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EUROJÄRJESTELMÄ  
EUROSYSTEMET

# **The Impact of the Global Financial Crisis on Business Cycles in Asian Emerging Economies**

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# Motivation

- China has experienced a strong growth of foreign trade since the beginning of the 1990s.
- Trade growth has been accompanied by high FDI and the reallocation of labor intensive production phases, which has had immense consequences for the international division of labor
- In many respects India has followed China, although there are some differences in specialization pattern.
- These trends are likely to affect international business cycles worldwide.

# Trade, Capital Flows, and Business Cycles

- There is long row of papers analyzing the links between trade, specialization pattern, capital flows and business cycles.
- Frankel and Rose (1997) discuss the synchronization of business cycles and trade intensity. Krugman (1993) presents an opposite view.
- Kalemli-Ozcan et al. (2003) discuss business cycles and specialization pattern.
- Backus et al. (1995) and Imbs (2004 and 2006) look at business cycle and financial integration.
- In sum, trade and financial integration might have positive or negative effects on business cycle synchronization.

# Business Cycles in South East Asia

- So far, the literature concentrated mainly on the regional business cycles (Hughes Hallett and Richter, 2008).
- In a special issue of the World Economy, de Grauwe and Zhang (2006) address the issue whether East Asia is an OCA.
- Sato and Zhang (2006) find common business cycles between selected countries of the region. Shin and Sohn (2006) find that trade integration (but much less financial integration) enhances the comovements of output in East Asia.
- Kose et al. (2008), Akin and Kose (2008) discuss decoupling of business cycles in industrial countries and emerging Asian economies.
- In turn, Jayaram et al. (2009) find an increasing degree of Indian business cycle synchronization with developed countries.

# Starting Hypotheses

We extend the discussion by:

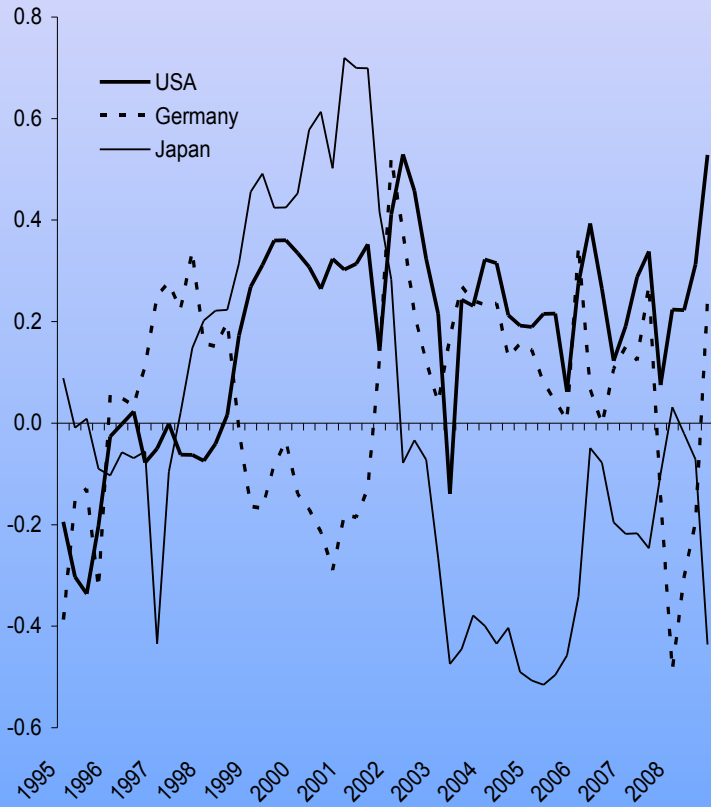
- We will analyze the synchronization and decoupling of Chinese and Indian business cycles with the OECD business cycles.
- We present dynamic correlation analysis because China and India may specialize on specific production phases with production cycles at different frequencies.
- We look whether increasing trade ties lead to higher correlation of business cycles.
- We analyze the impact of the financial crisis in 2008.

