Provincial Phillips Curves in China – The Role of Openness

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What this paper does

- We examine the inflation process at the provincial level in China
- The focus is on the importance of open-economy terms in a hybrid New Keynesian Phillips curve
- We compare the provincial inflation processes and draw implications for monetary policy

Motivation I

- Understanding of inflation dynamics is important for the effectiveness of China's monetary policy and evaluation of inflation pressures globally
- Monetary policy implementation in China evolving from quantity measures to price-based measures
- Forward-looking behaviour of agents could be important to improve policy effectiveness
- Concerns about higher inflation in China increasing prices of imports in advanced economies

Motivation II

- The New-Keynesian Phillips curve (NKPC) has become workhorse tool for modelling of inflation process
- For China, hybrid NKPC found to capture inflation process well (Funke, 2006; Scheibe and Vines, 2005)
- Mehrotra et al. (2010) show that the performance of the hybrid Phillips curve varies across provinces; inflation process differs significantly between coastal provinces and rest of country

Motivation III

- Institutional differences and different degrees of market development may create differences in inflation process across provinces
- Young (2000) mentions trade barriers between Chinese provinces; may have prevented price arbitrage
- Recent experience from euro area emphasizes that real exchange rate movements within a monetary union are important

Motivation IV

- Despite the relative openness of China, the openness factor – through exchange rates - has been omitted in evaluation of inflation dynamics
- China's monetary policy officially places emphasis on inflation and exchange rates through "stability of the value of currency"
- As China moves up value chain, changes in exchange rates likely to impact more on domestic economy (Cui and Syed, 2007)
- Exchange rate appreciation in general could alleviate inflation pressures

Research questions

- Has inflation process, measured by hybrid NKPCs, become more similar across Chinese provinces in recent years?
- What is the importance of economic openness – evaluated through real exchange rates – for the inflation process?
- Is it more relevant to model exchange rates in levels or in differences for the Chinese provinces?

Theoretical considerations I

- NKPC with purely forward-looking inflation:

$$\pi_t = \rho mc_t + \beta E_t \pi_{t+1}$$

where

$$\rho \equiv \frac{(1-\theta)(1-\theta\beta)}{\theta} > 0$$

- A hybrid specification to account for persistence in inflation (Galí and Gertler, 1999) divides firms into two categories; a fraction (1-ω) of forward-looking and ω of backward-looking firms

$$\pi_t = \lambda mc_t + \gamma_f E_t\{\pi_{t+1}\} + \gamma_b \pi_{t-1}$$

Theoretical considerations II

- Kara and Nelson (2003) and Allsopp et al. (2006) extend the NKPC to open economy
- All imported goods serve as intermediate goods used in domestic production; all final consumer goods are domestically produced
- Changes in exchange rate affect marginal costs of firms; appreciation reduces production costs of domestic goods, potential output increases, exports and output gap fall, inflation pressure declines

$$\pi_t = \lambda mc_t + \gamma_f E_t\{\pi_{t+1}\} + \gamma_b \pi_{t-1} + \xi q_t$$

Theoretical considerations III

- Alternative assumption is that all imports are final consumption goods and priced abroad
- Nominal prices of domestically produced goods sticky, but final goods imports are priced flexibly
- Real exchange rate now enters in difference form (Galí and Monacelli, 2005):

$$\pi_t = \lambda mc_t + \gamma_f E_t\{\pi_{t+1}\} + \gamma_b \pi_{t-1} + \xi \, \Delta \, q_t$$

