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Indo-China Trade Relationship in Last Quarter Century: *An Empirical Analysis*

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ABSTRACT

Purpose: *The study tries to find pattern in the bilateral trade and impact of macro happenings like GFC, Chinese meltdown, Galwan conflict, COVID-19 on it over the period of 1995 to 2020.*

Design/Methodology/Approach: *The study has two dimensions. The first one analyses the monthly export and import figures between India and China product wise (based on HS Code at two-digit level) from Jan2016 to Jan 2021 whereas second one focus on annual data of Indo-China Export and Import along with their annual GDP for 26 years starting from 1994-1995 to 2019-2020. Bilateral trades are analysed by using four tools namely- Bilateral Trade Dependence Index (BTDI); Trade Intensity Index (TII); Herfindahl Hirschmann Market Concentration Index (HHI); and Index of Export market penetration (IEMP). The study has also used Time series analysis to find the relationship between total bilateral trade and GDP of respective countries using Johansen Cointegration Test, Granger Causality Test, and VAR model.*

Findings: *The annual growth rate of import and export for India with China suggest the short-term impact of macro happenings.*

Research Limitations: *The study has several limitations with respect to availability of very recent data, availability of cost components of trade items in respective countries etc.*

Managerial Implications: *Policy makers for India are suggested to work towards import substitution via various programs like Make-in-India with priority of domestic productions of HS Code 85, 84, 29 which are increasing the trade deficit continuously.*

Originality/Value: *This study is an original effort to highlight the dynamic bilateral trade relationships between India and China in last twenty-five years.*

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Introduction

India and China, the two oldest civilization and trade partners have economic cooperation with each other since ancient time. Their modern economic tie is also seven decades old dated back to the beginning of diplomatic relationship in April 1st , 1950 followed by signing the joint statements advocating the 'five principles of Peaceful Coexistence' by Chinese premier Zhou Enlai on his India's visit in 1954 and by Indian Prime minister Jawahar Lal Nehru (The Hindu, 2020). Prior to 1979, Chinese policies kept the economy poor, stagnant, centralized, inefficient, and isolated from the global economy but afterward they changed their economic policies and philosophies and got ready for an Open economy. They started inviting foreign investments for capacity building, low-cost production not only for self-consumption but also for exports. However, India started its open economy journey a decade late in 1991 under compulsion of Balance of Payments crisis. By that time China had got the momentum of growth and became one of the fastest growing economies of the world. As per International Monetary Fund, (2021) estimates, China has become the largest economy of the world in PPP terms (US$ 26.66 trillion) making USA second (US$ 22.68 trillion). India is at the third position with the GDP of US$ 10.20 trillion in PPP terms. Though, in the nominal term China (US$ 14.34 trillion GDP) is still second to USA (US$21.43 trillion).

With the onset of new millennium these two Asian giants accelerated their economic growth in symbiotic relation and ready to serve as the manufacturing house (China) and Service center (India) for global economy. This was strongly witnessed by reopening Nathu La Pass after 44years on July 6th, 2006 connecting Tibet (in control of China) to Sikkim in India. Their powerful combined representation to the world economy offered for hardware in China and software in India (Khanna, 2007). The projections made by various studies had a consensus about continued faster economic growth of India and China for next few decades (Goldman Sachs, 2007). As per data represented by World Integerated Trade Solution (2018), China is a net service importer country (Service import of US$525.82b compared to US$233.57b of export) whereas India is a net service exporter (import of US$124.18b compared to US$204.96b of export). However, in absolute term even service export of China is more than that of India. Imports and exports of Goods and services (percentage of GDP value) are 23.64% and 19.74% for India whereas the same values for China are 18.73% and 19.51% respectively. This indicates the greater dependency of Indian economy on other countries compared to that of China. Dolla (2011) in his study highlighted the growing technological prowess in India and China and shown the shift of duo economy from technology-importer during 1980s to technology-exporter countries in new millennium. However, his study also found that India's import from China is more technology intensive products compared to its export basket to China. Devadason (2012) through his study pointed out the potential complementary strengths of Indo-China trade and invited the attention towards low level of intra-industry bilateral trade compared to each country's intra industry trade with rest of world.

Increasing US-China rivalry and improving US-India trade relationship motivated China for further strengthening trade ties with India by emphasizing on ""Sino-Indian ties" and highlighting it as the most "important bilateral partnership of the century" (Pandit & Parashar, 2012). This trade relationship kept increasing even under the shadow of continued border conflict and moved from US$ 3 billion in the year 2000-01 to US$ 95.7 billion in 2018-19 (Embassy of India, Beijing, 2021). *This put China as* India's second-largest trading partner just next to USA in 2019 and largest partner in H1 of 2020-21. Even, during the decline in all trade values in 2020-21, trade between these two countries dropped only by 15% compared to drop of 32.46% in overall figures. This may be because of heavily dependence of India on Chinese imports. For example, electronic items (70%), consumer firmness (45%), Active Pharmaceutical Ingredients (APIs) (70%), and leather goods (40%) come from China. India has the third largest industry in the world but 2/3rd of its key ingredients come from China which underlines the relevance of Chinese import for the country. After small decline in bilateral trade during January - March 2020 period, China's share in the Indian import basket again started rising and reached to 18.11% for April-August-2020 period. This may be because of increase in demand for natural chemicals, electrical equipment and machinery, pharmaceutical products, and medical equipment. Monthly trade of September 2020 for organic chemicals, electrical appliances, boilers, and machinery reached almost the same levels as that of previous year (month-on-month basis). Pharma-products' import hit a high, registering a growth of 50.32% as compared to previous year. Many sectors including surgical or medical equipment have also shown growth

in their imports whereas mineral ores and products, and organic chemicals are among other things which constitute the bulk of the exports from India to China in 2019-20.

However, these trades were highly skewed in the favour of China. India's bilateral trade deficit was widening year after year and became highest in 2018-19 (US$63.05 billion trade deficit) (see Figure 1).

