

# Industrial Structure and Trade Performance of the Wood Products in East Asia

Jun Ma  
Center for Far Eastern Studies,  
University of Toyama

# Motivation(1)

- important facts:

- Japan, China and Republic of Korea have become net importers of roundwood since 1960's.
- China has grown in importance as both a producer and consumer of forest products, is the largest producer and consumer of wood-based panels and paper, and the largest importer of industrial roundwood, sawnwood and fibre furnish, and the largest exporter of wood-based panels.
- The republic of Korea remained the fourth largest wood pellets importer in the world.
- Japan is a big fibre furnish exporter and producer and consumer of paper and paperboard. etc.

(Based on the FAO's forest products statistics)

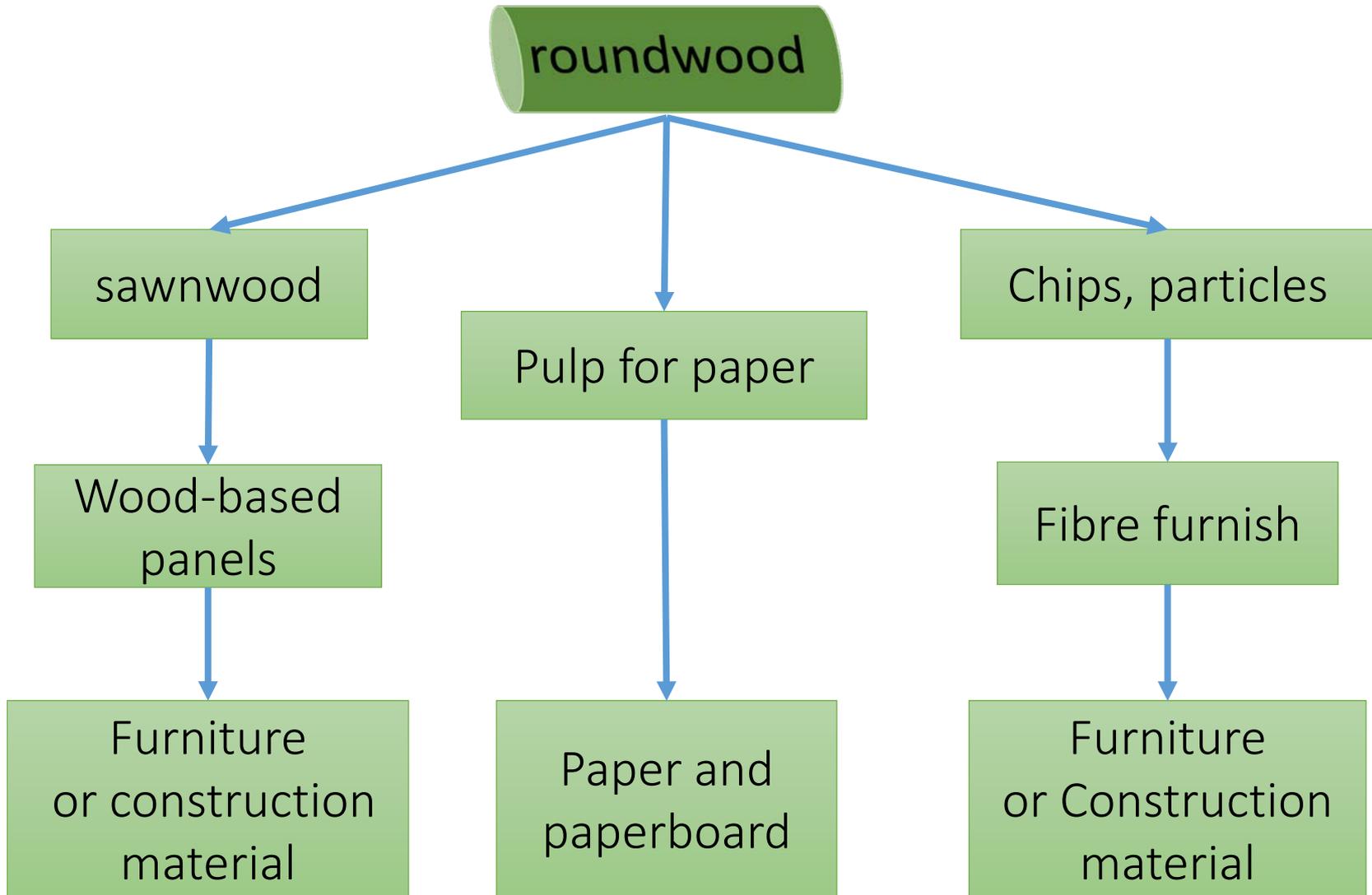
# Motivation(2)

- To compare and explain countries' relative competitiveness on the sector levels has received academic attention in the economics literature.
  - Heckscher-Ohlin model of international trade
    - Different nations should gain comparative advantage in products that use intensively those resource that the nations have an abundance of.
  - Uusivuori, Jussi and Tevo, Mikko(2002)
    - Provided panel data evidence on the question of how forest endowment and economic activity affect net exports of industrial roundwood and forest products by using a dataset of 18 OECD countries during 1977-1998. Gave a limited support to the Heckscher-Ohlin theorem in the group of countries which has been decreasing or stagnant on net exports of forest products.
  - Koebel, Bereand et al(2016)
    - Analysed the determinants of international trade of wood products: woodworking products, pulp and paper and wooden furniture by extending the heckscher-ohlin-Vanek framework based on data on European countries between 1995 and 2007.
    - And the HOV hypothesis is partially confirmed in that the forest resource endowment is a significant determinant for explaining differences in net trade of two products(pulp and paper, furniture)but not for woodworking products.

# Research Questions

- What kind of international specialization and Why is there in the wood industry among three countries?
- Which sector has a comparative advantage in this industry of each country?
- How do production and trade of roundwood, as a renewable resources, influence on production and exports of other wood products which is produced from roundwood in each country?
- How does the industrial structure ( or the value chain) affect the comparative advantage ( or trade performance ) of wood products in each country?

