Direction of trade and changing pattern of Indian marine products exports

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ABSTRACT

The present study was initiated with the objective of analyzing the export performance of marine products in India. The study is based on the secondary data i.e., quantity of export of marine products from 2005-06 to 2014-15 compiled from official website of Marine Products Export Development Authority of India. The structural change and direction of trade in marine products was analyzed using Markov Chain approach. The Cumulative Annual Growth Rate of export of marine products from India in volume and value terms is positive with 8.67 and 19.58 per cent during the period from 2005-06 to 2014-15. The increased export growth in marine products is mainly attributed its increasing demand from animal and human consumption, food processing as well as alternative purposes such as cosmetics, fishmeal and fish oil, bio active compounds, pharmaceuticals, marine protein and food processing aids and bi-products are used for valuable ornamentals. European Union, South East Asia and China are the stable importer of Indian marine products as reflected by the highest probability of retention was 79, 78 and 74 per cent respectively. Therefore, efforts are needed to promote exports to these countries by stabilizing the markets by supplying quality marine products and make its price competitive in the international market.

Key words: Cumulative annual growth rate, Direction of trade, Export competitiveness, Marine products, Structural change.

INTRODUCTION

Indian marine products have come to occupy a supreme position in the global market over the years. Today, India is a major supplier of marine products like fish, shrimp, squid, cuttlefish, scampi, lobster, octopus, and bivalve products to the international market. However, the country faces fierce competition from other major players in the field, both the existing and new entrants in the fray. Ironically, the major challenge is from within Asia itself where countries like China, Malaysia, Philippines, Thailand, Singapore and Indonesia among others pose a big threat to Indian marine products (Devaraj, 2007).

Export of marine products from India reach an all-time high of $ 5511 million during the financial year 2014-15. Marine product exports crossed all previous records in quantity, rupee value and US Dollar ($) terms. Exports aggregated to 10,51,243 tonnes valued at Rs 33,441 crore and $5511 million. Compared to previous year, seafood exports recorded a growth of 6.86 per cent in quantity, 10.69 per cent in rupee and 10.05 per cent growth in US$ earnings (Anonymous, 2015).

There has been an increased interest in understanding the behavior of market shares and competitiveness of exportable commodities in World trade with the changing World economic environment. The major Indian fisheries importing countries in 2014-15 were Japan, E.U, China, South East Asia and Middle East. The structural change and direction of marine products was analyzed using Markov chain approach estimation of the export share was done for the study period (Jalajakshi, 1994), (Mamatha, 1995), (Tejaswi, et al. 2006), (Mahadevaiah, et al. 2005), (Singh, 2010). Trade matrices were estimated and the primary impetus was to identify important relationships that exist among importing countries. These loyalty characteristics are long term phenomenon and Markov Transitional probability matrix facilitates a reasonable estimate of the same.

Markov chain analysis was employed to analyze the structural change in any system whose progress through...
time can be measured in terms of single outcome variable (Dent, 1967). In the present study, the dynamic nature of trade patterns that is the gains and losses in export of Indian marine products in major importing countries was examined using the Markov chain model.

Markov chain analysis involving developing a transitional probability matrix ‘P’, whose elements, $P_{ij}$ indicate the probability of exports switching from country ‘i’ to country ‘j’ over time. The diagonal element $P_{ii}$, where $i=j$, measure the probability of a country retaining its market share or in other words, the loyalty of an importing country to a particular country’s exports.