There are about 86 'line' items including consumer electronics, computer hardware, telephone equipment, air conditioners and refrigerators, of which India 'relies heavily' on Chinese imports. India's share in global production stands at 2.8% while the consumption is much more. China contributes the largest share to Indian imports, with more than 18% in April-September 2020. This share rose despite the Corona and subsequent lockdown in the country whereas China was able to control the menace and keep its industries operational. There were 119 price tags in which Indian imports exceeded USD 100 million annually in 2018-19 and the imports from one country accounted for more than 50% of total sales of goods in line. 86 such tags were owned by China while 17 lines were owned by South Korea and six by Vietnam. China's advantage in low-cost goods means India's reliance on China could continue in the near future, especially in things like electronics and machinery, even if it could reduce imports of items such as plastics and toys (Nair & Pandey, 2020). Widening trade deficit coupled with depreciating Indian Rupee against USD and other major currencies put India into "Fragile Five" by Morgan Stanlay (Badkar, 2013). This compelled Indian policy makers to revisit the trade positions of India and make a shift to keep the overall current account deficit (as percentage of GDP) under control. The special attention was given to the expanding bilateral deficit with China. Launch of 'Make-in-India' drive on 25th September 2014 by the newly formed Indian government was a step towards it (Mehra, 2014). India wanted to address this issue through friendly talk with China, but it did not work. In the meantime, China also launched "Made in China 2025" in 2015 to transform the country into a hub for advanced manufacturing – pushing for leadership in robotics, information technology and clean energy (Erdenebileg & Hu, 2017). Increasing China's control over global supply chain, dominating attitude towards partners during bilateral trade negotiation and encroachment behaviour jeopardized the Indo – China diplomatic and trade relationship. Growing border tension escalated to a fatal confrontation on 15th June 2020 in the Galwan Valley where 20 Indian soldiers sacrificed their lives (Gettleman et al., 2020). This fueled anti-China sentiments throughout India which resulted into cancellation of INR 471 Crore agreement by the Indian Railways with a Chinese company. BSNL also decided not to use the Gear made by Huawei company of China for its network upgradation. Government of India has asked for a tag on all the products imported to have a Country of Origin. The Power transmission systems based on imported networks from China was blocked by the Department of Energy in the backdrop of cyber security threats, which accounts for about 30% of imports from China. Further, Government announced for banning 59 Chinese app as a gesture of resentment over Galwan issue (The Economic Times, 2021). But matter of fact remains that China is the most important trade partner of India and its economy is heavily dependent on Chinese imports. India's import of semifinished goods, bulk goods and end consumer goods from China is 12%, 30%, and 26% of their respective imports. From electronics and machinery to the API, Indian market is dominated with Chinese products in almost all sectors. This is primarily due to lower cost of production in China compared to India. For example, fertilizer is 76% , electrical circuits- 23%, and data processing units are about 10% cheaper, if made in China than in India (Nash-Hoff, 2011). Even post Wuhan happenings i.e., COVID-19 less than 30% of the companies who are interested to relocate from China has shown India as their preferred destination. Indian government is trying to woo the companies migrating from China through various offers including Production linked incentive scheme (PLI) (BusinessToday.in, 2020). Continued improvements in the 'Ease of Doing Business' rankings is another evidence of efforts made by India. In sum, the existing literature provides a comprehensive body of knowledge on Indo China Bilateral Trade. However, most of the studies have not covered HS Code wise Import and export between the two economies. Further, existing research has not touched upon more recent period particularly after the Chinese meltdown of 2015-2016, Indirect tax reforms of India (Goods and Service Tax Integration) in 2017, Galwan Valley border conflict and the ongoing COVID -19 effects.

In the present study we cover these aspects and check the impacts of all those factors through different Indices and data analysis tools.

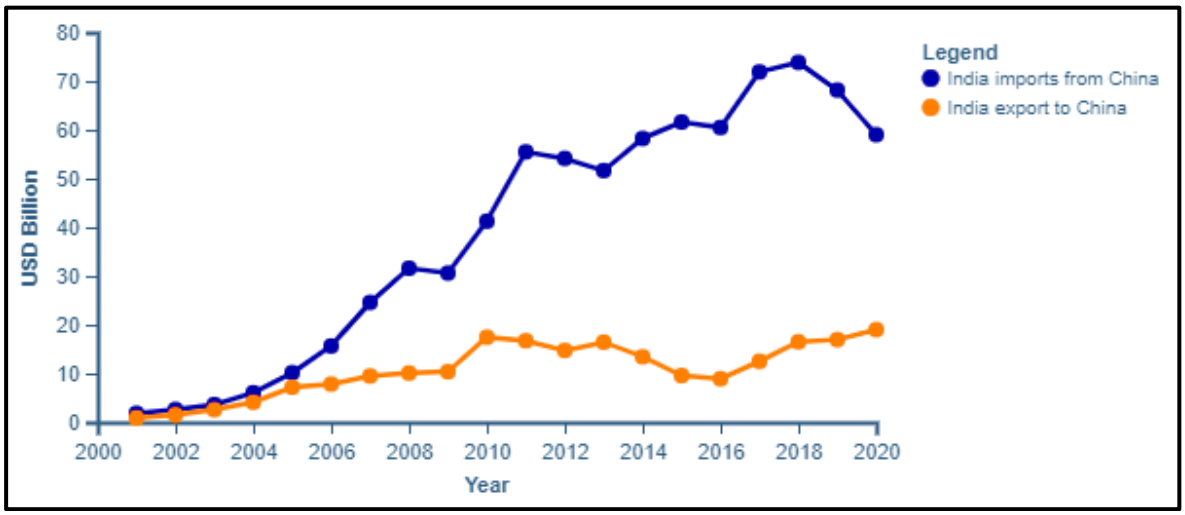

Figure 1: India's Export and Import
Source: www.trademap.org

Thus, this study provides an opportunity to examine the trend of bilateral trade between two countries starting from 1995 i.e., the pre-crisis period, period of Global Financial Crisis and post crisis periods, including the period in and around the Chinese melt down. It also covers the period of recent happenings like launch of make-in-India, Galwan valley conflict and COVID-19. This study also tries to find the changing behaviour of trade at product level based on Harmonized Commodity Description and Coding System (HS code).

This paper is organised in five sections including Introduction. The second section contains data description whereas third section elaborates the methodologies used in the study. Empirical findings and their analyses are explained in fourth section followed by summary and suggestions in the last section.

Data

Two sets of data are taken for the study. The first set is the monthly export and import figures between India and China product wise (based on HS Code at two-digit level) from Jan2016 to Jan 2021 i.e., for 61 months. However, finally only those HS codes which are traded at least for 50% time (minimum for 30 months) are considered. Thus, for export 24 items and for Import 25 items are considered for the study. In the second set, annual data of Indo-China Export and Import is taken for 26 years starting from 1994-1995 to 2019-2020. Along with this annual GDP values for both the countries are taken. Data are extracted from the Department of Commerce under Ministry of Commerce and Industry of Government of India. All monetary data are presented in USD. In addition to this, data required for presentation of Trade Intensity Index (TII), HH Market Concentration Index (HHI), and Index of Export market penetration (IEMP)are collected from World Integrated Trade Solutions (WITS) for the period of 1992 to 2018.

Methodology

First, the descriptive statistics (particularly mean, maximum and volatility) for each item of 2-digit HS Code considered for the study are analysed on monthly data for last five years. Then to understand the trend, and interdependence of bilateral trade between India and China, we first observed the descriptive aspects of the export and import data followed by applying the bilateral trade analysis tools namely

1. Bilateral Trade Dependence Index (BTDI);
2. Trade Intensity Index (TII);
3. Herfindahl Hirschmann Market Concentration Index (HHI);
4. Index of Export market penetration (IEMP)

1. ***Trade Dependence Index (TDI) and Bilateral Trade Dependence Index (BTDI)***

TDI or trade to GDP ratio, is a measure of the degree of openness of the economy. In another word it is the dependence of the economy on the rest of world. The trend of the index indicates the changing dynamics of the economy which is function of many factors, specifically trade restrictions like tariffs, nontariff barriers, foreign exchange regimes, non-trade policies and the structure of national economies.