# Value Chain in wood industry



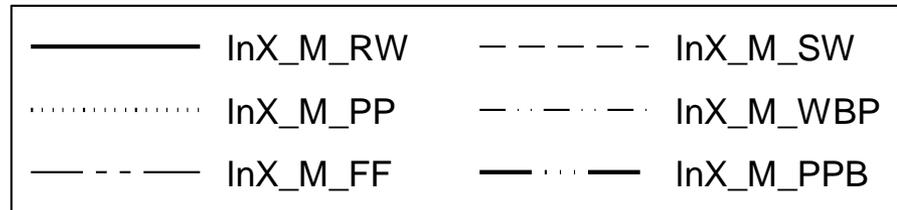
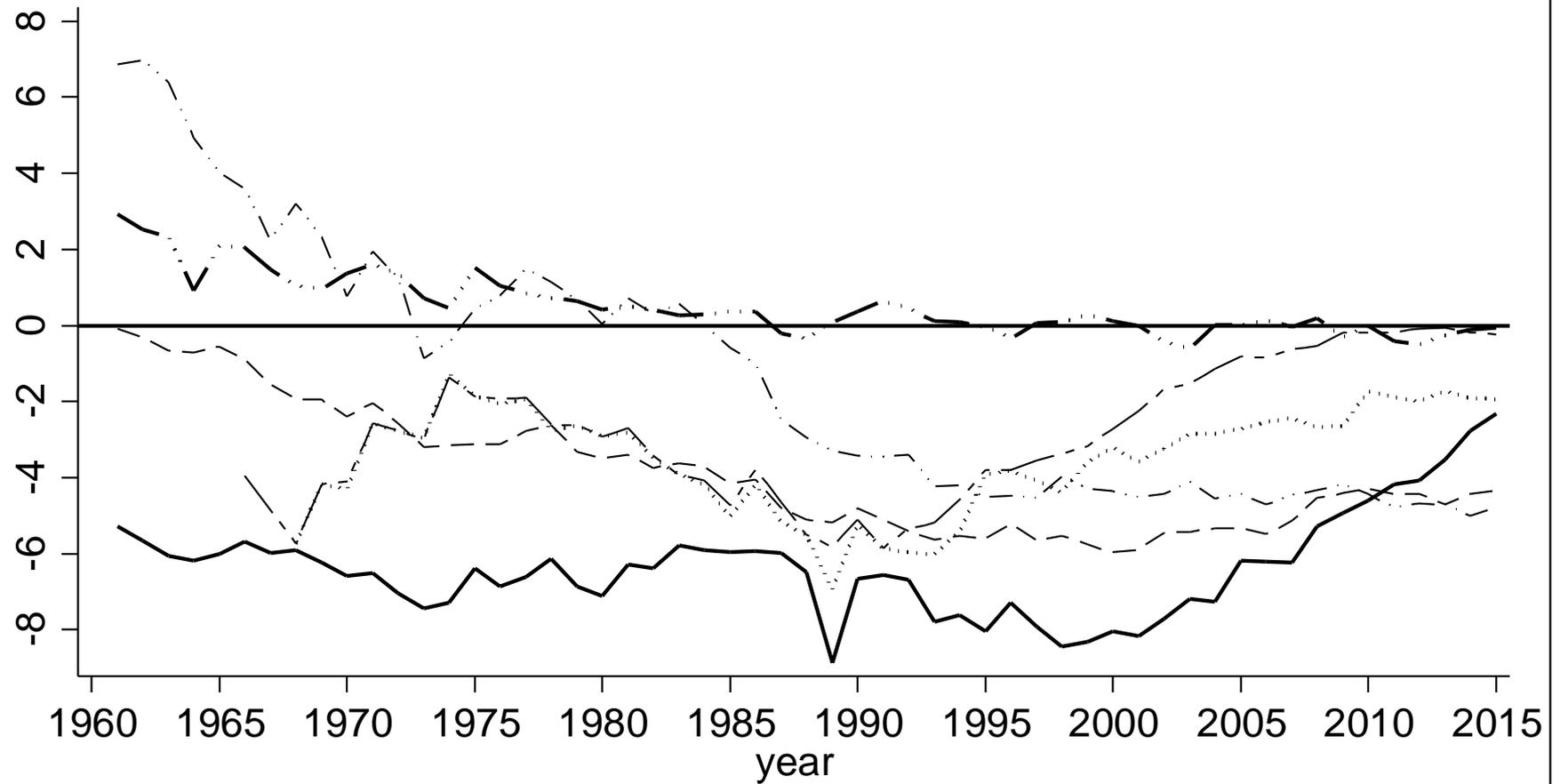
# Data

- The data for production of each product (by million cubic meters, excluding fuelwood) were obtained from FAOSTAT database.
- Imports and exports data for the calculation of net exports (by billion USDs) of Japan and China are based on the FAOSTAT statistics, while the corresponding data of Korea were obtained from UN COMTRADE database.
- The GDP(by constant 1990 USDs) data of three countries were obtained from World Bank database.

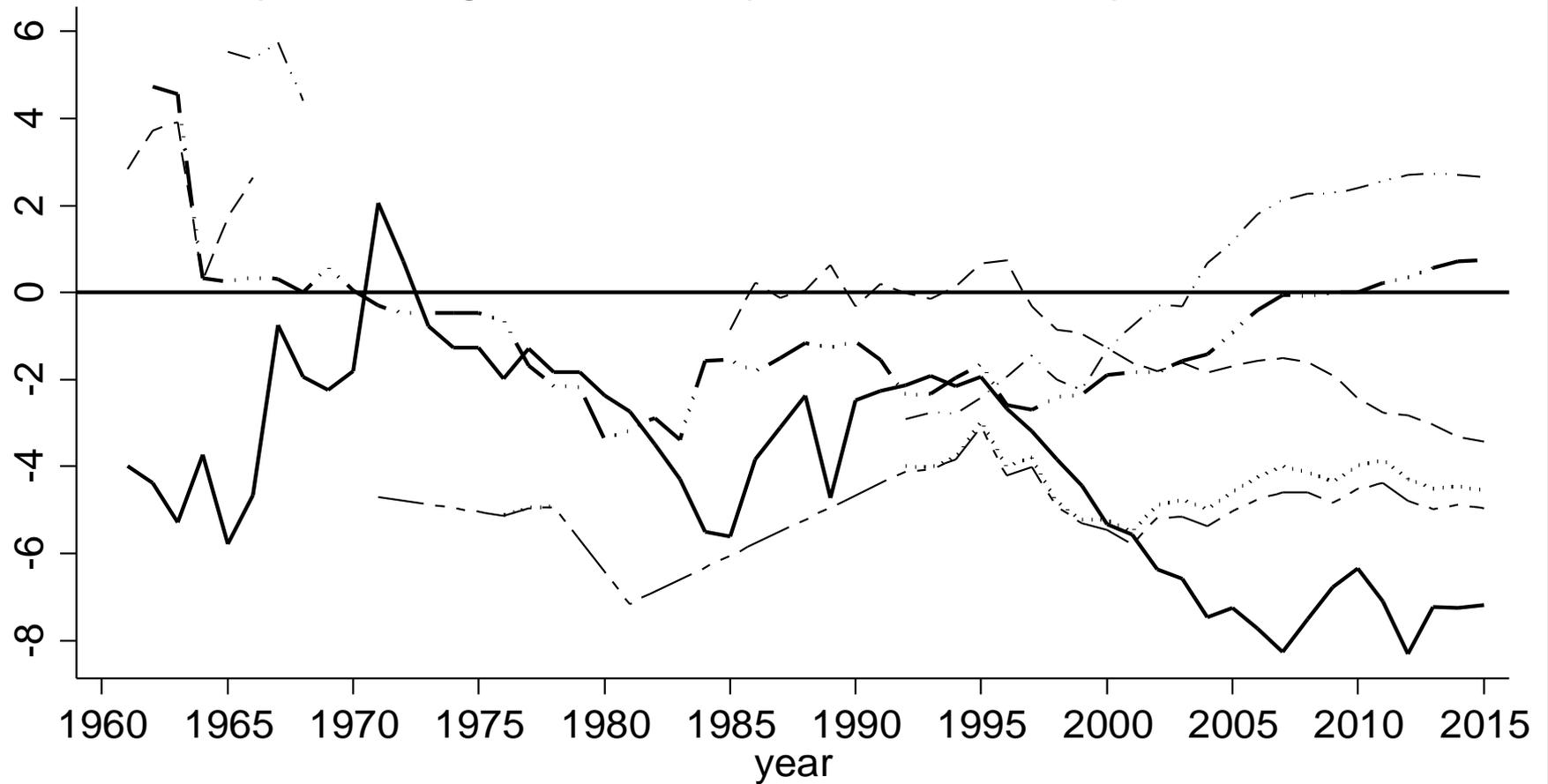
# Observed facts from time series data(1)

- Use a logarithmic net exports index ( $\ln(X) - \ln(M)$ ), where  $X$  and  $M$  represent exports and imports respectively in three countries during the period of 1962 to 2015.
- One similarities
  - all of the three countries are net importers of roundwood and pulp for paper.