In the context of current application, structural change was treated as a random process with seven importing countries for marine products. The assumption was that the average export of marine products from India amongst importing countries in any period depends only on the export in the previous period and this dependence is same for all the periods. This was algebraically expressed as

$$E_{jt} = \sum_{i=1}^{n} [E_{i(t-1)}] P_{ij} + e_{jt}$$

Where,

- $E_{jt}$ = exports from India to the jth country in the year t
- $E_{i(t-1)}$ = exports of ith country during the year t-1
- $P_{ij}$ = Probability that exports will shift from ith country to jth country
- $e_{jt}$ = the error term which is statistically independent of $E_{i(t-1)}$
- n = the number of importing countries

The transitional probabilities $P_{ij}$, which can be arranged in a $(c \times n)$ matrix, have the following properties.

$$\sum_{i=1}^{n} P_{ij} = 1 \text{ And } 0 \leq P_{ij} \leq 1$$

Thus, the expected share of each importing country during period ‘t’ is obtained by multiplying the exports of Indian marine products to these countries in the previous period (t-1) with the transitional probability matrix. The probability matrix was estimated for the period 2005-06 to 2014-15.

Thus transitional probability matrix (T) was estimated using linear programming (LP) frame work by a method referred to as minimizing of Mean Absolute Deviation (MAD).

$$\text{Min} , O P^* + I e$$

Subject to

$$X P^* + V = Y$$

$$\text{GP^*} = 1$$

Where,

- $P^*$ is a vector of the probabilities $P_{ij}$
- $O$ is the vector of zeros
- $i$ is an appropriately dimensional vectors of areas
- $e$ is the vector of absolute errors
- $Y$ is the proportion of exports to each country
- $X$ is a block diagonal matrix of lagged values of $Y$
- $V$ is the vector of errors
- $G$ is a grouping matrix to add the row elements of $P$ arranged in $P^*$ to unity.

Prediction of quantity of marine products exports were made by using the Transitional Probability Matrix.

$$B_0 = B_0^* \times T$$

Where,

- $B_0$ = Quantity exported in Base years
- $B_0^*$ = Quantity exported in next year (prediction)
- $T$ = Transitional probability matrix

The values in the transition probability matrix will have different interpretations. The value of diagonal elements indicates the probability of retention of the previous year’s share, while values in the columns reveal probability of gain by a particular country from other countries, values in rows reveal probability that a country might lose to other countries in respect of a specific commodity exports.

RESULTS AND DISCUSSION

Transitional Probability Matrix of export of marine products from India during 2005-06 to 2014-15: The export performance of marine products from India during 2005-06 to 2014-15 was estimated. The analysis was carried out to identifying the direction of trade and stability in export among the different countries such as Japan, E.U, China, South East Asia, Middle East and Other countries. The result of transitional probability analysis indicated that matrix for the period 2005-06 to 2014-15 are presented in the Table 1. It is evident that European Union has been the only stable

<table>
<thead>
<tr>
<th>Destination</th>
<th>Japan</th>
<th>USA</th>
<th>European Union</th>
<th>China</th>
<th>South East Asia</th>
<th>Middle East</th>
<th>Others</th>
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</thead>
<tbody>
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<td>Japan</td>
<td>0.2970</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.7030</td>
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<td>0.6284</td>
<td>0.1938</td>
<td>0.0000</td>
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</tr>
<tr>
<td>European Union</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.7954</td>
<td>0.1230</td>
<td>0.0000</td>
<td>0.0000</td>
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</tr>
<tr>
<td>China</td>
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<td>0.0000</td>
<td>0.0720</td>
<td>0.7407</td>
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<td>0.0000</td>
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<tr>
<td>South East Asia</td>
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<td>0.1170</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.7812</td>
<td>0.0069</td>
<td>0.0531</td>
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<tr>
<td>Middle East</td>
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<td>0.0583</td>
<td>0.0000</td>
<td>0.3143</td>
<td>0.5514</td>
<td>0.0000</td>
</tr>
<tr>
<td>Others</td>
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<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.6065</td>
<td>0.1702</td>
<td>0.1650</td>
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Table 2: Actual and Predicted quantity of marine products export from India to selected countries (Qty in tonnes)