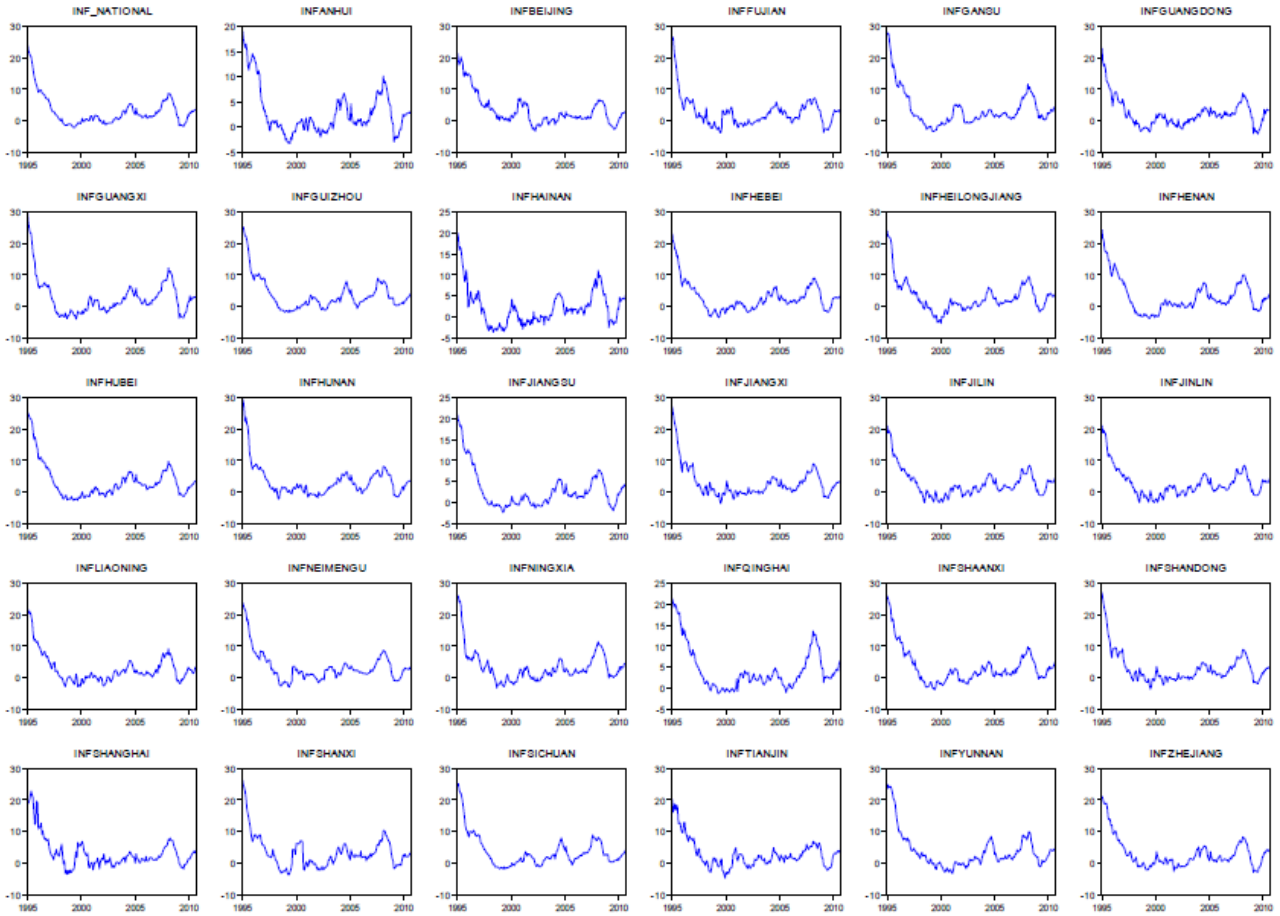
Theoretical considerations IV

- Real marginal cost generally considered related to unit labour cost or output gap
- In presence of employment adjustment costs, may be necessary to include difference in growth rate of employment today and expected growth rate of employment in next period (Rotemberg and Woodford, 1999)
- If employment is temporarily high, marginal costs increase; current growth in employment is larger than growth in employment expected for next period

Data

- Sample covers 1995M1-2010M8
- We focus on 28 provinces (incl. autonomous regions and municipalities), excluding Chongqing, Tibet and Xinjiang
- Dependent variable is the year-on-year change in CPI (China’s headline inflation)