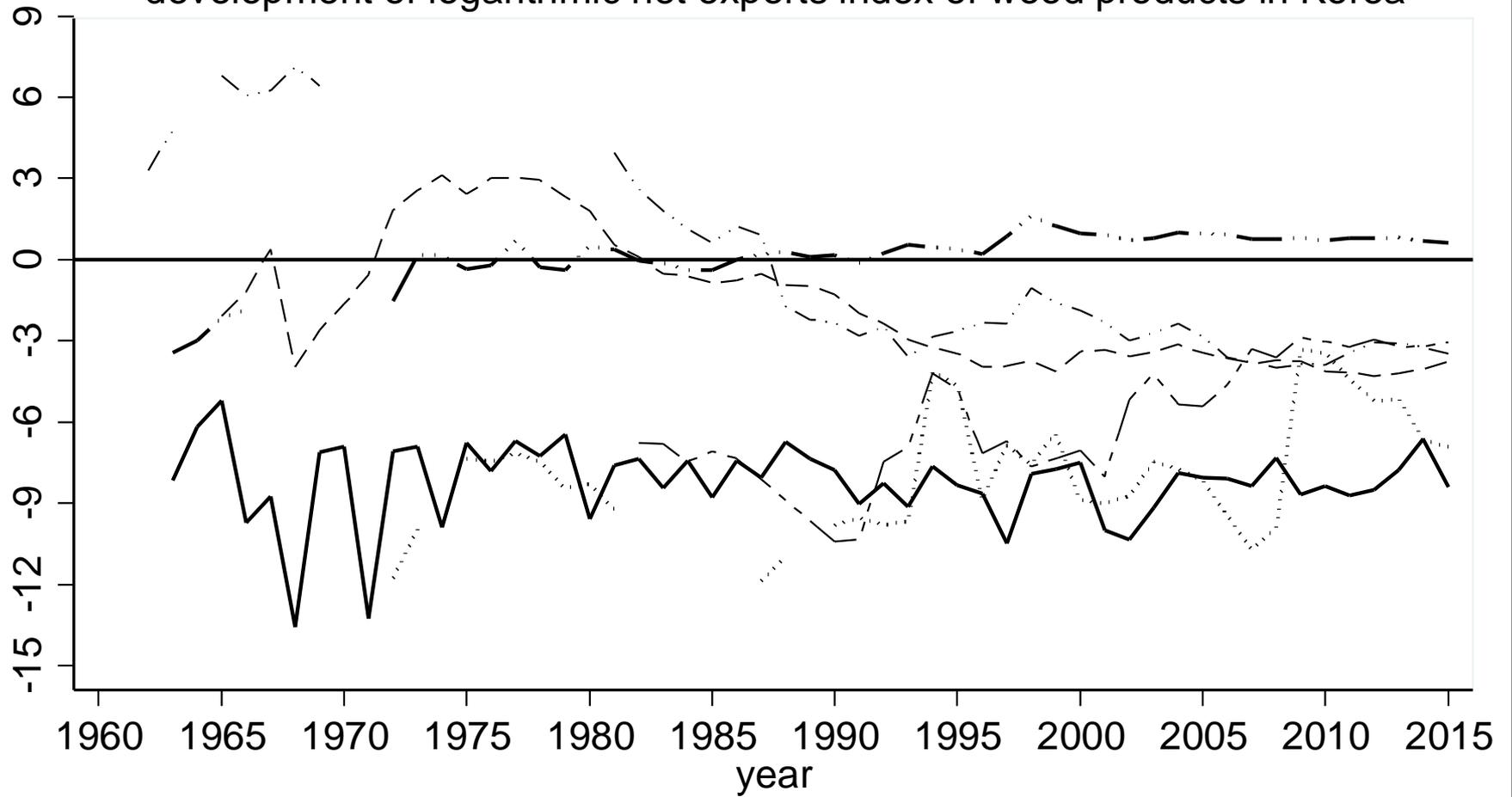
Development of logarithmic net exports index of wood products in Japan



Development of logarithmic net exports index of wood production in China



development of logarithmic net exports index of wood products in Korea



# Observed facts from time series data(2)

- Three main differences:
  - In wood-based panel sector, Japan and Korea has converted from a net exporter to a net importer from the middle of 1980 's which the tendency was expected to be further increased; Whereas China has become a net exporter from a net importer in around 2003, and the tendency is also being strengthened.
  - In sawnwood sector, the transition point from net exporter to net importer is different among three countries, which Japan was at beginning of 1960's, Korea was at beginning of 1980's, and China was at middle of 1990's.
  - In the case of paper-and-paperboard sector, while all of three countries are in moderate balanced status now, the processes to achieve that are totally different. Japan was changed from net exporter at beginning of 1980's; Korea was changed from net importer at middle of 1970's, while China switched from net importer into net exporter with a strong tendency since 2010.