<table>
<thead>
<tr>
<th>YEAR</th>
<th>COUNTRY</th>
<th>JAPAN</th>
<th>US</th>
<th>EU</th>
<th>CHINA</th>
<th>SEA</th>
<th>ME</th>
<th>OTHERS</th>
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<tr>
<td>2005-06</td>
<td></td>
<td>59785</td>
<td>56396</td>
<td>55817</td>
<td>44400</td>
<td>118370</td>
<td>60140</td>
<td>78385</td>
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<tr>
<td>2006-07</td>
<td></td>
<td>67437</td>
<td>69377</td>
<td>43758</td>
<td>149773</td>
<td>145579</td>
<td>147312</td>
<td>121925</td>
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<tr>
<td>2007-08</td>
<td></td>
<td>67373</td>
<td>56033</td>
<td>36612</td>
<td>149381</td>
<td>139413</td>
<td>139792</td>
<td>121925</td>
</tr>
<tr>
<td>2008-09</td>
<td></td>
<td>57271</td>
<td>55694</td>
<td>36877</td>
<td>155161</td>
<td>146418</td>
<td>147312</td>
<td>121925</td>
</tr>
<tr>
<td>2009-10</td>
<td></td>
<td>62690</td>
<td>59110</td>
<td>33444</td>
<td>164800</td>
<td>153136</td>
<td>144290</td>
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<tr>
<td>2010-11</td>
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<td>71322</td>
<td>50095</td>
<td>170960</td>
<td>162058</td>
<td>159147</td>
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<tr>
<td>2011-12</td>
<td></td>
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<td>70091</td>
<td>68354</td>
<td>185854</td>
<td>176136</td>
<td>164290</td>
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<tr>
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<td></td>
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<td>72112</td>
<td>91347</td>
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<td>157804</td>
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<tr>
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<td></td>
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<td>73682</td>
<td>92447</td>
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<td>157804</td>
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<tr>
<td>2014-15</td>
<td></td>
<td>78772</td>
<td>77604</td>
<td>92711</td>
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<td>157804</td>
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<tr>
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<td></td>
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<td>92711</td>
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<td>157804</td>
<td>147069</td>
<td>138917</td>
</tr>
<tr>
<td>2016-17</td>
<td></td>
<td>81630</td>
<td>81630</td>
<td>92711</td>
<td>20157</td>
<td>157804</td>
<td>147069</td>
<td>138917</td>
</tr>
</tbody>
</table>

Note: A-Actual exports in tonnes. P-Predicted exports in tonnes. Figures in parentheses indicate export share in per cent.
importer of Indian marine products as reflected by the high probability of retention indicated by Transitional Probability value 0.7954. This implied that the share of import by EU was 79 per cent. Besides EU, SEA, and China are the other countries which are importing Indian marine products with a contribution of 78 per cent (0.7812) & 74 per cent (0.7407) respectively. Japan, Middle East and USA have depicted low probability retention of 0.2970, 0.5514 & 0.6284 respectively during 2005-06 to 2014-15.

This indicating Japan, Middle East and USA are the low stable Importers of Indian marine product. This is attributed by the stiff competitor offered and higher market penetration efforts from by major marine products exporting countries like China. This causes for appropriate policy measures and marketing efforts to sustain in these growing markets. We need to improve our export competitiveness by decreasing cost of production and improving quality. Also, we need to move away from the present policy regime of controlled exports through export quota so as to enable our exporters to enter in long-run contract with the buyers in the international markets and achieve growth. Interestingly, the minor importer of marine product, the other countries had remained the less stable and non-loyal markets for Indian marine products, as indicated by retention probability value of 0.1650 (16%).

**Actual and predicted quantity of marine products export from India to selected countries:** The market share projections of Indian marine products exports to the major importing countries for 2016-17 were computed using the transitional probability matrix. The actual and predicted values of Indian marine products exports to major importers are presented in Table 2.

