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An Empirical Evaluation of the Seafood Exports in the Post-WTO Regime from India and Kerala

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Abstract

Seafood export sector is a major trade item in the globalized trade of all commodities. However, the fishery trade sector witnessed profound changes in the post-WTO period. This is because of the use of several technical and non-tariff trade barriers, which in most cases are stipulated by the importing developed countries. India is a prominent fishery exporting country with a foreign exchange earnings of $ 6.1 billion as per January 2022. State of Kerala is having a good legacy in seafood trade and one of the major fishery's exporting coastal states of India. The post-WTO period has witnessed many dynamics in the fishery trade both in India and Kerala. The stipulations in the areas of TBT and NTBs and other quality standards have worked as a penumbra in the seafood trade and hence have to search for the traditional to non-traditional and emerging markets with the idea of uninterrupted seafood trade flow. Hence, the article tries to unravel the issues of these in this post WTO period. The article uses the data obtained from the Marine Products Export Development Authority in the form of monthly, quarterly and annual data. Along with this it also uses data from CEPII and UN Comtrade. The result also shows that there is a change from traditional to new markets in some cases, whereas the US and EU still dominate as major importers of the seafood from India and Kerala. The Gravity model explanation is giving a clear espousal that the values under stipulations are significantly related. The instability model also authenticates that there are instabilities in varying proportions from market to market.

Keywords: seafood trade, post-WTO, traditional markets, emerging markets, instability, gravity model

1. Introduction

India has vast fishery resources and hence has comparative advantage in the seafood export front. Before the formation of WTO and trade liberalisation the importers gave restriction in the form of tariff and quotas. The formation of WTO and its several rules have paved the way for the imposition of Non-Tariff Barriers mostly in the form of quality standards in the name of TBT. These, in addition to the processors and exporters, the whole supply chain is impacted due to these regulations. Some export processing units have closed down as they were unable to adhere to the strict guidelines and develop their facilities due to the cost factor. There has also been a shift in markets over a period.

New changes in the export arena with the formation of WTO with multiple issues of technical barriers of trade (TBT), Non-Technical Barriers (NTBs), stringent quality standards stipulations like SPS and other technical stipulations by some importing countries outside the ambit of WTO framework have generated several ramifications in the sector. TBT has been used (or misused) to substitute for tariffs and other non-tariff barriers to trade. Unlike tariffs and other non-tariff barriers, TBT can promote trade or restrict trade. On one hand, TBT promotes trade by providing consumers of importing countries with confidence on the quality, safety, and other health related concerns of the imported products. On the other hand, governments of importing countries can use TBT to restrict imports even if the imported products are safe and meet the standard imposed. Facing potential examination of harassment under TBT, importers and exporters are discouraged to carry out their trade. There are cases of rejection of seafood exports from India-Kerala for not following technical standards prescribed by export markets and these stipulations create trade distortion in the sector. In this background, it is worth to notice Indian and Kerala's seafood exports trade in the post-WTO period.

Though India has taken several steps to overcome these technical and other stipulations, Indian marine product export still faces many problems and the outcome of all these stipulations is the decline in seafood export to some of the traditional markets and thereby forcing for market diversification owing to new demand development in some emerging economies. In spite of all these hurdles, the trade in fishery products have increased globally with twin reasons, firstly its nutritional value, health aspects together and secondly with the increasing income and the associated income elasticity of demand of the fish-eating population of the developed economies. Another impetus in the fishery trade is the globalisation associated changes in the sector. Particularly, the TBT agreements, akin to other seafood exporting countries, had been devastating to the sector in the beginning, but the exporting firms and countries have taken their own efforts to overcome the embargo, however among these firms, the big and experienced firms had an advantage and finally the institutional interference could manage to combat the issue to a certain extent. Hence the article tries to scrutinize the seafood trade related issues with requisite data both for India and Kerala. Using secondary data, it tries to project the trajectory of seafood export trade of India-Kerala with major six markets in tune with the existing trade barriers. Market concentration and market diversification are worked out using ranking and instability analysis. The gravity model also is highlighting the impact of TBT in fisheries trade on the seafood exports from India.

2. Theoretical Framework and Literature

While Smith (1776) comes up with absolute advantage theory to support trade between countries, Ricardo (1817) propounds that it is not absolute advantage but comparative advantage i.e., country can produce goods at a lower cost compared to other country, which determines trade. These can be further connected to the Hecksher–Ohlin Factor Endowment theorem (Hecksher, 1919; Ohlin, 1935). These have become the cornerstones in any commodities trade and hence is equally connectable in the seafood export trade. Revealed Comparative Advantage Index by Balassa (1965) and Export Similarity Index by Finger and Kreinin (1979) are some major updated theories which are also showing the insightful relation of fisheries and its determining forces in distorting the seafood trade. In the trade embargo level three things are interrelated in the seafood trade like the competitiveness, technological and human factors.

