

Economic recession and Indian seafood exports: reflections and paradigms

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Abstract

Objectives: Focus of the current article is to identify the trade performance of Indian marine products with reference to two time periods: pre-recession (1995-2007) and post-recession (2008-2018) in terms of geographic and commodity diversification with special focus on analysing the impact of recession via growth, constancy and retention terms.

Methods/Statistical analysis: The econometric and statistical tools such as compound growth rates, indices of diversity and instability have been carried out to assess the various parameters of the study. Analysis such as Growth Retention Matrix and Decomposition models were performed to quantify the variability and the sources influencing the growth in marine products of the country and its export.

Findings/Application: The study revealed that, amidst the global recession and economic meltdown, the sector performed well. Frozen shrimp registered the highest growth rate during both the recession periods from 3 to 18% in quantity. India continues to be the world largest exports of shrimp and economic recession across the world since 2008. But the trend does hinder neither the growth of Indian export nor the trade, and the growth rate was noted to be around 10 to 15% in the last decade.

The study advocated for government interventions in regulating fish exports and the development of a real time fish market grid for the integration of domestic and international markets to ensure more sustainability of fisheries trade and export.

Keywords: Economic recession, Decomposition analysis, Growth rate, Export instability, Simpson Index of Diversity

1. Introduction

Indian marine products and its export was initiated since 1938 and the marine products include salted fishes, dry fish, smoked fish, oil extracts, fish meal, fertilisers and other animal and plant products [1]. Dry fishes were majorly exported to the other Asian countries such as Myanmar, Sri Lanka, Singapore and Hong Kong. The share of total production that is exported increased significantly from 25% in the mid-1970s to nearly 40% in 2011, reflecting the sector's growing degree of integration in the global economy [2]. The seafood export processing industry has undergone several changes. Consumer preferences and tastes are strongly in favour of easy cook and ready-made foods and eating in restaurants has become immensely popular in domestic as well as foreign market. By exporting seafood worth of US \$7 Billion, the seafood sectors have earned a remarkable position in India's export expansions. The marine product export of the country upraised from 13 lakh tons to 7 billion US \$ in the year 2018-2019. However, the growth rate registered in the year 2007-08 was to about 20%. The major contribution to the export in the year 2018-19 is 65 % from the inland sectors.

2. Recession impacts on fisheries in India

The marine products exported from India are shrimps, squids and fishes in different conditions such as frozen, dried, and live and chilled to diverse countries. Seventy five% of the total seafood products exported from India is frozen form of fin fishes and shrimps. However a global economic meltdown has affected almost all the countries of the world during 2007 and was entitled to be "Great Recession".

The term “Great Recession” was a global economic crisis that distressed the millions of population to a down surge losing their financial savings, job and shelter. This was the longest economic decline prior to “the Great Depression” period 1930. On the other hand, Economic recession is defined as a decline in the country’s economy and its activities for a prolonged duration. This can be visible in real-time trends of GDP, real personal income, job, industrial manufactures and sales. The condition occurs when the consumers are not dependent on the economy growth and spend less. This leads to a decreased demand for goods and services, which in turn leads to a decrease in production, lay-offs and a sharp rise in unemployment [3].

Prior to the Diasporas of world-wide economic crisis, there was an immediate decline in international markets for Indian fisheries. The quantity exported during 2007-08 was 5.41 lakh tonnes on comparison to 6.12 lakh tonnes during 2006-07 highlighting the negative impact of economic crisis on fisheries export. The wholesale prices of imported Indian fishes were also shortened in European Union. There was high reduction in the scale of transaction and purchase prices of Indian fishes/shrimp. Farm gate price was almost half of the highest at peak. This caused damage to small-scale fishers who are engaged in catching fry and young fish [4]. Due to western economic strategies employed by the policy makers to diversify exports, the Indian exports was pulled down in the global markets and it remained slothful in the year 2013 [5]. The worldwide recession has also taken a toll on the fishing industry of Veraval, Kerala, India which has huge fish processing plants and industries that export best quality marine products to countries such as Japan, China, USA, Gulf and European countries.

