# The Difference in Development Stages and the Costs of Monetary Union

## —A New Open Economy Macroeconomics model

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## Outline of the presentation

1. Introduction
2. The difference in development stages - A sectoral point of view.
3. The model
4. Calibration results and the transmission mechanisms of shocks
5. Concluding remarks

# Introduction (1)

- Recently there has been a wide discussion of introducing a common currency (CC) for East Asia, which is motivated by the following factors:
- The recognition of the vulnerability of the unilateral dollar-peg regime after the Asian crisis 1997-98
- The rapidly-prevailing economic integration in the region
- The successful launch of the euro in Europe

# Introduction (2)

- In this discussion, it is often argued that a CC would be difficult for East Asia *because countries in the region are at different development stages*.
- It is not clear why?
- In addition, how to define the difference in development stages is also an important issue.

## The Costs of Monetary Union (1)

According to the theory of Optimum Currency Area,

- One of the main costs of MU is the cost arising when the countries have to give up their monetary policy autonomy.
- This cost will be relatively small if shocks occurring in these countries are *symmetric*.

## The Costs of Monetary Union (2)

- This argument takes for granted the condition that the economies respond similarly to a symmetric shock.
- This condition may not hold if the countries are at different development stages because they have different economic structures.
- Then, the problem is when the countries are at different development stages, what happen to their responses to a symmetric shock.

## This paper (1)

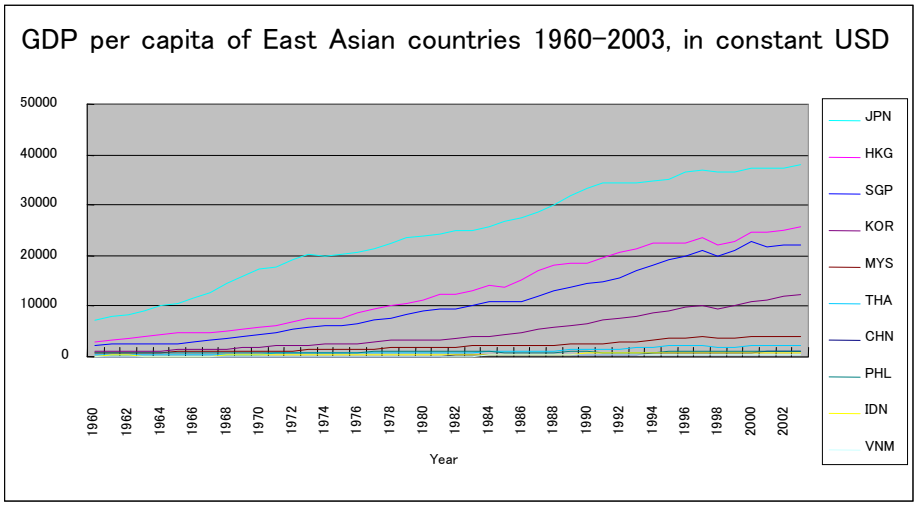
- Gives an explicit definition of the concept 'difference in development stages' by looking at the differences in sectors between the countries.
- Based on that, builds a theoretical model that is suitable to analyze the effects and the transmission mechanisms of various kinds of symmetric shocks.

## This paper (2)

- The model in this paper differs from other models built so far in the NOEM literature in one main point: It emphasizes the importance of resource allocation across sectors to the transmission of shocks.
- It also has some advantages over existing empirical studies on CCA in East Asia in two points.
  - able to specify the transmission mechanism of shocks.
  - able to study the CC regime which does not exist yet in the region.