In this respect the work of Brown and Goldin (1992) need special mention as the comparative advantage theory still holds relevance during the competitive free trade era where the firms are unable to compete and hence have to exit from the field. Similar to this the Revealed Comparative Advantage Index developed by Balassa (1965) and Export Similarity Index by Finger and Kreinin (1979) are some of the recent theoretical frameworks hold meaningful in the recent seafood trade theories which can well be connected to the trade barriers in the WTO levels. To maximise trade fishery resource rich economies, engage in overfishing often resulting in severe environmental impact and resource depletion. However, those who propound free trade quote 'Environmental Kuznets Curve' (EKC) which states that there is an increase in environmental damage in early stages of growth which eases down as there is increase in national income (Harris and Roach, 2017).

One of the major methods of computing the trade between and among economies is Gravity Model by Jan Tinbergen (Tinbergen, 1962). Though this model is applicable to all commodities coming under global trade, the application of this in the seafood is not vividly attempted. In short, economic size or current GDP of the countries attract them into trade and distance between them (higher distance would mean higher trade costs) weakens the same. Technological differences, factor endowments and product differentiation (Eaton and Kortum, 2002; Deardroff, 1998; Anderson 1979; Helpman and Krugman 1987; Bergstand 1985) are the basic determinants of international trade as they create forces of gravity which in turn ultimately leads to international trade. Market structure and multi country setting is taken into account by Eaton and Kortum (2002). The model has been widely used in fisheries trade especially in evaluating the impact of food safety standards and non-tariff barriers on the seafood exports to the US, Japan and the EU regions (Nguyen and Wilson 2009; Wilson and Bray 2010; Tran et. al. 2013). Gravity model is used by Ramli et. al. (2020) assesses the comparative advantage and export determinants of Tuna in Indonesia.

3. Materials and Methods

Statistical tools like CAGR, Cuddy-Della Index of Instability (CDI) (Cuddy & Valle, 1978), Time series forecasting and Gravity Model are used. Secondary information relating to monthly, quarterly and annual data on marine products exports from India and Kerala during the post-WTO phase have been collected from MPEDA and this forms the main source of data for time series analysis, ranking and trend evaluation as well as for instability analysis. Time series analysis is used to understand the seasonality type like the Expert Modeler. Unlike other export products the marine products show the highest levels of fluctuations owing to the randoms in the harvest sector. The fluctuations in marine products exports from Kerala and India after the setting up of the WTO are computed using CDI. While CV or Coefficient of Variation is used to work out instability with respect to data that do not exhibit the nature of trended, the CDI helps as an aid to highlight the instability in the case of time-series data.

The Cuddy-Della Index of Instability (CDI) is: $CDI = CV \times \sqrt{(1 - R^2)}$

Gravity model analysis is done using secondary information collected from various sources like CEPII (Conte et al., 2021), UN Comtrade, etc. with the help of double log linear regression estimation method. The regression equation is:

Log ExIndia = C + a log GDPIn + b log GDPImp + c log Dist + d Cadmium + e Mercury + f Lead +g TBT

4. Results and Discussions

4.1 Export of Marine Products during post-WTO Period

The export data of marine products from India during the Post-WTO phase i.e., 1996-97 to 2020-21 indicate that the exports in terms of quantity reached the peak of 1051243 MT in 2014-15, then showed a slight decline in 2015-16 and increased up to 1392559 MT in terms of quantity in 2018-19. The marine products exported has been declining during 2019-20 and in 2020-21, the exports stood at 1149510 MT. Despite some variations during two periods, might be result of the Covid pandemic, overall trend in terms of quantity of seafood exported from India has been positive. Though the overall trend is positive, there are some oscillations. The total quantity of exports increased from 45684.47 tons in 1996-97 to 157698.10 tons in 2020-21. Data show that 2017-18 was the peak year with 195176.77 tons of seafood exported from Kerala. After this, the seafood exports from the state have been declining. The 2020-21 data show that a total of 157698.10 tons of seafood exports from the state.

The exports in terms of value in Rupee terms reached Rs. 33442 crores in 2014-15, then showed a slight decline in 2015-16 and increased up to Rs. 46589 cores in terms of value in 2018-19. Even though there has been a fall from the peak quantity during 2018-19, value exported during 2019-20 has increased compared to the earlier period i.e., from Rs. 46589 crores to Rs. 46663 crores. The value of marine products exported from Kerala during the post-WTO phase have also shown an increase both in Rupee terms. From Rs. 515.67 crores, there was an increase of more than 10 times as the total export value stood at Rs. 5623.12 crores during the review phase of 1996-2021.

The trend in value of marine product exports in US$ also showed a similar pattern to that of Rupee. From 2014-15 value of $ 5511 million, the export value came down to $ 4688 million in 2015-16. The value of exports was at its peak of $ 7082 million during 2017-18 and has been showing a decline in the subsequent years. It came down to $ 6729 million, $ 6679 million during 2018-19 and 2019-20 periods and stood at $ 5957 million during 2020-21. The exports in terms of value have shown a positive trend after the WTO period. Similarly for Kerala, the value in US$ terms increased from US$ 144.24 million in 1996-97 to US$ 766.76 Million in 2020-21. The value of exports was at its peak at Rs. 6656.90 crores and US$ 1045.55 million in 2017-18, after which the total export value from the state registered a fall in the subsequent years.

