

Changing Pattern in the Comparative Advantage of Seafood Industry in Asia

- with Special Reference to Shrimp and Tuna Processing Industries -

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ABSTRACT

Promoting seafood processing industry, such as shrimp and tuna processing, is one of the effective ways to earn foreign currencies and to reduce rural poverty by creating employments for developing countries. However, there is a question if rising wage rates might be a constraint for further development. Thailand, for example, has already established a firm position in these industries, but its export quantity of frozen shrimp has peaked out, and newly emerging countries such as Vietnam are following its path. This paper tries to answer this question by applying an analysis based on the revealed comparative advantage (RCA). We compared RCA indexes for major exporters of processed shrimp, and found that RCA of processed shrimp depended not only on RCA of frozen shrimp but also on GDP per capita of the country which is an indicator of wage rates. The GDP per capita around 2,713 US\$ could provide the maximum value for the RCA of processed shrimp under the given RCA of frozen shrimp. This finding implies that countries with huge blackish water and mangrove areas for shrimp farming can take long term development strategy, starting from shrimp farming - frozen shrimp export in the initial stage of economic development to high value processed shrimp export in the stage of middle income level. Regarding tuna canning industry, the shape of comparative advantage - GDP per capita curve has one peak near the 1,000\$ GDP per capita. Therefore, the strategy of developing a tuna canning industry would be recommended for countries without natural resource bases as often seen in island countries.

Keywords: revealed comparative advantage, frozen shrimp, processed shrimp, canned tuna, wage rate

PURPOSE

Promoting seafood industry is one of the effective ways to earn foreign currencies and to reduce rural poverty for developing countries. Though shrimp culture prevails widely and tuna canning industry is emerging in Asia, there is a question if the rising wage rates might be a constraint for further development. Thailand, for example, has established a firm position in the world markets, but the export quantity of frozen shrimp has peaked out in the 1990s, and newly emerging countries such as Vietnam are following its path. This paper tries to answer this question by applying an analysis based on the revealed comparative advantage (RCA), and by analyzing factors that determine the RCA.

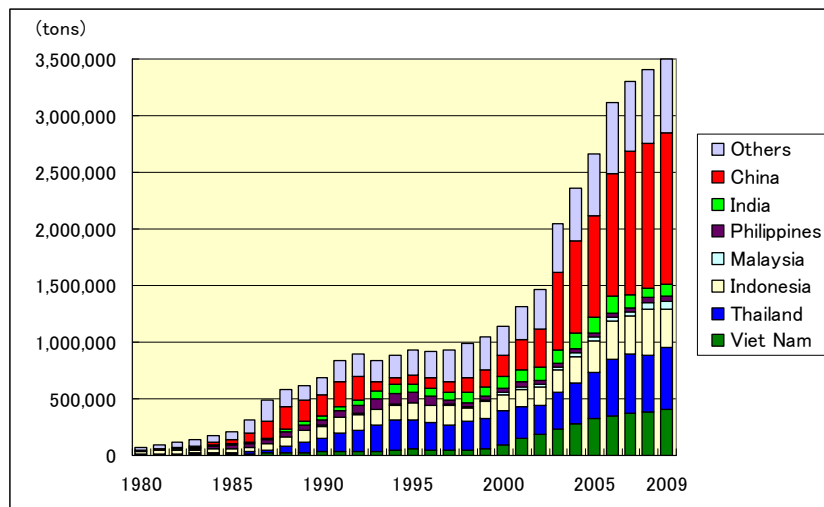
INTRODUCTION

Shrimp production and exports

Shrimp culture has grown rapidly since the latter half of the 1980s, and the share in the world shrimp production is nearly 50% at present due to a diffusion of farming technologies and a limitation of natural

shrimp resources. Asian countries such as Vietnam, Thailand, Indonesia, India, and China are major producing countries of cultured shrimp (Figure 1). Black tiger used to be a major species of cultured shrimp, but species are diversified and white shrimp is prevailed especially in Southern China and Thailand. Intensive culture prevails in Thailand and Indonesia, while extensive and semi-extensive culture prevails in Vietnam, India and Bangladesh.