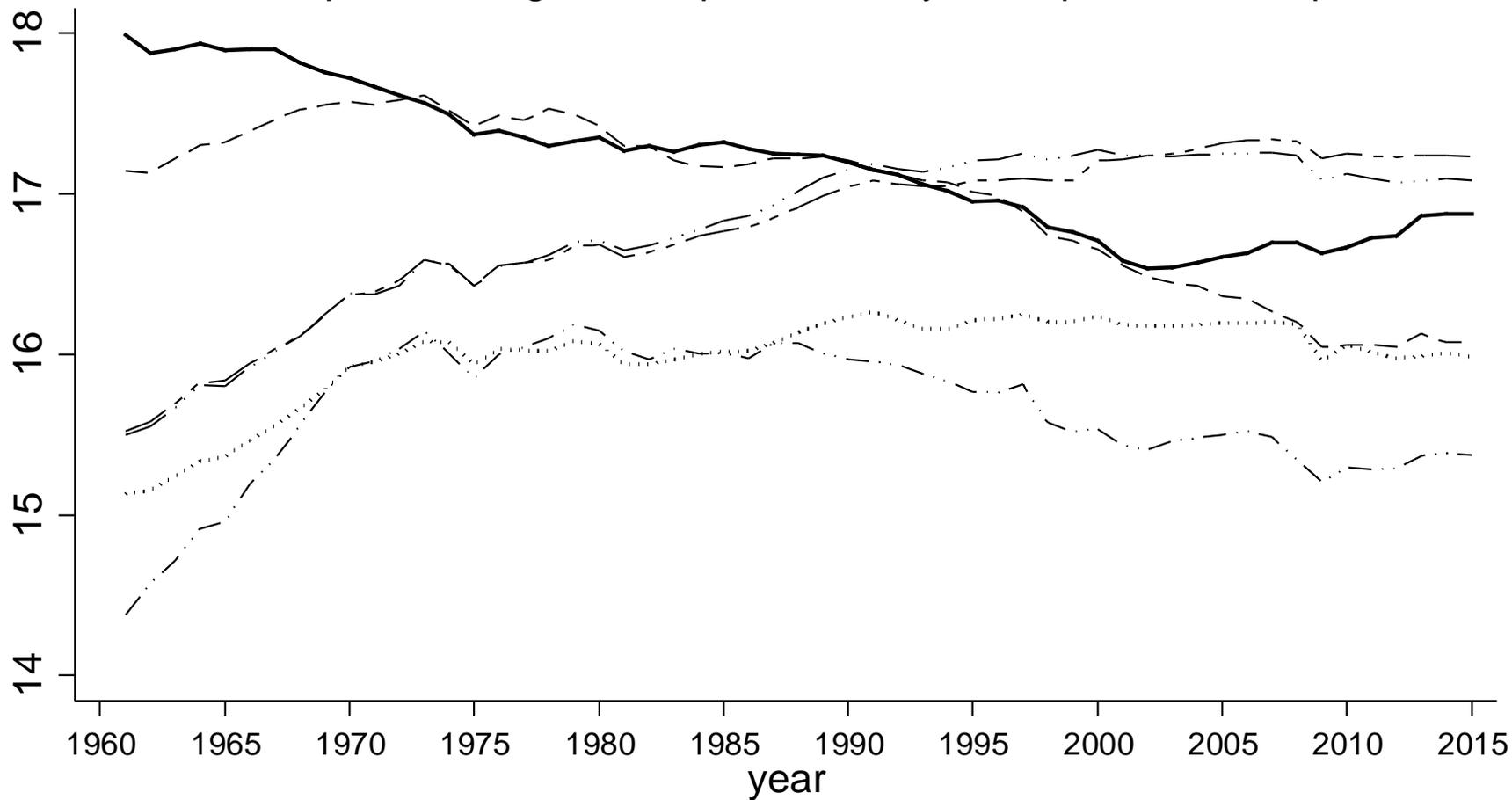
Which sector has a comparative advantage in this industry of each country?

- paper and paperboard in three countries, but relative, very small in Japan and Korea
- In addition, In China, wood-based panels

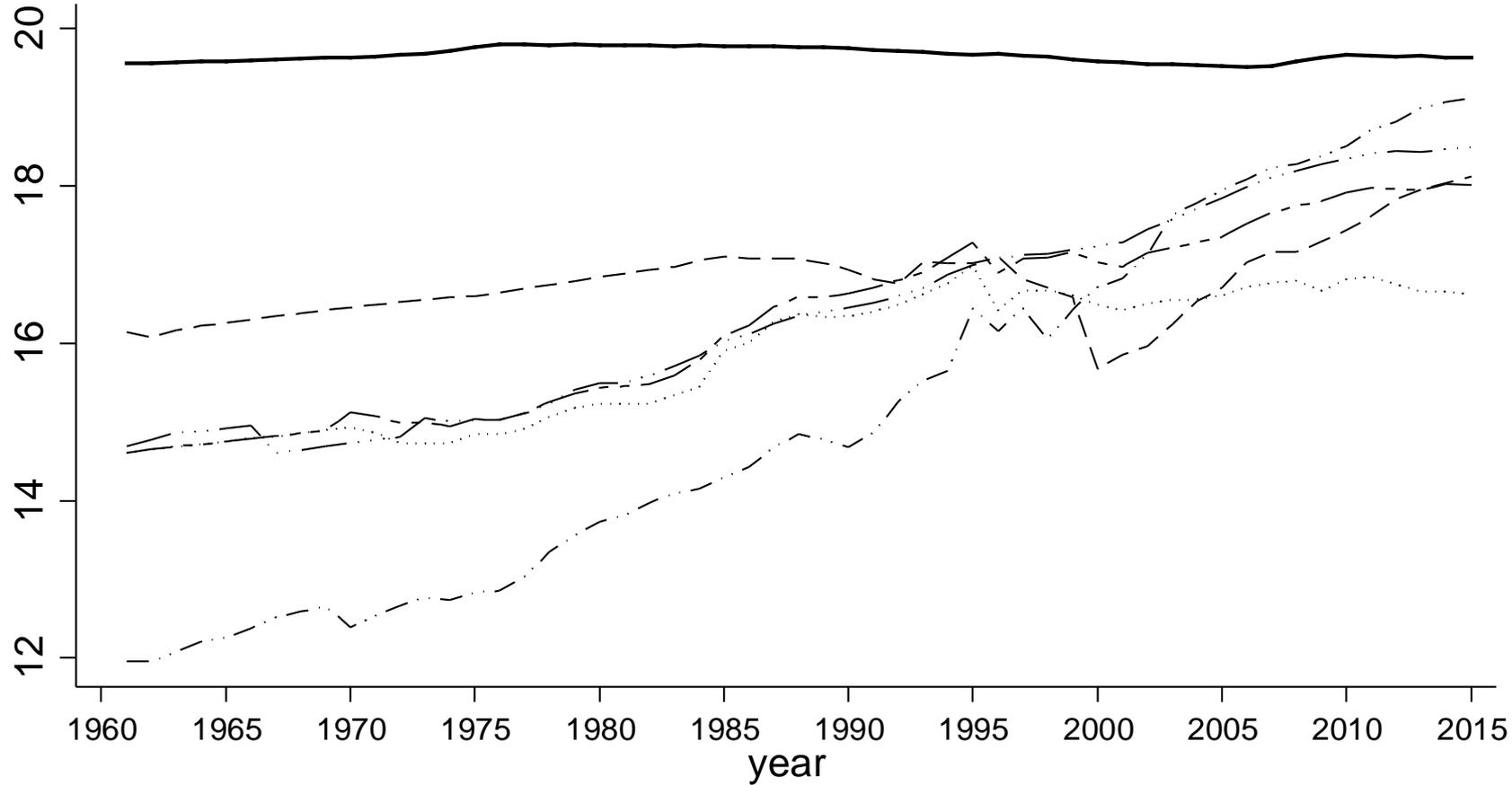
# Observed facts from time series data(3)

- The production of the roundwood
  - In Japan: decreased at first, reached its bottom in 2000, and grew steadily after that.
  - In china: is remained to be the highest level.
  - In Korea: has remained unchanged during the observed period
- The production of other products
  - In Japan and Korea, fibre furnish and paper-and-paperboard became the largest among all wood products from 1990's.
  - the production of pulp-for-paper is the lowest in China and Korea, but wood-based panel production is lowest in Japan.