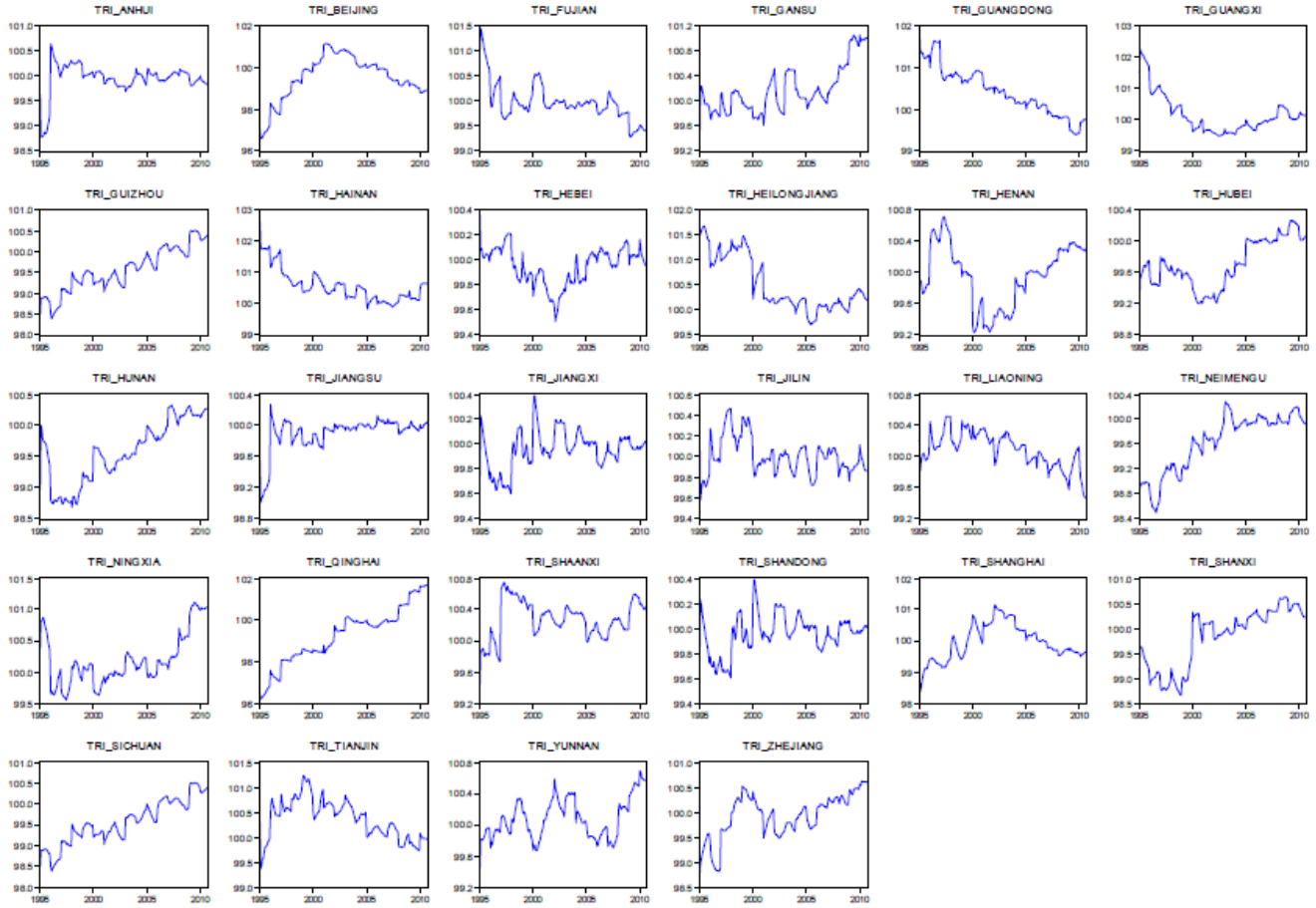
Provincial inflation more volatile than national aggregate



Specifying the real exchange rate

- Internal real exchange rate (within a currency union) specified as the ratio between the price level of individual province and aggregate Chinese economy
- External real exchange rate takes into account the ratio between the price level in a Chinese province and the US, together with the USD-CNY exchange rate
- Real effective exchange rate (REER) published by the BIS also considered (but not province-specific)

