The Changing Nature of the Real Exchange Rate: The Role of Central Bank Preferences

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* The views and conclusions presented are our own and do not necessarily represent those of the Central Bank of Chile.

Question of interest

- Previous literature on the real exchange rate (RER) volatility argues that demand shocks are the main source of RER fluctuations (E.g. Lastrapes (1992), Glarida & Galí (1994), Enders & Lee (1997), Rogers (1999), Farrant and Peersman (2006)).
- There are, however, several unsettled issues regarding RER behavior. The question to study: How does the adoption of inflation targeting (IT) affect the RER volatility, i.e. are demand shocks still the main source?
- Two complementary exercises: (i) DSGE model with explicit formulation of preferences of the central bank (Kam et al., 2009). (ii) Let the data "speak" in SVAR models, where shocks are identified by sign restrictions (Inuoe & Kilian, 2013).

This paper

1. Apply existing calibration of a DSGE model to derive signs of responses of key economic variables from four types of shocks: Demand, supply, monetary, country risk premium (exchange rate).
2. Employ data from 1986 to 2014 for nine IT countries (Australia(93), Canada(91), Chile(91), Israel (92), Norway(01), Philippines(02), S. Africa(00), Sweden(93), UK(92) and three NIT (Denmark, Singapore, Hong Kong) to estimate (i) Panel VARs and (ii) country SVARs. Evaluate if the sources of RER fluctuations have change over time (rolling estimations).
3. Evaluate if empirical results can be explained in the DSGE model by changes of the central bank's preferences.

Main findings

- The role of demand shocks as source of RER fluctuations has diminished over time. On the other hand, country risk premium (CRP) shocks have become more important.
- This seems to be more pronounced in the IT countries compared to NITs.
- When changing the central bank's preferences in a DSGE model, such that it is more inflation averse and less preoccupied with exchange rate movements, demand shocks explain a smaller part of the RER volatility, while CRP shocks explain a larger proportion.

The presentation

1. Introduction of the shocks in the Kam et al.(2009) DSGE model
2. Very briefly about the Inoue and Kilian(2013) sign restriction approach
3. Evidence from panel VARs: IT and NIT countries
4. Some country results
5. Changing central bank preferences and the influence on the RER dynamic
6. Conclusions

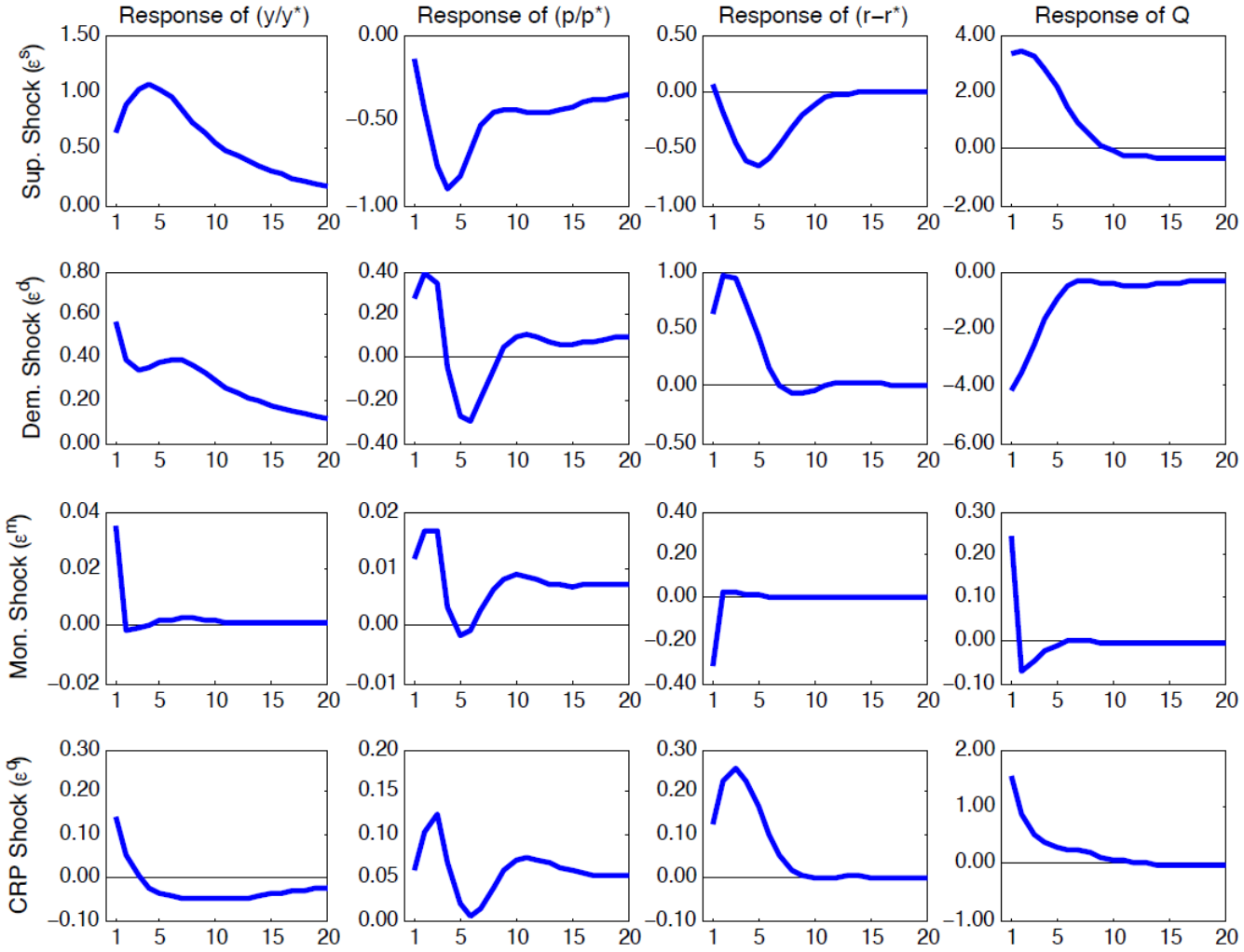
The shocks in the Kam et al. (1999) model

