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Growth and Performance of Indian Fish and Fishery Products Exports

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Abstract

This study profiles the growth and instability of the Indian fish and fishery products export and its performance over the past five decades. The results show that growth rates of seafood exports has been increasing, though the instability increased. The possible reason for the growth and instability of Indian fish and fishery exports have also been discussed in this study.

Keywords: Export trend, fish trade, fisheries policy, growth rate

Introduction

Fish and fishery products are one of the most traded food commodities worldwide. India ranks seventh in both fish production and exports. In 2016, the global value of fish and fishery products exports reached USD 129.1 billion and of that, shrimp, the most important food traded commodity was 15% of the global fish trade. In 2010, Indian fish and fishery product exports accounted for 10% of the quantity total agricultural exports (excluding forest produce) and 1% in value terms. The per capita consumption of fish was estimated at 19.2 kg for global and 8.9 kg for India in 2012 (FAO, 2014).

The plateauing of marine fish production and rising demand for fish and fishery products resulted in increasing importance of aquaculture. Instability in production and export in association with trade liberalization policies has been studied in the field of agriculture but there are few studies in fisheries. Indian fish and fishery products were exported in different forms namely frozen, dried, live items, chilled items and other forms. It is influenced by the demand, domestic production, consumer preference, trade agreements between countries and trade policies. Instability can have a direct impact (Hazell, 1982; Rao et al., 1988; Larson et al., 2004), contrary impact (Mahendradev, 1987; Chand & Raju, 2008) and mixed impact on export (Kumar , 2010; Paltasingh & Goyari, 2012). Many methods are used to calculate the instability (Wasim, 2007; Cuddy & Della, 1978; Ray, 1983; Coppock, 1962). In this study, an attempt has been made to analyse growth and instability of fish and fishery products exports and find out relationship between the growth and instability.

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Material and Methods

Time series export data (1961 - 2012) and market wise export data (1996-97 to 2015-16) were collected from the Marine Product Export Development Authority (MPEDA), Government of India. For assessing the growth and instability the entire time period was divided into five decadal groups; 1960s (1961- 62 to 1970 - 71), 1970s (1971- 72 to 1980 –81), 1980s (1981- 82 to 1990 –91), 1990s (1991- 92 to 2000- 01) and 2000s (2001-02 to 2012- 13).

The growth rate was estimated using Compound Growth Rate (CGR). CGR was used (Fauzi & Anna, 2012; Jeyanthi & Gopal; 2012, Rani et al., 2012; Radhakrishnan et al., 2016) to estimate the growth rate for Indian fish and fishery products exports. It was computed as follows.

$$\log y = \log \alpha + t \log \beta + \epsilon$$

Where, 'y' is the fish and fishery products export at time t, α is the constant, β is a coefficient yielding the growth rate and ϵ is an error term.

$$CGR = [\exp (b) - 1] \times 100$$

Where, b = the rate of change

Instability was estimated using the Coefficient of Variance (CV), Cuddy-Della Valle Index (CDVI), Ray Instability Index (RII) and Coppock Instability Index (CII). The coefficient of variance (CV) is a usual measure of variability (Wasim, 2007). It was calculated for the export of fish and fishery products of India (Pal, 1992; Larson et al., 2004).

$$CV = \frac{\text{Standard deviation}}{\text{Mean}} \times 100$$

The coefficient of variance overestimates the level of instability in time series data when characterized by long-term trend (Kumar et al., 2005) whereas the Cuddy Della Valle Index overcomes this problem. Cuddy & Della (1978) created and applied this method to compute the instability, and the same was also used by Kumar et al. (2005) and Rani et al. (2012).

$$TCV = C.V. \times {}^{2}\, 1 - R^2$$

TCV is the CV around the trend line, CV is the simple coefficient of variation, R^2 is adjusted coefficient of determination

$$CV = \frac{\sigma}{X} \times 100$$

Where σ is standard deviation, X is mean.

Ray Instability Index method was developed and applied by Ray (1983). Mahendradev, (1987), Rao et al. (1998), Chand & Raju, (2008) have employed the index to estimate the instability index in the field of agriculture.

$$RII = \text{standard deviation of natural logarithm } \frac{(Y_{t+1})}{Y_t}$$

Where, Y_t is the export in the current year and Y_{t+1} is for the next year. This index is unit free and very robust, and it measures deviation from the underlying trend (log-linear in this case).

The Coppock Instability Index (CII) technique was introduced by Coppock (1962). Shah (2007); Wasim (2007); Fauzi & Anna (2012) and Radhakrishnan et al. (2016) have used CII to examine instability.

$$CII = [\text{Antilog } \log V - 1] \times 100$$

$$\log V = \frac{[\log \left(\frac{X_{t+1}}{X_t}\right) - m]^2}{N - 1}$$

Where, X_t = export in the year, "t" N = number of years, M = arithmetic mean of the difference between the logs of x_{t+1}, X etc. and Log V = logarithmic variance of the series

Results and Discussion

The percent of quantity and value export of Indian fish and fishery product is depicted in Fig. 1 and 2 respectively. During 1996-97, the largest quantity of India fish and fishery product was exported to China at about 37.64% which has then notably diminished to 5.29% during 2015-16. About 12.26% of Indian fish and fishery product was exported to Southeast Asia in 1996-97; which has steadily increased in the last five years (Shinoj et al., 2009). The export quantity did not vary much for the USA (10%) and Japan (12%). In the last two decades, the European Union and Japan hold the Indian export share each of 23% which indicated that the higher market value products were exported to these countries where consumers had greater purchasing power This trend has been maintained which is evidenced from the Fig. 1.