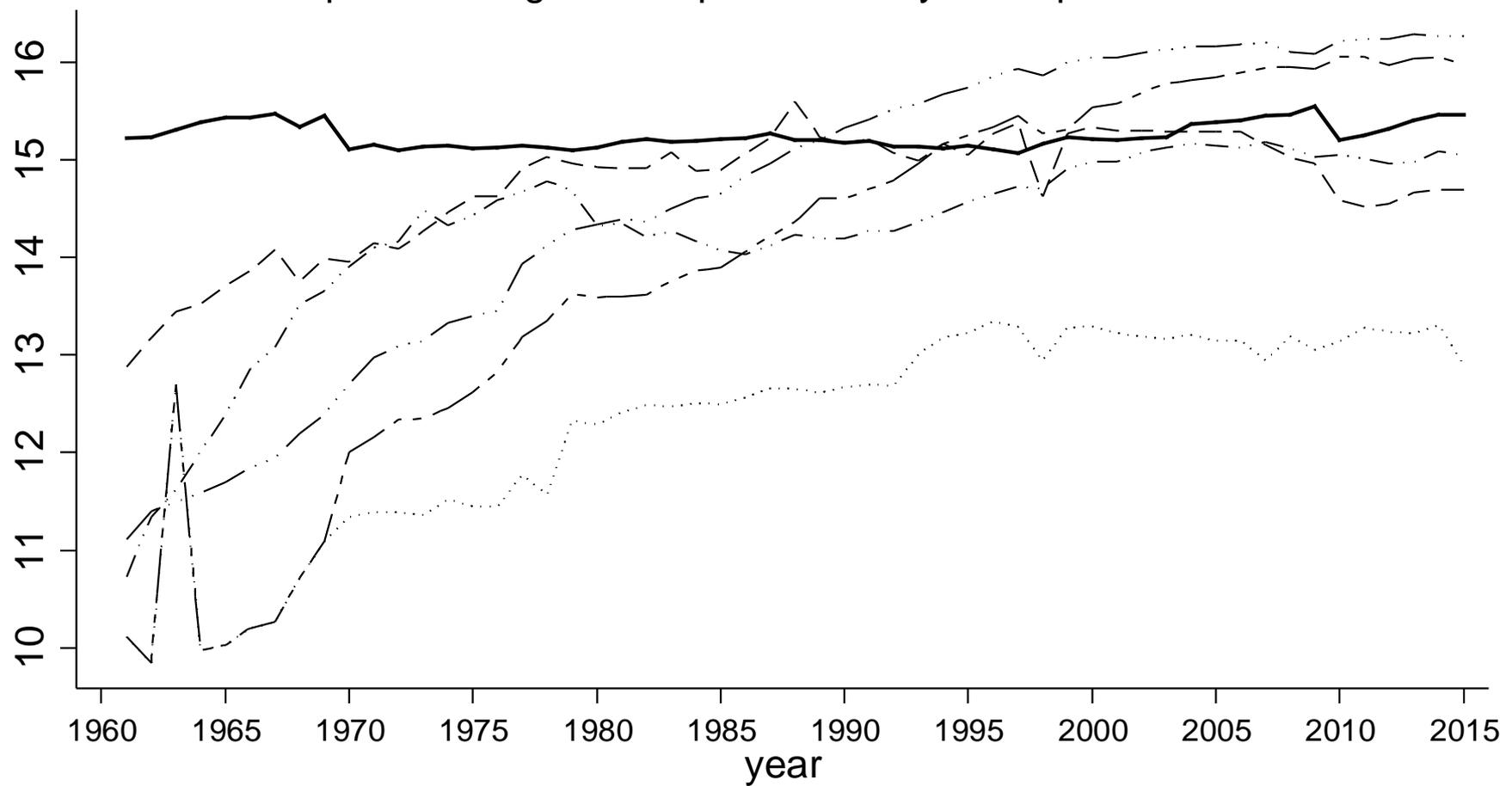
Development of logarithmic production by wood products in Japan



# Development of logarithmic production by wood products in China



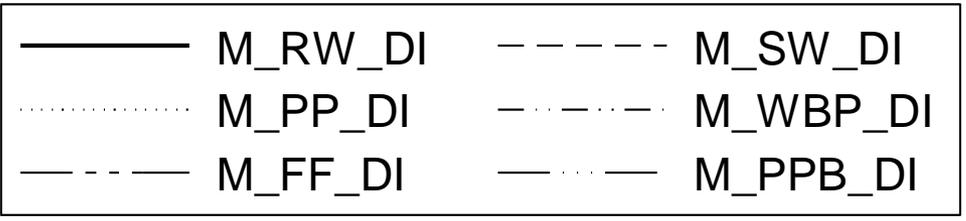
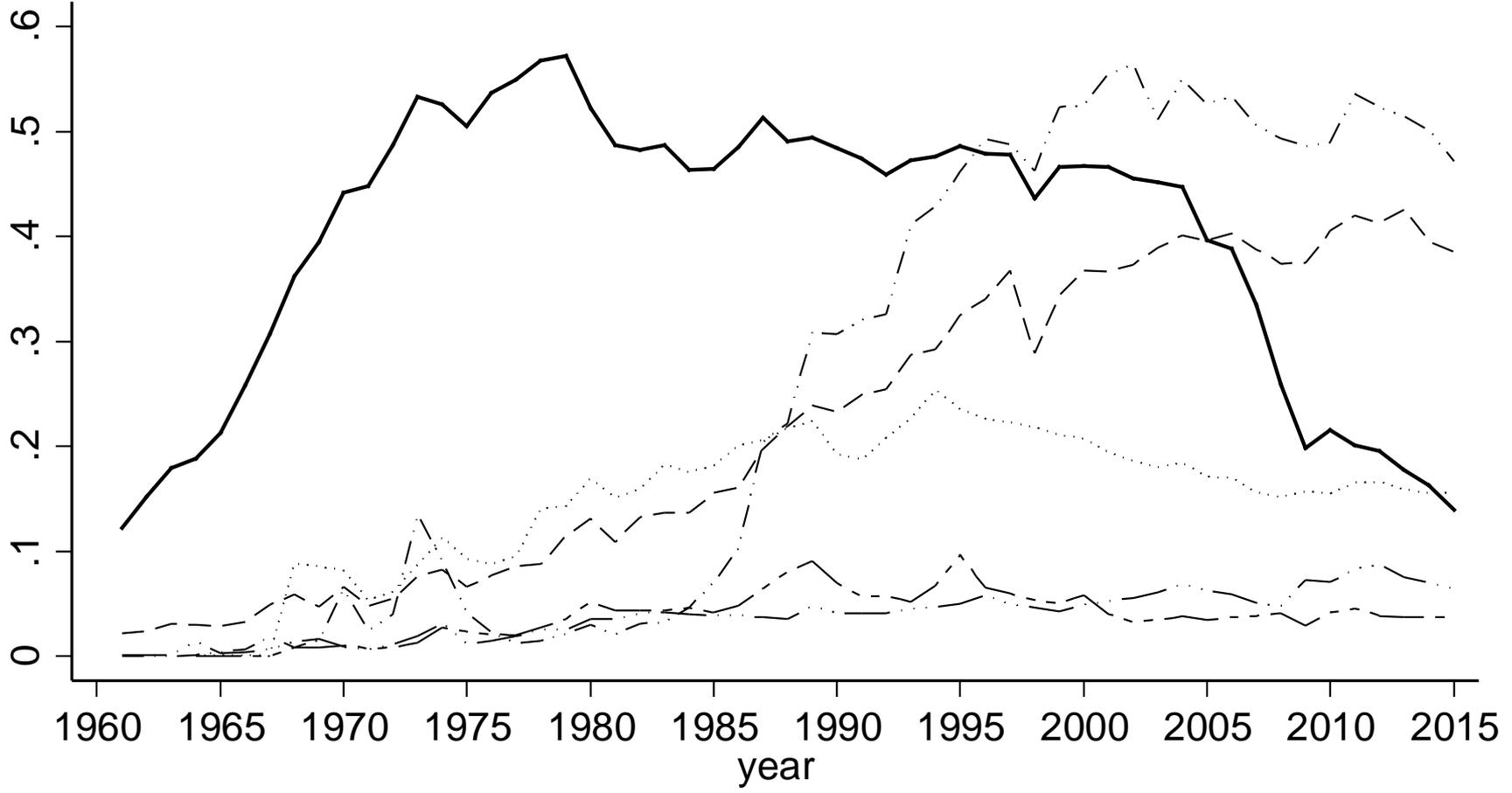
# Development of logarithmic production by wood products in Korea