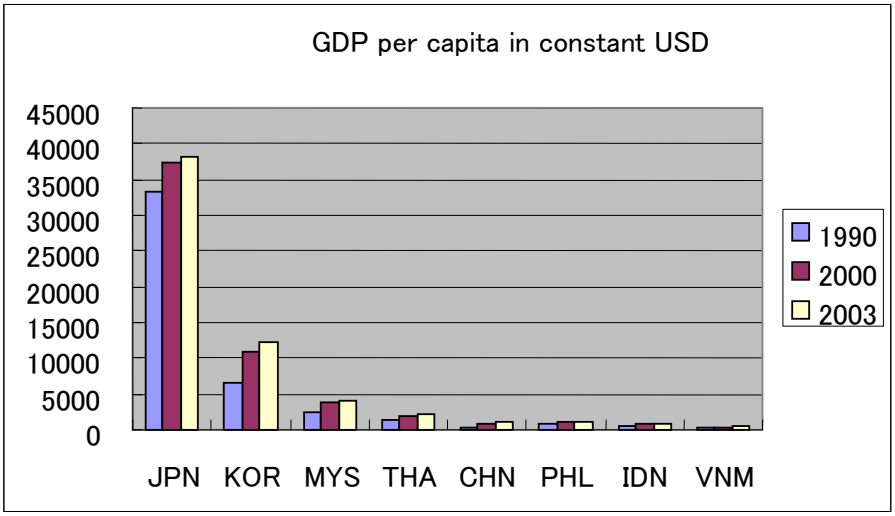
# The difference in development stages

## -A sectoral point of view (1)



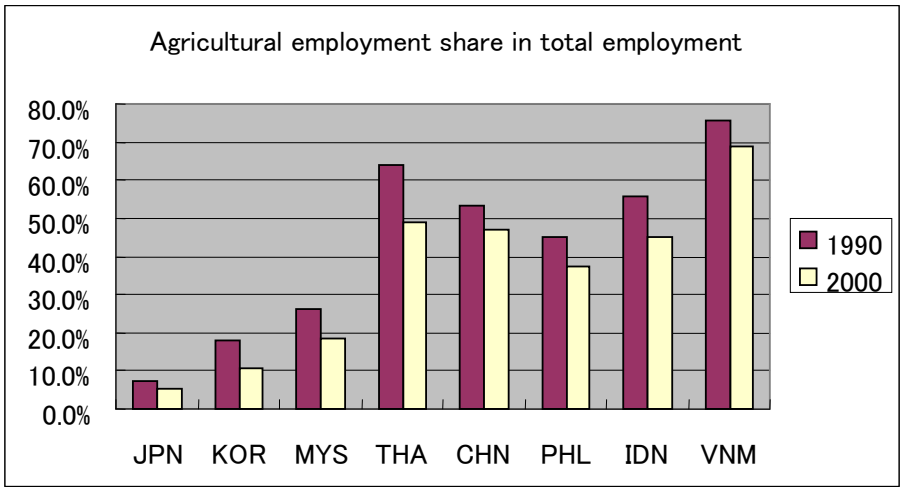

# The difference in development stages

## -A sectoral point of view (2)



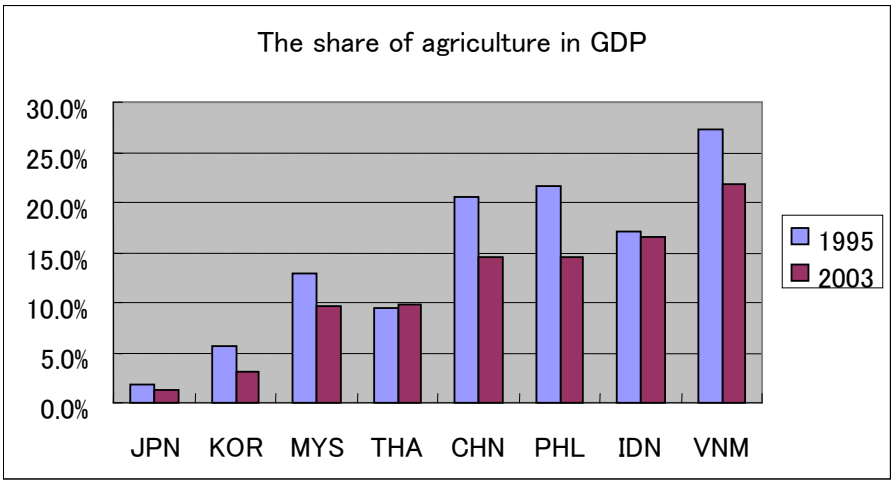
# The difference in development stages -