TDI = [total trade (export + Import) /total GDP] *100

In this study, we additionally calculated the customized version of this index i.e. BTDI. It is measured as the degree of bilateral trade exposure with each other or their relative interdependence.
BTDI = [total trade (export + Import) with each other/total GDP] *100

2. ***Trade Intensity Index (TII)***
It measures the intensity of bilateral trade relationships between two countries compared to their participation in the world trade. It is calculated as the ratio of one country's exports going to a partner country divided by the share of world exports going to that partner country as given below:

$$T_{ab} = (x_{ab}/X_{at})/(x_{wb}/X_{wt})$$

Where:

X_{ab} and x_{wb} are the values of country a's exports and of world exports to country b and

X_{at} and X_{wt} are country a's total exports and total world exports, respectively.

Greater than one value for this index indicates intense bilateral trade relationship i.e., larger than expected bilateral trade flow highlighting the partner country's importance in world trade. A value less than one will represent lower than expected bilateral trade flow.

3. ***HHI or Hirschman-Herfindahl Index***
This index is used to measure the export concentration which in turn reflects their space to develop competence. It reflects the dispersion of trade value across an exporter's partners. The value for the index ranges between 0 to 1. Lower the value more the diversification in terms of number of countries where the exports are made by the country in the reference. Comparing on the basis of HHI, lower valued country will have better trade position than that with higher value. A generalised formula for the HHI can be written as follows:

$HHI = (MS_1)^2 + (MS_2)^2 + (MS_3)^2 + (MS_4)^2 \ldots + (MS_n)^2$

where;
MS= Share of Product Category with code HS
n = Number of products

4. ***Index of Export market penetration (IEMP)***
It is an index which measures the penetration of an exporting country for a particular product among the countries importing that product. It is calculated as the ratio of the number of countries importing the product from the reporting country divided by the number of countries that reported importing that product during the same year. This represents the export market penetration which in turn also indicates the extent of the partnering countries importing from that country. We collected these values for both India and China from WITS and analysed the same to understand the relative penetration of the two economies.

The study has also used **Time series analysis** to find the relationship between total bilateral trade and GDP of respective countries. The Unit Root test using augmented Dickey-Fuller procedure indicated that all three series, namely Total Bilateral Indo China Trade, GDP of India and GDP of China are integrated at the first difference. Thus, Johansen Cointegration Test is performed for the series followed by Granger Causality test. Finally, the Vector Auto Regression (VAR) Estimates are made for the given series. These tests are performed using EViews software.

Unit Root Test- Augmented Dickey-Fuller Test:
It is a test for the presence of unit root in a time series sample. It tests the stationarity or trend-stationarity in the time series. It constructs a parametric correction for higher-order correlation based on assumption that the *y* series follows an AR(p) process. It keeps adding p lagged difference terms of the dependent variable *y* to the right-hand side of the test regression:

$$\Delta y_t = \alpha y_{t-1} + x_t'\delta + \beta_1 \Delta y_{t-1} + \beta_2 \Delta y_{t-2} + \ldots + \beta_p \Delta y_{t-p} + v_t$$

where $\alpha = \rho - 1$. The null and alternative hypotheses may be written as:

$H_0: \alpha = 0$; $H_1: \alpha < 0$

and evaluated using the conventional *t*-ratio for α:

$t_\alpha = \dot{\alpha} / (se(\dot{\alpha}))$

where $\dot{\alpha}$ is the estimate of α and $(se(\dot{\alpha}))$ is the coefficient standard error.

Johansen Cointegration Test:
It is a test to determine if three or more time series stationary at first difference, I(1), are cointegrated to each other. It decides the validity of a cointegrating relationship, using a maximum likelihood estimates (MLE) approach. Presence of Cointegration implies that the series used for test are related to each other and hence may be combined in a linear way.

Granger Causality test:
It is a statistical testing of hypothesis about their cause-effect relationships. If a time series Granger causes another time series, then

forecasting the series will become easy. A time series *X* is said to Granger-cause *Y* if lagged values of *X* (along with lagged values of *Y*) provide statistically significant information about future values of *Y,* usually through a series of t-tests and F-tests.

Vector Auto Regression (VAR)

The VAR is a powerful tool for forecasting the interrelated time series and analyzing the dynamic impact of random disturbances on the system of variables. Since VAR model treats every endogenous variable in the system as a function of the lagged values of all the endogenous variables in the system, requirement of the structural modeling does not arise.

The VAR equation is as:

$$y_t = \alpha_1 y_{t-1} + \ldots\ldots + \alpha_p y_{t-p} + \beta x_t + e_t$$

where y_t is a k vector of endogenous variables, x_t is a d vector of exogenous variables, $\alpha_{1....}\ \alpha_p$ and ß are coefficients, and e_t is a vector of innovations. e_t may be contemporaneously correlated but not correlated either with their own lagged values or with all of the right-hand side variables.

Results

The annual trade data (Export to China, Import from China, total trade value and trade balance) for both the countries is presented in **Figure-1**. From the figure, it is observed 2000 onwards bilateral trade between India and China started increasing and recorded their highest growth rate around 60% during 2003 to 2005 for exports and till 2007 for imports for India. This two additional years of high growth in the import for India put the country into a big trade deficit trap. India is yet to come out of this trap. During the global financial crisis, India's import from China registered a negative growth of 3% (2008 to 2009) but in 2010 bounced back to positive 35%. The post crisis period of 2011to 2012 and 2012 to 2013 realised negative growth of 2.4% and 4.6% respectively in India's import before becoming positive 12.8% in 2014. The impact of Chinese meltdown (2015-16) is felt with negative growth of 2% (approx.) of India's import from China. However, throughout post GFC period India's export to China registered negative growth of more than 10% per annum leading to continued widening of trade deficit which reached to its peak of US$ 63.05 billionin 2018. The negative growth rates for both import and export of India with China in 2020 may be contributed to the impact of Galwan conflict and COVID-19. However, for conclusive remarks on causative relation requires waiting for future trade values and subsequent analysis.

The detailed analysis of monthly data from January 2016 to January 2021 for various HS code items indicates that India's top three imports from China are HS 85 (Electrical Machinery and Equipment) of US$ 111.53 billion, HS 84 (Nuclear Reactors and Boilers) of US$ 64.97 billion and HS29 (organic Chemicals) of US$ 37.93 billion. The volatility, measured through standard deviation for these imported items during the 61 months period are 498.93, 218.88 and 147.33, respectively. These high volatilities reflect the instability in policy and approach towards import of these items from China. Similarly, top three exports to China during the same 61 months period in USD billion are HS29 (organic Chemicals) 11.19, HS26 (Ores, Slags and Ash) 9.94 and HS27 (Mineral Fuels, Mineral oils and Mineral waxes) 8.28 and volatility for these exported items are highest for HS26 (97.81) followed by HS27 (91.29) and HS29 (87.43). It is also interesting to note that there are twelve items at two-digit HS code level numbered 27, 28,29, 32, 38, 39, 48, 71, 72, 84, 85, and 90 where two way trade (both export and import) take place (**see table -1**).