- A standard small open economy DSGE model with imperfect exchange rate pass-through.
- The **demand** (preference) **shock** introduced the Euler equation.
- The **supply shock** is added to the hybrid new Keynesian Phillips curve for domestic inflation.
- **Country risk premium** (UIP) **shock** added to the UIP equation.
- **Monetary policy shock** generates deviations between the actual rate and the optimal path
- Central bank's loss function:

$$L = \frac{1}{2}[\mu_\pi \tilde{\pi}_t^2 + \mu_y y_t^2 + \mu_e \Delta e_t^2 + \mu_r (r_t - r_{t-1})^2]$$

Impulse-responses and sign restrictions

Theoretical IRF under Baseline Calibration



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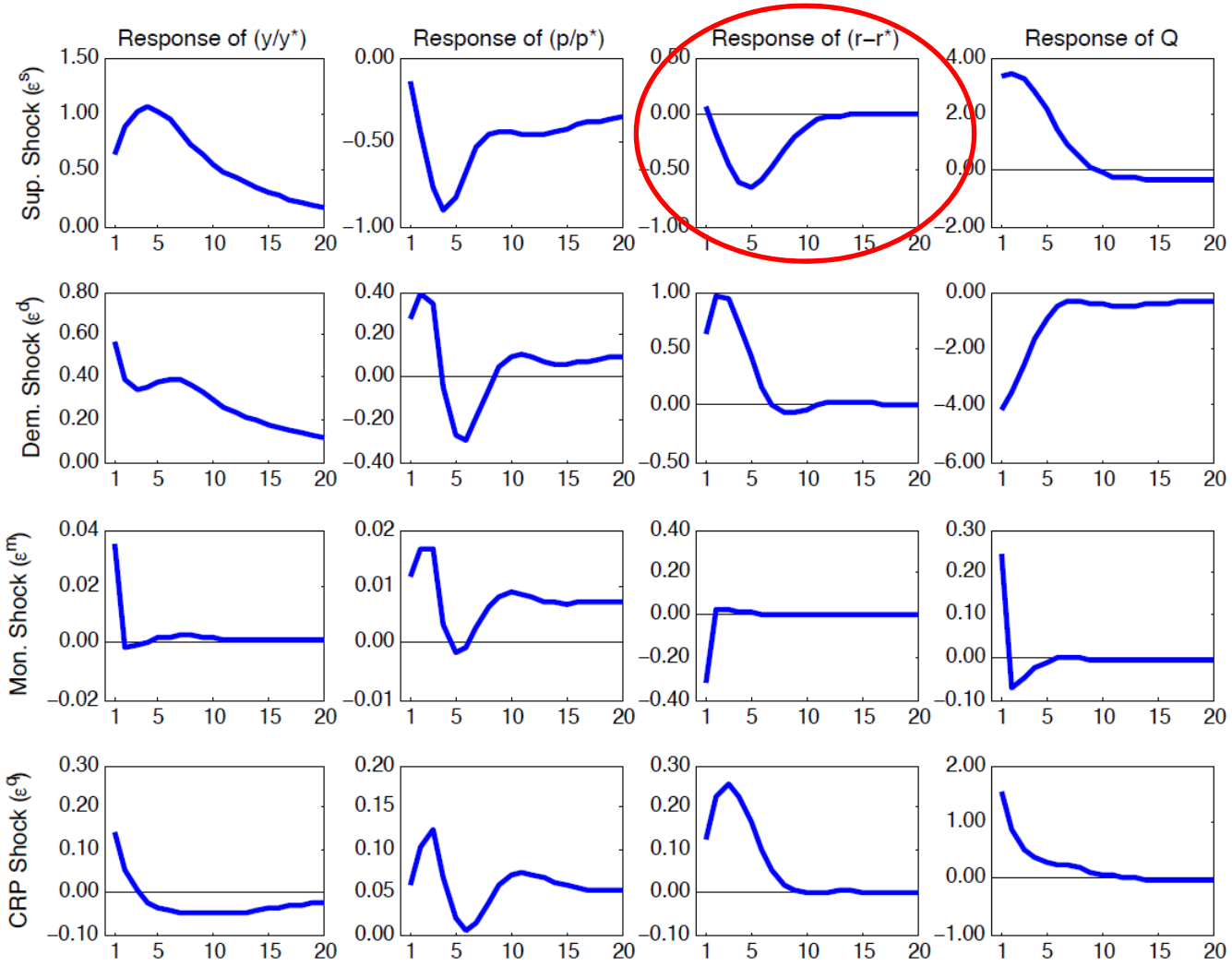