## -A sectoral point of view (3)



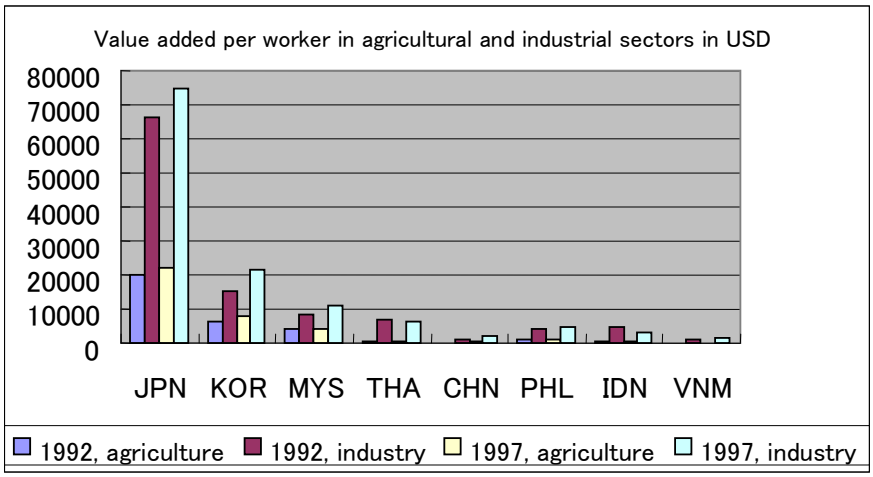

# The difference in development stages

## -A sectoral point of view (4)



# The difference in development stages

## -A sectoral point of view (5)




# The difference in development stages -

## -A sectoral point of view (6)

Summarize: in comparison with a developed country, a developing country will

- have a relatively large agricultural sector in terms of both output and employment.
- have technology level which is lower in industrial sector, and much lower in agricultural sector.
- have an excess of labor in the agricultural sector

(from the development experience of Japan in the past and China and Vietnam today) .

## The difference in development stages -
-A sectoral point of view (7)

Differences between agricultural and industrial sectors

- Agricultural goods are better substitutes of one another than industrial goods.
- Prices are more flexible for agricultural goods than for industrial goods

## The NOEM literature (1)
-The model of Obstfeld and Rogoff (1995)

- A dynamic structure
- Micro-foundation: taking into account the behavior of each individual household and firm
- Monopolistically competitive firms
- Nominal rigidities in the short run
- The adjustment to shocks are described in 3 periods: the steady state, short run and long run.

## The NOEM literature (2)

-The model of Obstfeld and Rogoff (1995)

- Two countries, which are completely symmetric in structure (except for population).
- One sector
- Consumer-laborer-producer setting

## This paper (3)

- Inherits the main characteristics noted above.
- However, extends to two sectors, namely the agricultural (T) and industrial (M) sectors, which are different in
  - technology level,
  - elasticity of substitution between goods,
  - degree of price rigidity

## This paper (4)

- The two countries, namely the developed and developing countries are now different in many aspects such as
  - the relative size of sector,
  - technology level,
  - the degree of ‘labor excess’ in the agricultural sector
- The assumption consumer-laborer-producer is revised to allow labor to move across sector.

## The model (1)

- The world consists of two countries, TH and JP.
- Each economy has two sectors, T and M.
- All goods are traded
- Labor is freely mobile domestically, but not internationally.
- There are no restrictions or impediments to capital mobility across countries.
- There are households, firms and the government in each country.

# The model (2)

- The (representative) household maximizes its lifetime utility function given below,

$$U_0(x^j) = \sum_{t=0}^{\infty} \beta^t u_t(x^j)$$

with the periodic utility

$$u(x^j) = \ln C(x^j) - \frac{\kappa}{2}\left[h(x^j)\right]^2 + \chi \ln\left[\frac{M(x^j)}{P^j}\right]$$

under the budget constraint

$$M_t(x^j) + P_t^j B_t(x^j) = (1 + r_{t-1}^j) P_t^j B_{t-1}(x^j) + M_{t-1}(x^j) - P_t^j C_t(x^j) - P_t^j T_t(x^j)$$
$$+ W_t^j h_t(x^j) + \gamma_{T,j} \prod_t (z^{T,j}) + (1 - \gamma_{T,j}) \prod_t (z^{M,j})$$

# The model (3)

- The household's consumption basket comprises of agricultural and industrial goods of TH and JP (CES function)

$$C(x^j) = \left[ (C(x_T^j))^{(1-\rho)/\rho} + (C(x_M^j))^{(1-\rho)/\rho} \right]^{\rho/(1-\rho)}$$

where

$$C(x_T^j) = \left[ \left( \int_{z_j^{T,TH}} c(x^j, z_j^{T,TH}) dz_j^{T,TH} \right)^{(\theta_T - 1)/\theta_T} + \left( \int_{z_j^{T,JP}} c(x^j, z_j^{T,JP}) dz_j^{T,JP} \right)^{(\theta_T - 1)/\theta_T} \right]^{\theta_T/(\theta_T - 1)}$$

$$C(x_M^j) = \left[ \left( \int_{z_j^{M,TH}} c(x^j, z_j^{M,TH}) dz_j^{M,TH} \right)^{(\theta_M - 1)/\theta_M} + \left( \int_{z_j^{M,JP}} c(x^j, z_j^{M,JP}) dz_j^{M,JP} \right)^{(\theta_M - 1)/\theta_M} \right]^{\theta_M/(\theta_M - 1)}$$