Internal RER dynamics differ, but within a small range

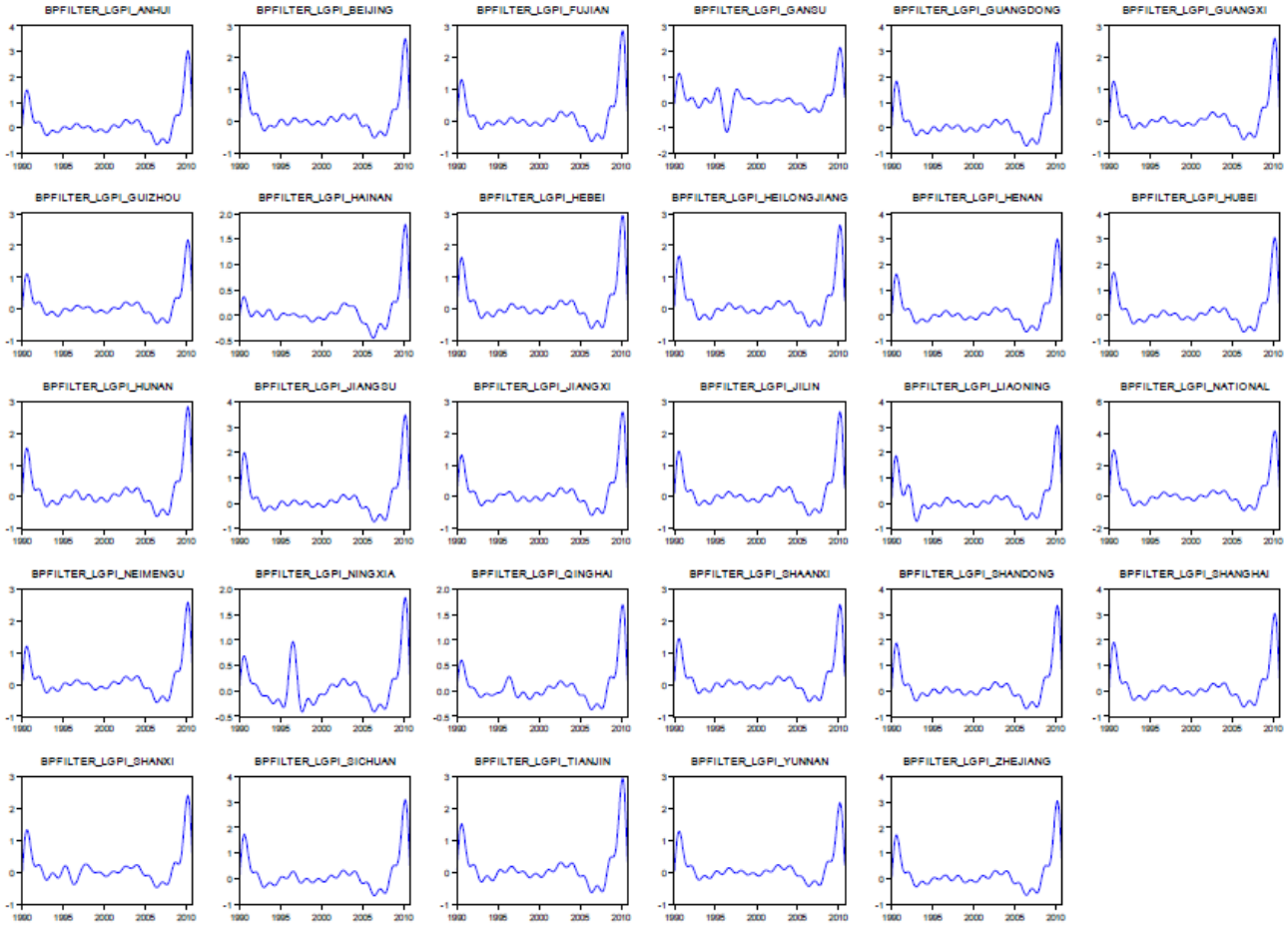


Output gap

- Measures of marginal cost based on wages and productivity cannot be computed at monthly frequency for the provinces

- Monthly output gaps computed with industrial output data, by using the band-pass filter proposed by Christiano and Fitzgerald (2003)

Provincial output gaps



Estimation strategy

- Hybrid NKPC estimated by GMM, using a conventional instrument set including lags of explanatory variables
- The overidentifying restrictions are never rejected for any province at conventional significance levels
- Importance of real exchange rate in levels and differences evaluated in separate estimations