Implied sign restrictions

Sign restrictions

Supply shock	$\frac{\partial(y/y^*)}{\partial\epsilon^s} \geq 0$	$\frac{\partial(p/p^*)}{\partial\epsilon^s} \leq 0$	$\frac{\partial(i-i^*)}{\partial\epsilon^s} \gtreqless 0$	$\frac{\partial q}{\partial\epsilon^s} \geq 0$
Demand shock	$\frac{\partial(y/y^*)}{\partial\epsilon^d} \geq 0$	$\frac{\partial(p/p^*)}{\partial\epsilon^d} \geq 0$	$\frac{\partial(i-i^*)}{\partial\epsilon^s} \geq 0$	$\frac{\partial q}{\partial\epsilon^d} \leq 0$
Monetary shock	$\frac{\partial(y/y^*)}{\partial\epsilon^m} \geq 0$	$\frac{\partial(p/p^*)}{\partial\epsilon^m} \geq 0$	$\frac{\partial(i-i^*)}{\partial\epsilon^m} \leq 0$	$\frac{\partial q}{\partial\epsilon^m} \geq 0$
CRP shock	$\frac{\partial(y/y^*)}{\partial\epsilon^q} \geq 0$	$\frac{\partial(p/p^*)}{\partial\epsilon^q} \geq 0$	$\frac{\partial(i-i^*)}{\partial\epsilon^q} \geq 0$	$\frac{\partial q}{\partial\epsilon^q} \geq 0$

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Econometric methodology: Inoue and Kilian (2013) – In words

- 4-dimensional VAR models are estimated with Bayesian methods. Prior y posterior distributions belong to normal-inverse Wishart distributions.

(1) Take a total of 100.000.000 random draws from the posterior

(2) Compute impulse-response for each set of parameters

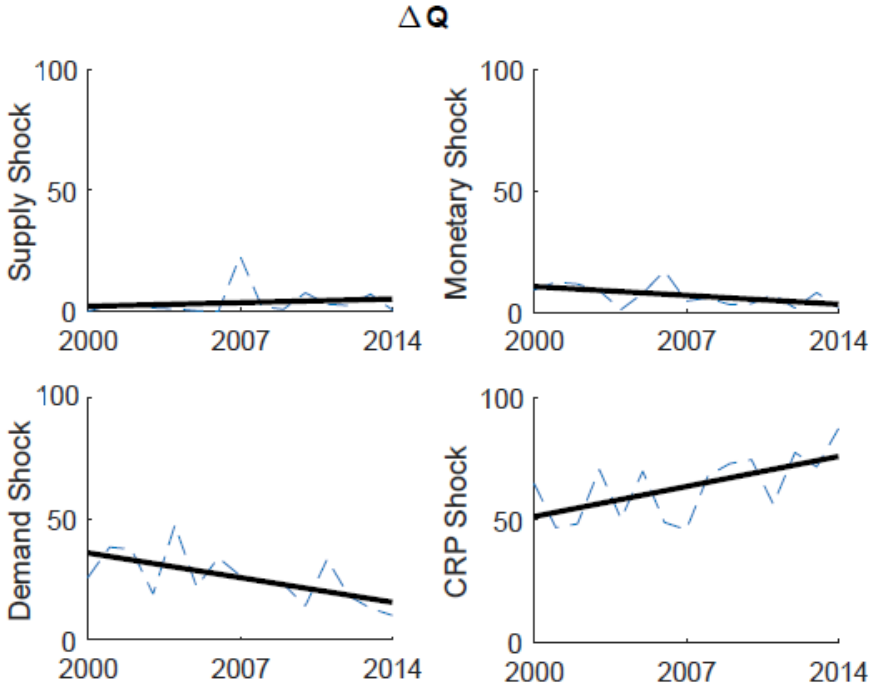
(3) Keep only those that satisfy sign restrictions

(4) "Most likely model": highest values of the posterior density of the structural impulses-responses

