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Indian Shrimp Trade: Reflections and Prospects in the Post–WTO Era

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Abstract

Indian fisheries sector in view of its potential contribution to national income, nutritional security, employment opportunities, social objectives, and export earnings plays an important role in the socio-economic development of the country. The marine products exports contributed a whopping 7245 crores of foreign exchange to the exchequer during 2005–2006, which is one-third of the total agricultural exports and 1.5 percent of the total GDP. Shrimps continue to be the predominant item in our marine export claiming about 29 and 67 percent in quantity and value terms share, respectively. Until recently, India depended heavily on one product (shrimp) and one market (Japan) for its marine products export and thus there is a need for product and market diversification. Shrimp export from India to the United States is also posing serious concern based on the restriction placed on the ground that these are not caught using turtle-excluding devices and with proper antidumping measures. The present study is an attempt to address the significance of the shrimp trade in the Indian seafood export basket based on the data collected for the period from 1979 to 2005 from different sources. The different export parameters like the growth, instability, competitiveness, dynamics of changes, integration, impediments faced, and prospects in the post-WTO framework are analyzed using econometric tools. The results of the study indicated that the trade liberalization initiated during 1991 had embarked improvement in the Indian shrimp export. However, recently, there is erosion in the competitiveness of Indian shrimp trade. Nevertheless, there are issues of concern due to the competitiveness, instability, and rejections on quality grounds. Infrastructure development, creating brand image, adoption of HACCP guidelines, value addition and antidumping measures, horizontal integration by ploughing in more area under shrimp farming considering the vast potential of unexploited brackish-water resources are the core issues, which need to be addressed.

Introduction

Indian fisheries sector, in view of its potential contribution to national income, nutritional security, employment opportunities, social objectives, and export earnings plays an important role in the socio-economic development of the country. Export earnings are presently valued to be more than Rs. 7,250 crores from a volume of 5.2 lakh tonnes. In addition, it provides direct and indirect employment and dependency

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for more than 14 million people in the country. With an estimated production potential of 8.4 million tonnes, the present level of production in the country is 6.57 million tonnes with an annual growth rate of about 6 percent with 60 and 40 percent contribution, respectively, from the inland and marine sector. Japan, USA, European Union, South East Asia, and Middle East are the five major markets for Indian seafood export.

Among the different species, shrimps continue to be the predominant item in our marine export accounting for about 28 and 60 percent share in quantity and value terms, respectively. Internationally traded fisheries products are characterized by a high degree of heterogenity, reflecting the wide range of species and of processing techniques (Chand, Ramesh. 1997). The seafood industry in many countries is undergoing a rapid change to process more and more ready to cook and ready to eat items in convenient packs. Indian seafood industry, by and large, still remains as a supplier of raw materials to the preprocessors in foreign countries and 90 percent of raw materials are exported in bulk packs, which is the prime reason for the drastic reduction in the unit value realization (Salim 2002).

India depends heavily on one product (shrimp) and one market (Japan) for its marine products export, and thus, there is a need for product and market diversification. India's predominant position in shrimp market is being eroded due to the sudden spurt in farmed shrimp production in China, Indonesia, Thailand, and Vietnam (Datta and Chakrabarti 2001).

The broad objectives of this investigation are to study the export performance and potential of Indian shrimp under the trade-liberalized economy. However, the specific objectives are as follows: To assess the dynamics of changes in export of Indian shrimp, to decompose the growth and instability of Indian shrimp exports and also to assess the market potential and opportunities in shrimp exports.

Materials and Methods

The secondary data pertaining to export quantity, export, export unit value, domestic price, and international price of major marine products at different markets were gathered from the various publications of Marine Products Exports Development Authority (MPEDA), Ministry of Commerce, Government of India, and the data pertaining to macroeconomic indicators like Gross National Income of the importing countries and exchange rate, etc were collected from various published Governmental and Non-Governmental sources for the study period.