The Trade dependence Index as represented in **Table-2a and Figure -2a** indicates that since the beginning of the sample period (1995) China has four times larger dependence compared to India and the highest value for China is recorded as 63.96% in the year 2006 whereas for India the highest value is 43.62% in 2011. After their respective peak values, it has been reducing continuously indicating their increasing domestic participation in the growing economy.

Table-2b and Figure -2b indicate the gradual increase of trade interdependence as a percentage of GDP since 1995 and peaked in 2010 for China (0.96%) and in 2011 for India (3.96%) before declining further. However, the comparative analysis indicates India's larger dependence (four times) on China than other way round. Decline in the index values in recent period is sharper for China than in India leading to increased dependence of India on China. As per 2020 index value, India (3.02%) is more than five times dependent compared to China (0.56%).

From the TII for both countries (presented in Table -3 and Figure -3) it is observed that the trade intensity gap between them has been

S No	HS Code	Commodity	Total Imports from China	S No	HS Code	Commodity	Total Export to China
1	27	Mineral Fuels	3293.52	1	3	Fish & Crustacean	3119.36
2	28	Inorganic Chem	3675.68	2	9	Coffee Tea	1099.85
3	29	Organic Chem	37930.68	3	15	Animal /Veg Fats	2268.28
4	31	Fertilizers	7972.98	4	25	Salt Sulphur	3191.59
5	32	Tanning/ Dyeing	2543.58	5	26	Ores Slags Ash	9935.58
6	38	Misc. Chemicals	6059.51	6	27	Mineral Fuels Oils	8277.1
7	39	Plastic Articles	11975.43	7	28	Inorganic Chem	337.06
8	48	Paper & Paper board	2260.24	8	29	Organic Chem	11188.45
9	54	Man-made filaments	1913	9	32	Tanning/ Dyeing	1108.08
10	59	Textile Fabrics	2343.31	10	33	Essential Oils	219.67
11	60	Knitted Fabrics	1622.68	11	38	Misc. Chemicals	609.8
12	68	Articles of Stone	2108.66	12	39	Plastic Articles	3754.21
13	70	Glass & Glassware	2675.15	13	41	Raw Hides and Skins	229.11
14	71	Pearls & Prec Stones	1513	14	48	Paper & Paper board	381.45
15	72	Iron & Steel	6862.9	15	52	Cottons	6080.89
16	73	Articles of Iron & Steel	7366.33	16	53	Veg Textile Fibres	286.71
17	76	Aluminium Articles	4242.88	17	67	Feathers Articles	870.89
18	84	Nuclear Reactors	64968.48	18	71	Pearls & Prec Stones	742.62
19	85	Electrical Machinery	111525.7	19	72	Iron & Steel	3867.24
20	87	Vehicles	6688.8	20	74	Copper and Articles	3508.62
21	89	Ships/ Boats	3191.56	21	76	Aluminium Articles	285.01
22	90	Optical Photographic	7675.53	22	79	Zinc and Articles	352.16
23	94	Furniture Beddings	4644.63	23	84	Nuclear Reactors	3589.64
24	95	Toys & Games	1909.64	24	85	Electrical Machinery	2914.58
25	98	Project Goods	2803.92				

Table-1 Item Wise (HS Code two digits) India's Import from and Export to China During Jan2016 to Jan2021 (Cumulative in USD Million)

Year	TDI of India	TDI of China	Year	TDI of India	TDI of China
1995	9.94672	38.23604	2008	41.19723	55.74467
1996	18.72855	33.56076	2009	35.28288	43.19417
1997	18.58779	33.81454	2010	37.4006	48.7453
1998	18.18663	31.49003	2011	43.62379	48.093
1999	19.12095	32.96443	2012	43.28742	45.17459
2000	20.57717	39.15452	2013	41.18037	43.29031
2001	19.88452	38.05082	2014	37.191	41.03578
2002	22.4638	42.21319	2015	30.59844	35.72659
2003	23.68134	51.25545	2016	29.03003	32.93333
2004	27.87716	59.04604	2017	29.57174	33.56154
2005	31.18506	62.20154	2018	31.25221	33.32767
2006	33.9176	63.96485	2019	27.45411	31.91164
2007	34.53352	61.26304	2020		31.56929
Note: The table presents the trade dependence of India and China on rest of world					

Table 2a: Trade Dependence Index (TDI)