Figure 1 Production of cultured shrimp by country



Data: FAO "FISHSTAT"

Shrimp produced in Asian countries are marketed mainly for Europe, USA and Japan. Shrimp is the most important fishery products for Vietnam, which accounts for more than 50% of the export value of marine products, and the ratio of the Japanese market has been around 25-30%, while the ratio of EU has been rising due to US anti-dumping measure. Recent ratio of US and EU is around 25% and 15%, respectively. The most important market for shrimp produced in Thailand is USA, and the ratio is nearly 50% recently. Japan used to be a major market, but the export of frozen shrimp from Thailand has been replaced by the export of processed shrimp such as "Sushi shrimp" and "Fried shrimp". USA is the most important market for Indonesian shrimp too, and the export has been increasing due to US adoption of anti-dumping measures against shrimp exported from Vietnam and Thailand. EU is the most important market for Indian shrimp.

As far as the processed shrimp is concerned, the export is concentrated to specific countries namely Thailand and China. This is because the agglomeration of food processing industry and secured supply of engineers as well as freezing facilities are necessary for the development of shrimp processing industry.

Canned tuna production

Thailand, United States and Spain are major countries producing canned tuna, and they accounts for more than 50% in the world production. In Asia, Japan used to be a major producer, but the production decreased a lot due to the outflow of foreign direct investment (FDI). Consequently, the production is concentrated to Thailand, while that of Indonesia, Philippines and Vietnam has been increasing recently. In Thailand, tuna canning has been positioned as main exporting industry in line with shrimp and broiler

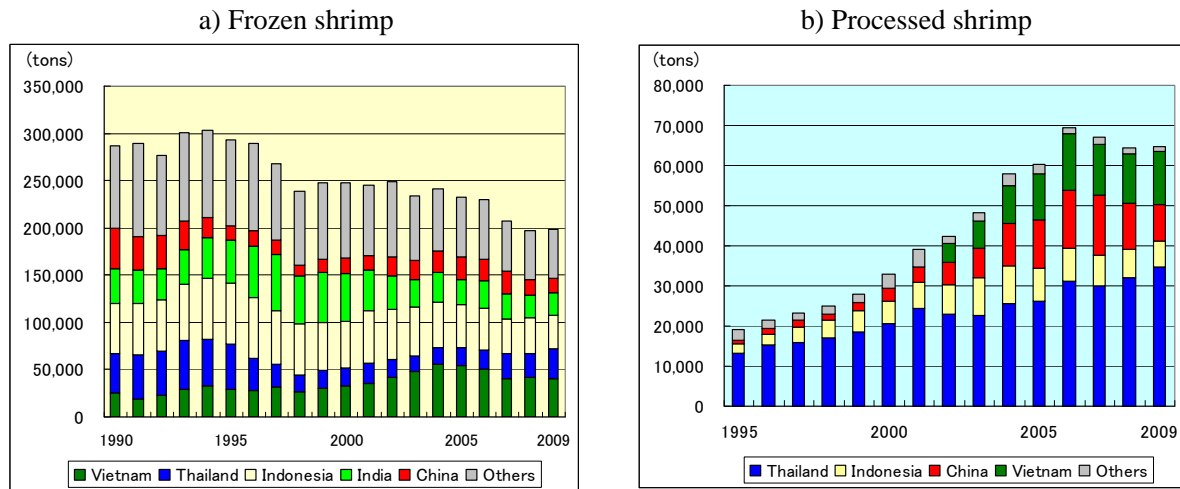
meat industries since 1984 (Yamashita (2005)). The characteristics of the three major countries are quite different. Thailand catches very few yellowfin tuna and skipjack used for canning, and imports most of them from Indonesia, Philippines and Pacific Island countries. The local markets are very thin, and most canned tuna produced are exported to global markets such as USA. United States produces large amounts of canned tuna for local consumption, and it imports almost same quantity too. Spain is outstanding in Europe in catching tuna, and the main markets of the canned tuna are EU countries.