The actual share of Japan in marine products export had shown fluctuation over the study period. On the whole, it has decreased from 12.80 to 10.20 per cent between 2005-06 to 2014-15. Similar trend was noticed with regard to prediction of export to Japan. The export share has declined from 18.71 to 5.05 per cent during the same period. However, the projected export share has shown a decreasing trend from 2015-16 to 2016-17 in comparison with actual share of 10.20 during 2014-15. The actual share of USA in marine products export has increased from -21.60 to 16.94 per cent between 2005-06 to 2014-15. Similar trend was observed in prediction of export to USA. The predicted export share has increased from -17.41 to 11.80 per cent during the same period. However, the projected export share has shown decreasing trend from 2015-16 to 2016-17 in comparison with actual share of 16.94 per cent during 2014-15. The actual share of European Union in marine products export had shown fluctuation over the study period. In overall, it has decreased from 9.45 to 7.64 per cent between 2005-06 to 2014-15. Similar trend was observed in prediction of export to European Union where the export decreases from 9.41 to 7.28 per cent during the same period. However, the projected export share has shown decreasing trend from 2015-16 to 2016-17 in comparison with actual share of 7.64 per cent during 2014-15. The actual share of China in marine products export had shown fluctuation over the study period. The actual export share has decreased from 48.47 to -21.46 per cent between 2005-06 to 2014-15. Similar trend was observed in prediction of export to China where in the export share increases from 30.03 to -15.48 per cent during the same period. However, the predicted export share has shown increasing trend from 2015-16 to 2016-17 in comparison with actual share of -21.46 per cent during 2014-15. The actual share of South East Asia in marine products export had shown fluctuation over the study period. It has decreased from 12.49 to 7.86 per cent from 2005-06 to 2014-15. Similar trend was observed in prediction of export to South East Asia where the export share decreases from 17.30 per cent to 7.30 per cent during the same period. However, the predicted export share has shown decreasing trend from 2015-16 to 2016-17 in comparison with actual share of -21.46 per cent during 2014-15. The actual share of Middle East in marine products export had shown fluctuation over the study period. It has increased from 5.90 to 11.32 per cent from 2005-06 to 2014-15. While the predicted export share to Middle East has decreased from 15.38 to 8.80 per cent during the same period. However, the predicted export share has shown decreasing trend from 2015-16 to 2016-17 in comparison with actual share of 11.32 per cent during 2014-15. The actual and predicted exports share of India’s marine products exports to other countries showed a decreasing trend from 41.48 to 7.00 per cent and 13.20 to 8.10 per cent during 2005-06 to 2014-15. However, the predicted export share has shown decreasing trend from 2015-16 to 2016-17 in comparison with actual share of 7.00 per cent during 2014-15.

Parvathy et al. (2012) reported that exporting marine products from India have facing several challenges in its traditional markets such as the EU, the US and Japan owing to the strengthening of food safety standards and technical regulations in the post WTO phase in the wake of the SPS and TBT agreements.

**CONCLUSIONS**

The global marine products market is growing significantly due to the growing demand from animal and human consumption, cosmetics, fishmeal and fish oil, bioactive compounds, pharmaceuticals, marine protein and food processing aids and bi-products are used for valuable ornamentals. The multi-functionality of marine products in various industrial applications is an important driving factor for expanding its role in the international market.

In view multi-faceted advantage in its production of marine products can be successfully harvested in India because of high demand in the international market. Therefore, it is necessary to create awareness among Indian
fishermen about its importance at the international market to exploit its full market potential.

From the direction of trade European Union, South East Asia and China were found to be highly loyal markets for Indian marine products. Therefore, the export promotion activities should orient towards these countries for further expansion of exports.

Marine Products Export Development Authority should focus on under prevailing international market situations. Depreciation of Euro, weaker economic condition in China, devaluation of Yen, depreciation of the Indian Rupee, improvement in supply conditions in South East Asian (SEA) countries in comparison to previous year has resulted in continuous drop in prices of shrimp, a principle commodity of Indian seafood export basket.

India can capitalize the opportunity to make further inroads into the South East Asian nations, only if the ASEAN nations open up their markets further by giving greater access to fish and shishery products such as frozen shrimp, frozen tuna etc. in which India has a comparative advantage. The AIFTA in the present framework does not offer much prospects for our marine product exports in the SEA market. It calls for further liberalization and preferential treatment for the marine product exports of India so that we can capitalize on the gains that have already been made.

REFERENCES