From US$ 3.05 in 1996-97, the Unit Value has increased to US$ 5.18 during 2019-20 and then declined to 3.2 in 2020-21. The average UV realization of marine products exports from Kerala during the post-WTO period was at 3.73. Overall, it increased from 3.1 to 4.8 during the 25-years period after the WTO establishment. Similar to quantity and value exported, the UV was 5.3 during 2017-18.

The CAGR in terms of quantity is 4.55, in terms of value there has been a growth of 9.91 in seafood exports during the period. The CAGR values for Kerala are similar with a growth of 4.90 in terms of quantity and 9.77 in terms of value during the period under review. In terms of value in US$, the CAGR for India and Kerala is 6.79 and 6.51, respectively.

4.2 Market-wise Exports during post-WTO Phaset

During the pre-WTO phase, the export market of marine products concentrated in three major markets viz. US, EU and Japan. Even though there has been a slight decline in exports to these markets, it constituted a major part of the seafood exports from India. The quantity and value of marine products exported based on the six major markets viz. Japan, US, EU, China, SEA, Middle East and Other markets are evaluated for 1996-97, 2006-07, 2016-17 and 2020-21. The markets are ranked from highest to lowest value of quantity of seafood exported from India. The first phase (1996-97 and 2006-07) was dominated by China which imported 142448 MT and 203513 MT of seafood during the two years. With a total quantity of 1600834 MT, China emerged as a major market during the initial 10 years of the post establishment of WTO. In 2016-17, SEA replaced China to emerge as the prime imported of Indian marine products in terms of quantity. During 2016-17 and 2017-18, China was in the last position. During the last three years, the share of China has shown some improvement and the latest data during 2020-21 reveal that China is the importer for 19 percent of seafood exported from India. China has come up to the second position as per the 2020-21 data. Overall, from 37.7 percent in terms of quantity of seafood exported from India during 1996-97, China's share has come down to 19 percent during 2020-21. For the two time periods i.e., during the beginning of the WTO phase (1996-97) and the latest data during 2020-21. In terms of quantity, the share of Japan, China and EU has come down during the period. From 17.1 percent, share of Japan has declined to 7.5 percent. From 18.6 percent, the share in terms of quantity exported to EU has declined to 13.3 percent during the period. However, the percentage share of US has shown an increase from 7.9 percent to 25.4 percent during the 25-years period after the setting up of the WTO.

The EU was the second major importer until 2016-17 with an average share of 20 percent during 1996-2017. Apart from 1997-98, share of EU in terms of total exports has stood at more than 15 percent. EU has come down to the fourth position in 2020-21 in terms of marine products imported from India. Japan ranked the third position based on quantity of seafood exported from India during 1996-97, which fell to 4th position in 2006-07, 5th in 2016-17 and is in the sixth position during 2020-21. On the other hand, US has emerged as a major importer of India's seafood in terms of quantity as per the 2020-21 data. The US was in the fifth position during 1996-97 in this regard. Nonetheless, the 2020-21 data reveal that the US, China and SEA are the major destinations where highest quantity of Indian seafood is exported, the share of EU has drastically come down and EU is 4th in terms of quantity of seafood exported. The decline in exports to EU may be attributed to the EU-Vietnam Free Trade Agreement signed during July 2019 which has made Vietnam as a zero-duty trading partner with seafood. This might be the major factor[1]. Hence the seafood exporters from Vietnam got comparative advantage and this inasmuch as resulting in a decline in quantity exported from India to EU. Table 1 (a) shows the rank of major markets in terms of quantity of seafood exported for the four periods.

Table 1. Market-wise Rank of Marine Products Exported

1996-97	2006-07	2016-17	2020-21	1996-97	2006-07	2016-17	2020-21	1996-97	2006-07	2016-17	2020-21
Quantity				Value (Rs)				Value ($)			
(a) India											
China	China	SEA	USA	Japan	EU	USA	USA	Japan	EU	USA	USA
EU	EU	EU	China	EU	Japan	SEA	China	EU	Japan	SEA	China
Japan	SEA	USA	SEA	China	USA	EU	EU	China	USA	EU	EU
SEA	Japan	Others	EU	USA	China	Japan	SEA	USA	China	Others	SEA
USA	Others	Japan	Others	SEA	Others	Others	Others	SEA	Others	Japan	Others
Others	USA	MEA	Japan	Others	SEA	MEA	Japan	Others	SEA	MEA	Japan
MEA	MEA	China	MEA	MEA	MEA	China	MEA	MEA	MEA	China	MEA
(b) Kerala											
EU	EU	EU	EU	EU	EU	EU	EU	EU	EU	EU	EU
US	SEA	SEA	SEA	US	Japan	SEA	US	US	Japan	SEA	US
China	Others	US	China	Japan	US	US	SEA	Japan	US	US	SEA
Japan	China	MEA	US	China	Others	MEA	China	China	Others	MEA	China
SEA	US	Others	Others	Others	China	Japan	Japan	Others	China	Japan	Japan
Others	Japan	Japan	MEA	SEA	SEA	Others	Others	SEA	SEA	Others	Others
MEA	MEA	China	Japan	MEA	MEA	China	MEA	MEA	MEA	China	MEA