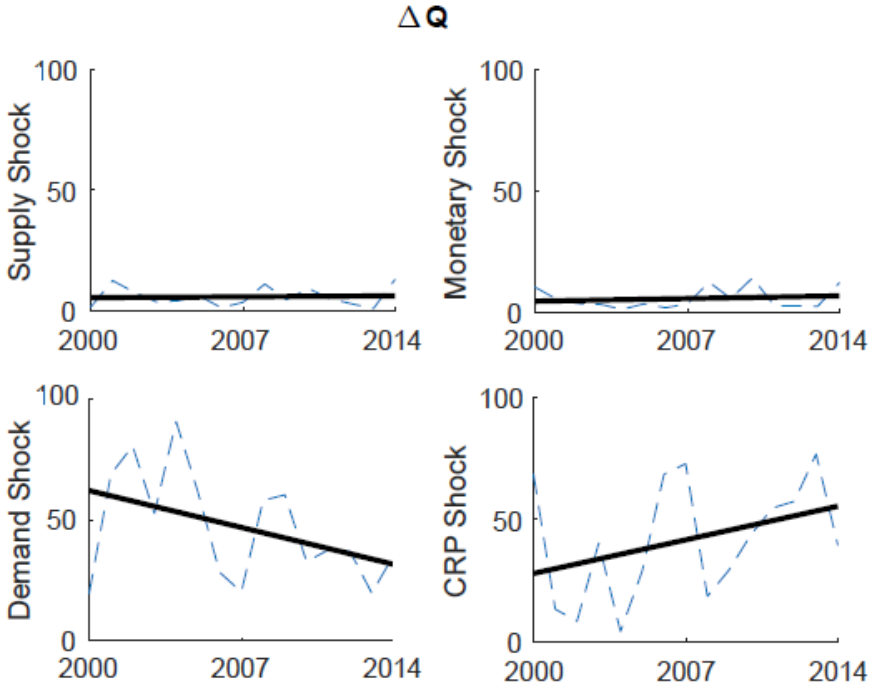
Panel VAR estimations: Notably change in sources of RER fluctuations….

Rolling Variance Decompositions. Horizon: Four Quarters

IT Countries



NIT Countries



… but necessary to take a closer look at the results.

Rolling Variance Decompositions. Horizon: Four Quarters

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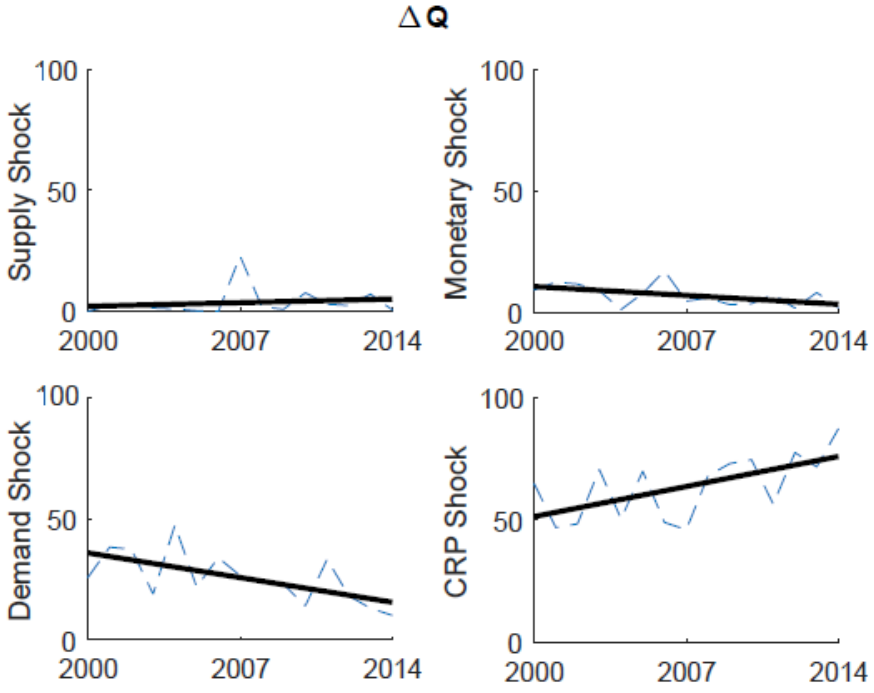