The export quantity of frozen shrimp and finfish had increased by 28 and 76% whereas the value increased only 13 and 18% respectively. In case of the frozen cuttle fish and frozen squid and live items export quantity had doubled in 2015-16 when compared to 1995-96. The percent of frozen shrimp export had increased from 27.87 (1995-96) to 39.52 (2015-16) however the value of export has not changed. The export of frozen finfish has declined

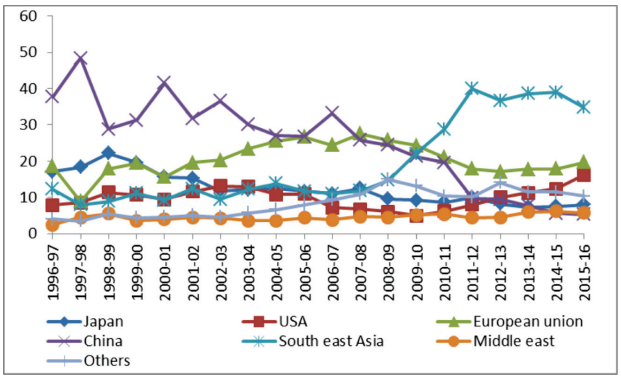

Fig. 1. Percent of quantity of export of Indian marine product

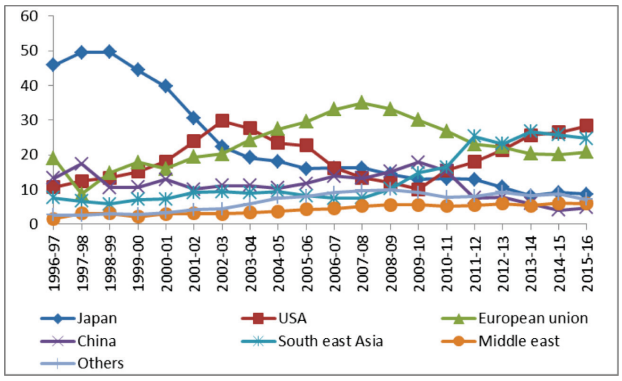

Fig. 2. Percent of value of export of Indian marine product

from 45.7 to24.1%. Table 1 shows the shift in the share of quantity of from export frozen finfish (1996-97) to frozen shrimp (2015-16), however the percent in value was highest for shrimp in growth these period (at 65%).

The CGR of India's Indian fish and fishery product exports (1961 to 2012) were computed decade wise and is presented in Table 2. The estimated growth rates revealed that quantity, value and unit value has diminished, but upswing is noticed during 1990s. The growth rate was higher for value than for quantity and unit value. The CGR was found to be positive across the study period, but the highest rate was accounted in 1960s (10.76% in quantity, 31.51% in value and 18.73% in unit value). During 1961 to 2012, the CGR was 8.48, 17.42 and 8.25% for quantity, value and unit value respectively.

In value terms, exports rose from 11.31% (1980s) to 16.63% (1990s), of which, one-third was contributed by crustaceans. Value of exports naturally depends on the form and quantum of exports and domestic production. The fish production increased to 23.91 lakh tonnes in 1990s from 17.02 lakh tonnes in1980s (DAHDF, 2009). In the case of growth rate, a spike was noticed in 1990s, which could be attributed due to the interventions of trade liberalization policies and conducive institutional arrangements. Till the introduction of the new trade policy (1991), Indian fish and fishery products were exported through the open trade regime. Export and Import Policy introduced during 1992-97 allowed duty-free and licences free import of production inputs which indirectly aided to raise the export of fish production (VIII five-year plan, 1992-97). Five-year plans with institutional and financial support and fisheries policies played a vital role in Indian fish and fishery exports development. The IIInd and Vth plans enabled the production of quality seafood through modern processing facilities (Barros, 1999; Malhotra & Sinha, 2007) and VIIth five year plan (1985-1990) focused on the investment and production sector.