# The model (4)

- The government consumes goods in the same way as the household.
- Its budget constraint is as follows,

$$G_t^j = \frac{M_t^j - M_{t-1}^j}{P_t^j} + T_t(x^j)$$

# The model (5)

- The monopolistically competitive firm with the following production function

$$y(z^{k,j}) = A_{k,j}[h(z^{k,j})]^{\alpha_{k,j}}$$

maximizes its profit given below,

$$\prod(z^{k,j}) = p(z_j^{k,j})y(z_j^{k,j}) + S^{j/f}p(z_f^{k,j})y(z_f^{k,j}) - W^j h(z^{k,j})$$

# The model (6)

- Market equilibria

  Labor market $h(x^j) = \gamma_{T,j} h(z^{T,j}) + (1-\gamma_{T,j}) h(z^{M,j})$

  UIP $1 + i_t^j = \frac{S_{t+1}^{j/f}}{S_t^{j/f}}(1 + i_t^f)$

  Bond market $nB^{TH} + (1-n)B^{JP} = 0$

  Fisher equation $1 + i_t^j = \frac{P_{t+1}^j}{P_t^j}(1 + i_t^f)$

- The common currency regime

$$S_t^{j/f} = 1$$

# The model (7)

- Put all equations derived above and solve for the steady state (SS)(where the amount of bond holding is zero in both country).
- In the presence of a shock the dynamics of the economy are described by three period: the SS, the long run (new SS), and the short run (the adjustment period).
- Four kinds of shocks are generated: tech. shocks to sectors M and T, monetary and gov. spending shocks.
- All shocks are *positive* (with an amount of 1%), *permanent* and *symmetric* to both countries.

# The model (8)

Quantitative method:

- Since it is difficult to solve for the solution analytically, a numerical method is adopted.
- The numerical method adopted in this paper has one strong point in that it can solve for the exact solution without linearizing.

# Main findings – Results (1)

- Table 2-4 **Case 4: All asymmetries together**

$A_{T,TH} = \exp(0), A_{T,JP} = \exp(1.2), A_{M,TH} = \exp(1.0), A_{M,JP} = \exp(2.8)$

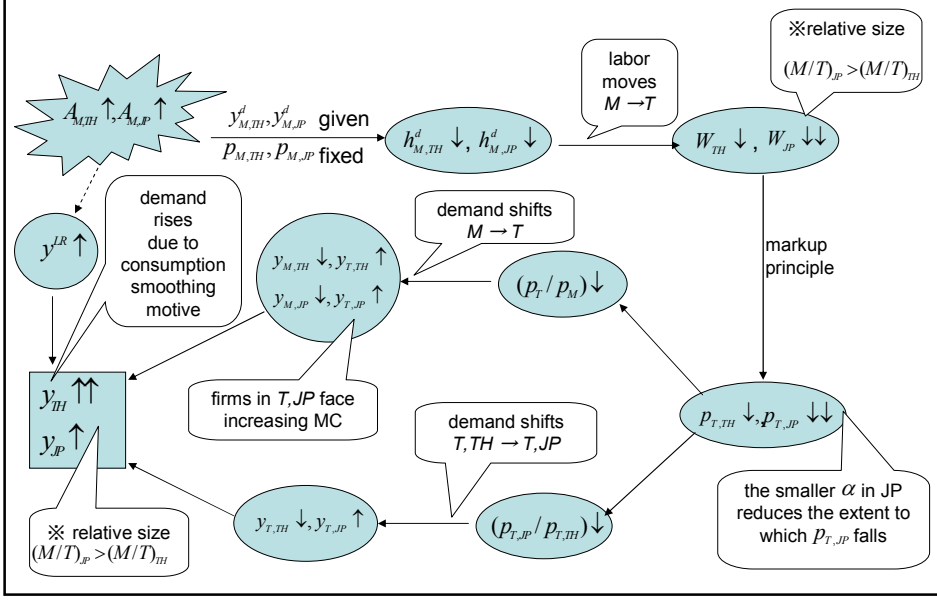
$\alpha_{T,TH} = 1, \alpha_{T,JP} = \alpha_{M,TH} = \alpha_{M,JP} = 0.5$