Source: Worked out from the MPEDA data, 1996-2021

An assessment of major markets based on the value of seafood exported from India in Rupee terms is done and as a result the markets are ranked from highest to lowest value (Table 1). Overall, China has been dominating the post-WTO phase by including mostly in the first four positions except for 2016-17 during the four periods taken together, the EU was in 2nd, 1st, and 3rd rank (two times during 2016-17 and 2020-21). While the drop in percentage share in terms of Value for the EU is from 19 percent in 1996-97 to 13.8 percent in 2020-21, the period during 2006-10 came with more than 30 percent share in value terms for seafood exported from India, after which it has been coming down. The export share in terms of value for Japan has come down from 45.8 percent to 6.9 percent during 1996-97 to 2020-21. Japan has fallen from 1st rank to 6th rank during this period in terms of value of seafood exported. The erosion has come from 2000-01 where the percentage share slipped to 30.6 percent, then to 22.3 percent in 2001-02 and from 39.7 percent in 1999-2000. Major markets of Indian seafood exports in terms of US$ million are similar to the results in Rupee terms except for 2016-17 for Japan which is 4th in Rupee terms and has dropped to 5th when ranked in terms of US$ earnings.

The post-WTO phase witnessed that the Kerala seafood exports were mainly channelized to the EU. Based on rank, it is evident that the EU is the major market where the marine products from Kerala are exported [Table 1 (b)]. The EU

[1] https://www.thehindubusinessline.com/economy/indias-seafood-exports-to-eu-to-be-hit-after-vietnam-eu-free-trade-pact/article29099944.ece

ranked first based on quantity and value of marine products exported. However, the second major market has changed. SEA ranks second in terms of quantity of marine products exported during 2006-07, 2016-17 and 2020-21. The results in terms of value varies considerably over these periods. The US is ranked second in terms of quantity and value of marine products exported in 1996-97. During 2006-07 Japan is second in terms of value. SEA is second in terms of value during 2016-17. For 2020-21, the US is changed to second rank based on the value of marine products exported from Kerala. Based on 2020-21 data, it is inferred that the EU and the US are ranked first and second in value terms. SEA, China and Japan are the third, fourth and fifth positions, respectively in terms of value of marine products exported. SEA which was in the fifth position in 1996-97 has come up to the third based on value of seafood exported from Kerala. This implies a change in market share of export of marine products from Kerala compared to the initial stages of post-WTO phase.

The seafood exports from the country have grown after the establishment of WTO, it is evident that the quantity as well as value of seafood exported to various markets during the 25 years post-WTO phase of 1996-2021. However, the market concentration has changed over the years and it varies when compared with the post-WTO phase. USA and China are the major markets both in quantity and in value terms for the Indian seafood export as per the latest data. Japan's exports have come down both in value and in quantity terms. Data clearly reveal a change in the major markets after the WTO phase as prominence of exports to Japan has come down. The results of change in market concentration are further evaluated using the CAGR assessment during the 25-year review period. The results are depicted in Table 2. Japan has shown the lowest CAGR of 1.18 based on quantity of seafood exported. In terms of value in Rupees, the CAGR for Japan is 1.92. However, the US$ earning CAGR is -0.98 for Japan. USA has the highest CAGR in quantity and in value terms i.e., 9.56 and 16.04 (in Rs) and 12.75 (in US$). This shows that exports to the US have shown an uptrend during the 25 years under review. Other markets and the Middle east have also shown an impressive CAGR both in quantity and value terms even though their percentage share in total marine products exports from the country is less. China's CAGR in quantity terms is 1.72 whereas seafood exports from India to China in value terms have exhibited a CAGR of 10.71 (in Rs) and 7.56 (in US$).

Table 2. Market-wise Marine Products exported from India CAGR during 1996-97 to 2020-21

	India			Kerala		
Market	Q	V	V$	Q	V	V$
JAPAN	1.18	1.92	-0.98	0.60	5.51	2.37
USA	9.56	16.04	12.75	3.60	9.57	6.25
EUROPEAN UNION	3.16	8.51	5.44	3.19	8.63	5.44
CHINA	1.72	10.71	7.56	4.49	12.39	9.10
SOUTH EAST ASIA	6.38	11.67	8.51	10.64	15.88	12.48
MIDDLE EAST	6.87	14.64	11.39	13.76	17.30	13.73
OTHERS	9.00	14.40	11.16	7.68	10.08	6.84
TOTAL	4.55	9.91	6.79	4.90	9.77	6.51

Source: Worked out from the MPEDA data, 1996-2021

While evaluating the data of seafood exports from India during the post-WTO phase of 1996-97 to 2020-21 that there has been a shift in market share as predominance to Japan has come down, whereas that of USA and China have increased. SEA has also emerged as a market with a good CAGR. Exports to Japan have also come down during this period. Even though with this third position, exports to traditional market like EU have also shown a decline. In terms of species, frozen fish was the highest in terms of quantity exported, the earnings were highly related to the export of frozen shrimp, which attracted high value in the international markets.