The study was based on secondary data covering a period of thirty-two years, starting from 1975 to 2006. The study period was divided into two segments *viz.*, preliberalization (1975 to 1990) and postliberalization (1991 to 2006) periods. This grouping was carried out to compare the export performance of the Indian shrimp export

in the preliberalization and postliberalization periods. The growth, instability, direction of export, demand-supply elasticities of exports, and competitiveness were analyzed, and the analytical tools used in this study are discussed below

Tools of Analysis

A. Analysis of Growth

The growth in quantity exported, export value, and unit value realized from exports were analyzed using the exponential growth function of the form,

$$Y = ab^t e_t \qquad (1)$$

where Y = dependent variable for which growth rate was estimated; a = Intercept; b = Regression coefficient; t = Time variable; e = Error term

The compound growth rate was obtained for the logarithmic form of the equation (A) and is given below.

$$\text{In } Y = \text{Ln } a + t \text{ Ln } b. \quad (2)$$

Then, the compound growth rate (r) was computed by using the relationship

$$r = (\text{Anti Ln of } b - 1) \times 100 \quad (3)$$

B. Decomposition Model

The decomposition model of Hazell & Peter (1982) was used to find the source of growth and variability in Indian marine products exports. The export quantity and export unit values were first detrended using the linear relations of the form

$$z_t = a + b + e_t, \quad (4)$$

where z_t denotes the dependent variable (export quantity and export unit value); t = time variable; and e_t = random variable residual with zero mean and variance σ^2. After detrending the data, the residuals were centered on the export mean export quantity and export unit value resulting in the detrended time series data of the form

$$z^*_t = e_t + \bar{z}, \quad (G)$$

where $\bar{z}$ = mean of export quantity/unit value; z^*_t = detrended export quantity or unit value.

The detrended values were subjected to the following analysis

$$EV = EQ.\ EUV \quad .(5)$$

EV = The export value of shrimp products

EQ = The export quantity of shrimp products

EUV = The export unit value of shrimp products

The variance of the export value ($V(EV)$) is expressed as follows:

$$V(EV) = \overline{EQ}^2\ V(EUV) + \overline{EUV}^2 + V(EQ) + Cov(EQ, EUV) - Cov(EQ, EUV)^2 + R, \quad .(6)$$

where and = the mean export quantity and mean export unit value; R = the residual term, which is expected to be small

It is apparent from the above expression that $V(EV)$ is not only a function of the variances in export quantity and unit value but also a function of the mean export quantity and unit value and of the covariance's between quantity and unit value. Evidently, a change in any one period of these components would lead to a change in $V(EV)$ between these two periods, and similarly, average export value $E(EV)$ can be expressed as follows:

$$E(EV) = \overline{EQ}\ \overline{EUV} + COV\{EQ.EUV\} \quad ...(7)$$

It was affected by the changes in the covariances between export quantity and unit value and also by the changes in the mean export quantity and unit value. The objective of the decomposition analysis is to partition the changes in the $V(EV)$ and $E(EV)$ between the two periods into constituent parts, which could be attributed separately to changes in the mean, variances, and covariance of export quantity and export unit value, which is

$$E(EV_I) = \overline{EQEUV}_I + COV\{EQ_I.EUV_I\} \quad ..(8)$$

$$E(EV_{II}) = \overline{EQEUV}_{II} + COV\{EQ_{II}.EUV_{II}\} \quad .(9)$$

Each variable in the second period could be expressed as the counterpart in the first and the change in the variable between the two.

For example,

$\overline{EQ_{II}} = \overline{EQ_I} + \Delta\overline{EQ}$ and $\Delta\overline{EQ_{II}} = \overline{EQ_{II}} - \overline{EQ_I}$. Therefore,

$$E(EV_{II}) = (\overline{EQ_I} + \Delta\overline{EQ})\ (\overline{EUV_I} + \Delta\overline{EUV}) + Cov(EQ_I.EUV_I) + \Delta Cov(EQ, EUV) \quad ...(10)$$

The change in the average export value [$\Delta E(EV)$] was then obtained by subtracting equation (K) from (M).