The Japanese market for shrimp

Since Japan is not a major market for canned tuna, we focus on the Japanese markets for shrimp here. Japan is one of the major markets of shrimp, while the import of frozen shrimp has gradually been decreasing due to prolonged unfavorable economic performance ^{note 2)} and the import substitution with processed shrimp (Figure 2).

Regarding the frozen shrimp in the Japanese market, Thailand and Indonesia used to have firm positions while it is replaced by Vietnam. Import from China has been decreasing due to an expansion of the local market. Regarding the processed shrimp, Thailand still has the dominant market share, while Vietnam is catching up.

Figure 2 Japanese import of shrimp



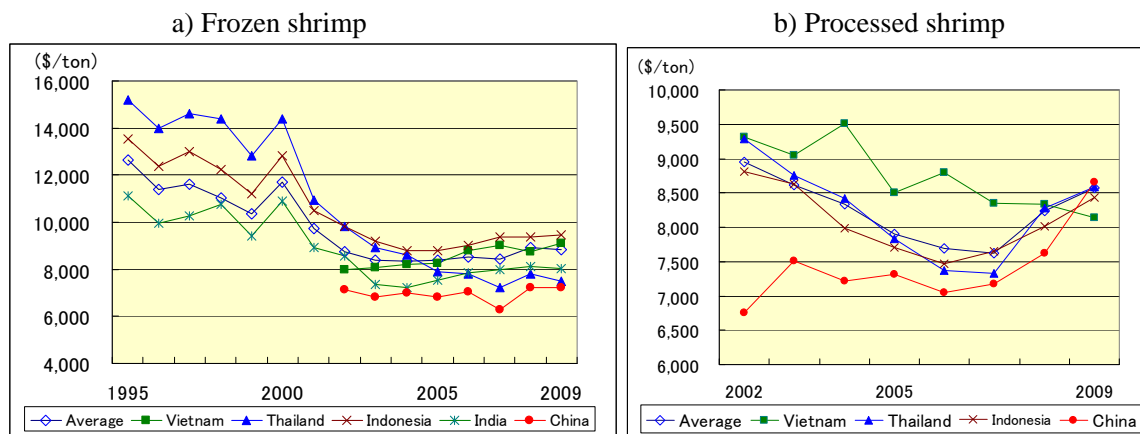
Data: JETRO “Trade data base”

In order to estimate evaluations by the Japanese market for imported shrimps from major countries, we compared CIF prices by country and they are presented in Figure 3. Japanese CIF prices of frozen shrimp have downward trends due to Japanese economic recession. Looking by country, a downward trend of Thai price and an upward trend of Vietnamese price over the average price are outstanding. Competitiveness of Vietnamese shrimp farming from the viewpoint of revenue-cost spread is mentioned by the Asian Development Bank (ADB) and Network Aquaculture Centres in Asia-Pacific (NACA) (1996) and Ling et al (1999). In addition, the flexibility of arranging appropriate size of shrimp is another source of the competitiveness (NIKKEI (2005)).

These trends are quite different for processed shrimp, in which Vietnamese price shows a downward trend and Chinese price has an upward trend.

Through observations on shrimp production and exports above, we found that production and market share by country are not stable. Technology diffusion and availability, changes in wage rates and environmental constraints might be the factors behind the observations. Then, what directions are these countries going ahead? To obtain a perspective for this issue, we analyzed the trend of the competitiveness of major countries producing shrimps and canned tuna based on the concept of revealed comparative advantage (RCA).

Figure 3 Import prices of shrimp in the Japanese market



Data: JETRO “Trade data base”

RCA ANALYSIS ON SHRIMP TRADE

Index of Revealed Comparative Advantage (RCA) and Domestic Resource Cost Ratio (DRCR) are commonly applied to analyze the comparative advantage of specific commodity or industry. Since RCA analysis uses export value data and DRCR analysis uses price and cost data, RCA can be applied to commodities for which data availability is very limited, while DRCA can adopt various scenario analyses. We apply RCA analysis since the recent cost survey data is not available, and the RCA index is defined as

$$RCA\ index = (EX_{i,j} / EX_j) / (EX_{i,w} / EX_w),$$

where EX: export value, i: commodity, j: country, and w: world, based on Balassa (1989).