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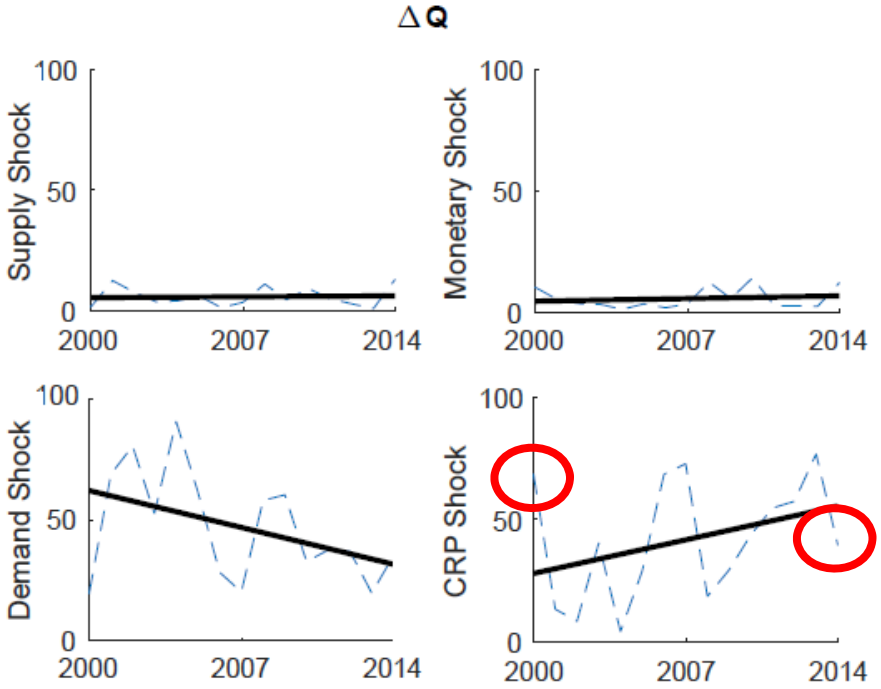
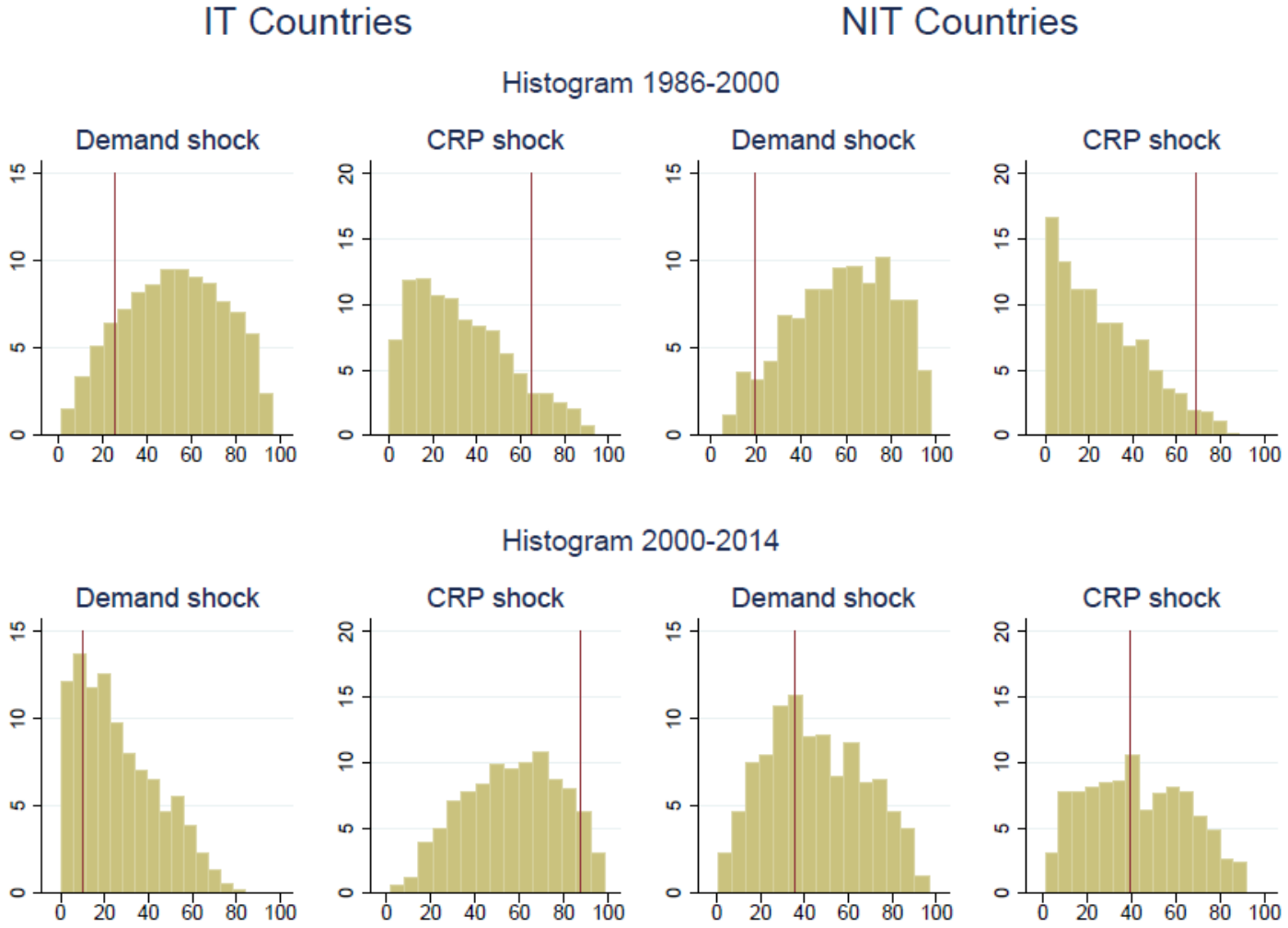