# Data Description

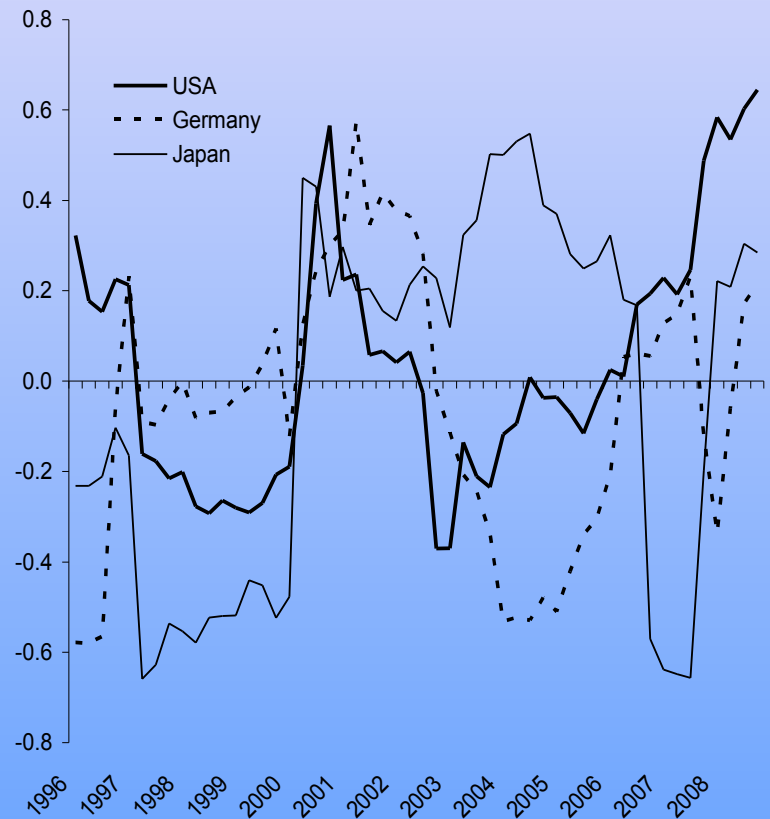
- For OECD countries, we use IMF quarterly GDP data starting already before 1992 (used for seasonal adjustment).
- For India, we use IMF data between 1993 and 2008.
- For China, we use national quarterly data in current prices according to national sources (the series were revised recently but only for annual frequency). Data is deflated by the CPI.
- All time series are seasonally adjusted by the census X12 and transformed to the logs and first differences.

# Moving correlations of GDP growth rates

## China



## India



# Dynamic Correlation Analysis

- Correlation analysis is a standard tool for investigating the international business cycles, which is extended in dynamic correlation analysis proposed by Croux (2001) :

$$\rho_{xy}(\lambda) = \frac{C_{xy}(\lambda)}{\sqrt{S_x(\lambda)S_y(\lambda)}}$$

- $\rho(\lambda)$  is the dynamic correlation between the real waves of frequency  $\lambda$ ;
- $S_x$  and  $S_y$  are the spectra of time series  $x$  and  $y$ , respectively;
- $C_{xy}$  is the cross-spectrum of both time series.

