Analysis on the Characteristics of Aquatic Products Trade between China and ASEAN based on the HS Classification

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Abstract: In the favorable background of the "21st century Maritime Silk Road", the aquatic products trade between China and ASEAN is facing a historic opportunity. In order to make guidance of transformation for the aquaculture enterprises, this article thoroughly analyzes the scale, market structure and product structure, as well as the intra-industry status of China's aquatic products export to ASEAN countries. The result indicates the aquatic products trade between China and ASEAN keeps on increasing and is inconsistent with the trends of the ASEAN's demand. However, China's export of processed aquatic product to ASEAN fluctuates and trends to downward and meets a bilateral inter-industry trade status.

1. Introduction
Mainland China has a 2500-year long history of aquaculture. Nowadays aquaculture has become the major contributor to China’s aquatic output since the early 1990s [1]. As the world’s leading areas in aquaculture, China and ASEAN have the natural link of South China Sea to improve their maritime economic cooperation and the aquatic products trade between China and ASEAN has been fully developed under the construction of the 21st Century Maritime Silk Road. In the face of new opportunities, China has to consider the challenge of how to enhance the competitiveness of China's aquatic industry cooperation with ASEAN through the industrial restructuring. Therefore, in order to provide a more targeted theoretical basis and empirical evidence for strengthening capacity cooperation between China and ASEAN under the background of "21st Century Maritime Silk Road", and to guide the way to industrial restructuring to improve China's export competitiveness of aquatic products, this article makes a comprehensive analysis on the characteristics of China’s exports of aquatic products to ASEAN in accordance with HS classification.

2. Aquatic Products Trade based on HS Classification
The data in this paper is from the UN COMTRADE database from 2002 to 2015. According to the definition of Food and Agriculture Organization of the United Nations, the classification of aquatic products according to the HS standard is carried out and the main codes are shown in Table 1. The HS standard covers both the CTC Customs Classification of Goods Catalog (CCCN) and the UN classification code of the International Trade Classification (SITC) to facilitate detailed and systematic study on the classification of international trade commodities. In recent years, more than 200 member countries, including China and ASEAN, have used the code to calculate the amount of tax and trade...
volume, which has been widely used in the study of regional trade, especially intra-industry trade (Han Yonghui et al., 2013)\cite{2}. Wang Jing (2008)\cite{3} calculated the intra-industry trade index for each type of agricultural product during the period from 1996 to 2005 in China using HS classification. Ito and Okubo (2012)\cite{4} focused on EU trade with Eastern European countries, using trade data at the HS code system eight-digit product level for the period 1988–2010.

| HS Code | Category name               | HS Code         | Category name                                                                 |
|---------|-----------------------------|-----------------|-------------------------------------------------------------------------------|
| 0301    | Live fish                   | 051191          | Fish, shellfish and crustaceans (non-food)                                    |
| 0302    | Fish, fresh or chilled, whole| 7101            | Pearls, natural or cultured, not mounted or set                               |
| 0303    | Fish, frozen, whole         | 1504            | Fish, marine mammal fat or oil not chemically modified                         |
| 0304    | Fish fillets, fish meat, mince except liver, roe | 1604 | Prepared or preserved fish, fish eggs, caviar                                |
| 0305    | Fish, cured, smoked, fish meal for human consumption | 1605 | Crustaceans, molluscs, etc, prepared or preserved                             |
| 0306    | Crustaceans                 | 130231          | Agar-agar                                                                     |
| 0307    | Molluscs                    | 230120          | Flour or meal, pellet, fish, etc, for animal feed                              |
| 0508    | Coral, shell, cuttle bone, etc, unworked, and waste | 391310 | Alginic acid, its salts & esters, in primary forms                            |

*a*The above category descriptions come from UN COMTRADE database.

