forecasters (Ramey, 2011)



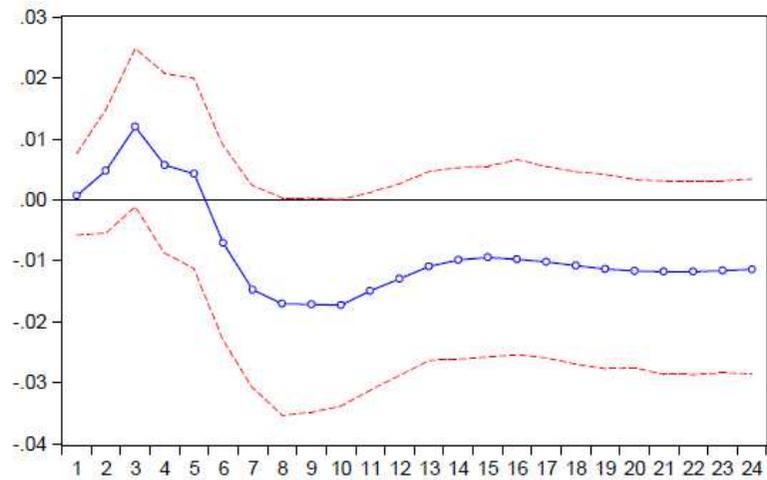
Taxes



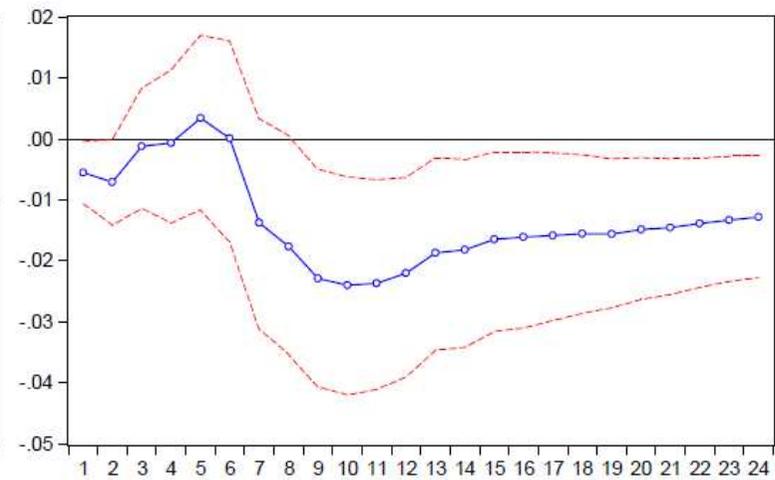
Industrial Production

Response to Romer and Romer tax shock

Pre-1990



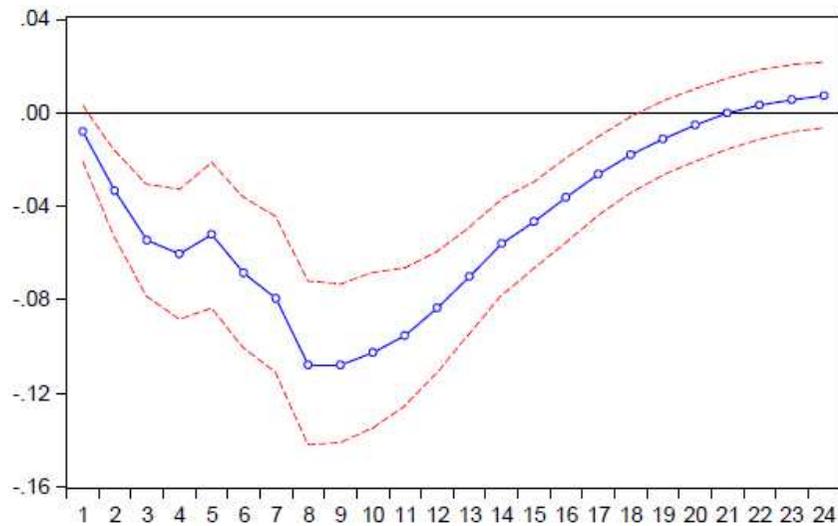
Post-1990



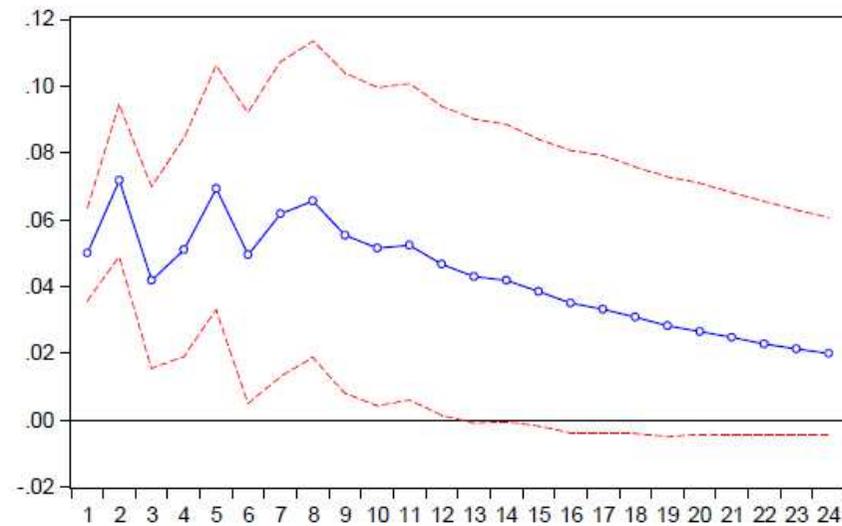
Real exchange rate

Response to Romer and Romer tax shock

Pre-1990



Post-1990



Theory



Theoretical predictions in a nutshell

- ▶ Hard to reconcile recent results with standard theory. For monetary policy in particular.
- ▶ Several channels of transmission
 1. Demand spillovers: $i \uparrow \rightarrow r^w \uparrow \Rightarrow C^w \downarrow \rightarrow Y^* \downarrow$
 2. Expenditure switching: $i \uparrow \rightarrow e \downarrow$ (\$ appreciates) $\Rightarrow Y^* \uparrow$
 3. Monetary policy response: $Y^* \downarrow \Rightarrow i^* \downarrow \Rightarrow Y^* \uparrow$
 4. Wealth effect: $Y \downarrow \Rightarrow CA \downarrow \Rightarrow \text{Wealth}^* \uparrow \Rightarrow n^* \downarrow \Rightarrow Y^* \downarrow$
- ▶ In calibrated model that follows, (1) dominates (2), so that there are positive spillovers., contrary to data.
- ▶ If we match exchange rate response, (1) and (2) push in the same direction and output response in the data cannot be matched.



Model