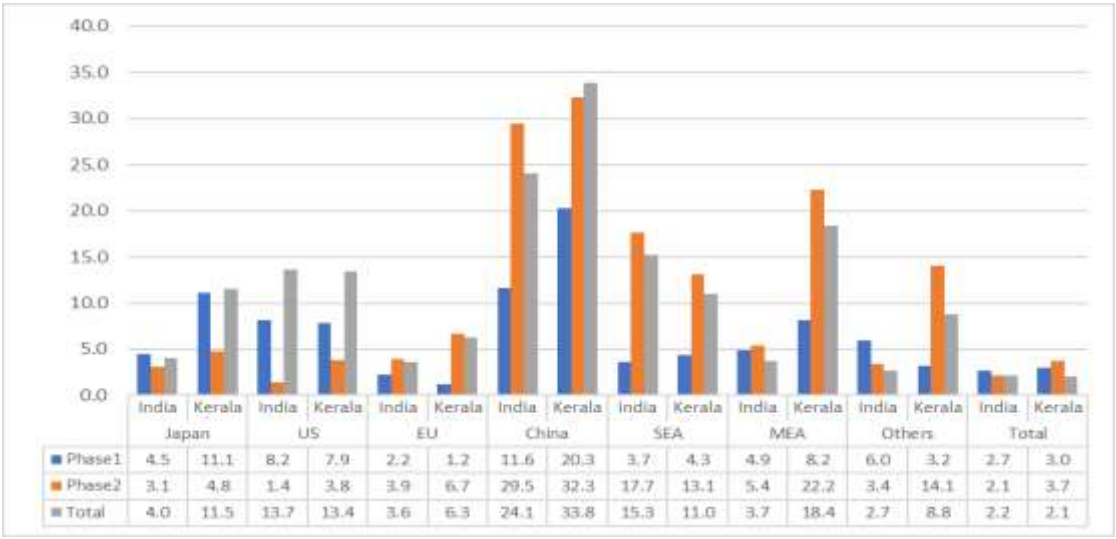
The variation in market share is evident when the CAGR as it is evaluated for major markets to which the marine products are exported from Kerala (Table 2). Overall CAGR for the post-WTO phase is 4.90 in terms of quantity and 9.77 and 6.51 in Rupee and $ terms. CAGR in quantity and value terms is below 10 percent for the traditional markets like Japan, US and EU. SEA and Middle East have shown the highest growth in seafood exports from the state. The corresponding values for SEA are 10.64, 15.88 and 12.48. Even though percentage share of Middle East is in single digits as per the 2020-21 data (6.4 in quantity and 4.6 in value terms) the CAGR is impressive during 1996-97, the share in exports from Kerala was less than one percent.

4.3 Instability in Marine Products Exports during the post-WTO Phase

To calculate the market-wise instability in marine products exports after the WTO establishment, the export data of Kerala and India are classified into two phases viz. Phase 1 (period between 1996-2008) and Phase 2 (period between 2009-2021) by considering the amplitude of instability. Instability is calculated in terms of quantity exported and value of exports in US$ for both the phases for each market separately for Kerala and India.

The CDI results for quantity of marine products exported for various markets are shown in Figure 1. Compared to Phase

1 CDI score based on quantity of marine products exported from India and Kerala has come down in Phase 1 for exports to Japan and US. This shows that exports to these markets are stabilizing. However, CDI has increased for EU during this period indicating towards higher variation in quantity of seafood exported in second phase compared to Phase 1. Fluctuating exports to the traditional markets mean a dwindling revenue to the export processing units. It is evident from the quantity data that the share of EU in total quantity of exports from India and Kerala has been coming down both in quantity and value terms. During Phase 1 itself, the CDI for China was in double digits. This has further increased in the second phase. In fact, exports to China have the highest CDI score during both the phases for Kerala and India. The exports to SEA are also showing a high level of instability in the second phase compared to Phase 1. For MEA exports, variation in instability is less for quantity of marine products exported from India. However, for Kerala, CDI in phase 2 is higher than the CDI score in phase 1 indicating unstable exports to the MEA markets from Kerala. Instability in overall quantity of seafood exported from India is 2.7 in phase 1 which has slightly come down to 2.1 in phase 2. For Kerala, the CDI has shown an increase from 3.0 to 3.7 during the period under review.