3. Analysis on the Characteristics of Aquatic Products Trade between China and ASEAN

In many occasions of trade cooperation in certain industry researches, the academics will focus on the scale, market distribution, products structure and intra-industry trade status of trade between two places. This paper will follow the same paradigm on studying the characteristics of aquatic products trade between China and ASEAN and will analyze on the intra-industry trade status by calculating the G-L index.

3.1 Scale of China's Aquatic Products Export to ASEAN

Since 2002, when the Framework Agreement on Comprehensive Economic Cooperation between China and ASEAN was signed, which marks the beginning of the construction of ACFTA, the intra area trade between China and ASEAN has achieved great leaps. From 2002 to 2015, aquatic products trade between China and ASEAN has consistently been booming from US$217.89 million to US$3835.11 million, with a high growth rate of 23.98% annually and the trade surplus is also increasing year by year (Figure 1). Especially since the establishment of the China-ASEAN Free Trade Area in 2010, the tariffs on aquatic products between China and ASEAN have been gradually reduced to zero, and the growth rate of aquatic products trade between the two regions has also accelerated obviously. In 2011, the export of China's aquatic products to ASEAN increased by nearly 66%. Since 2014, under the "Belt and Road Initiative", both China's import and export of aquatic products with ASEAN break the percentage of 10% of the total volume. With a series of policies supporting aquatic products trade releasing, the aquatic products trade between China and ASEAN will continue to develop at a high speed and ASEAN's status in China's export of aquatic products will become increasingly important.
Figure 1. Export Scale and Proportion of China’s Aquatic Products Exports to ASEAN (2002-2015)
Data source: Calculated based on the data from General Administration of Customs of China.

3.2 Market Distribution of China’s Aquatic Products Export to ASEAN
From the market distribution of China's export of aquatic products to ASEAN (Figure 2), China's aquatic products export market is mainly concentrated in Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam from 2002 to 2015, which are added up to more than 90% of the total volume of China's aquatic products export to the whole ASEAN market.

From the trend of change, the overall scale of Malaysia market is most prominent, but the Thailand market grows most rapidly. Especially from year 2011, the Thailand market has been increasing so fast that it exceeded Malaysia to become China's largest export market in ASEAN. In general, the trends of China’s aquatic products export to ASEAN are rather inconsistent with the trends of the ASEAN's demand (Figure 3). Data was calculated based on UN-Comtrade International Trade Statistics Database.

Figure 2. Market Distribution Share of China’s Exports of Aquatic Products to ASEAN

Figure 3. Market Distribution Share of ASEAN’s Demand of Aquatic Products
3.3 Product Structure of China's Aquatic Products Export to ASEAN

In order to observe the product structure, this article divides the aquatic products into two groups as primary product group and processed product group based on the descriptions of categories in HS classification and the HS codes grouped are as follows: Primary Aquatic Products Group includes 0301, 0302, 0303, 0304, 0305, 0306, 0307, 0508, 7101, 130231, while Processed Aquatic Products Group includes 1504, 1604, 1605, 051191, 230120, 391310.

In comparison with the primary aquatic products, China has a much lower export scale of processed aquatic products to ASEAN (figure 3). Even the growth trend of processed aquatic products is slower than that of primary aquatic products. Especially after 2012, China's processed aquatic products export has a downward trend and the gap is widening year by year, which is similar to the situation of export to the world market (figure 4). In general, China's export of processed aquatic product to ASEAN fluctuates and trends to downward while the primary aquatic products scale rises rapidly.

In contrast, both of the export of primary and processed aquatic products from ASEAN to the world rises rapidly and evenly and the export product structural is more balanced than that of China (Figure 4).

3.4 Intra-Industry Trade Status of Aquatic Products Trade between China and ASEAN

The analysis on intra-industry trade status can reveal the understanding of the development of trade relations between two regions (Greenaway et al., 1995)\textsuperscript{[5]}. Even nowadays, the most commonly used tools to measure the intra-industry trade status is G-L index, Yosida (2008)\textsuperscript{[6]} used the index to contribute to the existing empirical investigation of Japan-Korea international trade by providing new evidence of intra-industry trade between Korea and Japanese sub-regions. Kumar and Ahmed (2014)\textsuperscript{[7]} investigates the intra-industry trade between India and Bangladesh over the period of 1975 to 2010.Kohler and Smolka (2016)\textsuperscript{[8]} investigate the link between productivity of firms and their sourcing behavior take use of calculating the index. Hu Jian-bo et al. (2017)\textsuperscript{[9]} used the G-L index to
research of China and South Africa intra-industry trade.