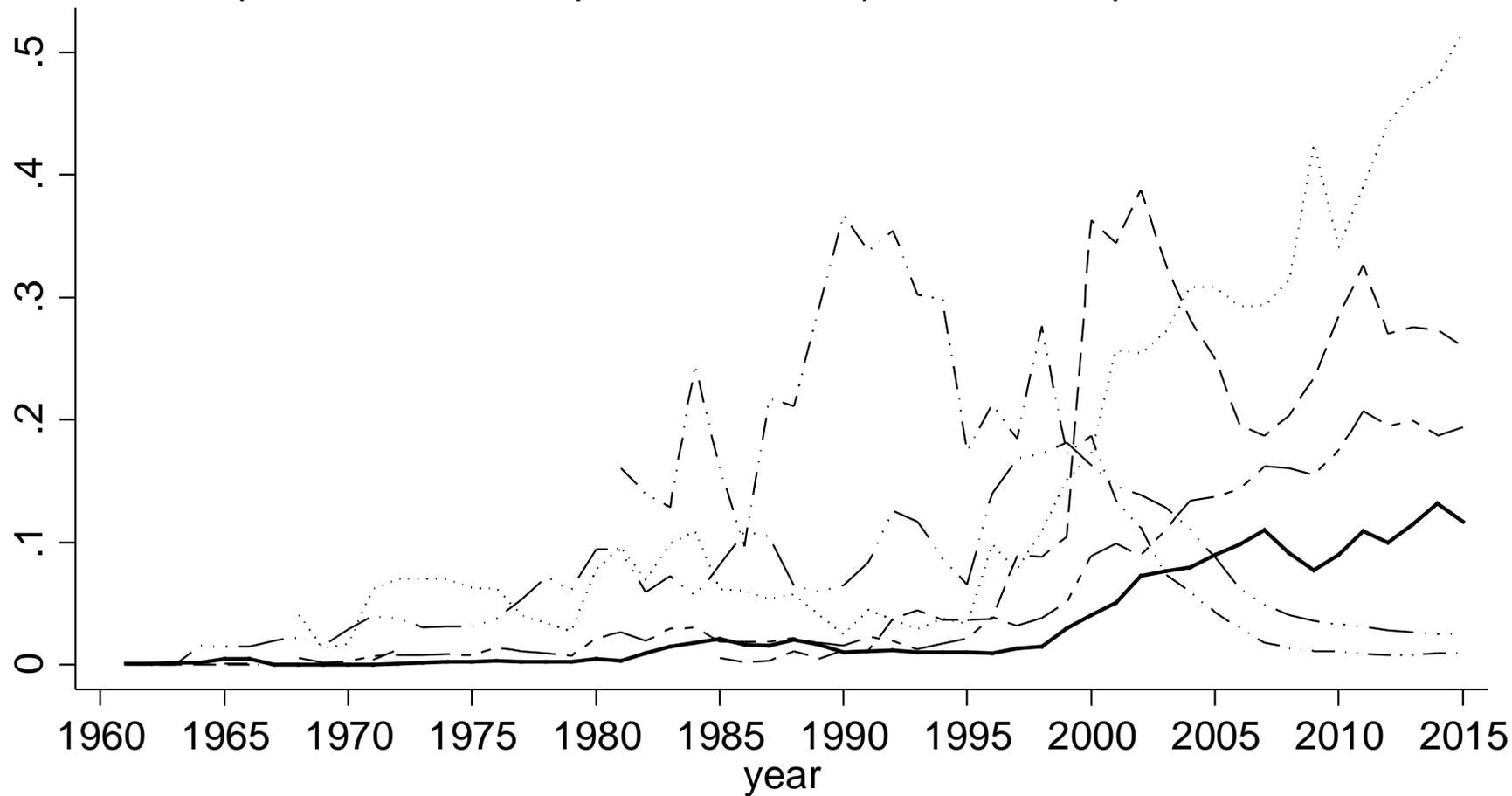
# Observed facts from time series data(4)

- Imports of **wood** products
  - Use a dependence on imports index( $M/(P+M)$ )
  - In Japan, roundwood has risen remarkably and began to fall gently after 2005, but still remained high level.
  - In china, roundwood was in a completely low level until 2000, but an upward trend has been shown after that, which leded a surpass against wood-based panel and paper-and-paperboard.
  - In Korea, roundwood rose until 1980, and remained a high level with fluctuation until the first half in 2000 's, and began to drop from 2005, then at a same level with sawnwood and wood-based panel at present.

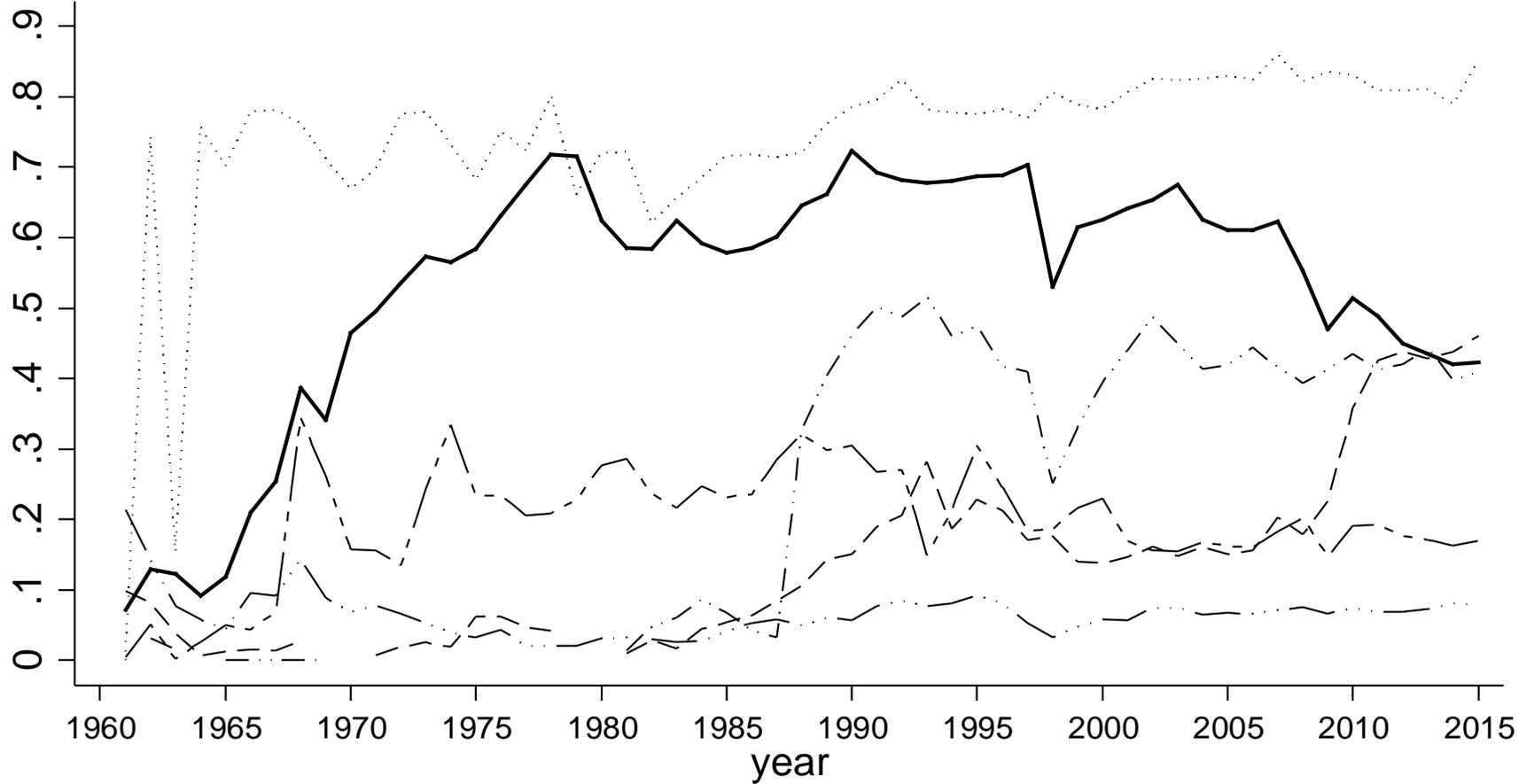
Development of rate of dependence on imports of wood production in Japan