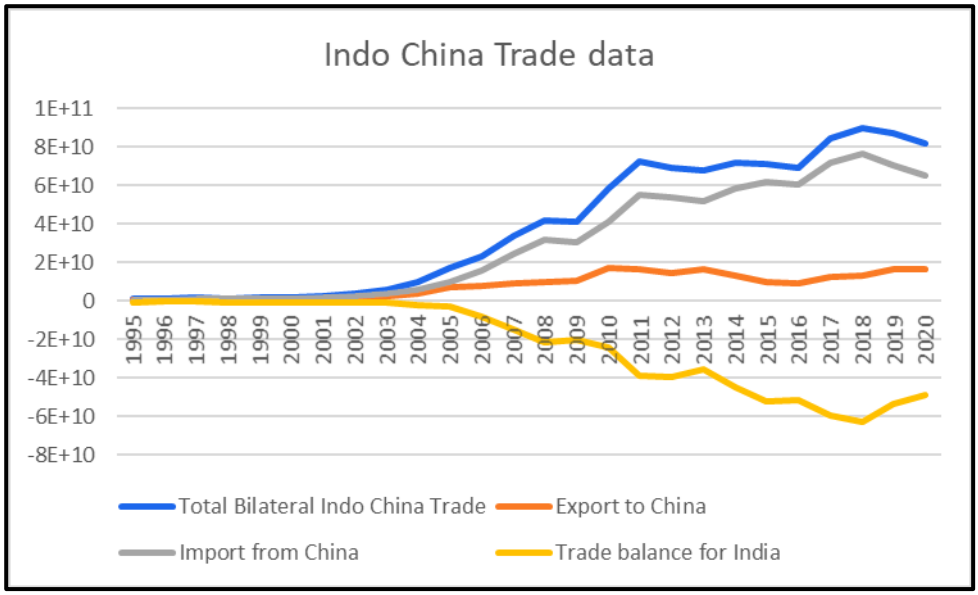

Figure 1: Bilateral Indo China Trade data along with India's trade deficit

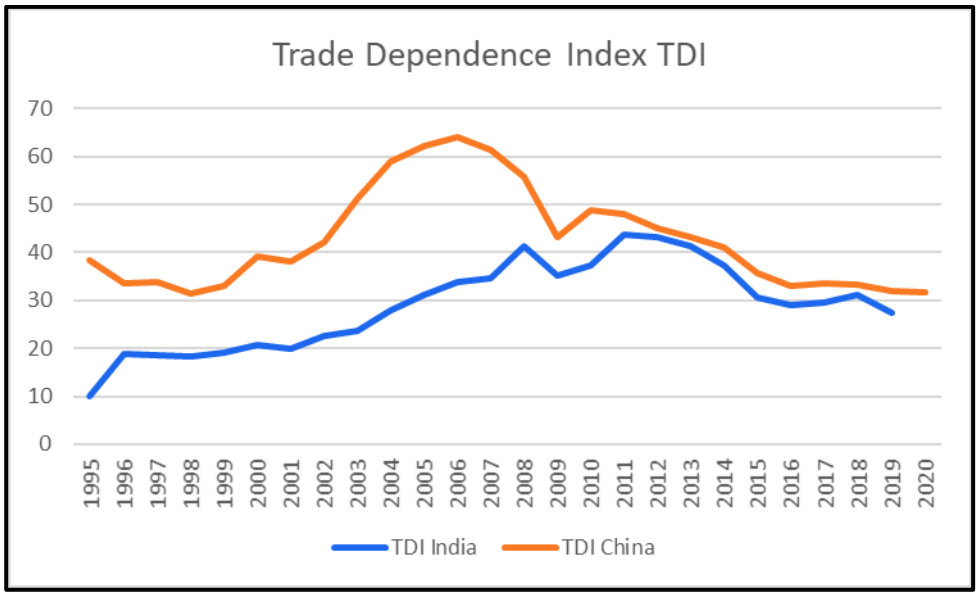

Figure 2b: TDI for India and China calculated by total trade percentage of GDP

increasing after 2006 proving the dominance of Chinese trade intensity in India.

HHI values for both economies are given in Table - 4 and Figure-4. It is evident from the values that India has been more diversified compared to China since the beginning of the study period (1992). However, after 2006 HHI for China also got reduced indicating its expansion and diversification of international trade in terms of increasing number of partner countries and number of products. It is further substantiated with the facts that both China and India are exporting and importing more than 4400 products (China: export of 4416 and

Year	BTDI of India with China	BTDI of China with India	Year	BTDI of India with China	BTDI of China with India
1995	0.321210659	0.155446	2008	3.511508839	0.906439
1996	0.353740707	0.158761	2009	3.095564302	0.802031
1997	0.445671001	0.19017	2010	3.54270809	0.962019
1998	0.36674991	0.148166	2011	3.960440716	0.953454
1999	0.405763529	0.167906	2012	3.768239511	0.804502

2000	0.478737008	0.182645	2013	3.665183288	0.708345
2001	0.574173253	0.205323	2014	3.51448346	0.68367
2002	0.817104263	0.282306	2015	3.38571712	0.643318
2003	1.031080842	0.372362	2016	3.051546463	0.620134
2004	1.450612091	0.519078	2017	3.245823828	0.689819
2005	2.14499077	0.759016	2018	3.321383801	0.645891
2006	2.55001734	0.852729	2019	3.033333566	0.607196
2007	2.836351356	0.959065	2020	3.022534213	0.556206
Note: The table presents the bilateral trade dependence index for Indo China trade with respect to their size of economy measured in terms of respective GDP					

Table-2b: Bilateral Trade Dependence Index (BTDI)

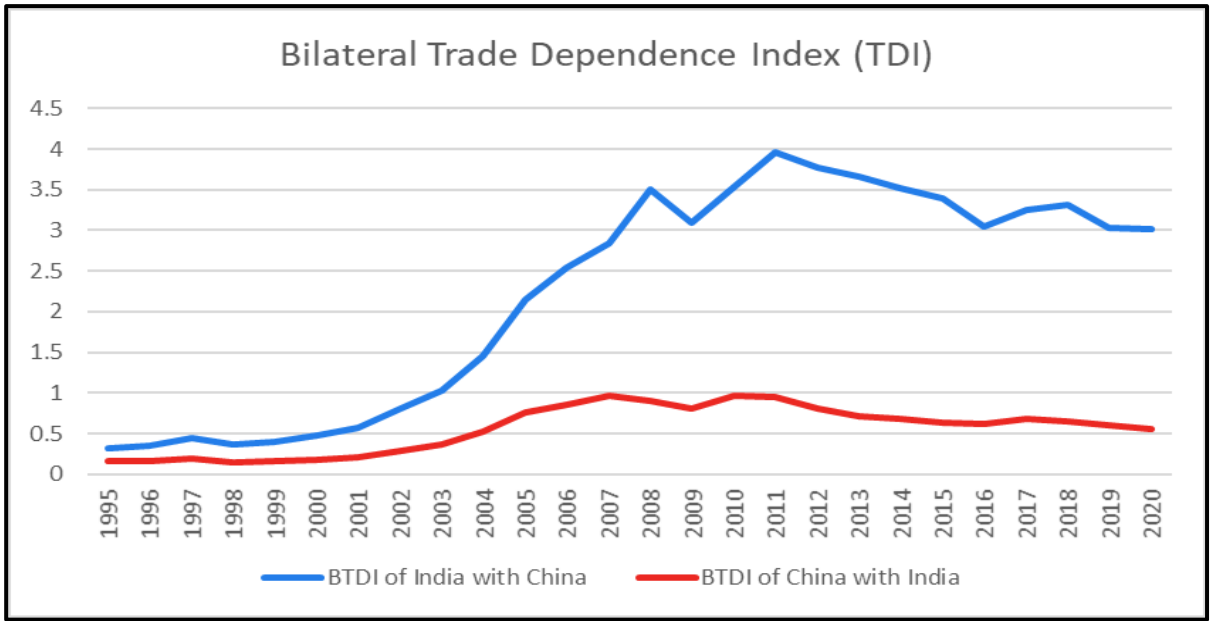

Figure 2b: BTDI for India and China calculated by total trade with each other to their respective GDP

Year	TII India with China	TII of China with India	Year	TII India with China	TII of China with India
1995	0.370994	0.696875	2008	0.776761	1.173985
1996	0.661117	0.639562	2009	0.724409	1.109272
1997	0.768896	0.776562	2010	0.765259	1.081956
1998	0.482998	0.742366	2011	0.57476	1.095411
1999	0.485975	0.730637	2012	0.499196	0.996917
2000	0.517153	0.828139	2013	0.507447	0.983942
2001	0.59182	0.91472	2014	0.419958	1.054661
2002	0.711959	0.947752	2015	0.359898	1.177435
2003	0.823396	0.8922	2016	0.326555	1.203538
2004	0.89378	0.935033	2017	0.396034	1.21063
2005	1.108982	0.939509	2018	0.364875	1.148756
2006	0.949032	1.05393	2019	0.641718	1.477925
2007	0.853279	1.122293			
Note: TII is the ratio of one country A's export to B as a fraction of A's total export to B's total import as a fraction of world's export.					