Changes seem more pronounced in IT countries

Histograms of Weights in Variance Decompositions. Horizon: Four Quarters



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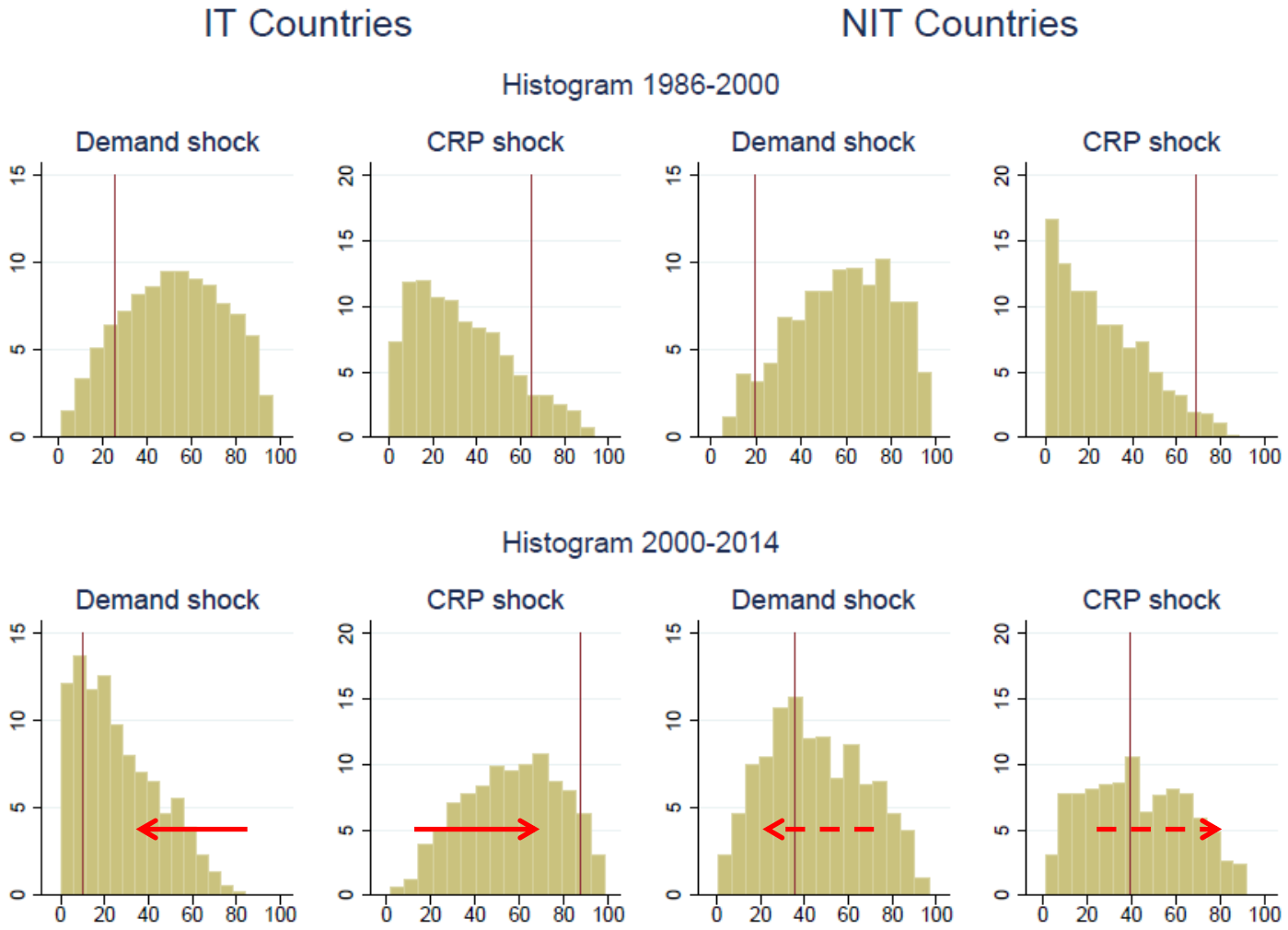
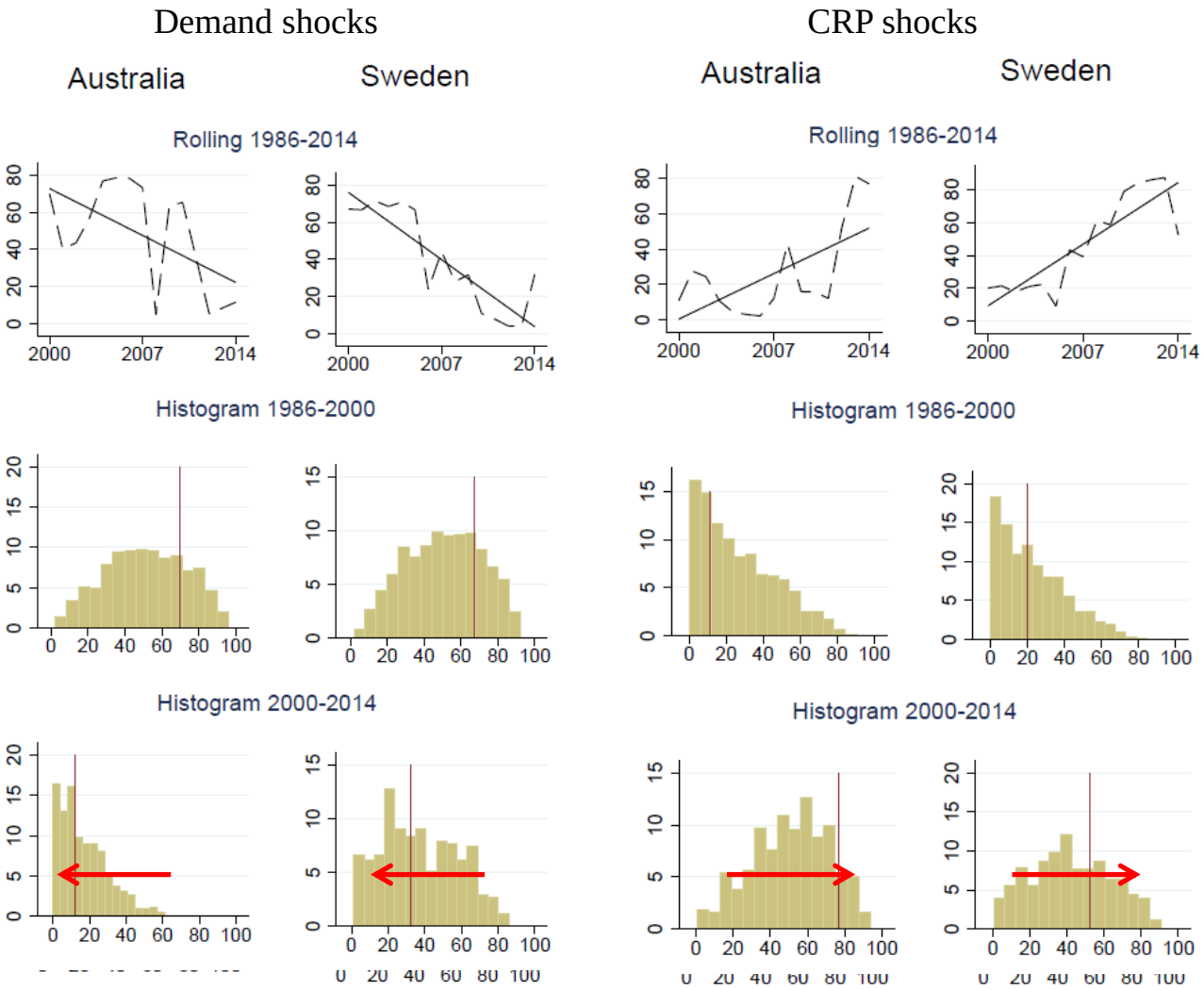