- ▶ Two countries H and F with measures n and $1-n$ of households and differentiated goods.
- ▶ Preferences

$$U_t^h = E_t \left[\sum_{s=t}^{\infty} \beta^{s-t} U(C_{t+s}^h) + N \left(\frac{M_{t+s}^h}{P_{t+s}} \right) - V(L_{t+s}^h) \right]$$

$$C = \left[n^{1/\zeta} C_H^{(\zeta-1)/\zeta} + (1-n)^{1/\zeta} C_F^{(\zeta-1)/\zeta} \right]^{\zeta/(\zeta-1)}$$

$$C_H = \left[\left(\frac{1}{n} \right)^{1/\sigma} \int_0^n c(z)^{(\sigma-1)/\sigma} dz \right]^{\sigma/(\sigma-1)}$$

$$C_F = \left[\left(\frac{1}{1-n} \right)^{1/\sigma} \int_n^1 c(z)^{(\sigma-1)/\sigma} di \right]^{\sigma/(\sigma-1)}$$



Households

- ▶ Budget constraint (complete/incomplete markets)

$$P_t c_t^h + M_t^h + \sum_{s^{t+1}} Q(s^{t+1}|s^t) B^h(s^{t+1}) = W_t^h l_t^h + M_{t-1}^h + B^h(s^t) + \Pi_t^h + T_t^h$$

$$P_t c_t^h + M_t^h + B_{t+1}^h + B_{f,t+1}^h = W_t^h l_t^h + M_{t-1}^h + (1 + i_t) B_t^h + (1 + i_t^*) B_{f,t}^h + \Pi_t^h + T_t^h$$

- ▶ FOCs:

$$\frac{U_c(C_t^h)}{P_t} = (1 + i_t) \beta E_t \left\{ \frac{U_c(C_{t+1}^h)}{P_{t+1}^h} \right\}$$
$$-\frac{V_L(L_t^h)}{U_c(C_t^h)} = \frac{W_t^h}{P_t^h}$$



Firms

► Production

$$y_t(h) = A_{H,t} L_t(h)$$

$$P_t c_t^h + M_t^h + B_{t+1}^h + B_{f,t+1}^h = W_t^h l_t^h + M_{t-1}^h + (1 + i_t) B_t^h + (1 + i_t^*) B_{f,t}^h + \Pi_t^h + T_t^h$$