This was reduced to

$$\Delta E(EV) = E(EV_{II}) - E(EV_I)$$

$$= \overline{EQ_I}\ \Delta\overline{EUV} + EUV.\Delta\overline{EQ} + \Delta\overline{EQ}.\Delta\overline{EUV} + \Delta Cov(EQ,EUV) \quad ...(11)$$

Table 1. Components of Change in Average Export Value

Sl.No	Source of Change	Symbol	Components of Change
1	Change in mean export value	$\Delta\overline{EUV}$	$\overline{EQ}$, $\Delta\overline{EUV}$
2	Change in mean export quantity	$\Delta\overline{EQ}$	$\overline{EUV}$.Δ $\overline{EQ}$
3	Interaction between changes in (1) and (2)	$\frac{\Delta\overline{EUV}\Delta}{\overline{EQ}}$	$\Delta\overline{EUV}\Delta$ $\overline{EQ}$
4	Change in EQ-EUV covariance	ΔCov(EQ,EUV)	Δ Cov(EQ,EUV)

Table 2. Components of Change in the Variance of Export Value

	Source of Change		Components of Change
	Description		Symbol
1	Change in Mean EUV	$\Delta\overline{EUV}$	$2\ \overline{EQ_1}\ \Delta EUV\ \text{Cov}(EQ_1,EUV_1) +$ $([2\ \overline{EUV}_1\Delta\ \Delta\overline{EUV}) + (\Delta\overline{EUV})^2]\ \text{V}(EQ_1)$
2	Change in mean EQ	$\Delta\overline{EQ}$	$2\ \overline{EUV}_1\Delta\overline{EQ}\ \text{Cov}(EQ_1,EUV_1) + [2\ \overline{EQ_1}\Delta$ $\overline{EQ}\ + (\Delta\ \overline{EQ})^2]\ \text{V}(EUV_1)$
3	Change in EUV variance	ΔV(EUV)	$(\overline{EQ_1})^2\Delta\text{V}(EUV)$
4	Change in EQ variance	ΔV(EQ)	$(\overline{EUV}_1)^2\ \Delta\text{V}(EQ)$
5	Interaction between changes in mean EUV and EQ	$\Delta\overline{EUV}\Delta\ \overline{EQ}$	$2\Delta\overline{EUV}\Delta\overline{EQ}\ \text{Cov}(EQ_1,EUV_1)$
6	Changes in EQ-EUV Covariance	Δ Cov(EQ,EUV)	$[2\ \overline{EQ_1}\ \overline{EUV}_1 - 2\ \text{Cov}(EQ_1,EUV_1)]$ Δ Cov(EQ,EUV)–[Cov(EQ,EUV)]^2
7	Interaction between changes in mean EQ and EUV covariance	$\Delta\ \overline{EQ}\ \Delta$V(EUV)	$[2\overline{EQ}\Delta\overline{EQ} - (\Delta\overline{EQ})^2]\Delta\text{V}(EUV)$
8	Interaction between changes in mean EUV and EQ covariance	$\Delta\overline{EUV}\ \Delta$V(EQ)	$[2\overline{EUV}\ \Delta\overline{EUV} - (\Delta\overline{EUV})^2]\Delta\text{V}(EQ)$
9	Interaction between changes in mean EQ and EUV and changes in EQ–EUV covariances	$\Delta\overline{EUV}\Delta\overline{EQ}$ Δ Cov(EQ,EUV)	$[2\overline{EUV}_1\Delta\ \overline{EQ}\ + 2(\ \overline{EQ_1}\ \Delta\overline{EUV}) + 2\Delta$ $\overline{EQ}\ \Delta\overline{EUV}\ ]\ \Delta$ Cov(EQ,EUV)
10	Change in residual	ΔR	Δ V(EQ,EUV) – Sum of other components

Where $\overline{EQ}\,\Delta\overline{EUV}$ and $\overline{EUV}\,.\,\Delta\overline{EQ}$ arose form the changes in mean export unit value and mean export quantity. They are called as the pure effects, as they arose even when no other sources of change.