Initially there was a lot of pressure to survive in the economically challenging time, but the quality together with various other factors helped the seafood industry of India to survive. The country’s exports grew significantly in terms of dollar despite the decline in aquaculture production and a slump in fish landings, with realisation to unit price value. Conversely, the domestic marine product marketing in India is steeply increasing and there also exists a paradox of export the impacts of recession in this sector has a huge role. With this note, the need for study on analysing the recession impacts in the fisheries sector of India was distinguished to be significant research line. This work presents the evaluations on impacts and consequences of recession in the marine product trade of India during the two pre-recession and post-recession periods.

3. Objectives

The major objectives of the study are:

1. To identify the export trends of marine products of India with reference to the geographic location, commodity diversification in the recession periods.
2. Analysing the impact of recession via growth, constancy and retention terms during the pre-post-recession periods.
3. To quantify the growth and its source with its variability of marine fisheries trade from India.

4. Data and Methodology

The study uses the secondary datasets and information from the different publications of marine fish landings and trade from the Marine Products Export Development Authority, India, Food and Agriculture Organisation Statistics Year Book and National Marine Living Resource Data Centre, Central Marine Fisheries Research Institute. The datasets from the years 1995 to 2017 was used to define the two time periods such as pre-recession (1995-2007) and post-recession (2008-2018). The growth rate analysis was done to evaluate the export trends of marine products during both the periods. Market-wise and Commodity-wise export performance of the marine products was assessed during the recession tenure in the Indian Seafood Export. Export instability indices and the Growth Constancy Retention matrices of the marine products and destination periods were identified to understand the impact of recession in the Indian marine fisheries sectors. Analysis on the growth instabilities, export directions and potentials, competitiveness were done using economic and statistical measures.

4.1. Analytical framework

Generalised statistical tools such as compound growth rates, indices of diversity and instability. The methodologies associated with the analysis are furnished below.

4.2. Simpson index of diversity

The diversification and concentration of export with respect to the pre (1995-2007)-post-recession (2008-2017) periods have been measured using the Simpson Index of Diversity (SID). The index ranges between 0-1, tend towards zero when there is specialisation and towards one when there is complete diversification. The Simpson Index of Diversity is calculated using the following equation:

$$SID = 1 - \sum_{i=1}^n W_i^2 \quad \text{and} \quad W_i = \frac{X_i}{\sum_{i=1}^n X_i},$$

Where X_i = export value /import value of i^{th} commodity

W_i = Export Proportionate value /import of i^{th} commodity out of total exports or imports

4.3. Growth Constancy Retention Matrix (GCR)

The Growth Constancy Retention Matrix (GCR) was used to compute the export performance of Indian marine products exported to different countries among both the periods. The matrix includes three components as follows:

1. Growth

Growth was estimated using the compound growth rate, G and $r = (\text{Anti Ln } (b) - 1) * 100$. Based on the export growth rate commodities and destinations were grouped into high growth, medium growth and low growth.

2. Constancy

Constancy refers to the stability of the market/ product over the period. The stability is assessed using the instability indices computed for the commodities and destinations were grouped into high, medium and low stability.

The instability index = $((\text{antilog}(g) - 1) * 100$

Where,

X_t = Export value in year t or Export quantity in year t

N = no. of years – 1

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

V log = logarithmic variance

3. Retention

The brand reliability and constancy of the Indian exports with specific references to commodities and destinations were assessed using the retention. Retention was assessed by weighted averages based on the percentage retention of the export over the years. The retention for the commodities and destinations were grouped into high, medium and low retention.

4.4. Decomposition model

The Hazell's (1982) decomposition model was employed to identify the source of growth and variations in marine products exports of India. The quantity of the commodity and the unit values were detrended using the equation:

$$Y_t = A + B + E$$

Where, Y_t , denotes the export quantity and export unit value, t = time and E_t = random variable with residuals of zero mean and variances. After detrend, the residuals are to be centered with mean export quantity and unit values to estimate the detrended time-series datasets:

$$Y_t^* = E_t + y$$

Where, y = Mean values of export quantity or unit values,

Y_t^* = detrended time-series of export quantity or unit values.