► Calvo pricing, price setting:

$$\max E_t \sum_{k=0}^{\infty} \delta^k M_{t+k|t} (\tilde{p}_t(h) y_{t+k|t}(h) - MC_{t+k} y_{t+k|t}(h))$$



$$\tilde{p}_t(h) = \frac{\sigma}{1 - \sigma} \frac{E_t \sum_{k=0}^{\infty} \delta^k M_{t+k|t} MC_{t+k} \tilde{y}_{t+k|t}^h(h)}{E_t \sum_{k=0}^{\infty} M_{t+k|t} \tilde{y}_{t+k|t}^h(h)}$$

$$\tilde{p}_t^*(h) = \frac{\sigma}{1 - \sigma} \frac{E_t \sum_{k=0}^{\infty} \delta^k M_{t+k|t} MC_{t+k} \tilde{y}_{t+k|t}^h(h)}{E_t \sum_{k=0}^{\infty} M_{t+k|t} S_{t+k} \tilde{y}_{t+k|t}^f(h)}$$



Asset Markets

- ▶ Complete Markets

$$M_{t+k|t} = \frac{\beta^k U_c(C_{t+k})}{P_{t+k}} \frac{P_t}{U_c(C_t)}$$

- ▶ + complete risk sharing.

- ▶ Incomplete Markets:

$$M_{t+k} = \prod_{z=0}^k \frac{1}{1 + i_{t+z}}$$

- ▶ Risk Sharing:

$$E_{t+1} \left[\frac{u_c(C_{t+1})}{u_c(C_t)} \frac{P_t}{P_{t+1}} \right] = E_{t+1} \left[\frac{u_c(C_{t+1}^*)}{u_c(C_t^*)} \frac{P_t^*}{P_{t+1}^*} \frac{S_t}{S_{t+1}} \right]$$



Monetary Policy

- ▶ Taylor Rule

$$\widehat{i}_t^j = (1 - \gamma)(\Phi_\pi \pi_t^j + \Phi_y y_t^j) + \gamma \widehat{i}_t^j + \epsilon_t^j$$

- ▶ Parameterization: Clarida, Gali and Gertler (2000)

- ▶ $\Phi_\pi = 2.15$

- ▶ $\Phi_y = 0.23$

- ▶ $\gamma = 0.79$



Parameterization

$$U(c) = \frac{c^{1-\rho}}{1-\rho}$$
$$v(L) = -\frac{L^\mu}{\mu}$$

$\rho = 2$

$\mu = 0.5$

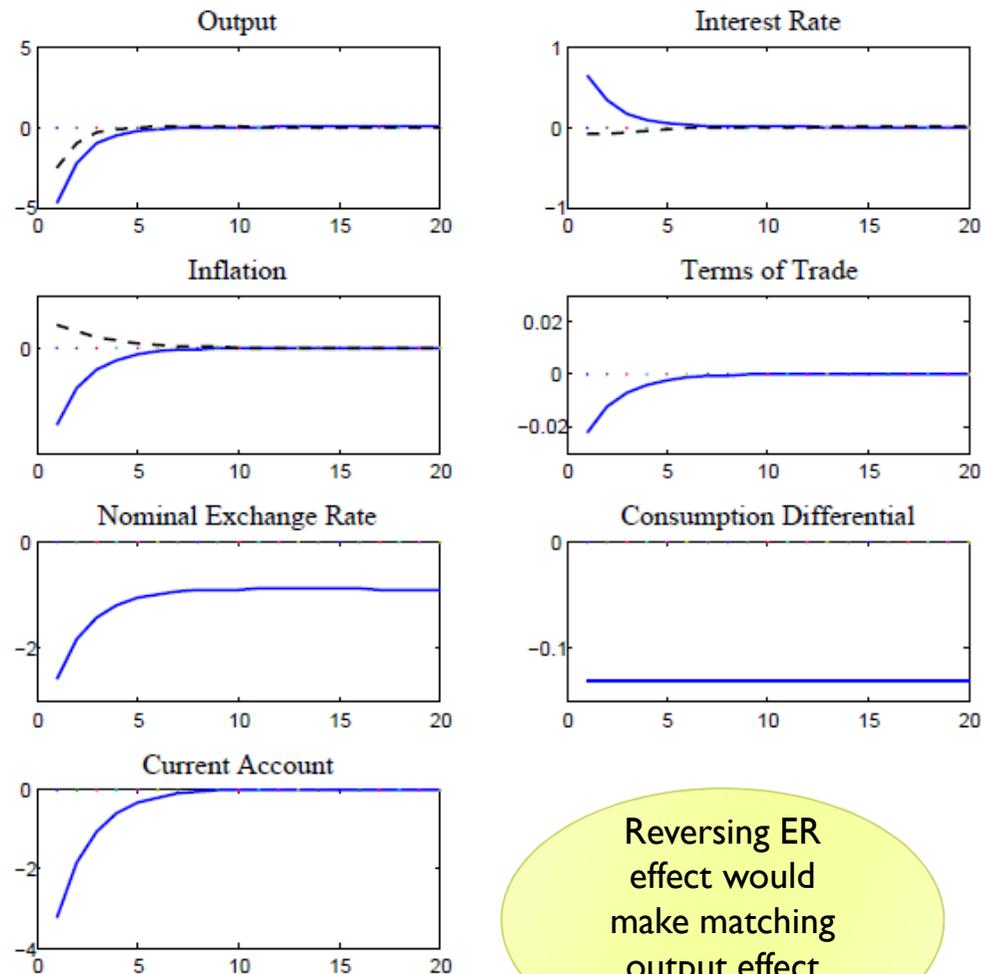
- ▶ $\zeta = 1.5$ (elasticity of substitution between H and F goods.)
- ▶ $\sigma = 6$ (elasticity of substitution among each country's goods)
- ▶ $\delta = 0.7$ (30% of firms adjust prices in each quarter)
- ▶ $\beta = 0.99$