Development of rate of dependence on imports of wood production in China



Development of rate of dependence on imports of wood products in Korea



# Model(1)

- In order to explain the effect of industrial structure of the wood products on the competition advantage (net export), the production, and the dependence on imports of the product, as determinate factors, are brought to the model as a predictor variable.

$$\ln(X_{i,t}/M_{i,t}) = \alpha_i + \beta \ln(P_{i,t}) + \gamma_i DI_{i,t} + \rho \ln(Y_t) + e_{i,t} \quad (1)$$

# Model(2)

$$\ln(X_{i,t}/M_{i,t}) = \alpha_i + \beta_{11}\ln(X_{i,t-1}/M_{i,t-1}) + \beta_{12}\ln(P_{t-1}) \\ + \sum \gamma_i DI_{i,t} + \rho \ln(GDP_t) + e_{1i,t}$$

$$\ln(P_{i,t}) = \alpha_i + \beta_{21}\ln(X_{i,t-1}/M_{i,t-1}) + \beta_{22}\ln(P_{t-1}) \\ + \sum \gamma_i DI_{i,t} + \rho \ln(GDP_t) + e_{2i,t}$$

(2)

# Model(3)

- Model is essentially a first-order VARX-model with a vector-autoregressive component (net exports and production of product  $i$ ) and an exogenous component (current period gross domestic production and rate of dependence on import of wood product  $i$ , roundwood and products which produced the product  $i$ ).
- In addition, variations of net export and production of the wood products, and GDP (as the proxy variable of domestic demand) are transformed into logarithms, so that the coefficient estimates can be interpreted as a elasticity.



Fig. 5a. Chart of relations between GDP, industrial structures and trade of the wood products, China.