Table-3: Trade Intensity Index (TII)

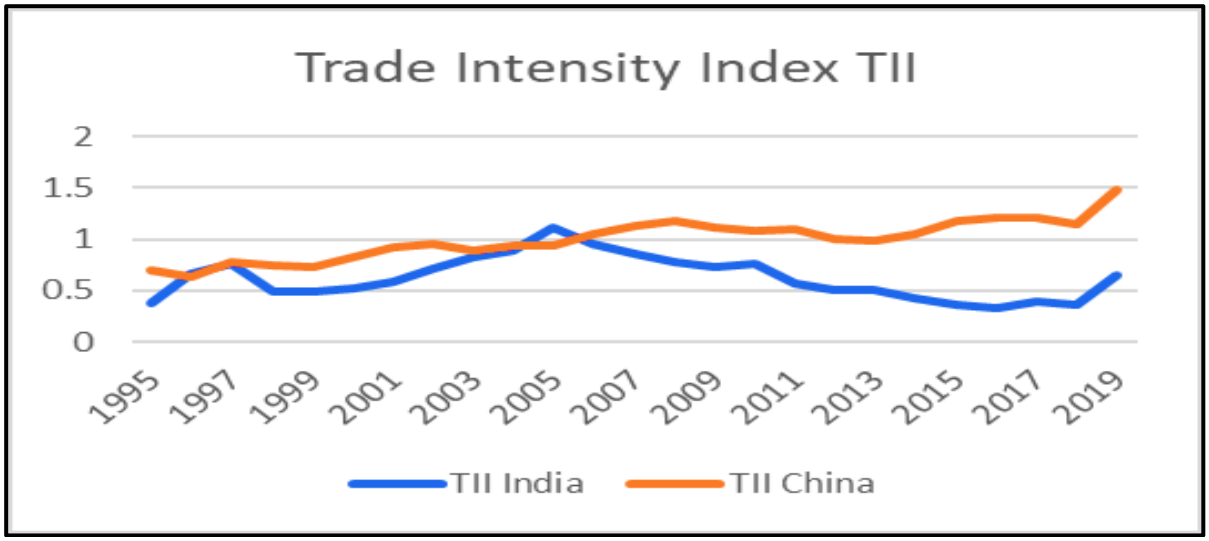

Figure 3 Trade Intensity Index of India and China

Year	HHI India	HHI China	Year	HHI India	HHI China
1992	0.12	0.19	2006	0.05	0.09
1993	0.09	0.21	2007	0.05	0.07
1994	0.08	0.19	2008	0.04	0.07
1995	0.07	0.17	2009	0.04	0.07
1996	0.06	0.17	2010	0.04	0.06
1997	0.06	0.16	2011	0.04	0.06
1998	0.07	0.16	2012	0.04	0.06
1999	0.08	0.15	2013	0.04	0.06
2000	0.07	0.13	2014	0.04	0.06
2001	0.06	0.12	2015	0.05	0.07
2002	0.07	0.12	2016	0.05	0.07
2003	0.06	0.11	2017	0.05	0.06
2004	0.06	0.1	2018	0.05	0.06
2005	0.06	0.09			

Table-4: Herfindahl Hirschmann Market Concentration Index (HHI)

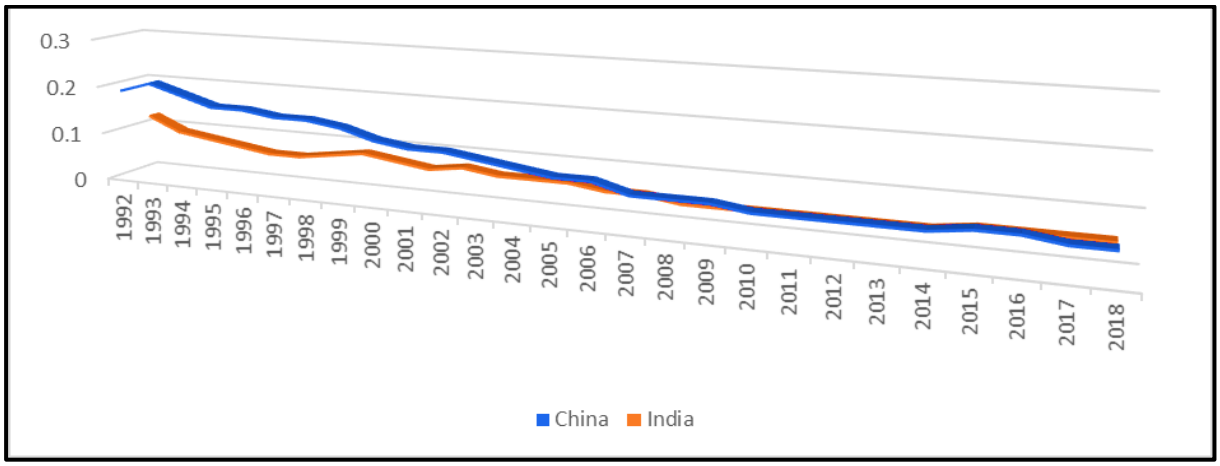

Figure-4: HHI Market Concentration

Year	IEMP India	IEMP China	Year	IEMP India	IEMP China
1992	7.44	12.15	2006	23.8	48.43
1993	8.34	13.85	2007	25.01	51.01
1994	9.82	16.24	2008	25.79	51.21
1995	10.33	17.84	2009	25.78	51.67
1996	11.29	19.34	2010	27.08	53.61
1997	12.31	21.89	2011	26.91	53.48
1998	13.18	23.69	2012	27.46	53.42
1999	14.06	25.47	2013	28.53	54.21
2000	16.64	30.96	2014	28.25	53.8
2001	17.59	33.6	2015	28.12	52.67
2002	18.61	35.68	2016	28.62	52.63
2003	19.86	38.95	2017	29.53	53.57
2004	20.5	41.67	2018	27.15	47.41
2005	22.97	45.14			

Table-5: Index of Export market penetration (IEMP)