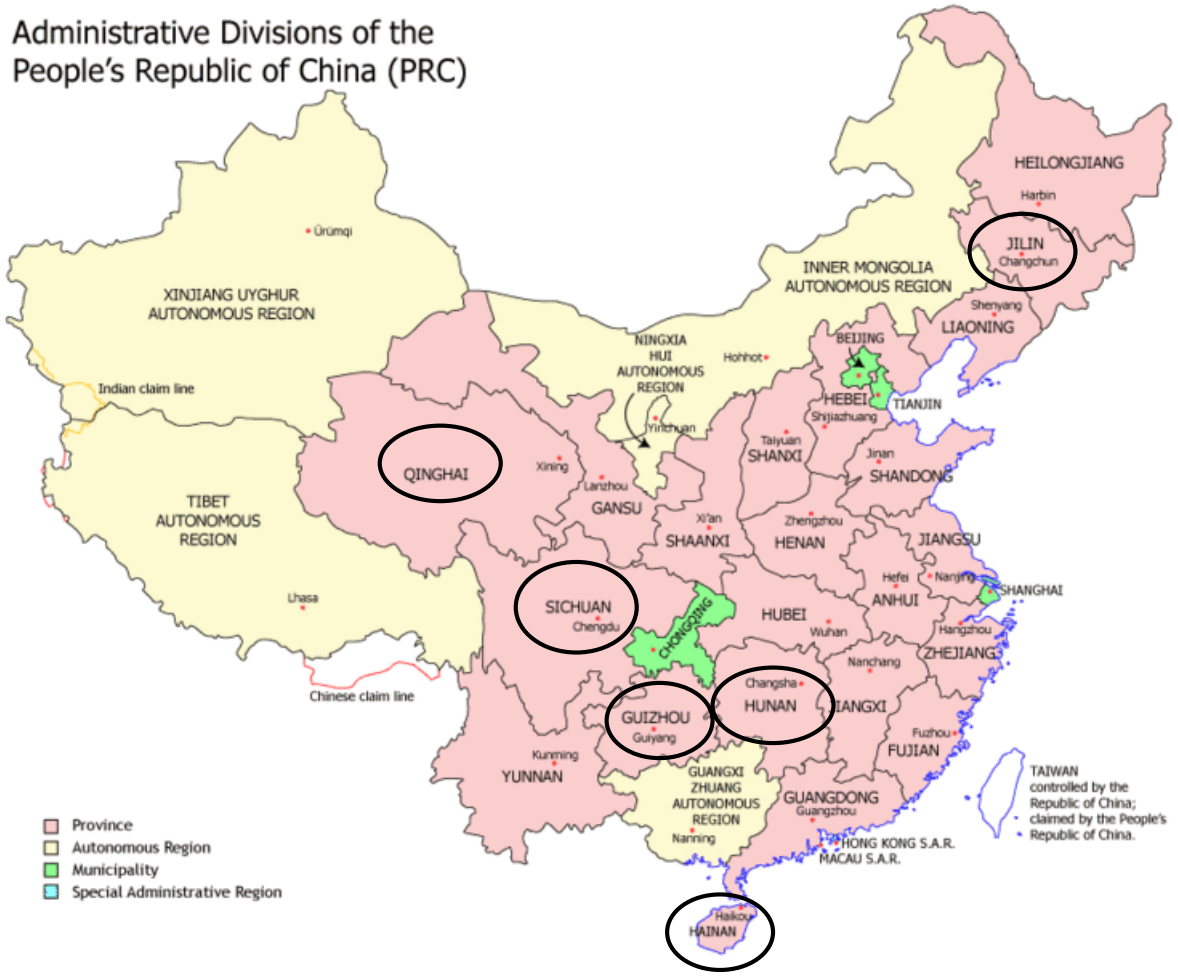
Results I

- The inflation terms (both forward and backward-looking) are consistently significant across the provinces and different models
- Two inflation terms typically sum to one, without imposing such a constraint
- Output gap is not statistically significant for the provinces, similarly to Porter (2010) for the aggregate Chinese economy

Results II

- When USD-CNY (provincial) exchange rate is included in levels, it is statistically significant and negative in the case of six provinces; real exchange rate appreciation leads to a fall in inflation
- The coefficients on exchange rate vary between - 0.01 and - 0.12
- But these provinces are relatively closed in terms of trade