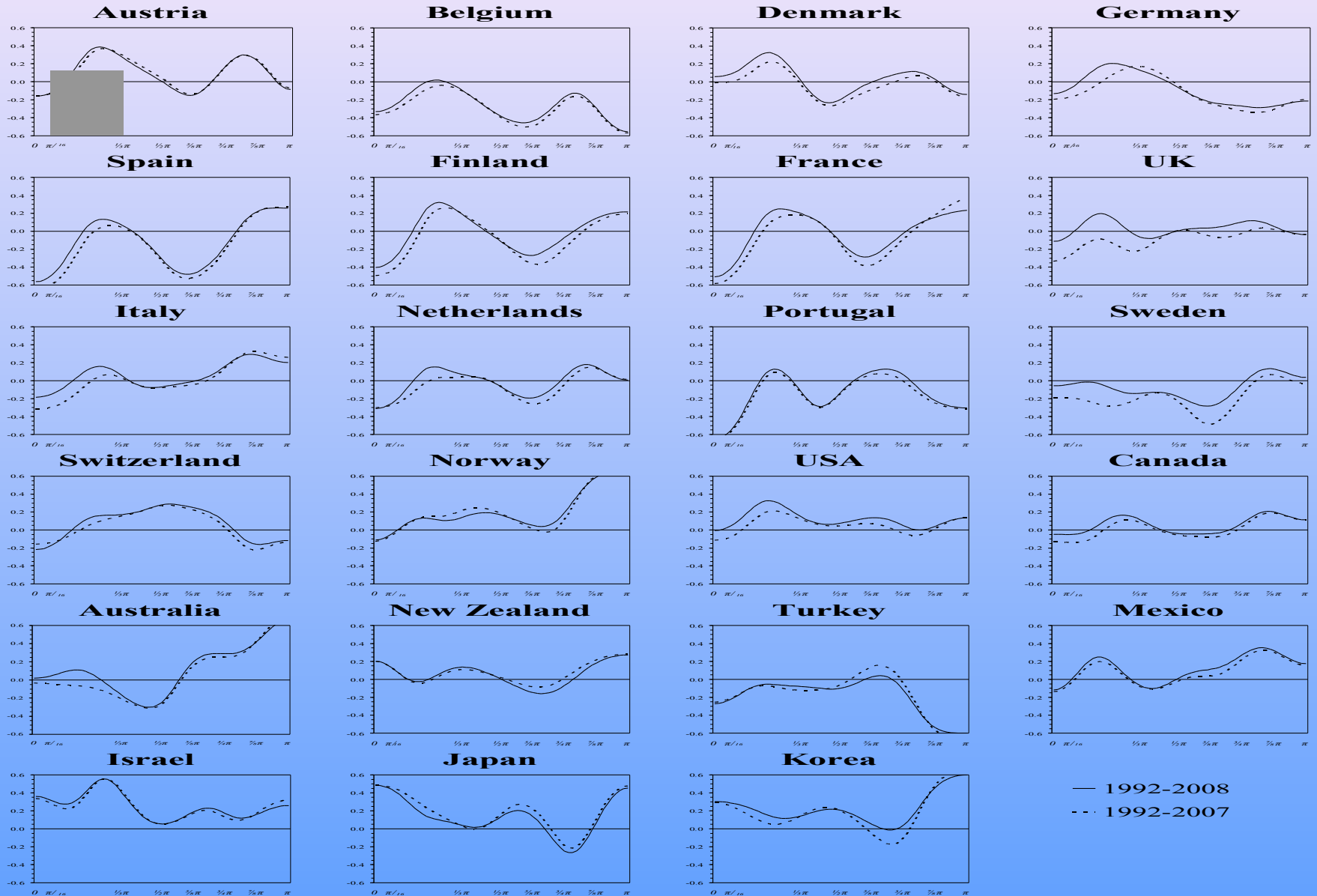


# Decomposition of Cyclical Developments

It is obvious to differ between three components of the aggregate correlation:

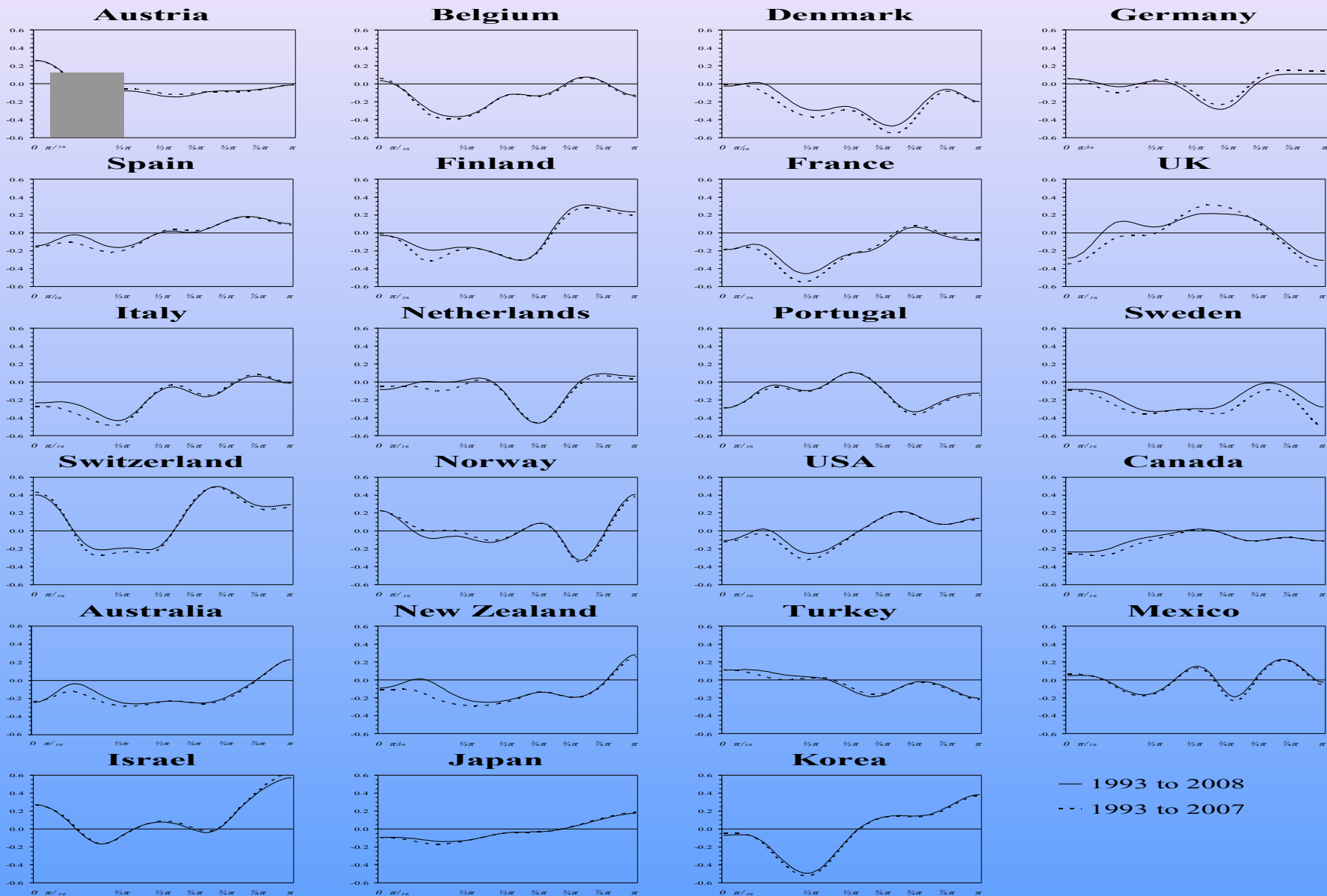
- I. The *long-run cyclical movements* (over 8 years) are defined by frequencies below  $\pi/16$ .
- II. The traditional *business cycle* frequencies (cycles with a period between 1.5 and 8 years) are defined between  $\pi/16$  and  $\pi/3$ .
- III. Finally, the *short-run cyclical movements* (less than 1.5 years) are defined by frequencies over  $\pi/3$ .