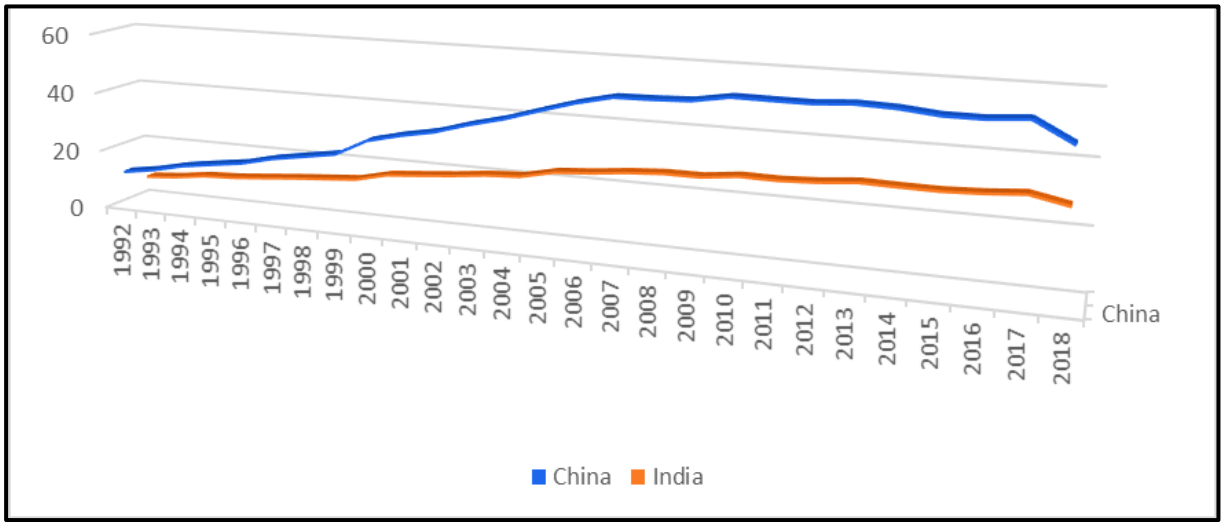

Figure 5: Index of Export Market Penetration

Trend assumption: Linear deterministic trend				
Series: TOTAL_BILATERAL_INDO_CHI GDPCHGDPIN				
Lags interval (in first differences): 1 to 1				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.763409	45.90312	29.79707	0.0003
At most 1	0.371008	11.30899	15.49471	0.1932
At most 2	0.007543	0.181728	3.841466	0.6699
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.763409	34.59413	21.13162	0.0004
At most 1	0.371008	11.12726	14.26460	0.1479
At most 2	0.007543	0.181728	3.841466	0.6699

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table-6: Johansen Cointegration Test

Pairwise Granger Causality Tests			
Sample: 1995 2020			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
GDPCH does not Granger Cause TOTAL_BILATERAL_INDO_CHI	24	3.92594	0.0374
TOTAL_BILATERAL_INDO_CHI does not Granger Cause GDPCH		14.7763	0.0001
GDPIN does not Granger Cause TOTAL_BILATERAL_INDO_CHI	24	5.94516	0.0099
TOTAL_BILATERAL_INDO_CHI does not Granger Cause GDPIN		0.33608	0.7187
GDPIN does not Granger Cause GDPCH	24	12.9562	0.0003
GDPCH does not Granger Cause GDPIN		0.01538	0.9848

Table-7 Pairwise Granger Causality Tests

Sample (adjusted): 1997 2020		
Included observations: 24 after adjustments		
Standard errors in ( ) & t-statistics in [ ]		
	TOTAL_BILATERAL_INDO_CHI	GDPIN
TOTAL_BILATERAL_INDO_CHI(-1)	0.638833	0.723907
	(0.26992)	(6.56045)
	[2.36678]	[0.11034]
TOTAL_BILATERAL_INDO_CHI(-2)	0.591884	3.515801
	(0.32225)	(7.83250)
	[1.83671]	[0.44887]
GDPIN(-1)	0.055771	1.091546
	(0.01686)	(0.40978)
	[3.30801]	[2.66376]
GDPIN(-2)	-0.069030	-0.253603
	(0.02030)	(0.49337)
	[-3.40076]	[-0.51403]
C	6.75E+09	1.32E+11
	(3.6E+09)	(8.7E+10)
	[1.88173]	[1.50991]
R-squared	0.981321	0.982921
Adj. R-squared	0.977388	0.979325
Sum sq. resids	4.76E+20	2.81E+23
S.E. equation	5.01E+09	1.22E+11
F-statistic	249.5444	273.3703
Log likelihood	-567.2712	-643.8480
Akaike AIC	47.68926	54.07067
Schwarz SC	47.93469	54.31610
Mean dependent	4.21E+10	1.41E+12
S.D. dependent	3.33E+10	8.46E+11
Determinant resid covariance (dof adj.)		6.13E+40
Determinant resid covariance		3.84E+40
Log likelihood		-1189.504
Akaike information criterion		99.95869
Schwarz criterion		100.4495

Table -8: Vector Autoregression Estimates between Total bilateral Indo-China trade and GDP of India

Vector Autoregression Estimates		
Sample (adjusted): 1997 2020		
Included observations: 24 after adjustments		
Standard errors in ( ) & t-statistics in [ ]		
	TOTAL_BILATERAL_INDO_CHI	GDPCH
TOTAL_BILATERAL_INDO_CHI(-1)	1.833975	73.51111
	(0.29578)	(14.1336)
	[6.20057]	[5.20116]
TOTAL_BILATERAL_INDO_CHI(-2)	-0.313521	-29.23200
	(0.26993)	(12.8986)
	[-1.16149]	[-2.26630]
GDPCH(-1)	-0.016751	0.177331
	(0.00600)	(0.28694)
	[-2.78954]	[0.61801]
GDPCH(-2)	0.013856	0.600617
	(0.00519)	(0.24788)
	[2.67114]	[2.42300]
C	6.17E+09	3.44E+11
	(2.1E+09)	(1.0E+11)
	[2.94779]	[3.43981]
R-squared	0.978512	0.997717
Adj. R-squared	0.973988	0.997236
Sum sq. resids	5.48E+20	1.25E+24
S.E. equation	5.37E+09	2.57E+11
F-statistic	216.2993	2075.927
Log likelihood	-568.9525	-661.7535
Akaike AIC	47.82937	55.56279
Schwarz SC	48.07480	55.80822
Mean dependent	4.21E+10	6.20E+12
S.D. dependent	3.33E+10	4.88E+12
Determinant resid covariance (dof adj.)		1.01E+42
Determinant resid covariance		6.33E+41
Log likelihood		-1223.122
Akaike information criterion		102.7602
Schwarz criterion		103.2511

Table -9: Vector Autoregression Estimates between Total bilateral Indo-China trade and GDP of China

Vector Autoregression Estimates		
Sample (adjusted): 1997 2020		
Included observations: 24 after adjustments		
Standard errors in ( ) & t-statistics in [ ]		
	GDPCH	GDPIN
GDPCH(-1)	0.906291	-0.008567
	(0.27952)	(0.12962)
	[3.24232]	[-0.06610]
GDPCH(-2)	-0.182529	-0.001216
	(0.18211)	(0.08445)
	[-1.00230]	[-0.01440]
GDPIN(-1)	2.980770	1.070496
	(0.61888)	(0.28699)
	[4.81639]	[3.73004]
GDPIN(-2)	-1.271968	0.001302
	(1.05423)	(0.48888)
	[-1.20654]	[0.00266]
C	-3.57E+11	5.66E+10
	(2.5E+11)	(1.1E+11)