The detrended time-series datasets were then used for the further analysis:

$$SV = SQ \cdot SUV$$

Where, SV = the export value,

SQ = the export quantity,

SUV = the export unit value.

The variable descriptions used for analysis the component of variation in average export value and export values are presented in Table 1.

Table 1. Components of variation in export quantity and export unit value

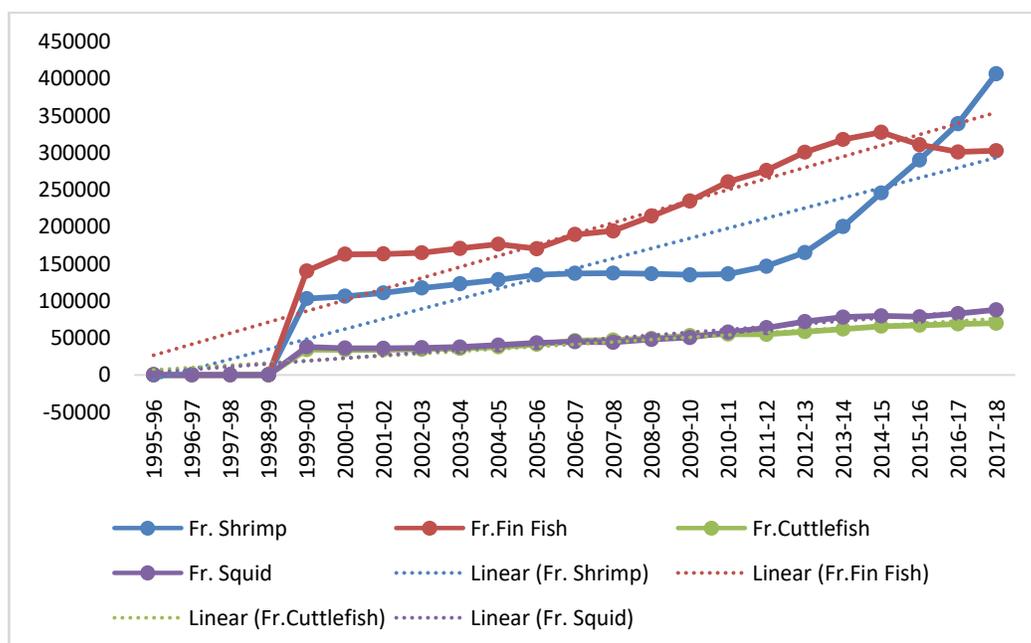
Sr. No.(1)	Source of change(2)	Symbol(3)	Components of change (4)
1	Variation in mean export value	ΔSUV	$SQ, \Delta SUV$
2	Variation in mean export quantity	ΔSQ	$SUV, \Delta SQ$
3	Interaction between changes in (1) and (2)	$\Delta SUV \Delta SQ$	$\Delta SUV \Delta SQ$
4	Variation in SQ-SUV covariance	$\Delta COV (SQ, SUV)$	$\Delta COV(SQ, SUV)$

5. Result and Discussion

1. Export performance of fisheries sector of India

From analysing the export performance in terms of export quantity and export value, frozen shrimp stands in the first position with 39.5 % of shares in quantity and 66% share in the US \$ earnings. The quantity of Vannamei shrimps has increased from 2.22 lakh MT to 2.56 lakh MT in the years 2015 to 2016. In values, the shrimp was exported to USA (50%), South East Asian Countries (17.2%), European Union (15.7%), Japan (4.5%), Middle East (3.6%), and China (2.2%) and to the other countries (6.4%). Black tiger shrimps were marketed majorly to Japan (37%), USA (20%) and South East Asia (19.2%). Moving averages of five year was estimated to draw the trends of shrimp quantity in total export. The annual trends of quantity of shrimp in total export are presented in the Figure 1. The results illustrate that the annual exports from India amplified in the years 2009-2010 with the export quantity.