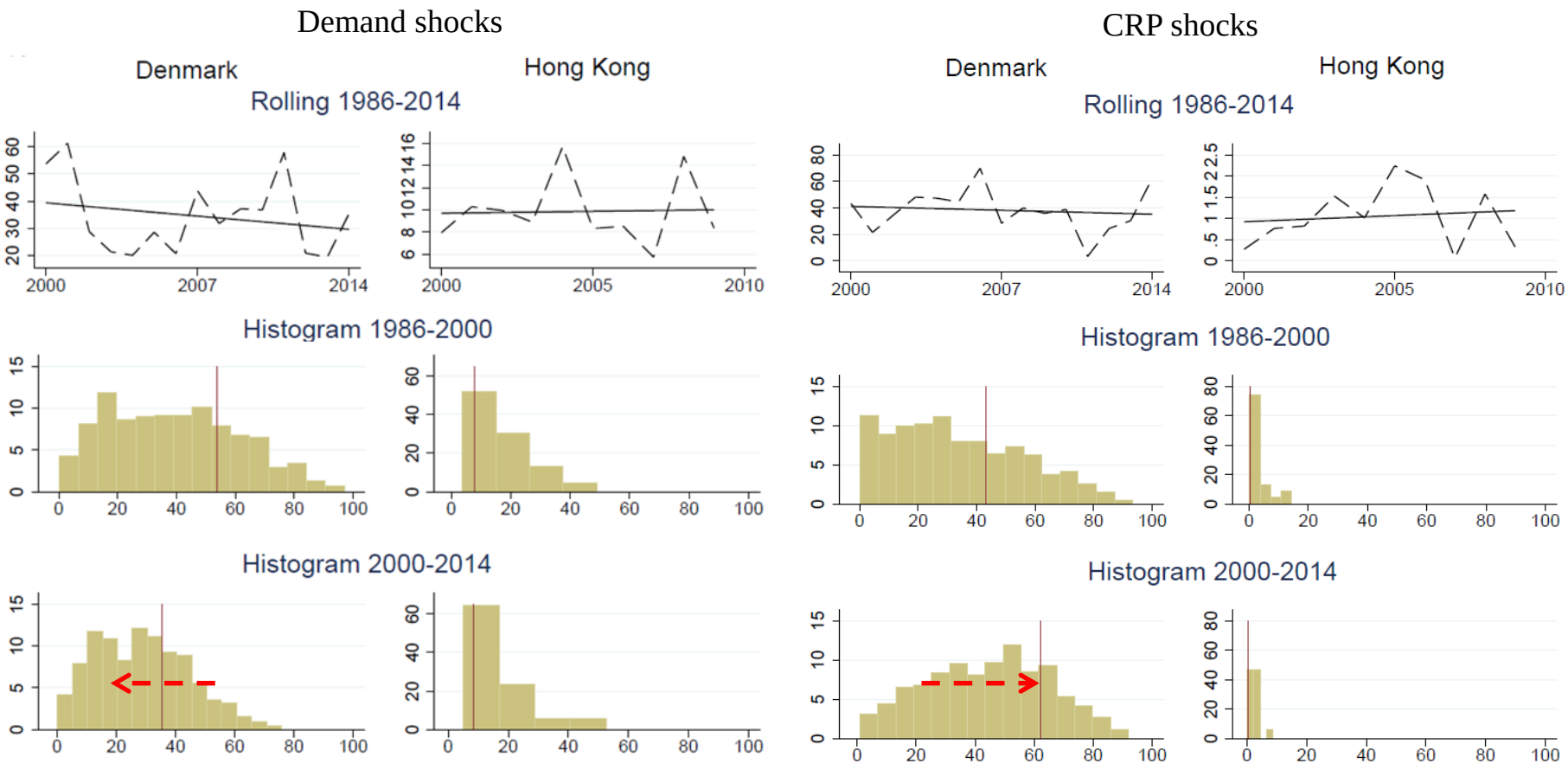
Country estimations: Clear examples from a couple of developed IT countries