$\Delta\overline{EUV}$ was an interaction effect, which occurred from the simultaneous occurrence of changes in mean export unit value and mean export quantity. Obviously, this term will be zero if either the mean export value or the mean export quantity remains unchanged.

$\Delta COV\ (EQ.EUV)$ occurred from the changes in the variability of the export quantity or export unit value.

Since

$$COV\ (EQ, EUV) = \rho\ [V\ (EQ)\ V\ (EUV)]^{1/2}. \quad (12)$$

where ρ is the correlation coefficient, then it can be observed that $\Delta COV\ (EQ.EUV)$ occurred from the changes in the variances of export quantity and unit value and from the changes in the correlation between the two.

The changes in the variance of export value $V\ (EV)$ can be decomposed in an analogous way. The components of the change in the variance of export value are given below. Thus, there are 10 sources of changes in export value variance; four of these are changes in mean export unit value, changes in mean export quantity, interaction between changes in mean export quantity and mean export unit value, and changes in the export quantity–unit value variance, which are similar to that of Table 1. However, changes in export value variance had also occurred from the changes in the variances of export quantity and unit value and from changes in interaction terms between all these components.

C. Export Instability

Instability in export is expected to hamper the process of economic development. This analysis was used to find out the fluctuations in export of major marine products during preliberalization and postliberalization periods. (Begum, S. and A.F.M. Shamsuddin, 1998) To study the export instability, Coppock's instability index was used to estimate the variation in the export of shrimp, which algebraically is expressed as the following estimable form:

$$\text{V Log} = \frac{\sum_{i=1}^{n} \left(\log \frac{X_{t+1}}{X_t} - m \right)^2}{N}. \quad (13)$$

$$\text{The instability index} = (\text{antilog}\sqrt{\text{V log.g}} - 1) \times 100, \quad (14)$$

where

X_t = Value of exports in year t or volume of exports in year t

N = Number of years – 1

m = The arithmetic mean of the difference between the logs of X_t and X_{t+1} etc.

V log = Logarithmic variance of the series

D. Dynamics of the Structural Change in Exports

The structural change in export of major marine products was examined by estimating the transitional probability using Markov-chain model. This econometric analysis not only helps to know the trend in sustaining existing market but also helps to know the shift in shares from one country to another over a period of time.

Results and Discussion

Export Growth of Indian Shrimp

The growth patterns in the export of shrimp from India during the pre-liberalisation (1975-1990) and post-liberalisation (1991-2006) period in both quantity and values are furnished in Table 3.

Table 3. Export growth of Indian shrimp products

Year	Pre-liberalization (1975–1990	Post-liberalization (1991–2006)
Total		
Quantity (tonnes)	3.72**(1.84)	7.04** (2.37)
Value (Rs)	3.48* (1.62)	11.72** (3.48)
Value (US $)	3.44** (1.92)	5.89** (1.81)
Unit Value (Rs)	–0.28* (-0.14)	4.37(–0.02)
Frozen Shrimp		
Quantity (tonnes)	1.21* (0.89)	5.15** (2.67)
Value (Rs)	2.10* (0.97)	5.08** (2.36)
Value (US $)	2.07* (1.10)	5.11**(2.42)
Unit Value (Rs)	1.24 (0.82)	–0.07* (–0.03)

Figures in parenthesis indicate the standard errors of the estimates; ** indicates 1% level of significance; * indicates 5% level of significance.

The growth rate of marine products in terms of quantity, value in rupees, dollar, and unit value for the different commodities are estimated in Table 3. The

commoditywise export of marine products indicated that the postliberalization period performed better than the preliberalization period with respect to quantity, value in rupee, and US dollar terms with 7.04, 11.72, and 5.89 percent, respectively. The export basket during the postliberalization was characterized by the dominance of diversification of frozen squids, cuttlefish fresh, and frozen fishes compared with the high-valued species (shrimps and lobster), which resulted in the increased realization of prices.

Frozen shrimp, the largest value component, registered a 5.15 percent growth in quantity and 5.08 percent in value terms. However, the unit value registered a decline of –0.07 percent during the postliberalization period, which can be attributed to lower unit value realization and the price-making behavior of the buyer in the export markets.