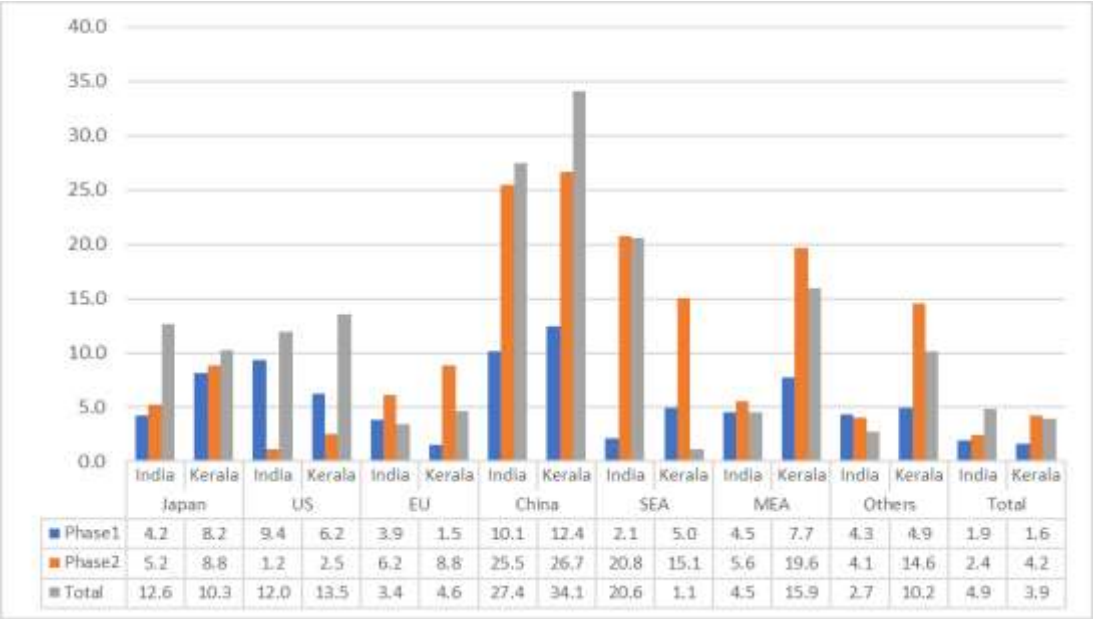
	India	Kerala	India	Kerala	India	Kerala	India	Kerala	India	Kerala	India	Kerala	India	Kerala	India	Kerala
	Japan		US		EU		China		SEA		MEA		Others		Total	
Phase1	4.5	11.1	8.2	7.9	2.2	1.2	11.6	20.3	3.7	4.3	4.9	8.2	6.0	3.2	2.7	3.0
Phase2	3.1	4.8	1.4	3.8	3.9	6.7	29.5	32.3	17.7	13.1	5.4	22.2	3.4	14.1	2.1	3.7
Total	4.0	11.5	13.7	13.4	3.6	6.3	24.1	33.8	15.3	11.0	3.7	18.4	2.7	8.8	2.2	2.1

Figure 1. CDI for quantity of marine products exported

Source: Worked out from MPEDA data, 1996-2021

The CDI results for value of marine products exported for various markets are depicted in Figure 2. It is evident from the CDI scores based on value that there has been a slight increase in exports instability for Japan in phase 2 compared to phase 1. For exports to US, instability has come down drastically (from 9.4 to 1.2 for India and from 6.2 to 2.5 for Kerala). For the EU markets, there has been an increase in the CDI score. CDI during phase 1 was 3.9 and 1.5 for India and Kerala respectively. This increased to 6.2 and 8.8 during phase 2. As is the case with quantity, based on value as well, the instability for China is higher during the phase 2 compared to phase 1 while analyzing export data of India and Kerala. For SEA, the CDI has increased ten times for India and 5 times for Kerala in the second phase compared to Phase 1. This indicates that there have been huge variations in foreign exchange earnings from the export of marine products to these markets in the second phase compared to Phase 1. Overall, the CDI during phase 1 is 1.9 for India and 1.6 for Kerala which has increased to 2.4 and 4.2 respectively. Also, it is evident from the data that in phase 2, the instability is more for Japan, SEA, the instability for Kerala is higher than the Indian value. However, based on total value of exports, CDI for India is more than that of Kerala. It is a fact that instability leads to the change and its composition of exports to one market to another and this may even help for the emergence of new markets and this kind of changes are widely notable in the post-WTO trade regime. The findings of the instability analysis are an indication of market concentration to market diversification over the post-WTO phase. With limited tariff barriers imposed by the importing markets, it has to be connected this instability to the NTBs prevalent in the importing countries. In a way, this is emphasized the role of TBT and NTBs in increasing instability.

Report any other analyses performed, including subgroup analyses and adjusted analyses, indicating those that were pre-specified and those that were exploratory (though not necessarily in the level of detail of primary analyses). Consider putting the detailed results of these analyses on the supplemental online archive. Discuss the implications, if any, of the ancillary analyses for statistical error rates.



	India	Kerala	India	Kerala	India	Kerala	India	Kerala	India	Kerala	India	Kerala	India	Kerala	India	Kerala
	Japan		US		EU		China		SEA		MEA		Others		Total	
Phase1	4.2	8.2	9.4	6.2	3.9	1.5	10.1	12.4	2.1	5.0	4.5	7.7	4.3	4.9	1.9	1.6
Phase2	5.2	8.8	1.2	2.5	6.2	8.8	25.5	26.7	20.8	15.1	5.6	19.6	4.1	14.6	2.4	4.2
Total	12.6	10.3	12.0	13.5	3.4	4.6	27.4	34.1	20.6	1.1	4.5	15.9	2.7	10.2	4.9	3.9

Figure 2. CDI for value of marine products exported

Source: Worked out from MPEDA data, 1996-2021

4.4 Gravity Model Explanation of Marine Products Exports from India

The pivotal factors of marine product exports from the country are assessed using a model pattern and the most popular in this respect for evaluating trade is the Gravity model. The analysis also throws light into how the NTBs impact the seafood exports from India. Most of the quality standards imposed on the marine products exported are stringent than the international Codex standards making it tough for the processor to adhere to them so as to annul rejections. Any rejection or return impacts the seafood exports from the country. The EU, which is a major importer of India's seafood in quantity and value has stringent quality standards than other importers. Similar is the case with Japan with regard to quality assessment. The US is strict on certifications like country of origin inter alia many technical barriers. Aim of the gravity model analysis is to evaluate whether the TBTs and NTBs imposed on India's seafood exports impede the trade.