Developed IT countries. Variance Decompositions. Horizon: Four Quarters



Country estimations: Differences among NIT countries

NIT countries. Variance Decompositions. Horizon: Four Quarters



Changing the central bank´s priorities

$$L = \frac{1}{2}[\mu_\pi \tilde{\pi}_t^2 + \mu_y y_t^2 + \mu_e \Delta e_t^2 + \mu_r (r_t - r_{t-1})^2]$$

Policy Preferences and Sources of RER Volatility

	Preferences				Variance Decomposition Δq		
Configuration	μ_r	μ_π	μ_y	μ_e	ϵ^q	ϵ^d	ϵ^d/ϵ^q
A	0.000	1.000	0.000	1.000	1.6%	40.8%	24.8
B	0.517	1.000	0.404	0.700	7.6%	42.0%	5.5
C	0.517	1.000	0.404	0.500	8.4%	43.4%	5.2
D	6.067	1.205	0.404	0.000	15.0%	40.0%	2.7
E	10.660	1.182	0.404	0.000	17.0%	38.0%	2.2
F	23.727	1.342	0.404	0.000	18.6%	35.9%	1.9
G	40.442	1.352	0.404	0.000	20.0%	35.0%	1.8

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Conclusions

- Employing the calibration outcome of a DSGE model, we identify shocks in SVARs to evaluate changes in determinants of RER volatility.
- In the early sample we con reconcile the existent evidence for IT countries, demand shocks are main driver of RER volatility, but in the later subsample country risk premium (CRP) shocks play a bigger role.
- DSGE calibrations show that as central banks become more concerned with inflation and interest rate smoothing, CRP shocks explain a larger part of the RER volatility.

Appendix: Economic mechanisms

Exchange rate targeting:
Supply and demand shocks have little impact on exchange rate and, hence, little policy reaction.
Stronger monetary policy reaction to address monetary and CRP shocks, as they are not absorbed by the exchange rate.

Inflation targeting:
Supply and demand shocks affect inflation rate and trigger strong monetary policy reaction.
The exchange rate absorbs the effect of monetary and CRP shocks and, hence no policy reactions. Real shocks require policy action.

IRF under exchange rate targeting (red) and inflation targeting (blue)