Results: Monetary Shock PCP, incomplete markets

Exchange rate effect always same

Complete Markets:
roughly the same, spill-overs stronger: more risk-sharing



LCP:
roughly the same
+ weaker expenditure switching effect.

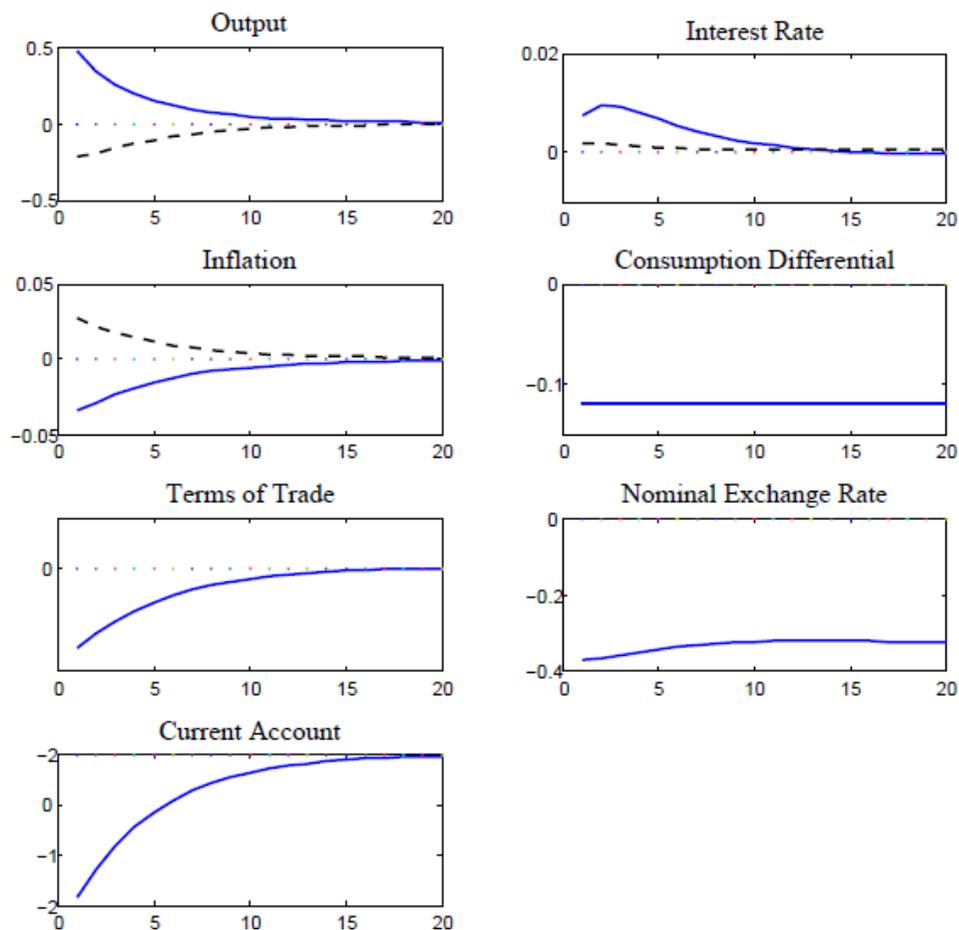
Reversing ER effect would make matching output effect impossible



Results: Fiscal Shock

PCP, incomplete markets, home bias in G

Complete Markets:
generates positive
spill-overs
(but no RER
depreciation as in
empirical evidence)



Robustness

- ▶ PCP/LCP
- ▶ Non-tradable goods / home bias
- ▶ Productive capital



Summary



Summary

- ▶ Robust evidence that something has changed in the transmission of US policy shocks to the ROW circa 1990.
- ▶ Hard to reconcile responses of output and exchange rate to US monetary shock in the recent period.
- ▶ Currently working to see whether the fit of the NOEM model has declined in the recent period.