Variables used in the gravity model include: export of seafood from India to major markets, which acts as the dependent variable, Real per capita GDP of India, Real per capita GDP of importing market, distance between capitals of exporting and importing markets (proxy to trade costs), TBTs imposed by the importing countries and level of lead, cadmium and mercury set by the importers, which are taken in log values. Data during the post-WTO phase i.e., 1996-2021 is used.

Table 3 shows the model summary results. Here, R is 0.862 and adjusted R2 is 0.743 which shows that about 74 percent of the variation in dependent variable or in this case export of seafood from India can be explained by the independent variables. The ANOVA results in Table 4 shows that the regression model is statistically significant with an F value of 50.348 and hence a good fit for the data.

The Coefficient Estimates are shown in Table 5. All the variables are giving a robust significant explanation. The Coefficient values for GDP of India and Importing country are positive. As the GDP of exporting country is positive, it is inferred that the country can export more if the GDP further increases as it signifies enhanced production capabilities of the nation. In the case of importing economies, a positive coefficient for GDP indicates overall economic progress and better consumption and hence better prospects for exports to these markets. This is valid especially for high valued items like shrimps. Consumers prefer to high quality and valued items. Quality, safety and nutritional concerns necessitates stringent standards by the importers. However, stricter regulations on the part of the importing country may negatively impact the trade between nations and in fact a constraint to the flow trade of commodities as contemplated in the WTO regime as trade needs to flow uninterruptedly. In the case of India, it has been observed that the coefficient value for GDP of importing country was negative when data up to 2010 was evaluated (Parvathy and Rajasenan, 2012). This implied that higher GDP of the importers negatively affected the exports of seafood from India as the seafood processing units found it difficult initially to adhere to the consumer requirements and stipulations. However, by considering the latest data reveal a positive coefficient. The export processing units have been able to adhere to the quality standards required by the importers to a certain extent. Geographical distance is bound to be important in the logistic chain and hence it could impact the trade cost. Short-distance countries will have a lesser cost of transportation than the economies which are further. The distance coefficient here is negative which implies that distance negatively

impacts trade between countries. The coefficient value of TBT is negative. TBT impede trade between nations and it negatively impacts the quantity exported. Mercury and lead will negatively impact the seafood trade between the nations, coefficient for cadmium is positive indicating that adverse impacts to trade are not present. However, the impact of TBT as an impediment to trade is hampering fisheries trade and this is well understood from the gravity model.

Table 3. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.862[a]	.743	.728	.44787

a. Predictors: (Constant), TBT, Mercury, Lead, LogGDPIn, LogDist, Cadmium, LogGDPImp

Table 4. ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	70.694	7	10.099	50.348	.000[b]
	Residual	24.472	122	.201		
	Total	95.166	129			

a. Dependent Variable: LogExIndia

b. Predictors: (Constant), TBT, Mercury, Lead, LogGDPIn, LogDist, Cadmium, LogGDPImp

Table 5. Gravity Model Parameters[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.238	.745		-.320	.750
	LogGDPIn	.478	.091	.338	5.272	.000
	LogGDPImp	1.737	.197	2.352	8.810	.000
	LogDist	-1.617	.211	-1.242	-7.676	.000
	Lead	-.519	.147	-.242	-3.528	.001
	Cadmium	1.521	.249	.711	6.108	.000
	Mercury	-1.293	.186	-.604	-6.952	.000
	TBT	-.252	.127	-.118	-1.991	.049

a. Dependent Variable: LogExIndia

4.5 Assessment of Marine Products Exports from Kerala During the post-WTO Regime Using Time Series Models

Time series analysis is used to evaluate the marine product exports from Kerala during the post-WTO phase. To assess this quarterly data from 1996-2020 is used. The best fitting model is identified using expert modeler and estimates are generated. Here, model is obtained for quantity and value of marine products exported from Kerala. Mode that best fits the data for both in terms of quantity and value is Simple Seasonal Model. The series in this case has a seasonal effect which is constant over time without trend. Level and season are the smoothing parameters for such model.

As per Table 6 the stationary R-squared for exports in terms of quantity is 0.476 and in terms of value is 0.261. R-squared is 0.909 and 0.966, respectively for exports in quantity and value terms. Ljung-Box Q statistics are insignificant indicating model adequacy. For both quantity and value, the estimates for level and season are statistically significant (see Table 7). One can conclude that the quantity and value of marine products exported from Kerala during the post-WTO phase are impacted by mean export quantity/value and seasonal effect. The forecast values and charting of trend and forecast are shown in Table 8 and Figure 3. The seasonality aspect is evident while analysing the seafood export data during the post-WTO phase based on the quantity and value of seafood exported. There has been a shift in market share, whereas the exports have grown at a constant rate over the period of time.