We adopt the G-L index to explain the intra-industry trade status of aquatic products trade between China and ASEAN. The formula G-L index is: \( GL_i = 1 - \left| X_i - M \right|/(X_i + M) \). The weighted average reflects the overall intra-industry trade level as: \( GLT = \sum w_i \cdot GL_i \times \left[ (X_i + M) / \sum w (X_i + M) \right] \), where \( i \) is the product category of category \( i \). The \( GL \) ranges \((0, 1)\) and takes 0.5 as a critical point. The higher the value is, the higher the inter-industry trade level is, otherwise, the higher the intra-industry trade level is.

Calculate the G-L index of intra-industry trade of aquatic products between China and ASEAN with the above formulas and the results are as illustrated in Table 2. Overall, the weighted average of the G-L total index \( GLT \) from 2002 to 2015 show that the aquatic products trade between China and ASEAN is of prominently complementary with high level of inter-industry trade. Specifically, the categories of aquatic products (all are primary products) of high G-L index value, which are characterized by high intra-industry level, are 0302 (Fish, fresh or chilled), 0303 (Fish, frozen), 0304 (Fish fillets, fish meat, mince), 0306 (Crustaceans), 0307 (Mollusks), 1504 (Fish, marine mammal fat or oil not chemically modified) and 121200 (Seaweeds and other algae), especially the categories 0304, 0303 and 0307. The G-L indices of categories 0301 (Live fish), 0305 (Fish, cured, smoked, fish meal for human consumption) and 051191 (Fish, shellfish and crustaceans (non-food)) fluctuate greatly with intra-industry and inter-industry trade situation frequently alternative. Other than that, inter-industry still dominates most of the other categories of aquatic products trade between China and ASEAN, which shows strong complementarities.