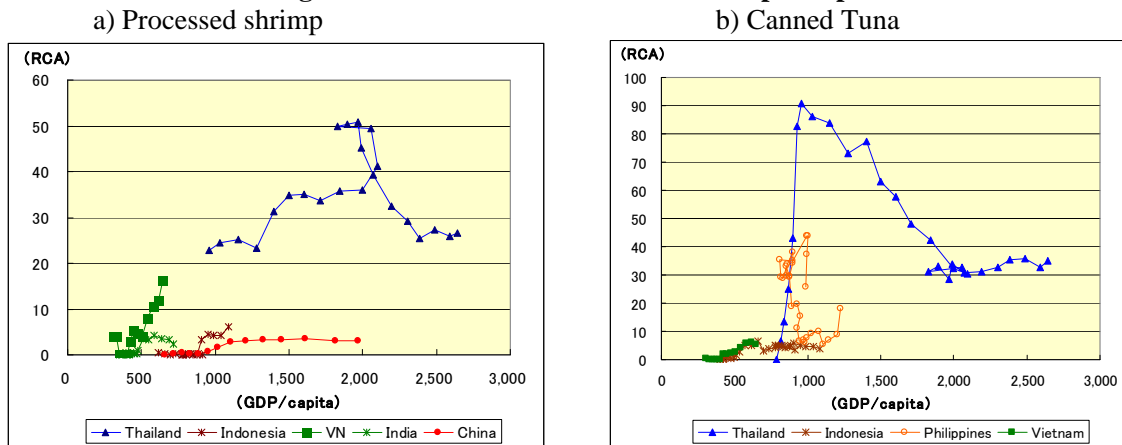
Determinant factors of RCA

RCA of food processing industry is basically determined by wage rate of the country where the industry locates, because the industry is labor intensive. As mentioned by Tada (2008), RCA of food processing industry as a whole generally indicates maximum value when the GDP per capita, which is an indicator of wage rates, is around 1,000\$ across countries. We applied the same method to the cases of processed

shrimp and canned tuna, and obtained Figure 4, presenting correlations of RCA with GDP per capita for main producing countries in Asia. Very high comparative advantages both in processed shrimp and canned tuna for Thailand and rising advantage in processed shrimp for Vietnam are outstanding.

What are the reasons behind the seeming uniform development path of canned tuna and the seeming diverse path of processed shrimp? We have a hypothesis that technology and wage rates are key factors that determine RCA of canned tuna, but natural conditions is also important to determine RCA of processed shrimp. This is because material tunas used for producing canned tuna can be imported for every country except inland countries, whereas local material shrimps are used for processing due to quality decline caused by defrosting frozen shrimp.

Figure 4 Correlation of RCA with GDP per capita



Note) GDP per capita of each country is converted to constant US 2000 year dollar term, WDI (World Bank).

Therefore, we can find a certain relation between the RCA of frozen shrimp and that of processed shrimp. Figure 5 presents the trend of both RCAs for selected countries. The peaks of RCA of processed shrimp come behind that of frozen shrimp for Thailand and China. The RCA of processed shrimp is rising while that of frozen shrimp has peaked out for Indonesia and India. Therefore, we can pose a hypothesis that the RCA of shrimp shifts from frozen to processed shrimp in accordance with the economic development.

This relation is presented as

$$RCA2 = f(RCA1, Y)$$

where RCA1: RCA of frozen shrimp, RCA2: RCA of processed shrimp, and Y: per capita GDP. The estimated result of this relation is as follows;