Table 6. Model Statistics

Model	Number of Predictors	Model Fit statistics		Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	R-squared	Statistics	DF	Sig.	
Q-Simple Seasonal	0	.476	.909	9.985	16	.867	0
V-Simple Seasonal	0	.261	.966	18.477	16	.297	0

Table 7. Exponential Smoothing Model Parameters

Model		Estimate	SE	t	Sig.
Q-Simple Seasonal	Alpha (Level)	.445	.088	5.045	.000
	Delta (Season)	.599	.148	4.054	.000
Q-Simple Seasonal	Alpha (Level)	.600	.088	6.846	.000
	Delta (Season)	1.000	.263	3.806	.000

Table 8. Forecast

Model	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022	Q1 2023
Q-Simple Seasonal	32443.78	29440.94	42823.24	47827.42	32443.78	29440.94	42823.24	47827.42	32443.78
V-Simple Seasonal	1151.00	1120.47	1484.20	1723.09	1151.00	1120.47	1484.20	1723.09	1151.00

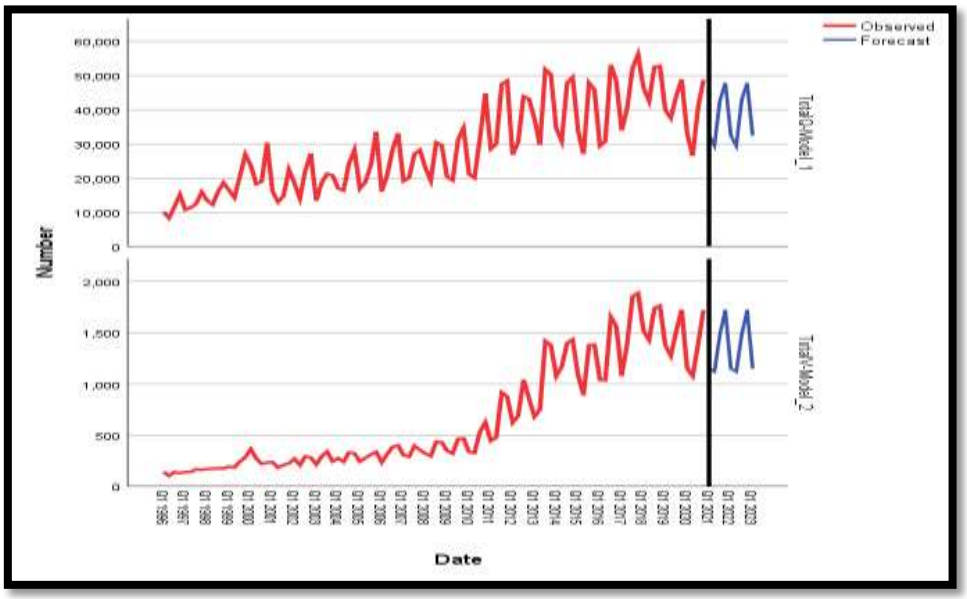


Figure 3. Forecast of Quantity and Value of Marine Products exported from Kerala 1996-2023

5. Conclusion

The paper gives a clear indication that seafood trade is meant for mutual benefit both for the importers and exporters. This seems to be the main agenda that the global trade is meant to gain from the trade and hence the GATT is replaced with WTO and several deliberations have been done to make the free flow of global trade beneficial to the participating countries. However, the stipulations though less in the beginning in comparison to GAAT, soon newer stipulations have been introduced by most of the developed importing countries as these countries have more members in the WTO and Codex committees. These in the case of seafood are TBT, NTBs, SPS and several interlinked stipulations. The paper also analyses, based on seafood export data, in an annual, monthly and quarterly data show wide random oscillations. There are also big differences in quantity and value inferences between and among countries of export and this is mostly done in the post-WTO regime and for analytical reasoning the post-WTO period is dichotomised into two meaningful facets. The indicator highlighting the market share as of CAGR implies market concentration to a larger extent, but market diversification is also probed and emerged mostly under stricter regulations and rejections of consignment and such markets are SEA and China. In spite of these, the US, EU are still the principal markets. But the post-WTO period also has witnessed high level of competition in the seafood export sector. An evaluation of marine products exported from Kerala to major markets viz. the USA, EU, Japan, SEA and China clearly show that the traditional markets still constitute as a major importer of Kerala's seafood, the new markets are also performing well and the exports are increasing. There is a change from traditional to new markets in some cases whereas the US and EU still dominate as major importers of the seafood from India and Kerala. The identification of newer markets is positive,

one issue is that importers like China import the seafood from India and reprocess it and market it as their seafood in the global market. In the Case of Kerala Shrimp holds good market and demand as it is mainly depending on the harvest sector. Nonetheless, the value earnings from Indian seafood export irrespective of regions or countries is mainly from shrimp, despite the anti-dumping duties on the part of the US and some of the EU countries. The Gravity model explanation is giving a clear espousal that the values under stipulations are significantly related.

The instability model also authenticates that there are instabilities in the post-WTO period in varying proportions from market to market and this could in turn force to reorient the fishery trade from the traditional and non-traditional markets. The impact of trade barriers imposed by the importers on marine products exported is also evident. Policy implications of the study shows that market diversification has happened in the post-WTO phase as the result of the chain TBT issues by one importing country to another importing countries. Though the priority towards newer markets have increased, the seafood exporters from Kerala still rely on the traditional markets of EU as most of the Kerala firms have compliance with the TBT and other quality standards. Policy favouring market and product diversification may help to a great extent to the seafood exporting firms.

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