Decomposition Analysis

Decomposition analysis was done for decomposing the sources of growth on average export value and variance of export value of Indian marine products. In addition, the decomposition of the sources of growth in average export value and variance of the export value were analyzed.

The results of the decomposition analysis of the components of change in the average export value and variance of fish exports are given in Tables 4 and 5. The components of changes in the export value of Indian shrimp in terms of change in mean export quantity and mean export unit value and their variability besides the interaction effect are given in Table 5.

Table 4. Decomposition analysis of the components of change in average export value of Indian fish exports

Sl. No:	Source of Change	Percentage Share
1	Change in Mean Export Unit Value	2.43
2	Change in Mean Export Quantity	93.08
3	Interaction between changes in (1) and (2)	4.67
4	Change in EQ-EUV covariance	-0.18

The results indicated that the contribution of change in mean export quantity was the highest among the other components of change, which accounted for 93.08 percent of the increase in average export value. This was as expected because the export quantity had recorded significant higher growth rates during both the period, whereas the export unit value recorded a negative growth rate during the postliberalization period. The changes in the covariance between the mean export quantity and the mean export unit value accounted 0.18 percent decrease in the mean export value. The changes in the covariances could have occurred through the changes in the variance of export quantity and export unit value. With regard to interaction effect, the export quantity was benefited to a small extent (4.67 percent) from both mean export quantity and mean export unit

value, which indicated that the increase in export value paved way for an increase in export quantity.

Table 5. Decomposition analysis of the components of change in the variance of export value of Indian marine products

Sl. No:	Source of Change in Variance Description	Percentage Share
1	Change in Mean EUV	–0.17
2	Change in Mean EQ	27.59
3	Change in EUV Variance	0.18
4	Change in EQ Variance	74.36
5	Interaction between changes in mean EUV and EQ	–0.14
6	Changes in EQ-EUV Covariance	–3.85
7	Interaction between changes in mean EQ and EUV covariance	0.84
8	Interaction between changes in mean EUV and EQ Covariance	5.35
9	Interaction between changes in mean EQ and EUV and changes in EQ-EUV Covariance	–9.32
10	Change in residual	5.16

The change in variability of export quantity accounted for 27.59 percent in the variance of export value. The coefficient of variation was worked out at 15.5 percent and 23 percent, respectively, during the preliberalization and postliberalization periods. The change in the variance of export quantity was the important source in increasing the export value variance to the extent of 74.26 percent. The change in the covariance between mean export quantity and mean export unit value was –3.82 percent, showing that the variability effect of both the mean export quantity and mean export unit value reduced the instability of export value variance to a small extent, thus generating a stabilizing effect among all other components of change.

The effect of interaction term was also important in determining the stability of the export value and when added together contributed 6 percent of the increases in the variance of total export value. The interaction terms arose in part from the change in mean export unit value and export quantity covariance and had induced a change in the behavior of the exporters, which affected the mean or variance of the export quantity and had led to the instability of the export value.

The results of the decomposition analysis of the components of change in the average export value and variance of Indian shrimp are given in Tables 6 and 7.

Table 6. Decomposition analysis of the components of change in average export value of frozen shrimp

Sl. No:	Source of Change	Percentage Share
1	Change in Mean Export Unit Value	30.85
2	Change in Mean Export Quantity	40.62
3	Interaction between changes in (1) and (2)	27.64
4	Change in EQ-EUV covariance	-0.89

The results indicated that the contribution of change in mean export quantity was the highest among all other components of change with 40.62 percent accountability for the increased in average export value. The change in mean export unit value accounted for 30.85 percent followed by 27.64 percent contributed by the interaction between the mean export unit value and mean export quantity. The contribution of mean export quantity and mean export unit value as the dominant sources of change in average export value of frozen shrimp is as expected as they registered significant growth with higher instability among export quantity and export unit value.