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Table 1. Item-wise performance of Indian marine product export

(Quantity in tonnes; value in ₹ Crore)

Item	Export				Percent			
	1995-96		2015-16		1995-96		2015-16	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Frozen shrimp	105427	2701.76	373866	20045.5	27.8	65.5	39.5	65.8
Frozen finfish	173005	636.92	228749	3462.25	45.7	15.4	24.1	11.3
Frozen cuttlefish	31778	272.37	65596	1636.11	8.4	6.6	6.9	5.3
Frozen squid	40924	290.45	81769	1615.21	10.8	7.0	8.6	5.3
Dried items	9893	42.67	43320	725.58	2.6	1.0	4.5	2.3
Live items	2030	33.97	5493	308.81	0.5	0.8	0.5	1.0
Chilled items	1578	18.74	33150	809.5	0.4	0.4	3.5	2.6
Others	13563	124.48	113949	1817.87	3.5	3.0	12.0	5.9

Table 2. Growth Rate of Indian marine exports

Decade	Compound growth rates		
	Q	V	UV
1960's	10.76	31.51	18.73
1970's	10.07	22.21	11.03
1980's	5.87	11.31	5.13
1990's	8.82	16.63	7.18
2000's	7.68	10.42	2.56
Over all	8.48	17.42	8.25

Q – Quantity, V- Value, UV- Unit Value

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The instability results of Coefficient of Variation (CV), Ray Instability Index (RII), Cuddy-Della Valle Index (CDVI) and Coppock Instability Index (CII) for Indian fish and fishery products exports are presented in Table 3. The CV of Indian fish and fishery products export was more or less stationary with small sigmoidal variation, and it varied between 0.207 to 0.346% in quantity, 0.364 to 0.758% in value and 0.139 to 0.496% in unit value. During 1961-2012, average CV was 1.056, 1.432 and 0.818% for quantity, value and unit value respectively and average CDVI of Indian fish and fishery products exports revealed that to the export quantity it was 0.461% and value at 0.799% and unit value 0.216%.

In RII, export products varied between 0.0293 to 0.0078% in quantity, 0.1486 to 0.0130% in value and 0.1948 to 0.0125% in unit value. On the average RII, during 1961 – 2012, was about 0.0161, 0.0766 and 0.0934% for quantity, value and unit value respectively. The CII has registered higher instability in quantity of 101.80% in 1990s but in case of value and unit value it was 191.88 and 133.05% in 1960s respectively. Through the years 1960-2012, Coppock Instability Index was at 90.53% for quantity, 153.35% for value and 95.38% for unit value.

While estimating the instability, all instability methods (CV, CDVI, RII and CII) have indicated declining trend in decadal quantity, value and unit value indices except in 1990s. The instability was found to be higher in value than quantity and unit value respectively.

Present results indicate that the growth rates are directly related to instability of Indian fish and fishery exports in the decadal analysis for quantity, value and unit value. Between the growth and instability, positive, negative and mixed linkages have been observed (Hazell, 1982; Mahendradev, 1987; Chattopadhyay, 2001). This study has revealed that instability was the consequence of growth which implied a positive association between growth and instability for Indian fish and fishery products exports. This was confirmed through

Table 3. Instability of Indian marine exports

Periods	Simple Coefficient of Variation			Cuddy Della Valle index			Ray Instability index			Coppock Instability Index		
	Q	V	UV	Q	V	UV	Q	V	UV	Q	V	UV
1960's	0.346	0.758	0.496	0.153	0.223	0.167	0.0293	0.1486	0.1948	92.92	191.88	133.05
1970's	0.309	0.539	0.318	0.130	0.147	0.128	0.0192	0.0644	0.0608	87.54	154.21	99.23
1980's	0.207	0.364	0.161	0.103	0.141	0.053	0.0083	0.0170	0.0229	82.21	116.47	62.61
1990's	0.270	0.416	0.216	0.131	0.085	0.075	0.0130	0.0182	0.0223	101.80	145.76	75.37
2000's	0.289	0.441	0.139	0.095	0.209	0.097	0.0078	0.0130	0.0125	79.59	103.51	49.57
Over all	1.056	1.432	0.818	0.461	0.799	0.216	0.0161	0.0766	0.0934	90.53	153.35	95.38

Q – Quantity, V- Value, UV- Unit Value

Coefficient of variation, Cuddy Della Vally Index, Ray instability Index and Coppock Instability Index which are positively associated with multiple annual growth rate.

The positive linkage between growth and instability has been reported in agricultural production and export (Hazell, 1982; Rani et al., 2012; Kumar et al., 2005; Nadakarni & Deshpande, 1983). The growth and performance of pelagic fisheries in Indonesia reported by Fauzi & Anna (2012) exhibited that the instability may be attributed due to the existing competition among the fishing vessels for the targeting fishery for the same fish stock. These reports strengthen the argument that higher growth rate was inversely related to higher instability and instability was the consequence of growth.

From this study, it can be concluded that the growth and instability of Indian seafood exports declined in terms of quantity, value and unit value. The trade witnessed the take-off phase during the 1990s which is attributed to trade liberalization. The exports were progressively increasing in quantity and value. Indian fish and fishery product exports have been higher in the recent test which resulted from the significant increase in domestic production of *Penaeus monodon* and *Litopenaeus vannamei* while the Thailand shrimp production drastically reduced due to Early Mortality Syndrome (EMS). However, the growth rate of Indian fish and fishery products export may also be increased by up scaling of domestic aquatic animal production through intensive farming practices including the cage culture.

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