# Dynamic Correlations between China and Selected Countries



— 1992-2008  
- - - 1992-2007

# Dynamic Correlations between India and Selected Countries



# Determinants of business cycle correlation

- Our previous results (Bátorová et al. 2008) show that countries trading more extensively with China and India also have higher correlation of business cycles
- We estimate the following equation for all frequencies  $\lambda$  (as well as for the static correlation) and denote with  $x_j$  the average of exports and imports between 1995 and 2006) between OECD country  $j$  and China or India to GDP of the particular OECD country

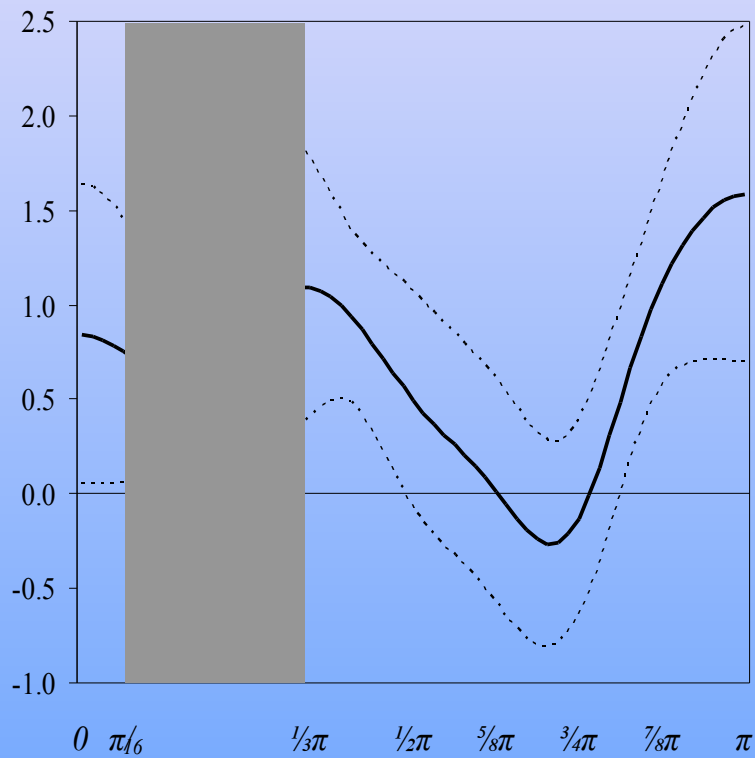
$$\rho_j(\lambda) = \beta_1(\lambda) + \beta_2(\lambda) \log(x_j) + \varepsilon_j(\lambda)$$