The components of change that affected the stability of export value are shown in Table 7. The effect of interaction terms is the most important in determining the stability of export and accounted for about 65 percent of the increase in the variance of total export value. The interaction terms arouse from the changes in mean export unit value and export quantity covariance, mean export quantity and export unit value covariances, and interaction between them. In addition, the export quantity variance, mean export quantity, and mean export unit value variance contributed 14.64, 13.01, and 9.27 per cent, respectively, in determining the stability of export value.

Thus, it could be summarized that the change in mean export quantity, mean export unit value, and interaction between mean export quantity and mean export unit value are the major sources of changes in determining the average export value of frozen shrimp, where the stability of export value depends more on the interaction terms (65 percent) rather than the individual components.

Export Instability

The export performance of a market during a period was also measured based on the extent of variability or fluctuations in addition to the point of view in the increase in quantity, value, and unit value. Thus, Coppocks instability index was used to study the degree of instability in quantity, value, and unit value of marine products export from India during the two period's *viz*., preliberalization and postliberalization for the different commodities and markets, and the estimated instability indices.

Table 7. Decomposition analyses of the components of change in the variance of export value of frozen shrimp

Sl. No:	Source of Change in Variance	
	Description	Percentage Share
1	Change in Mean EUV	1.84
2	Change in Mean EQ	13.01
3	Change in EUV Variance	9.27
4	Change in EQ Variance	14.64
5	Interaction between changes in mean EUV and EQ	0.78
6	Changes in EQ-EUV Covariance	6.24
7	Interaction between changes in mean EQ and EUV covariance	24.18
8	Interaction between changes in mean EUV and EQ Covariance	26.54
9	Interaction between changes in mean EQ and EUV and changes in EQ-EUV Covariance	15.89
10	Change in residual	-12.39

Export Instability of Indian shrimp

The instability indices of Indian shrimp export were analyzed using the Coppocks Instability Index, and the results are given in Table 8.

Table 8. Instability indices of Indian shrimp export

Year	Preliberalization (1975–1990)	Postliberalization (1991–2006)
Total		
Quantity (tonnes)	12.34	22.82
Value (Rs)	16.04	26.83
Value ($)	12.98	25.19
Unit Value (Rs)	10.15	18.39
Frozen Shrimp		
Quantity (tonnes)	7.15	12.18
Value (Rs)	18.12	23.46
Value ($)	18.25	23.42
Unit Value (Rs)	14.31	16.14

The results indicated that the degree of instability was more pronounced during the postliberalization period with 22.82, 26.83, and 18.39, respectively, in terms of quantity, value, and unit value even though more growth was associated. Some of the reasons that can be attributed to the growing instability is the increasing number of trading partners, fluctuations in the Japanese economy and frozen shrimp registered higher export quantity variation (12.18 percent) during postliberalization period compared with preliberalization period (7.15 percent), suggesting that there exist severe competition among the different exporters and the exports are very much responsive to the prices. In addition, the essentiality of a buyers market and lesser number of importers paved the way for higher instability.

Thus, it could be noted that the post liberalization period generated a higher degree of instability for frozen shrimp. The analysis suggested the need for diversification of commodities, which would reduce the degree of instability.

Structural Change in Shrimp Export

The dynamics in the directions of export and changing pattern in the trade of major marine products from India by shift in export shares from one country to another over a period of time were analyzed using the Markov chain model.

The estimated transitional probability matrix of Indian frozen shrimp export in quantity during the preliberalization period is presented in Table 9. The transitional probability gives a broad indication of the change in the direction of trade of frozen shrimp export from India over a period of 12 years .The major countries importing Indian frozen shrimp consistently included Japan, USA, and European Union accounting more than 80 percent in quantity and value. The export to remaining countries was pooled under 'Others.'