Provinces where RER in levels enters significantly and with correct sign

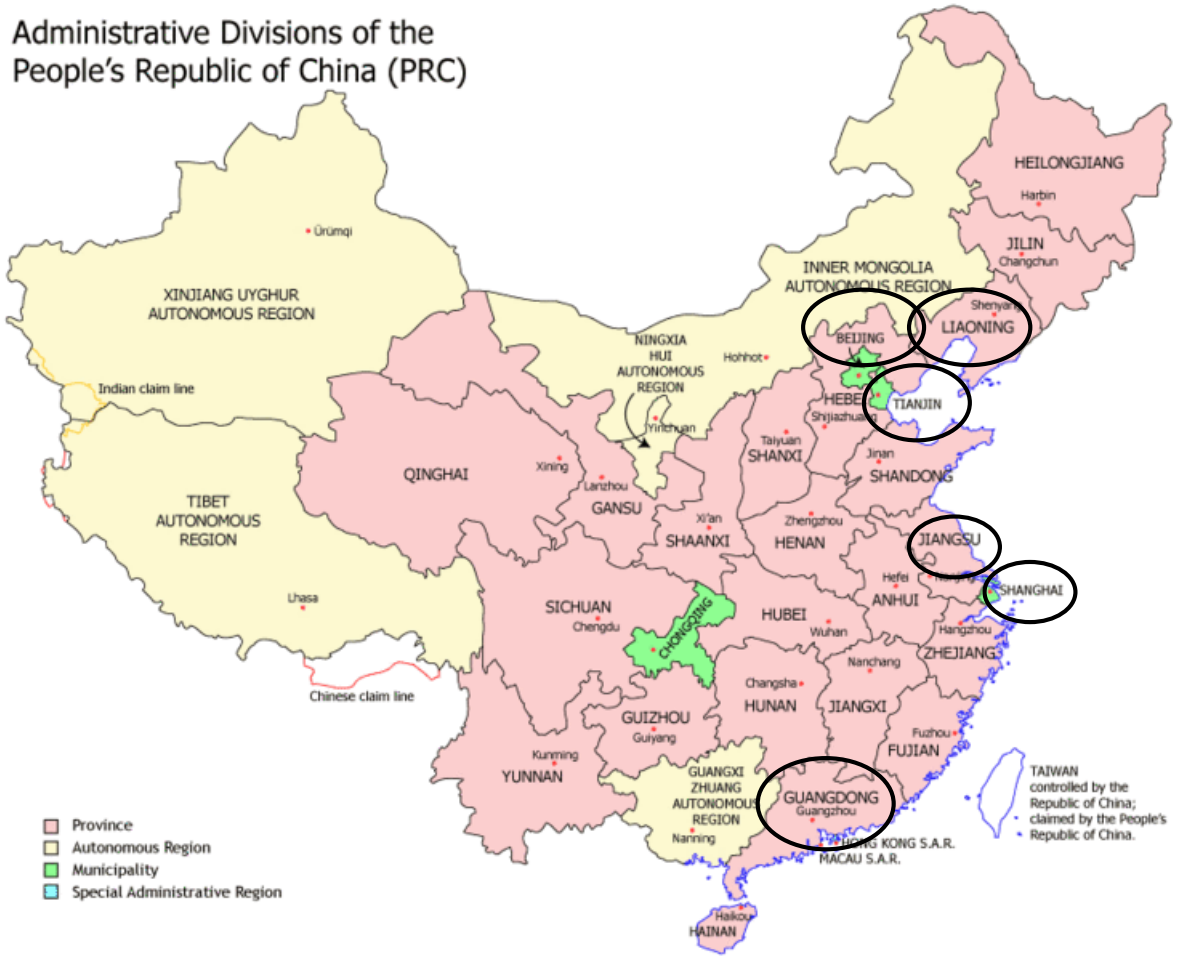


Map source: Wikimedia commons, http://en.wikipedia.org/wiki/File:China_administrative.gif

Results III

- When USD-CNY (provincial) exchange rate is included in differences, it is statistically significant and negative in the case of 19 provinces; a faster real exchange rate appreciation leads to a fall in inflation
- This includes many provinces with trade to GDP in excess of 40%
- The coefficients on the exchange rate are low, mostly -0.01 or -0.02

Some provinces where RER in differences enters significantly and with correct sign



Map source: Wikimedia commons,
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Comparison with previous research

- Including the real exchange rate in levels in a hybrid NKPC, Paloviita (2008) obtains an estimate of 0.168 using pooled euro area data, and 0.120 with aggregate data
- Including the real exchange rate in differences in a backward-looking model, Kara and Nelson (2003) obtain estimates ranging from 0.015 to 0.080 for the U.K.

Importance of employment adjustment costs

- For those provinces where employment growth for the current and future lag are statistically significant, they obtain the expected signs in four out of five cases
- This echoes the weak significance of output gap
- Importance of real exchange rate vis-à-vis the USD (in first differences) remains robust
- Internal real exchange rate mostly obtains the wrong sign (appreciation leads to higher inflation)

Conclusion

- Importance of open-economy terms in a hybrid NKPC evaluated for Chinese provinces
- When recent monthly data are used, hybrid NKPC seems to provide a good description of inflation process across Chinese provinces
- Forward-lookingness has increased and inflation processes have become more homogeneous
- Importance of real exchange rate relatively small, especially when included in levels

Policy implications I

- Similarity of inflation process and importance of forward-lookingness is important for monetary policy; provinces likely to react similarly to monetary policy in so far as it affects inflation expectations
- Relatively limited importance of openness for inflation determination supports argument for domestically oriented monetary policy focused on inflation control

Policy implications II

- As exchange rate movements do not impact strongly on domestic inflation process, policy focusing on stabilizing inflation rate *via* interest rate instrument becomes attractive

- In line with People's Bank's aim of moving ahead with market-based interest rate reform

Extra slide

Competitiveness (internal RER) and growth between provinces