# Determinants of business cycle correlation (Regression Results)

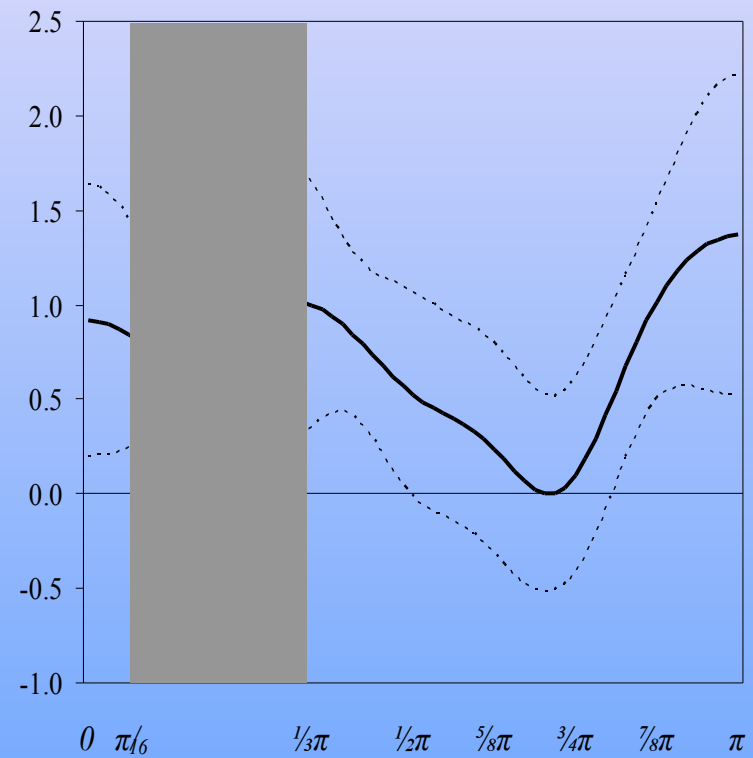
	Static correlation		Business cycle frequencies		Long-run frequencies		Short-run frequencies	
	1992-2007	1992-2008	1992-2007	1992-2008	1992-2007	1992-2008	1992-2007	1992-2008
	$\beta_1$	-0.090 <sup>***</sup> (-3.927)	-0.064 <sup>***</sup> (-3.057)	-0.125 <sup>***</sup> (-4.409)	-0.066 <sup>**</sup> (-2.526)	-0.151 <sup>***</sup> (-3.087)	-0.126 <sup>***</sup> (-2.820)	-0.060 <sup>**</sup> (-2.308)
$\beta_2$	0.719 <sup>***</sup> (2.835)	0.722 <sup>***</sup> (3.130)	0.859 <sup>***</sup> (2.737)	0.892 <sup>***</sup> (3.062)	0.821 (1.518)	0.899 <sup>*</sup> (1.808)	0.586 <sup>**</sup> (2.041)	0.622 <sup>**</sup> (2.298)
$N$	46	46	46	46	46	46	46	46
$\bar{R}^2$	0.135	0.164	0.126	0.157	0.028	0.048	0.066	0.087

# Regression Results for Trade Intensity by Frequencies

**1992-2007**



**1992-2008**



# Conclusions

- China has a special position in the world business cycles. Nearly all countries show a positive correlation only for the very short-run economic developments (supplier linkages). For India the dynamic correlations are even lower.
- However, countries with more intensive economic links with China and India show higher correlations of output movements, and this effect is most pronounced at the business cycle frequencies.
- The current crisis has clearly increased the business cycle correlation between the two Asian emerging economies and the OECD countries, as the shocks e.g. to the international trade have been so severe.

Thank you for Attention



# Comparison of our Results with Jayaram, Patnaik and Shah (2009)

- JPS' paper is a great paper with broad sensitivity analysis and a deep knowledge of Indian economy.
- The main differences between the papers are:
  - JPS use industrial production (FK: GDP);
  - JPS concentrate on the USA and the aggregate of 22 ICs;
  - Index of concordance vis-à-vis output correlations;
  - Stronger emphasis on the recent period (2003-2008).
- The results of both papers are remarkably similar when directly comparable. Both paper show low synchronization for the whole period, which is increasing recently.
- Is the increase because of strong recent shocks or is there a trend in business cycle synchronization?
- Is the glass half empty or half full?