Table 9. Transitional probability matrix of Indian frozen shrimp export during preliberalization period

Importing countries	Japan	EU	USA	Others
JAPAN	0.8072	0.0000	0.1833	0.0095
EU	0.0000	0.7512	0.1369	0.1119
USA	0.5564	0.1247	0.3189	0.0000
Others	0.0000	0.8687	0.0000	0.1313

Table 9 revealed that Japan and European Union were the stable Indian frozen shrimp export markets, which have been most stable during preliberalization period as reflected by the high probability of retention of 0.80 and 0.75, respectively. The results indicated that the probability that Japan retained its export share from one period to another was about 81 percent during 1975–1990 and that of the European Union was 75 percent. The higher retention of Japan was reinforced by high probability of transfer from United States (0.556) and that of European Union market were reinforced by high probability of transfer from USA (0.124) and 'Others' (0.868), respectively. The probability of retention of frozen shrimp by United States was found to be 0.31 between the periods from 1975-1990. There was small probability of loss from Japan and European Union markets to US market at 0.183 and 0.136, respectively. The probability of retention of 'Others' was found to be 0.131 with high probability of transfer from European Union (0.111). Others include South East Asian Countries and Middle East.

The estimated transitional probability matrix of Indian frozen shrimp export in quantity during the postliberalization period is presented in Table 10. The Table shows that Japan and European Union were the stable Indian frozen shrimp export markets, which have been most stable during postliberalization period as reflected by the high probability of retention of 0.756 and 0.465, respectively. The results indicated that the probability that Japan retained its export share from one period to another was about 75.6 percent and that of the European Union was 46.5 percent during 1975–1990. The higher retention of the Japan is reinforced by higher probability of transfer from European Union (0.365), whereas that of European Union was reinforced by high probability of transfer from United States (0.605). The probability of retention of United States was 0.328 with high probability of transfer of 0.158 from Japan and 0.219 from 'Others' even after losing 0.605 to European Union.

Table 10. Transitional probability matrix of Indian frozen shrimp export during postliberalization period

Importing countries	Japan	EU	USA	Others
Japan	0.7562	0.0000	0.1584	0.0855
EU	0.3656	0.4652	0.0809	0.0884
USA	0.0000	0.6054	0.3283	0.0663
Others	0.0910	0.0678	0.2196	0.6216

Thus, it can be concluded that the frozen shrimp market remained more or less stable with Japan as the major trading partner followed by European Union and United States. It is significant to note that the 'Others' gained sizeable probability of retention during the postliberalization period (0.621) compared with preliberalization period (0.131). The presence of 'Others' indicates the emergence of newer trading partners with India.

Market Potential and Opportunities
Export Demand and Supply Elasticity

Based on the export demand and supply function, the export demand supply equations for the shrimp were estimated using 2-stage least square (2SLS) estimates, and the results are discussed below. The price and the income elasticities obtained from the results would indicate whether the shrimp exports enjoy a competitive advantage in terms of higher price and income elasticities.

The demand and supply elasticities for frozen shrimp export to major countries using the 2SLS estimates during the preliberalization period are given in Table 11. The results indicated that the price elasticities of the export demand were significant at 1 percent level for Japan, United States, and UK. The price elasticity worked out to be 0.94, -1.93, and -0.35 for Japan, United States, and UK, respectively. It implied that 10 percent increase in the price had led to 9.4 percent increase in the quantity demanded for Japan, a reduction in 13 percent and 3.5 percent for the quantity demanded in United States and UK, respectively. The price elasticities estimated of USA and UK is in concordance with the neo classical theory of demand that the quantity demanded is inversely related with price rise.

Table 11. Demand and supply elasticities for shrimp exports to major markets during preliberalization period

Countries	Demand Elasticity		Supply Elasticity
	Price	Income	Price
Japan	0.94**	-0.50**	0.42**
USA	-1.30**	0.24**	0.05
Germany	-2.43	0.62**	0.38
UK	-0.35**	0.48**	0.48**
Spain	0.29	0.58	0.68

n = 15 **one percent level of significance

The income elasticity for Japan, USA and Germany was worked out at 0.50, 0.24 and 0.62, respectively, and was significant at one percent level. The results implied that one percent in income would increase the quantity demanded by 0.5, 0.24 and 0.62 percent. The price elasticities of supply worked out to be 0.42 and 0.48, respectively, for Japan and UK, which implied that one percent increase in the price would increase the supply by 0.42 and 0.48 percent, respectively.