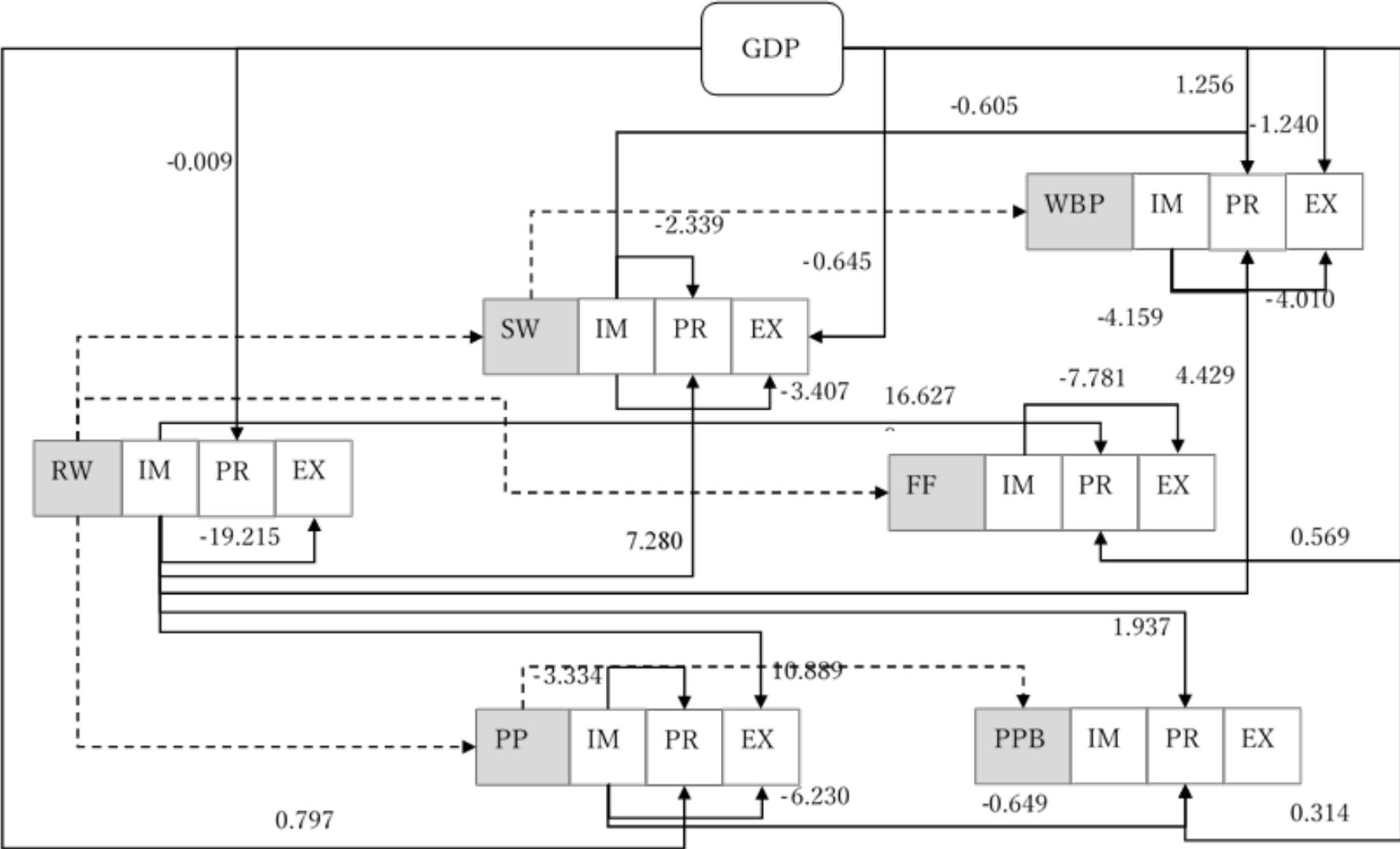
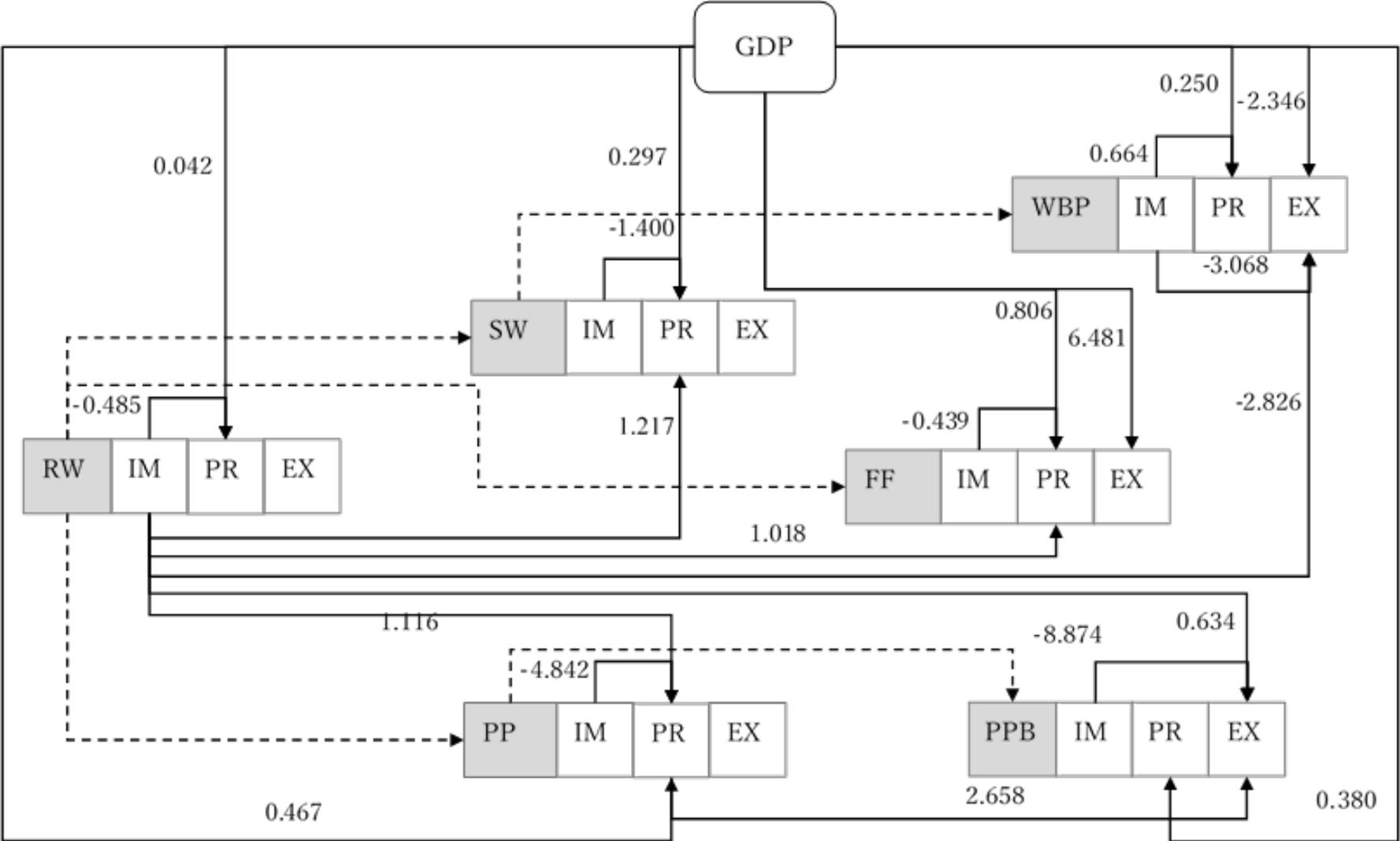


Fig. 5a. Chart of relations between GDP, industrial structures and trade of the wood products, Korea.



# Main Results and discussion(1)

- Paper and paperboard
  - Three countries have comparative competitive advantage on (it takes first rank of net export rates in Japan and Korea, second rank in China).
  - In Japan, the manufactory of paper-and-paperboard is highly relayed on the import of roundwood, while its export relays on pulp-for-paper's import and the domestic manufactory of itself. The circumstances above show that the paper-and-paperboard for export is made from imported roundwood and pulp, while those for domestic consume is made of imported roundwood and other materials (used paper, etc.).
  - In China, paper-and-paperboard that for both exports and domestic use is produced from imported roundwood and pulp.
  - In Korea, it is produced from imported roundwood and mainly for exports.
  - The implications mentioned above show that in paper-and-paperboard sectors, there may have competitions among the three investigated countries, but it may also exist the differentiation at the points of competitive advantage between each other.

# Main Results and discussion(3)

- Wood-based panel
  - China has competitive advantage, but highly import-dependent in Japan and Korea.
  - Chinese wood-based panel sector can be roughly divided into two patterns: The first pattern is, produce wood-based panels directly from imported roundwood; and the second is, using imported roundwood as raw material of sawnwood and produce panels from those domestic-made sawnwood. Where the second pattern means the value chain of roundwood to sawnwood, to wood-based panel has been integrated and its application on domestic trades have been generated.
  - In Japan, for both export and domestic consumption, wood-based panels are produced directly from imported roundwood, or reprocessed from imported low-value-added panels in order to generate more adding values. Meanwhile, as production of wood-based panels has not been influenced by Japanese GDP even though its import-dependence of that product is the highest among the three countries, it can be speculated that for Japan, wood-based panels have limited elasticity towards the demand.
  - In Korea, similar to Japan, the import-dependence of wood-based panels is high, and they are mainly domestically produced from imported roundwood directly which can also be speculated from the study on fibre furnish sector.

# Main Results and discussion(4)

- GDP

- the increase of a nation's GDP should be positively related to the demand of wood products as GDP is used as the proxy variable of domestic demand in this study.
- However, in China and Japan, negative relationships are shown between roundwood production and GDP. The reason has been considered to be that the domestic roundwood production becomes insufficient following the growth of GDP, so the two countries have to dependent on imported wood resources.
- Korea, whose available forestry resource was extremely limited in the past, has developed artificial forest to get rid of the global import competition on wood resources which is being even tougher these years. A lower production level in the past and the countermeasure mentioned above may lead the increase of roundwood production in Korea.
- This is likely to be a evidence for supporting the Heckscher-Ohlin Model?

# Further Study.....

- The value chain analysis have been limited in several Intermediate products while some important final products such as furniture and wood-based construct material will need to be studied.
- As a noticeably limitation of this study, exchange rates, price of import and export, and governmental regulations related wood industry have not been considered in this paper.
- Factors such as productivity and labour cost in the forestry industry should be considered as well.
- Con not still answer the question:
  - WHAT kind of international specialization is there in the wood industry among three countries?
  - and In WHICH sector and WHY?
- It's to be necessary to collect and clear up the data, and analysis more systematically.

Many Thanks for your attention!