Figure 1. Trend analysis of Export of major marine products to total export (5 year moving average)



The advancement of the shrimp farms with the gain in momentum of *P.vannamei* is considered as the major reason for this constant increase in the shrimp export. Better management practices in shrimp farming led to growth in the overall productivity of the shrimp farms there by allowing farmers to produce higher quantity of shrimps within the existing culture ponds. Studies showed that owing to the high demand for shrimps around the world, *P.vannamei* production has changed the shrimp production scenario by developing shrimps as the major export commodity. It has become a major foreign exchange revenue generator of the country and may continue to be so in the following years.

2. Diversification of Indian fishery export

The commodity baskets of Indian fishery export were highly diversified with various marine products viz., live, fresh/chilled, frozen, dried etc. However, majority of the exports are traded in frozen form. Frozen shrimp is the dominantly exported item with reference to quantity and unit value in the last ten years [6]. The extent of diversification in commodity basket of fish export was quantified for both region wise and commodity wise using Simpson index of diversity and furnished. The trend in the measure of diversity of exports to world and other major export destinations clearly indicated that the commodity basket of India's fish exports is getting diversified over the years. The results shows that the Simpson index of diversity (SID) of exports to various geographical destinations have increased almost three fold during both the periods. The exports to largest destinations like Japan (0.69 to 0.93), USA (0.86 to 0.86), EU (0.37 to 0.62), China (0.43 to 0.82), Middle East (0.97 to 0.98) and Other (0.87 to 0.95) have increased and are close to one which indicates the complete diversification of Indian fishery export, whereas export diversification to South East Asia has declined from 0.83 to 0.25.

Commodity wise trend of SID indicates that Frozen shrimp (0.56 to 0.95) holds the first place in the complete diversification of Indian export during the pre-post-recession periods followed by Frozen Squid (0.88 to 0.93) and Frozen Cuttle fish (0.88 to 0.89), whereas for Frozen fin fish, SID have decreased to almost half during the post-recession period. The results suggested that the export of frozen fin fish was associated with high rates of instability indicating greater inter-year fluctuations in the quantity exported during the post-recession period. The increase in SID could be due to rise in the frozen shrimp and squid exports in the study years. This sharp increase was accredited by large-scale aquaculture production of Vannamei shrimps and increase in catches and landings of black tiger shrimp and squids [7]. The marine industry of India worth billions of dollars has not been much affected by the worldwide recession.

3. Growth Constancy and Detainment of marine products

The export performances of both commodity and destination were analysed pre-post-recession periods based on the GCR matrix are indicated below:

3.1. Export performance of marine products during pre (1995-2007) –post (2008-2017) - recession periods: Commodity wise

India is a leading supplier of sea food products even during the times of persisting uncertainties in the global-scale of sea food trade. However, 99% of the seafood products are exported in frozen form to different international destinations [8]. Table 2 presents the commodity oriented export of marine products during the post-recession and pre-recession periods. There is a simultaneous increase from 4 to 7 % in the growth rate of quantity of export during the pre-recession period. The negative growth rate of 0.6% of unit value in export was registered in the pre-recession years whereas positive growth rate of 6% was observed in the post-recession years.

Table 3. GCR matrix of export Quantity across commodities during the pre-recession period (1995-2007)

Growth/Constancy	High	Medium	Low
High			
Medium	Fr.fin fish		Fr.cuttle fish
Low		Fr.squid	Fr.shrimp

Among the different commodities frozen shrimp registered the highest growth rate in quantity from 3.15% in pre-recession to 18.95% in the post-recession period. The increase in significant growth rate in frozen shrimp is ascertained to landings, price, 70% of culture shrimps and widened markets. Also there is a steep decline in the growth rate in quantity of frozen fin fish (4.51% to 1.51%), Fr.cuttle fish (3.98% to 2.82%), dried items (9.90% to 5.51%) chilled items (9.26% to 1.80%) and others (19.45% to 3.45%) during the pre – post recession periods. In addition, the frozen shrimps were noted to be higher in export quantity (11%) in the post-recession years relatively. This substantiates that the competition factors tend to be severe among the exporters and the price surges are reliant on to the exports [9-10]. The reasons for instability were due to the buyers’ market essentiality and reduced importers.