The demand and supply elasticities for frozen shrimp export to major countries using the 2SLS estimates during the postliberalization period are given in Table 12. The results indicated that the price elasticities of export demand were significant at one per

cent level for USA, UK, Spain, and Italy. The price elasticities worked out to be -2.69, -4.47, -0.15, and -0.18 for USA, UK, Spain, and Italy, respectively. The price elasticities for Japan were found to be 0.16, which indicated that the quantity demanded increased with price rise based on the fact that Japan continues to be the largest importer and consumer of fish. The results obtained for the other countries were supporting the neo classical theory of demand which states that one percent increase in the price would decrease the quantity demanded by the level corresponding to the elasticities. The income elasticities was the highest for UK with 3.98, which indicated that one percent increase in the income would increase the quantity demanded by 3.98 percent at one percent level of significance. The price elasticities of supply were the highest for Spain followed by Japan, USA, and Italy at 4.13, 2.75, 2.07, and 0.89 percent, respectively. This indicated that one percent increase in the price of frozen shrimp would increase the quantity supplied at the corresponding price elasticities of supply.

Table 12. Demand and supply elasticities for shrimp exports to major markets during postliberalization period

Countries	Demand Elasticity		Supply Elasticity
	Price	Income	Price
Japan	0.16**	0.02**	2.75**
USA	-2.69**	0.88**	0.89*
UK	-4.47**	3.98**	0.11
Spain	-0.15**	0.15	4.13*
Italy	-0.18**	0.50**	2.07**

n = 15 **1% level of significance *5% level of significance

Nominal Protection Coefficient

In accordance with the theory of comparative advantage in international trade and against the backdrop of liberalization, it becomes imperative to analyses the export competitiveness of major marine products. In the present study, an attempt was made to analyze the competitiveness of frozen shrimp (Balassa 1965). The estimated nominal protection coefficient (NPC) for frozen shrimp during the preliberalization and postliberalization periods is depicted below in Table 13.

It was found that the NPC was less than one clearly indicating the competitiveness of Indian shrimp in the world market. The average NPC for the preliberalization and postliberalization periods was estimated to be 0.86 and 0.62, respectively. The increase in competitiveness of the Indian shrimp in the postliberalization period is due to the emergence of more number of markets like European Union and USA, and the resultant demand generated a premium price for shrimp in the world market.

Table 13. Nominal Protection Coefficient (NPC) for Frozen Shrimp

Year	Domestic Price (US $)	Domestic Reference Price (US $)	International Reference Price (US $)	Nominal Protection Coefficient
Period I (1975-1990)	8.26	8.93	10.81	0.86
Period II (1991-2006)	7.54	8.13	13.02	0.62
2003	7.52	8.17	16.24	0.50
2004	7.86	8.54	12.75	0.61
2005	8.64	9.29	13.5	0.69

However, the situation of late is changing due to the increase in domestic prices and poor crustacean landings, scarcity of raw material, and higher input requirement in the form of processing charges, electricity etc. The competitiveness of Indian shrimp is declining in the recent years with the NPC calculated at 0.61 and 0.69 in 2004 and 2005, respectively.

Conclusions

The study concludes with the following findings:

- The analysis of growth indicated that there exists a decline in the unit value realization of shrimp exports during the postliberalization period
- The decomposition analysis for frozen shrimp shows that the change in mean export quantity, mean export unit value, and interaction between mean export quantity and mean export unit value are the major sources of changes in determining the average export value of frozen shrimp. The postliberalization period generated a higher degree of instability for frozen shrimp.
- Japan and European Union were the stable Indian frozen shrimp export markets during preliberalization period and postliberalization period as reflected by the high probability of retention. Thus, it can be concluded that the frozen shrimp market remained more or less stable with Japan as the major trading partner followed by European Union and United States
- The demand and supply elasticities for frozen shrimp export to major countries using the 2SLS estimates during the preliberalization period indicated that the price elasticities of export demand were significant at 1 percent level for Japan, United States, and UK. The results indicate that Japan continues to be inelastic