$$RCA2 = 0.667RCA1 + 0.043 Y - 8.00 \cdot 10^{-6} Y^2 - 32.45$$

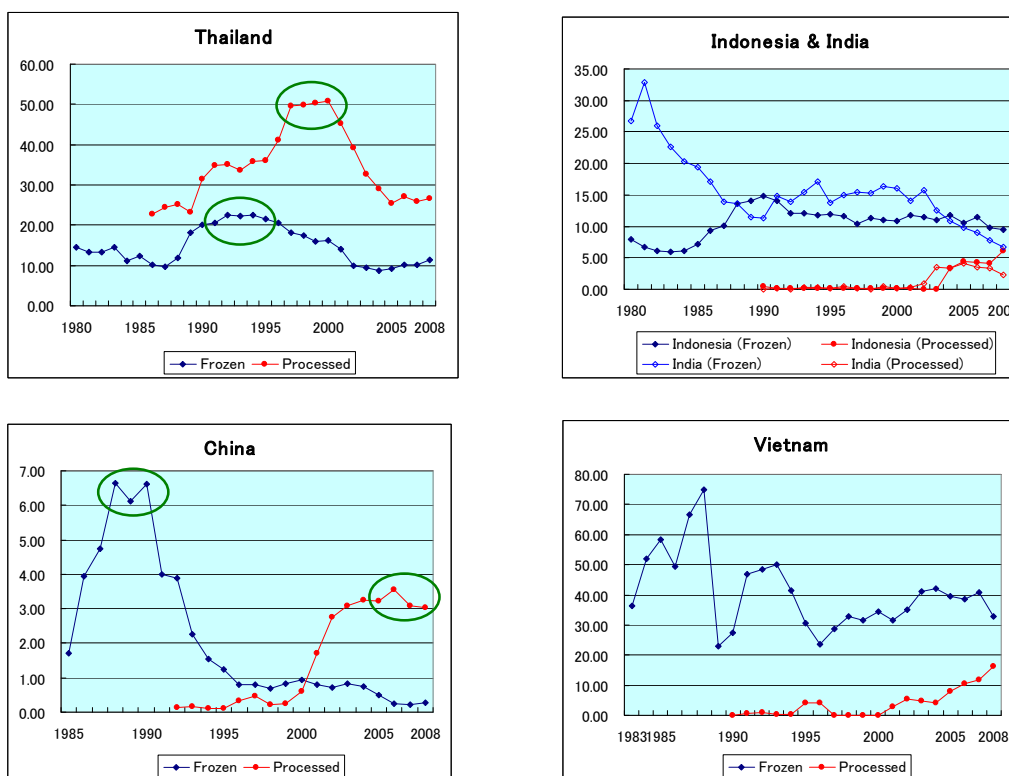
(7.38) (6.10) (-3.15) (-6.93)

$R^2: 0.74,$ () : t-value,

No. of observations: 84 (including Thailand, Indonesia, India, China and Vietnam).

This estimation implies that shrimp processing industry gains a comparative advantage in the early stage of economic development, and turns to lose it when the economy reaches middle income level due to a rise in wage rates, given the RCA of frozen shrimp which depends heavily on natural conditions such as the constraint of blackish water and mangrove areas. The GDP per capita that gives the maximum RCA for the processed shrimp is nearly 2,713\$ which is almost equal to that of Thailand.

Figure 5 Comparison of RCAs between frozen and processed shrimp



Data: FAO "FISHSTAT"

CONCLUSION

We compared RCA indexes for major exporters of frozen and processed shrimp, and found that countries that have wide natural resources for shrimp farming can gain high comparative advantage in frozen shrimp in the early stage of economic development, and that comparative advantage in processed shrimp depends on that of frozen shrimp and it gains maximum value when the GDP per capita is around 2,700\$ under the condition of constant comparative advantage in frozen shrimp. In this regard, Vietnamese and Indonesian shrimp processing industry might increase their comparative advantages in the near future due to their stable advantages in frozen shrimp and relatively low wage rates. This implies

that countries with huge coast areas suitable for shrimp farming can take long term development strategy starting from shrimp farming - frozen shrimp export in the initial stage of economic development to processed shrimp export in the stage of middle income level.

Regarding tuna canning industry, for which products are not so diversified as shrimp products, the shape of comparative advantage - GDP per capita has one peak near the 1,000\$ GDP per capita. Therefore, the strategy to develop tuna canning industry can be recommended for countries without natural resource bases as often seen in island countries.

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