| HS Code | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0301    | 0.14 | 0.69 | 0.76 | 0.28 | 0.17 | 0.08 | 0.08 | 0.11 | 0.11 | 0.12 | 0.05 | 0.03 | 0.04 | 0.11 |
| 0302    | 0.52 | 0.49 | 0.40 | 0.26 | 0.24 | 0.56 | 0.67 | 0.72 | 0.52 | 0.45 | 0.11 | 0.12 | 0.16 | 0.76 |
| 0303    | 0.90 | 0.97 | 0.91 | 0.95 | 0.82 | 0.89 | 0.60 | 0.65 | 0.41 | 0.31 | 0.24 | 0.24 | 0.27 | 0.23 |
| 0304    | 0.72 | 0.98 | 0.83 | 0.90 | 0.62 | 0.63 | 0.78 | 0.59 | 0.73 | 0.51 | 0.84 | 0.82 | 0.59 | 0.48 |
| 0305    | 0.11 | 0.07 | 0.22 | 0.20 | 0.22 | 0.13 | 0.09 | 0.41 | 0.91 | 0.97 | 0.69 | 0.41 | 0.25 | 0.44 |
| 0306    | 0.80 | 0.53 | 0.65 | 0.59 | 0.21 | 0.08 | 0.12 | 0.79 | 0.89 | 0.91 | 0.96 | 0.99 | 0.86 | 0.60 |
| 0307    | 0.88 | 0.92 | 0.93 | 0.99 | 1.00 | 0.91 | 0.83 | 0.78 | 0.53 | 0.30 | 0.36 | 0.33 | 0.19 | 0.17 |
| 0508    | 0.05 | 0.07 | 0.04 | 0.13 | 0.15 | 0.18 | 0.11 | 0.14 | 0.03 | 0.02 | 0.02 | 0.00 | 0.01 | 0.07 |
| 1504    | 0.80 | 0.54 | 0.07 | 0.37 | 0.59 | 0.32 | 0.24 | 0.70 | 0.35 | 0.45 | 0.41 | 0.10 | 0.27 | 0.38 |
| 1604    | 0.19 | 0.20 | 0.24 | 0.15 | 0.16 | 0.37 | 0.10 | 0.14 | 0.14 | 0.17 | 0.27 | 0.28 | 0.25 |
| 1605    | 0.06 | 0.05 | 0.02 | 0.00 | 0.01 | 0.02 | 0.02 | 0.11 | 0.04 | 0.02 | 0.02 | 0.02 | 0.02 | 0.03 |
| 7101    | 0.51 | 0.12 | 0.06 | 0.04 | 0.02 | 0.04 | 0.11 | 0.17 | 0.08 | 0.31 | 0.15 | 0.16 | 0.15 | 0.29 |
| 051191  | 0.15 | 0.14 | 0.88 | 0.51 | 0.76 | 0.15 | 0.06 | 0.06 | 0.47 | 0.14 | 0.05 | 0.08 | 0.08 | 0.05 |
| 121220  | 0.50 | 0.44 | 0.36 | 0.35 | 0.29 | 0.45 | 0.30 | 0.33 | 0.35 | 0.37 | 0.00 | 0.00 | 0.00 | 0.02 |
| 130231  | 0.13 | 0.12 | 0.11 | 0.23 | 0.22 | 0.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 |
| 230120  | 0.74 | 0.73 | 0.23 | 0.07 | 0.10 | 0.05 | 0.17 | 0.09 | 0.02 | 0.02 | 0.00 | 0.23 | 0.00 | 0.91 |
| 280120  | 0.00 | 0.08 | 0.00 | 0.00 | 0.00 | 0.93 | 0.39 | 0.00 | 0.16 | 0.01 | 0.12 | 0.03 | 0.04 | 0.11 |
| 391310  | 0.00 | 0.06 | 0.03 | 0.13 | 0.18 | 0.19 | 0.38 | 0.38 | 0.54 | 0.54 | 0.00 | 0.00 | 0.12 | 0.16 |

GLT 0.57 0.51 0.45 0.43 0.38 0.40 0.37 0.51 0.41 0.36 0.34 0.24 0.27 0.23

4. Conclusions and Suggestions

In this paper, we make a descriptive analysis on China’s export of aquatic products to ASEAN from the aspects of export trade scale, market structure, product structure and intra-industry status. In general, the aquatic trade relation between China and ASEAN is getting closer and closer. As the promoted by the Belt & Road initiative, the scale of aquatic products trade between China and ASEAN will keep on increasing. In view of market distribution, the trends of China’s aquatic products export to ASEAN are rather inconsistent with the trends of the ASEAN's demand, which presents the China’s dreadful increasing export to Vietnam. However, in view of products structure, China’s export of processed aquatic product to ASEAN fluctuates and trends to downward while the primary aquatic
products scale rises rapidly, which shows the lack of development on processing technology of aquatic products in China. As a matter of fact, from the view of intra-industry of aquatic trade between China and ASEAN, the aquatic products trade between China and ASEAN is mainly inter-industry trade and seems to be strong complementary with high level of inter-industry trade.

From the above conclusions, we can see it is not conducive to improve export if China keeps focusing on relatively slow growing product lines instead of developing the processed aquatic product lines. In order to change this situation, China shall enhance its competitiveness of aquatic products export especially the processed aquatic products since under the construction of 21st Century Maritime Silk Road to build up a long-term and effective cooperation mechanism for aquaculture industry with ASEAN.

Therefore, it is important for China to consider how to cultivate the ASEAN’s market, to introduce famous and excellent aquatic enterprises to ASEAN market and to integrate the industry resources to cohere the industry power and accelerate the technology innovation in China.

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