Tables 4. GCR matrix of Export Quantity across commodities in the post-recession period (2008-2017)

Growth/Constancy	High		Medium		Low	
High	Fr. shrimp					
Medium	Fr. squid					
Low	Fr.fin Fish Fr.cuttle fish					

Table 5. GCR matrix of Export value across commodities US \$ Million in the pre-recession period (1995-2007)

Growth/Constancy	High		Medium		Low	
High	Fr.cuttle fish					
Medium	Fr.fin fish				Fr.shrimp	
Low			Fr.squid			

Table 6. GCR matrix of Export value across commodities–post-recession period (2008-2017)

Growth/Constancy	High		Medium		Low	
High	Fr.shrimp					
Medium	Fr.squid					
Low					Fr.cuttle fish Fr.fin fish	

3.2. Marketwise export performance of marine products during pre (1995-2007) in the post (2008-2017) recession periods

Market-wise analysis of marine product exports in the post-recession years was noted to display higher growth of quantity, values, values in dollar, unit values and unit values(expressed in US \$) ranged to about 8.6%, 23%, 16%, 13% and 7%, respectively. The United States and South East Asia maintained its top most position in export of marine products with respect to its quantity and value. In the post-recession years, US followed by Japan were the major buyers of the marine products. South East Asia also noted to be showing increased growth rates of quantity and value in the post-recession years to about 3%. European Union faced the steady decline in export value and quantity due to improvisations in quality standards and increased value demanding for premium seafood products. This analysis sates that there are considerable improvements in the export and commodity diversification and also the market recession does not cause any hit over the total exports from India.

Instability analysis indicates that the higher degree of instability was observed in the values to about 17% in the post-recession periods in comparison with the pre-recession periods (11%). The results are presented in Table 5. The quantity of export showed lower degree of instability during the post-recession period (12 %) than pre-recession period (15 %). This states that the quantity of export is more constant than the value. Recession has not created any impact over the quantity of export of the Indian marine products. USA is the most stable market during the pre-recession periods as enumerated from the instability matrices of quantity and value.

Table 7. GCR matrix Export Quantity across destinations in the pre-recession period (1995-2007)

Growth/Constancy	High		Medium		Low	
High	Others		Middle East			USA
Medium	European Union			South East Asia		
Low						
	China					Japan

Table 8. GCR matrix Export Quantity across destinations during the post-recession period (2008-2017)

Growth/Constancy	High		Medium		Low	
High	USA					
Medium	Others		South East Asia		Middle East	
			Japan			
Low					European Union	

However, the parameters such as value and quantity have become lesser volatile in the post-recession years. Conversely, Japan becomes lesser volatile during the post-recession periods with reference to values and other parameters. Markets that scored less in export instability are EU, China and Middle East with specifications to its unit value. South East Asia was known for its significant growth in all the parameters of exports with stable increase in the degree of instability. The GCR matrices of marine export product parameters such as quantity and unit value in the recession periods are given in Tables 7-10.

Table 9. GCR Matrix of Export value across destinations in the pre-recession period (1995-2007)

Growth/Constancy	High		Medium		Low	
High		USA				
	European Union		Others			
Medium	China			Japan		
Low					South East Asia	

Table 10. GCR Matrix of Export value across destinations in the post-recession period (2008-2017)

Growth/Constancy	High		Medium		Low	
High	USA		South East Asia			
Medium	Japan		Middle East			
	Others					
Low					European Union	

3.3. Decomposition analysis of the components of change in the average export value and variance of Indian marine products

The analysis was carried out to identify the sources influencing growth on the average and variances of export value of Indian marine products. Major marine products such as frozen shrimp, frozen fin fish, frozen cuttle fish and frozen squid were chosen to perform the decomposition analysis to quantify the sources of growth in export average and variance of export value. The results were furnished below and it represents the different components influencing variability in the export value of Indian marine products in terms of mean export quantity and mean export unit value and their interaction effects were displayed.