	[-1.44042]	[0.49264]
R-squared	0.997532	0.982345
Adj. R-squared	0.997012	0.978629
Sum sq. resids	1.35E+24	2.91E+23
S.E. equation	2.67E+11	1.24E+11
F-statistic	1919.927	264.3021
Log likelihood	-662.6887	-644.2458
Akaike AIC	55.64073	54.10382
Schwarz SC	55.88615	54.34925
Mean dependent	6.20E+12	1.41E+12
S.D. dependent	4.88E+12	8.46E+11
Determinant resid covariance (dof adj.)		8.35E+44
Determinant resid covariance		5.23E+44
Log likelihood		-1303.728
Akaike information criterion		109.4773
Schwarz criterion		109.9682

Table -10: Vector Autoregression Estimates between GDP of India and GDP of China

import of 4429products; India: export of 4450 and import of 4343 products). Both the countries have more than 215 trade partners (WITS).
Index of Export market penetration (IEMP) is only 27.15 for India as compared to 47.41 for China indicating the comparatively lower presence of India in global export market as represented by Table-5 and Figure -5. The highest IEMP for India (29.53) was in 2017 and for China (54.21) in 2013.

Under the Time series analysis first Unit root test is performed and it is found that total bilateral trade between India and China, GDP of India, and GDP of China all three series are stationary at first difference. Then Johansen Cointegration test is run for these three series and results (see Table-6) indicate the presence of cointegration among thembecause the null hypothesis of no cointegration is rejected (Both Trace test and Max-eigenvalue test indicate 1 cointegrating equation at less than 0.05 probability) inferring that even if there are shocks in the short run which may affect movement in the given series,its long run impact will get nullified as they would converge with time. This substantiates the findings of trend analysis presented in the first paragraph of this section in terms of growth rate where after every shock growth in trade turns negative but rebound to positive without lags.

Pairwise Granger Causality Test is performed for these three series and result (see table-7) states that total bilateral Indo-China trade and GDP of China have bidirectional causality but stronger from trade to GDP whereas in the case of India this relationship is unidirectional from GDP to bilateral trade. It is also interesting to note that GDP of India have Causality relation with GDP of China but not the vice-versa.

Vector Auto Regression (VAR) Estimates are run for the given series and the resultsare recorded in Table -8 (VAR between Total bilateral Indo-China trade and GDP of India), Table – 9 (VAR between Total bilateral Indo-China trade and GDP of China). The result in table -8 &9 confirms the Granger Causality test results i.e. unidirectional causative relation of GDP of India with its the total bilateral trade values and bidirectional causative relationship between total bilateral trade values and GDP of China. Table -10 records the VAR between GDP of India and GDP of China and the result of this estimate also confirms the result of Granger Causality test by indicating the unidirectional impact of GDP of India on the GDP of China.

Summary and Suggestions

This paper aims to study dynamic relationship of bilateral trade (export and Import) between India and China over the period of 1995 to 2020. These two economies are connected to each other from ancient time and has continuously engaged on economic front ignoring their border disputes and competition to dominate the global supply -chain network specially in Asian region. This study has tried to observe the impacts of various happenings like the pre-crisis period, period of Global Financial Crisis and post crisis periods, and Chinese melt down on the bilateral trade relations. The period of study also covers the recent happenings like launch of make-in-India, Galwan valley conflict and COVID-19. Further, the study tries to find the nature and trade pattern of specific item (based on two-digit HS Code) in recent past on high frequency

(monthly) data starting from January 2016 to January 2021. The data are collected from Department of Commerce, Ministry of Commerce and Industry Government of India. In addition, World International Trade Solutions (WITS) is also used for data collection.

The trend analysis of annual trade values indicates the acceleration in bilateral trade after 2000 but in very skewed manner. Trade deficit for India kept increasing because of excessive import of high value-added products and export of low value raw materials. The impacts of various macro-economic happenings like GFC, Chinese meltdown are observed on the bilateral trade but only for shorter periods. Trade positions have rebound after every shock without long lag. However, import export gap has started reducing after touching the deficit of US$ 63.05 billion in 2018, which became the highest trade deficit value for India against China. The product wise analysis on monthly data for last five years highlights that Electrical Machinery and Equipment; Nuclear Reactors and Boilers; and Organic Chemicals with HS Code 85, 84 and 29 respectively are three largest importing items whereas Organic Chemicals; Ores, Slags and Ash; and Mineral Fuels, Mineral oils and Mineral waxes with HS Code 29, 26, and 27 respectively are three largest exporting items. It is also found that one dozen products at two-digit HS code have two-way trade between these two economies. The bilateral trade analysis using indices namely TDI & BTDI; TII; and IEMP prove the trade dominance of China over India whereas HHI indicates that India is more diversified compared to China since the beginning of the sample period.

The Time series analysis performed for the total Indo -China bilateral trade; GDP of India and GDP of China for better understanding of the trade relations between these economies. Augmented Dickey Fuller - Unit Root test finds all three series stationaries at the first level. The Johansen Cointegration test finds the cointegrating equation which implies that even if there are shocks in the short run, which may affect movement in the given series, but will fail to impact in the long run as they would converge with time. Paired Granger Causality test observes bidirectional causality between total bilateral Indo-China trade and GDP of China but stronger from trade to GDP whereas it is unidirectional from GDP to bilateral trade for India. It is also noted that GDP of India have Causality relation with GDP of China but not the vice-versa. Results of VAR Estimates confirm the Granger Causality tests for all the three pairs.

From the study it is clear that 'Make-in-India' drive has not shown any significant effect on the India's overall trade positions and specially on Indo-China bilateral trade. Main reason for continued trade deficit for India is the inability to add the value through cost effective process as evident from the nature of the products imported and exported. HS85 is the prime item which India should consider on priority basis for import substitution. It has contributed approximately on an average more than US$21billion per annum in bilateral trade deficit. Similarly, HS29 is another item of concerns where import substitution may easily be achieved as this item is in the top list of export from India. HHI indicates sufficient diversification in terms of markets or products so more trade intensity and export penetration through volume and value-added itemsis required. Policy makers should focus on R&D, local innovations and congenial environment for cost effective production.
This study may further be extended by analysing at 4 & 6-digit level of HS Code items. The study may be conducted in the area where feasibility may be tested for substituting China by other countries or trading blocks like ASEAN.

Note:
In March 2020, the government had announced a production linked incentive scheme (PLI) for large scale electronics manufacturing to boost domestic manufacturing and attract large investments in mobile phone manufacturing and specified electronic components. The scheme extended an incentive of 4 per cent to 6 per cent on incremental sales (over base year) of goods manufactured in India and covered under target segments, to eligible companies, for a period of five years subsequent to the base year as defined. Later such incentives were also extended to other sectors including pharma, auto, textiles, and food processing under the program.

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