$\gamma_{T,TH} = 0.5, \gamma_{T,JP} = 0.2$

| | 1% of money supply shock | | 1% of technology shock in sector M | | 1% of technology shock in sector T | | 1% of gov. spending shock | |
|---|---|---|---|---|---|---|---|---|
| | SR | LR | SR | LR | SR | LR | SR | LR |
| Real GDP of TH | **-0.01%** | 0.00% | **0.20%** | **0.22%** | 0.71% | **0.68%** | **0.09%** | 0.10% |
| Real GDP of JP | **0.83%** | 0.00% | **0.02%** | **0.86%** | -0.04% | **0.08%** | **0.21%** | 0.06% |

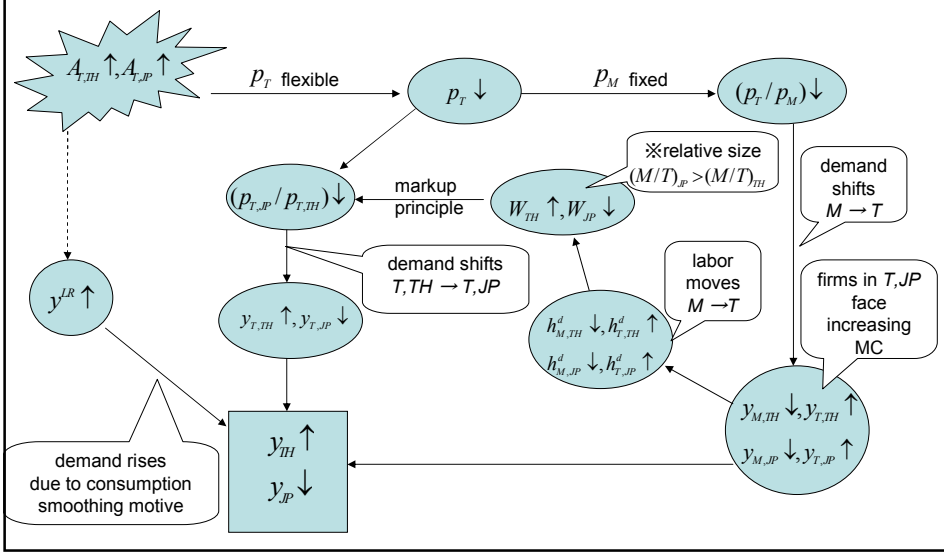
## Main findings – Transmission mechanisms of shocks (2)

The case of a symmetric technology shock to the *industrial* sector




## Main findings – Transmission mechanisms of shocks (3)

The case of a symmetric technology shock to the *agricultural* sector



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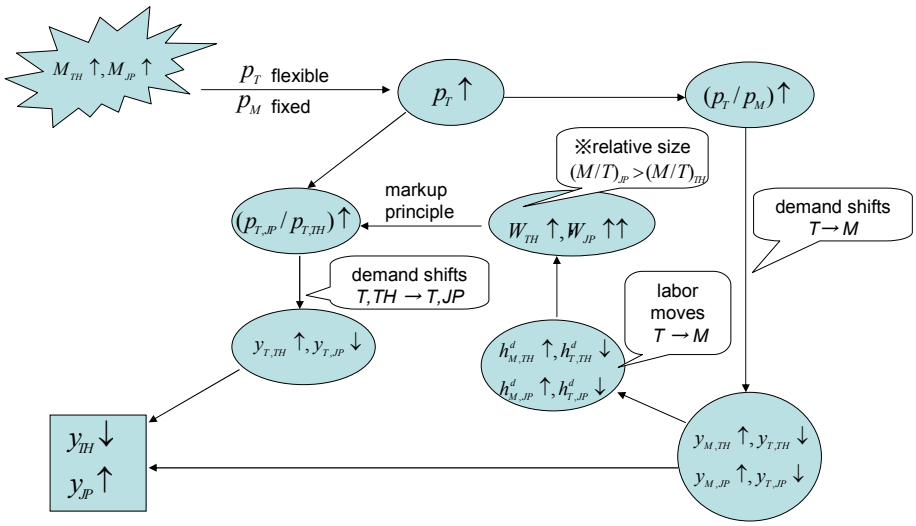


## Concluding remarks

- This paper builds a theoretical framework to give an answer to the question of how the difference in development stages affects the costs of monetary union.
- It finds that symmetric shocks, especially technology and money supply ones, can cause very different responses between the developed and developing countries which they hit. Also, in comparison with the long run, the responses in the short run predicted by the model are surprising.
- The results show that the difference in development stages is an important issue and should be taken in to account when considering forming a CCA.

## Concluding remarks

- In a future work, I shall try to extend the model to a three-country version will a fully dynamic structure and using data to estimate parameters such that they reflect better the reality in East Asia.

Thank you !