The contribution of change in mean export value was noted to be high in comparison to the other changes with respect to the frozen fin fish and frozen cuttle fish. The increase in mean export unit value was 41% of the increase in average export value for the frozen fin fish and 41.2% for the frozen cuttle fishes respectively. This was due to the export unit values and its increased growth in both the pre and post-recession years. Moreover, the export quantity recorded a negative growth rate in the post-recession years. The variability in the covariance of the mean value of export quantity and unit value was noted to be 0.45% decrease for the frozen cuttle fishes and 0.2% for the frozen fin fish in the mean export values. The variability in covariance could be due to the changes in variances of both the export parameters. In explaining the interactions among the parameters, the export value was profited to about 21% from both the mean export quantity and mean unit value. Though, the influence of variations in mean export quantity was high in the frozen shrimp to about 59% and frozen squid to about 58%.

Table 11. Decomposition analysis

Source of Change	Percentage Share						
	JAPAN	USA	EU	CHINA	SE	ME	OTHERS
Change in Mean Export Quantity	38.02	-24.10	66.71	118.37	37.40	60.25	35.74
Change in Mean Export Unit Value	61.93	127.79	29.45	-13.95	57.12	34.02	59.50
Interaction between changes in (1) and (2)	0.56	-4.00	3.81	-4.49	5.37	5.72	4.62
Change in SQ-SUV covariance	-0.50	0.31	0.03	0.07	0.11	0.01	0.14

The results portrays that the export quantity showed significant growth rate in the pre and post-recession periods for the commodities such as frozen fin fish and frozen cuttle fish. The variations in the covariance among the mean export quantity and mean unit value was 1 % decrease for the frozen shrimps and 0.7 % decrease for the frozen squid in the mean export value. From the varying components, the influence of disparities in mean export quantity of frozen shrimp and frozen squid was the dominant source for the change in average export quantity and the change in mean value is the major source for the highest export value for the frozen fin fish and the frozen cuttle fish. With reference to the economic recession, the influence of export quantity has generated major revenue for destinations such as European Union (66.71%), China (118.37%) and Middle East (60.25%), whereas for Japan (61.93%), USA (127.79%) and South East Asia it was due to the export value (Table 11).

6. Conclusion

Fish and fishery products of India play a very prominent role in providing significant increase in the Indian export sector. The export sector of India is well flourished with the fishery items and has become one of the major sources for foreign exchange in recent years. The study recession has not tampered the Indian seafood trade. The demand for raw fish rather than the fishery products had supported the fishery export sector of India for the consistent increase in the export scenario during the recession period. The export growth of the major export competitors of India have diminished due to the global economic recession during 2008 whereas India had a sustained export growth and the sector performed well during the world economic recession. The export of fishery products was on its hike during the recession period commenced from 2007. The export rate has increased from consistently from post-recession period to the recent years.

India exported 13 lakh MT of seafood worth an all-time high of US\$ 7.08 billion (₹ 45000 crore) in 2017-18 as against 9, 45,892 tons and 4.69 billion dollars a year earlier. The demands for frozen shrimp and frozen squid have expanded over the different destinations and have become the largest exported items from India. European Union, Japan and USA have become the primary destinations of frozen shrimp export. However the drop down of the shrimp price worked against the shrimp export to some destinations resulted in narrowing the price differentials between domestic and international markets. It has also been observed that, India's export basket has got diversified and has shown an incision towards low-value exports towards the South East Asian countries during the post-recession periods whereas European Union continues to be a preferred destination for the shrimp exports. The study also advocates that during the advent of recession the export markets were forced to high risk in terms of rejection, loss of damage in transit or variation in foreign exchange values. Even though country's sea food trade grew by double digit in quantum as well as value during pre-post-recession periods, the study highlights the need for government interventions in regulating export of fishes and other marine products to certify the safe and healthy domestic fish food and hence exchanging export with domestic markets.

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